EXHIBIT B

ANDURIL-216 SATELLITE ORBITAL DEBRIS ASSESSMENT REPORT

File Number: SAT-LOA-20260104-00002
Exhibit B – Orbital Debris Assessment Report
Date: January 30, 2026

This report is presented as compliance with NASA STD-8719.14C, Appendix A.

Document data is restricted.

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DAS software version used in analysis: v3.2.6

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Self-Assessment Evaluation

A self-assessment is provided below in accordance with the assessment format provided in Appendix A.2 of NASA STD-8719.14C.

Requirement		Status
#	Description	
4.3-1.a	All debris released during the deployment, operation, and disposal phases shall be limited to a maximum orbital lifetime of 25 years from date of release.	Compliant
4.3-1.b	The total object-time product shall be no larger than 100 object-years per mission.	Compliant
4.3-2	For missions leaving debris in orbits with the potential of traversing geostationary orbit (GEO), released debris with diameters of 5 cm or greater shall be left in orbits which will ensure that within 25 years after release the apogee will no longer exceed GEO-200 km.	N/A
4.4-1	For each spacecraft employed for a mission, the program or project shall demonstrate…that the integrated probability of explosion for all credible failure modes of each spacecraft is less than 0.001.	Compliant
4.4-2	Design of all spacecraft shall include the ability and a plan to deplete all onboard sources of stored energy and disconnect all energy generation sources when they are no longer required for mission operations or post-mission disposal or control to a level which cannot cause an explosion or deflagration large enough to release orbital debris or break up the spacecraft.	Compliant
4.4-3	Planned explosions or intentional collisions shall: a) be conducted at an altitude such that for orbital debris fragments larger than 10 cm the object-time product does not exceed 100 object-years, and b) not generate debris larger than 1 mm that remains in Earth orbit longer than one year.	N/A
4.4-4	Immediately before a planned explosion or intentional collision, the probability of debris, orbital or ballistic, larger than 1 mm colliding with any operating spacecraft within 24 hours of the breakup shall be verified to not exceed 10-6.	N/A
4.5-1	For each spacecraft in or passing through LEO, the program shall demonstrate that, during the orbital lifetime of each spacecraft, the probability of accidental collision with space objects larger than 10 cm in diameter is less than 0.001.	Compliant
4.5-2	For each spacecraft, the program shall demonstrate that, during the mission of the spacecraft, the probability of accidental collision with orbital	Compliant

Requirement		Status
#	Description	
	debris and meteoroids sufficient to prevent compliance with the applicable post-mission disposal requirements is less than 0.01.	
4.6-1 (a-c)	A spacecraft with a perigee altitude below 2,000 km shall be disposed of by one of the following three methods: a) leave the space structure in an orbit in which natural forces will lead to atmospheric reentry within 25 years, b) maneuver the space structure into a controlled de-orbit trajectory, c) maneuver the space structure into an orbit with perigee altitude above 2,000 km and apogee less than GEO-500 km.	Compliant
4.6-2	A spacecraft or orbital stage in an orbit near GEO shall be maneuvered at end of mission (EOM) to a disposal orbit above GEO.	N/A
4.6-3	For space structures between LEO and GEO, a spacecraft shall be left in an orbit with a perigee greater than 2,000 km above the Earth's surface and apogee less than 500 km below GEO, and a spacecraft shall not use nearly circular disposal orbits near regions of high-value operational space structures.	N/A
4.6-4	NASA space programs shall ensure that all post-mission disposal operations to meet the above requirements are designed for a probability of success of no less than 0.90 at EOM.	Compliant
4.7-1	For uncontrolled reentry, the risk of human casualty from surviving debris shall not exceed 0.0001.	Compliant
4.8-1	Intact and remnants of severed tether systems in Earth orbit shall meet the requirements limiting the generation of orbital debris from on-orbit collisions and the requirements governing post-mission disposal.	N/A

This ODAR follows the format recommended in NASA-STD-8719.14C, Appendix A.1, sections 1 through 8. Sections 9 through 14 apply to launch vehicles and are not covered here.

Section 1: Program Management and Overview

a. Identification of the HQ Mission Directorate sponsoring the mission, and the mission's Program Executive.

None—The mission is a commercial effort and is not sponsored by NASA.

b. Identification of the responsible program/project manager and senior scientific and management personnel.

Anduril Industries, Inc. ("Anduril"). Anduril is a U.S. company based in Costa Mesa, California.

c. Identification of any foreign government or space agency participation in the mission and a summary of NASA's responsibility under the governing agreement(s).

None.

d. Clear schedule of mission design and development milestones from NASA mission selection through proposed launch date, including spacecraft PDR and CDR (or equivalent) dates.

Please responses below.

e. Brief description of the mission.

The ANDURIL-216 satellite is expected to launch in June 2026 into a circular orbit at a nominal altitude of 550 km and inclination of 97.7° and operate for five years before being decommissioned. The ANDURIL-216 satellite will be equipped with Electro-Optical and Long-Wave Infrared sensor payloads to perform testing and demonstration activities associated with geospatial awareness and space domain awareness sensing. Anduril has begun constructing the ANDURIL-216 satellite and understands that such construction is at its own risk.

f. Identification of the anticipated launch vehicle and launch site.

The ANDURIL-216 satellite is anticipated to launch from the Vandenberg Space Force Base in California, using the SpaceX Falcon 9 launch vehicle as part of the Transporter-17 mission. Exact launch date and location is subject to confirmation by the launch provider.

g. Identification of the proposed launch date and mission duration.

The Launch is expected to occur in June 2026, subject to changes to the Transporter-17 mission schedule. Nominal mission duration is five years.

h. Description of the launch and deployment profile, including all parking, transfer, and operational orbits with apogee, perigee, and inclination.

The launch vehicle will deliver the ANDURIL-216 satellite directly into its operational circular orbit at a nominal altitude of 550 km and an inclination of 97.7 degrees. Orbital insertion tolerance from the launch vehicle provider has an altitude of ±20km and inclination tolerance of 0.1 degrees. The insertion orbit that is ultimately realized is subject to change by the launch provider, SpaceX.

i. Description of the spacecraft's maneuver capability, including both attitude and orbit control. Give the time period during which the capabilities will be exercised.

The ANDURIL-216 satellite employs Reaction Wheel Assemblies ("RWAs") and magnetorquers for altitude control. The satellite does not carry any propulsion system.

j. Reason for selection of operational orbit(s) (such as ground track, SSO, GEO, instrument resolution, co-locate with other spacecraft, etc.).

The orbit was selected to support the geospatial awareness and space domain awareness purposes of the mission, as well as commercial accessibility of the orbit due to the availability of rideshare launches.

k. Identification of any interaction or potential physical interference with other operational spacecraft.

The ANDURIL-216 satellite is not expected to interact with or have physical interference with other operational spacecraft.

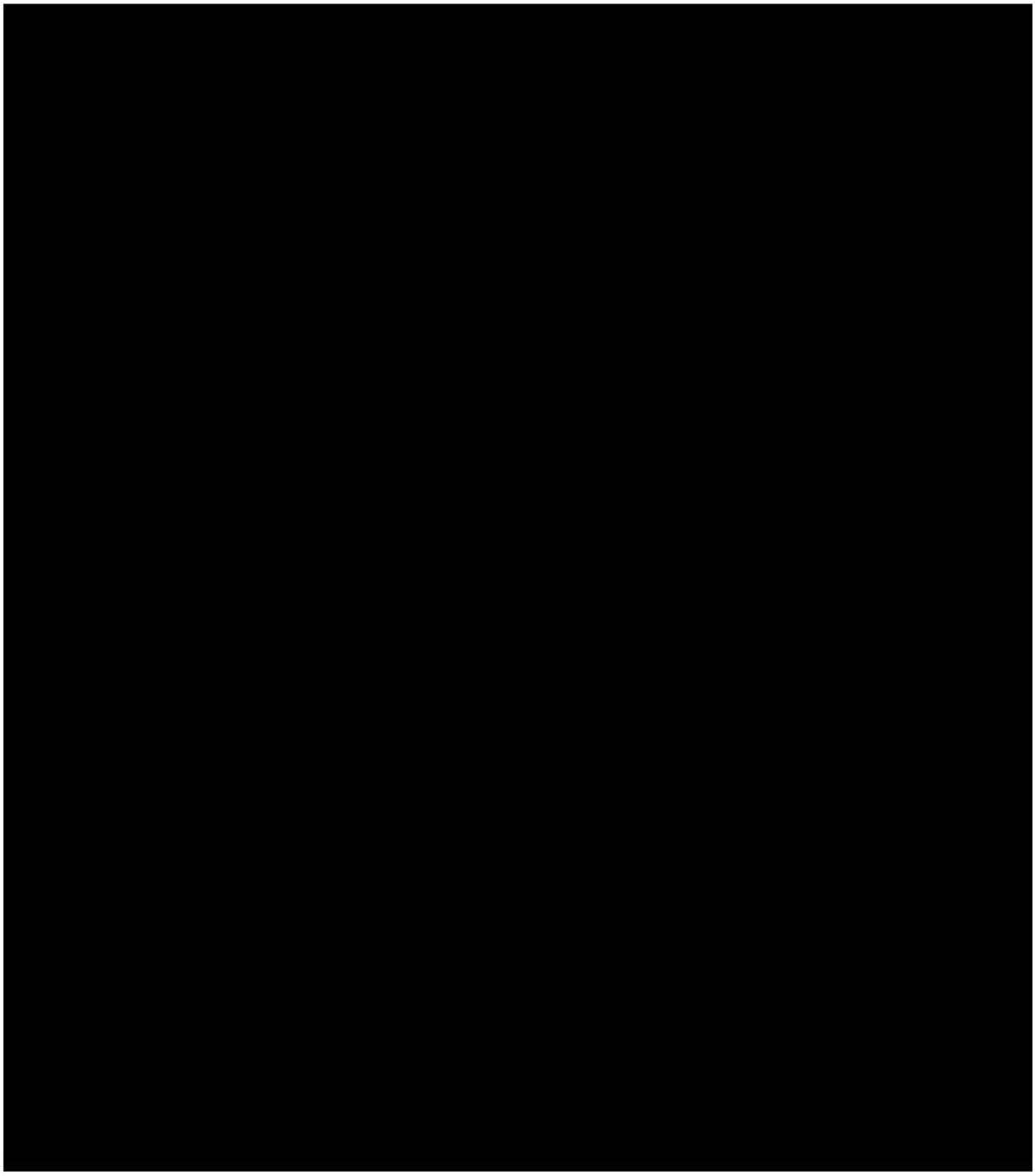
Section 2: Spacecraft Description

a. Physical description of the spacecraft, including spacecraft bus, payload instrumentation, and all appendages, such as solar arrays, antennas, and instrument or attitude control booms.

The ANDURIL-216 satellite is based on Apex's Aries spacecraft bus platform. Basic physical dimensions are 249 x 88 x 117 cm (solar arrays deployed). The satellite is composed of the Aries spacecraft bus, two deployable solar panels, exterior optical sensor payloads, a payload data processor, and miscellaneous support elements. The solar panels generate 250 W Orbit Average Power of electrical DC power, which is stored in a 60 Ahr commercial off-the-shelf Li-Ion unpressurized battery assembly. The solar array is deployed using a holdown mechanism. The bus is 3-axis stabilized, employing star trackers and sun sensors for attitude knowledge and RWAs and magnetorquers for attitude control.

b. Detailed illustration of the entire spacecraft in the mission operation configuration with clear overall dimensional markings.

Anduril is submitting these figures subject to the Request for Confidential Treatment submitted concurrently herein. These figures are proprietary and confidential and not subject to public disclosure. Figures do not use a consistent scale. **[BEGIN CONFIDENTIAL INFORMATION]**



[END CONFIDENTIAL INFORMATION]

c. Total spacecraft mass at launch, including all propellants and fluids.

208.8 kilograms. This mass included 2.5 kilograms of launch leave-behind mass, resulting in a spacecraft fly-away mass of 206.3 kilograms.

d. Dry mass of spacecraft at launch (minus all consumables and propellants).

The mass of the spacecraft at launch is 208.8 kilograms. The spacecraft will not carry any propellants or other consumables.

e. Identification, including type, mass and pressure, of all fluids (liquids and gases) planned to be on board (including any planned future in-space transfers), excluding fluids in sealed heat pipes. Description of all fluid systems, including size, type, and qualifications of fluid containers such as propellant and pressurization tanks, including pressurized batteries.

None.

f. Description of all propulsion systems (e.g.: cold gas, mono-propellant, bi-propellant, solid propellant, electric, nuclear).

None.

g. Description of all active and/or passive attitude control systems with an indication of the normal attitude of the spacecraft with respect to the velocity vector.

The guidance, navigation, and control ("GNC") subsystem of the spacecraft has a sensor suite consisting of star trackers, an Inertial Measurement Unit (containing gyros and accelerometers), GPS receiver, three-axis magnetometer, and sun sensors. The actuator suite of the spacecraft consists of reaction wheels and magnetorquers. The GNC subsystem has the following operational modes that enable the spacecraft to perform its mission:

- A detumbling mode is used to reduce angular rates below a threshold after launch vehicle separation or after a hardware failure in the GNC subsystem. The magnetometer is used to sense the orientation of the Earth's magnetic field and the magnetorquers are used to generate torques opposing the rotation of the spacecraft.
- A pointing mode is used to orient the spacecraft in either the velocity, anti-velocity, nadir, ground tracking, or inertially fixed directions. This mode is used for ground communication and payload activities.
- A safe mode is used to maximize solar power generation while also allowing communications with the ground network. Safe mode is entered either by ground command or autonomously by the flight software when it detects a low battery state of charge. During this mode, the spacecraft will maintain its solar panels pointing toward the sun and will also track selected ground stations when they come within line of sight.

During normal operations, the RWAs provide redundant 3-axis attitude control while the magnetorquers are used to maintain wheel speeds below their maximum limits. The nominal spacecraft orientation has the solar panels in the zenith direction (+R for radial) and the launch vehicle separation ring in the velocity direction (+T for tangential).

h. Description of any range safety or other pyrotechnic devices.

None.

i. Description of the electrical generation and storage system.

Standard lithium-ion batteries are used to store energy onboard.

j. Identification of any other sources of stored energy not noted above.

None.

k. Identification of any radioactive materials on board or an explicit statement that there are no radioactive materials onboard.

There are no radioactive materials onboard the spacecraft.

l. Description of any planned proximity operations or docking with other spacecraft in LEO or GEO, including the controls that will be used to mitigate the risk of a collision that could generate debris or prevent planned later passivation or disposal activities for either spacecraft.

None.

m. Address the trackability of the spacecraft.

The spacecraft will operate in low-Earth orbit and is larger than 10 cm in its smallest dimension. Therefore, the spacecraft is presumed tracakable under 47 C.F.R. § 25.114(d)(14)(v).

n. How does the operator plan to identify the space satation(s) following deployment and whether space station tracking will be active or passive.

After deployment, the satellite will engage in downlink telemetry with ground stations using a wide field-of-view beam, allowing Anduril to collect and maintain maintain ephemeris data of the satellite. Using this ephemris data and the two-line elements issued and regularly updated by the 18th Space Control Squadron, Anduril will be able to accurately compute the predicted orbital position of the spacecraft.

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

Prior to deployment, Anduril will register the spacecraft with the 18th Space Control Squadron.

i. 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.

Anduril intends to provide the 18th Space Control Squadron information regarding initial deployment and owner/operator ephemeris. This sharing is intended to provide better space situational awareness and improve the accuracy of conjunction analysis. The higher accuracy owner/operator ephemeris will improve the quality of the conjunction analysis and reduce the frequency of Conjunction Data Messages. Anduril intends to share ephemeris with other operators on an as-needed basis. As mentioned above, the spacecraft does not have propulsion capabilities. Therefore, no planned maneuvers will occur.

Section 3: Assessment of Spacecraft Debris Released during Normal Operations

a. Identification of any object (>1 mm) expected to be released from the spacecraft any time after launch, including object dimensions, mass, and material.

None.

b. Rationale/necessity for release of each object.

N/A.

c. Time of release of each object, relative to launch time.

N/A.

d. Release velocity of each object with respect to spacecraft.

N/A.

e. Expected orbital parameters (apogee, perigee, and inclination) of each object after release.

N/A.

f. Calculated orbital lifetime of each object, including time spent in LEO.

N/A.

g. Assessment of spacecraft compliance with Requirements 4.3-1 and 4.3-2.

Requirement 4.3-1: Mission Related Debris Passing Through LEO

Compliance statement: No intentional release of debris is expected to occur during the lifetime of the ANDURIL-216 satellite.

Requirement 4.3-2: Mission Related Debris Passing Near GEO

Compliance statement: This requirement is not applicable to this mission profile.

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

a. Identification of all potential causes of spacecraft breakup during deployment and mission operations.

None.

b. Summary of failure modes and effects analyses of all credible failure modes which may lead to an accidental explosion.

The battery safety systems are discussed under Section 4(f) below in the assessment of the spacecraft's compliance with ODAR requirement 4.4-1. The batteries are off-the-shelf batteries equipped with safety vent features that release excessive pressure build-up in the event of failures, precluding explosions.

c. Detailed plan for any designed spacecraft breakup, including explosions and intentional collisions.

There are no planned breakups.

d. List of components which are passivated at EOM. List includes method of passivation and amount which cannot be passivated.

The following two components of the spacecraft will be passivated at the end of mission:

- RWAs. The RWAs will be spun down and the spacecraft will be controlled via torque rods.
- Batteries. The batteries will be deenergized to a minimum charge state and then commanded to disconnect charging input and discharge output to the bus to ensure full passivation and no ability to power on the spacecraft.

e. Rationale for all items which are required to be passivated, but cannot be due to their design.

N/A.

f. Assessment of spacecraft compliance with Requirements 4.4-1 through 4.4-4.

Requirement 4.4-1: Limiting the risk to other space systems from accidental explosions during deployment and mission operations while in orbit about Earth or the Moon:

For each spacecraft and launch vehicle orbital stage employed for a mission, the program or project shall demonstrate, via failure mode and effects analyses or equivalent analyses that the integrated probability of explosion for all credible failure modes of each spacecraft and launch vehicle is less than 0.001 (excluding small particle impacts).

Compliance statement: Compliant. Anduril and its subcontracts have analyzed each of the failure modes that may result in battery explosion and determined that the probability of explosion in each instance is expected to less than 0.001. These failure modes are listed below. The estimated probability is based on several factors, including that (1) the mitigation methods will be employed, as further described under each failure mode listed below; (2) multiple independent faults must occur for each failure mode to result in an explosion, as further described under each failure mode listed below; (3) the batteries are off-the-shelf products, a proven track record of safety in flight; (4) each battery cell has over-voltage and over-current protection, which helps reduce the possibility of failure; and (5) the batteries will undergo extensive testing prior to the launch. Finally, in the unlikely event that a battery cell does explosively rupture, the small size, mass, and potential energy of these small batteries, coupled with the multiple enclosures surrounding the batteries, will ensure that any debris from the battery rupture is contained within the spacecraft.

- Failure Mode 1: Internal cell short circuit.
    - *Mitigation*: Qualification and acceptance shock, vibration, thermal cycling, and vacuum tests followed by maximum system rate-limited charge and discharge will prove that no internal short circuit sensitivity exists.
    - *Combined faults required for realized failure*: Environmental testing AND functional charge/discharge tests must both be ineffective in discovery of the failure mode.
- Failure Mode 2: Internal thermal rise due to high load discharge rate.
    - *Mitigation*: Battery cells were UL/UN tested in lab for high load discharge rates by short circuiting the terminal to determine the feasibility of an out-of-control thermal rise in the cell.
    - *Combined faults required for realized failure*: Spacecraft thermal design must be incorrect AND external over-current detection and disconnect function must fail to enable this failure mode.
- Failure Mode 3: Excessive discharge rate or short-circuit due to external device failure or terminal contact with conductors not at battery voltage levels (due to abrasion or inadequate proximity separation).
    - *Mitigation*: This failure mode is negated by (1) qualification tested short circuit protection on each external circuit; (2) design of battery packs and insulators such that no contact with nearby board traces is possible without being caused by some other mechanical failure; and (3) obviation of such other mechanical failures by proto-qualification and acceptance environmental tests (shock, vibration, thermal cycling, and thermal-vacuum tests).
    - *Combined faults required for realized failure*: An external load must fail/short-circuit AND external over-current detection AND disconnect function must all occur to enable this failure mode.
- Failure Mode 4: Inoperable vents.
    - *Mitigation*: Battery venting is not inhibited by the battery holder design or the spacecraft design. The battery can vent gases to the external environment.
    - *Combined faults required for realized failure*: The cell manufacturer and the satellite integrator must fail to install proper venting.

- Failure Mode 5: Crushing.
    - *Mitigation*: Failure mode prevented by design. No moving parts appear near the battery assembly. Battery cells are UL/UN tested for crush and impact.
    - *Combined faults required for realized failure*: A catastrophic failure must occur in an external system AND the failure must cause a collision sufficient to crush the batteries leading to an internal short circuit AND the satellite must be in a naturally sustained orbit at the time the crushing occurs.
- Failure Mode 6: Low level current leakage or short-circuit through battery pack case or due to moisture-based degradation of insulators.
    - *Mitigation*: These modes are negated by a) battery holder/case design made of non-conductive plastic and b) operation in a vacuum such that no moisture can affect insulators.
    - *Combined faults required for realized failure*: Abrasion or piercing failure of circuit board coating or wire insulators AND dislocation of battery packs AND failure of battery terminal insulators AND failure to detect such failure modes in environmental tests must occur for this failure mode.
- Failure Mode 7: Excess battery cell temperature due to orbital environment and high discharge combined.
    - *Mitigation*: The spacecraft thermal design will negate this possibility. Thermal rise has been analyzed in combination with space environment temperatures showing that the batteries do not exceed normal allowable operating temperatures under a variety of modeled cases, including worst case orbital scenarios. Analysis shows these temperatures to be well below temperatures of concern for explosions. Battery cells are UL/UN thermal tested without fire or explosion.
    - *Combined faults required for realized failure*: Incorrect thermal analysis AND thermal design AND mission simulations in thermal-vacuum chamber testing AND over-current monitoring and control must all fail for this failure mode to occur.

Requirement 4.4-2: Design for passivation after completion of mission operations while in orbit about Earth or the Moon.

Design of all spacecraft and launch vehicle orbital stages shall include the ability to deplete all onboard sources of stored energy and disconnect all energy generation sources when they are no longer required for mission operations or post-mission disposal or control to a level which cannot cause an explosion or deflagration large enough to release orbital debris or break up the spacecraft.

Compliance statement: Compliant. The satellite will be passivated by discharging the batteries and leaving them in a permanently discharged state, and the RWAs will be spun down. In this end-of-mission mode, all subsystems of the satellite will be disconnected from power.

Requirement 4.4-3: Limiting the long-term risk to other space systems from planned breakups.

Planned explosions or intentional collisions shall: a. Be conducted at an altitude such that for orbital debris fragments larger than 10 cm the object time product does not exceed 100 object-years. b. Not generate debris larger than 1 mm that remains in Earth orbit longer than one year.

Compliance statement: N/A. There are no planned break ups.

Requirement 4.4-4: Limiting the short-term risk to other space systems from planned breakups.

Immediately before a planned explosion or intentional collision, the probability of debris, orbital or ballistic, larger than 1 mm colliding with any operating spacecraft within 24 hours of the breakup shall be verified to not exceed 10^-6.

Compliance statement: N/A. There are no planned break ups.

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

a-c. Calculation of spacecraft probability of collision with space objects larger than 10 cm in diameter during the orbital lifetime of the spacecraft, assuming no collision avoidance capability. Calculation of spacecraft probability of collision with space objects, including orbital debris and meteoroids, of sufficient size to prevent postmission disposal. Assessment of spacecraft compliance with Requirements 4.5-1 and 4.5-2

Requirement 4.5-1: Limiting debris generated by collisions with large objects when operating in Earth orbit.

For each spacecraft and launch vehicle orbital stage in or passing through LEO, the program or project shall demonstrate that, during the orbital lifetime of each spacecraft and orbital stage, the probability of accidental collision with space objects larger than 10 cm in diameter is less than 0.001.

Compliance statement: Compliant. The probability of accidental collision with large space objects is estimated to be 9.4144E-05.

Requirement 4.5-2: Limiting debris generated by collisions with small objects when operating in Earth or lunar orbit.

For each spacecraft, the program or project shall demonstrate that, during the mission of the spacecraft, the probability of accidental collision with orbital debris and meteoroids sufficient to prevent compliance with the applicable post-mission disposal maneuver requirements is less than 0.01.

Compliance statement: Compliant. NASA DAS reports compliance with Requirement 4.5-2. Additionally, the ANDURIL-216 satellite relies on uncontrolled atmospheric reentry (natural decay of the orbit), and as a result, there are no critical surfaces which could result in a loss of control of sufficient severity to prevent post-mission disposal.

d. Detailed description and assessment of the efficacy of any planned debris avoidance capability intended to help in meeting the requirements of requirement 4.5-1, including any plans to move to less congested altitudes, as well as any tracking enhancements (GPS, laser retroreflector, e.g.) that may assist in reducing the covariance of collision estimates.

The ANDURIL-216 satellite will employ differential drag to minimize the risk of collision. Anduril will register the satellite with the U.S. Space Force's 18th Space Defense Squadron, which provides active monitoring. Anduril will attempt to contact and work the owner of any spacecraft which has the potential to collide with the ANDURIL-216 satellite, to avoid collision.

If at any time during the spacecraft's mission or de-orbit phase the spacecraft will operate in or transit through the orbits used by any planned or inhabitable spacecraft, including the International Space Station, describe the design and operational strategies, such as coordination, that will be used to minimize the risk of collision and avoid posing any operational constraints to the spacecraftas described.

During the de-orbit phase, the ANDURIL-216 satellite will transfer from an altitude greater than that of the International Space Station ("ISS") and other inhabitable spacecraft to an altitude below that of the ISS and other inhabitable spacecraft; thus, this phase may transit through an orbit used by the ISS or another spacecraft. The ANDURIL-216 satellite can employ differential drag as described above to minimize risk of collision. Anduril will work with the 18th Space Defense Squadron (by uploading predicted ephemeris) to plan and execute differential drag deorbit maneuvers while the ANDURIL-216 satellite passes through the orbits of the ISS and other inhabitable spacecraft to minimize the risk of collision.

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.

Upon receipt of a space situational awareness conjunction warning from the 18th Space Control Squadron, and consistent with 47 C.F.R. § 25.114(d)(14)(iv)(5), Anduril certifies that it will review the data and will attempt to contact the operator of any active spacecraft involved in such a warning, share ephemeris data and other appropriate operational information with any such operator, and modify the spacecraft's attitude, orbit, and/or operations to avoid a collision. If the operator of the other spacecraft does not have maneuvering capabilities, Anduril will upload a special ephemeris including potential collision avoidance maneuvers via the Application Programming Interface to the 18th Space Defense Squadron to avoid a collision after consultation.

Section 6: Assessment of Spacecraft Postmission Disposal Plans and Procedures

a. Description of spacecraft disposal option selected.

Anduril will dispose of the ANDURIL-216 satellite via uncontrolled atmospheric reentry (natural decay). The operational orbit of the satellite will decay due to atmospheric drag, and the satellite will eventually de-orbit by atmospheric reentry. The ANDURIL-216 satellite does not carry an onboard propulsion system, and it is therefore not possible to perform a controlled reentry.

b. Identification of all systems or components required to accomplish any postmission disposal maneuvers. Plan for any spacecraft maneuvers required to accomplish postmission disposal.

The ANDURIL-216 satellite does not carry a propulsion system and will not perform any postmission disposal maneuvers.

c. Calculation of area-to-mass ratio after postmission disposal, if the controlled reentry option is not selected.

0.0149 m^2/kg.

d. If appropriate, preliminary plan for spacecraft controlled reentry.

N/A.

e. Assessment of spacecraft compliance with Requirements 4.6-1 through 4.6-4.

Requirement 4.6-1. Disposal for space structures passing through LEO

Compliance statement: Compliant. As shown in the below orbital lifetime diagram produced using DAS demonstrates, after completing the five-year mission, the ANDURIL-216 satellite will naturally deorbit within approximately 4.2 years. The DAS analysis was run at an insertion altitude of 570 km to demonstrate compliance at the worst-case altitude. This de-orbit timeframe is consistent with five years post mission disposal requirement.

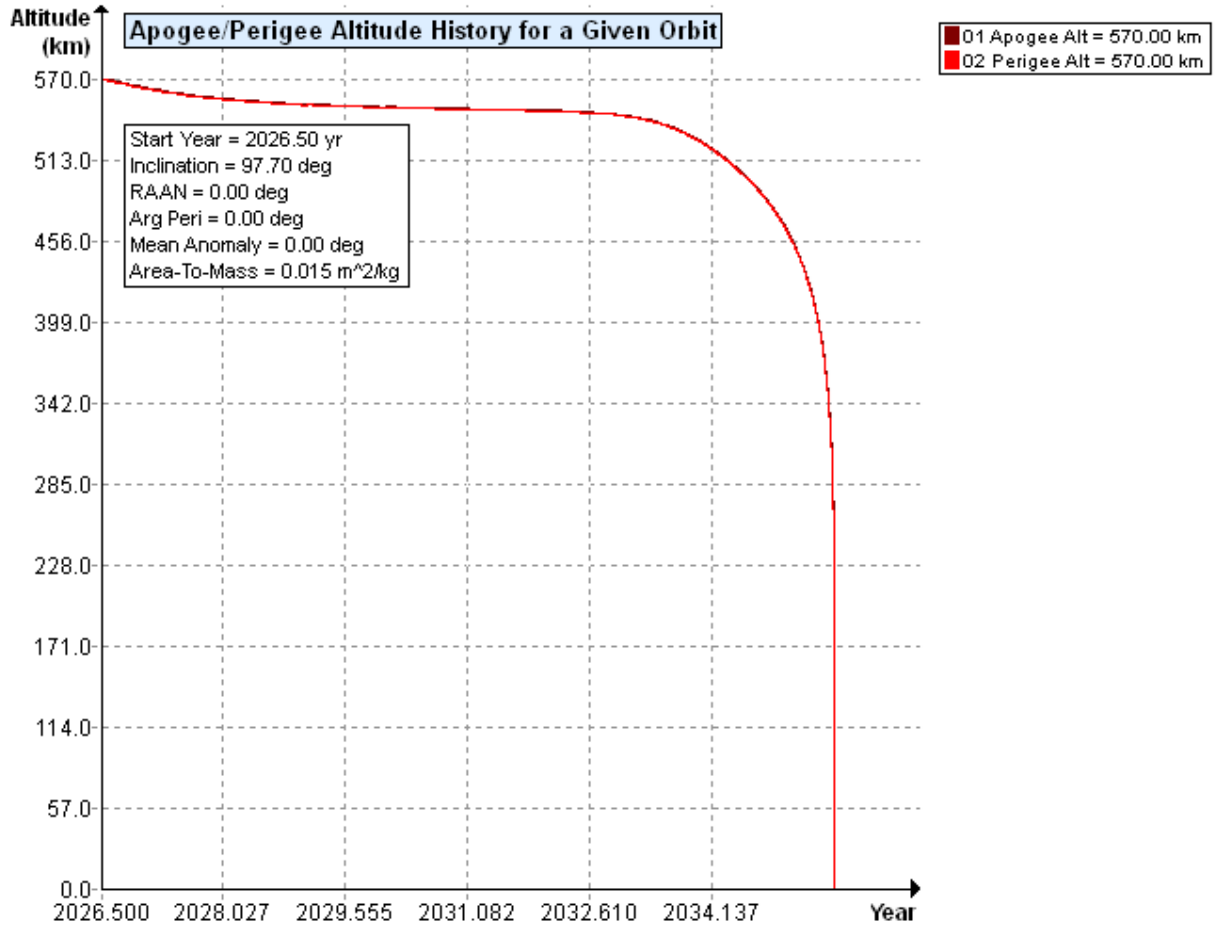


Figure 1. Natural Decay from Operational Orbit

Requirement 4.6-2. Disposal for space structures near GEO:

Compliance statement: N/A.

Requirement 4.6-3. Disposal for space structures between LEO and GEO:

Compliance statement: N/A.

Requirement 4.6-4. Reliability of Post-mission Disposal Operations:

Compliance statement: N/A. No postmission disposal maneuver is required to ensure deorbit of the ANDURIL-216 satellite within 5 years of mission completion.

Section 7: Assessment of Spacecraft Reentry Hazards

a. Detailed description of spacecraft components by size, mass, material, shape, and original location on the space vehicle, if the atmospheric reentry option is selected.

Please see DAS activity log attached at Appendix A.

b. Summary of objects expected to survive an uncontrolled reentry, using NASA DAS, NASA ORSAT, or comparable software.

The below spacecraft components are expected to survive an uncontrolled reentry and impact the surface of the earth, including some components with a kinetic energy in excess of 15 joules; however, NASA DAS assesses the total debris casualty area as 3.86 m^2 and the spacecraft as compliant with Requirement 4.7-1. Further details are available in the DAS activity log attached at Appendix A.

Name	Casualty Area (m^2)	Kinetic Energy (J)
Solar Array Substrate	3.56	14.81
V10 Optic	0.56	25692.36
V10 Optic Housing	0.51	101.24
V10 Heat Strap	0.35	329.57
V10 Baffle	0.73	1885.7
V10 Shroud	0.91	269.49
Backplate	0.38	83.96
Optic Housing	0.41	19.95

c. Calculation of risk of human casualty for the expected year of uncontrolled reentry and the spacecraft orbital inclination.

The calculated risk of human casualty is 1:20,100.

d. Assessment of spacecraft compliance with Requirement 4.7-1.

Compliance statement: Compliant. As stated above, the calculated risk of human casualty is 1:20,100.

Section 8: Assessment for Special Classes of Space Missions

Specify the special mission class(es) and detail how the ODAR addresses additional measures applied to the mission.

Compliance statement: N/A.

Appendix A: DAS Activity Log

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

=============== End of Requirement 4.3-1 ===============
12 24 2025; 15:05:53PM       Processing Requirement 4.3-2: Return Status : Passed

====================
No Project Data Available
====================

=============== End of Requirement 4.3-2 ===============
12 24 2025; 15:16:01PM       Processing Requirement 4.5-1:Return Status :  Passed

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

**INPUT**

       Space Structure Name = ANDURIL-216
       Space Structure Type = Payload
       Perigee Altitude = 570.000 (km)
       Apogee Altitude = 570.000 (km)
       Inclination = 97.700 (deg)
       RAAN = 0.000 (deg)
       Argument of Perigee = 0.000 (deg)
       Mean Anomaly = 0.000 (deg)
       Final Area-To-Mass Ratio = 0.0149 (m^2/kg)
       Start Year = 2026.500 (yr)
       Initial Mass = 206.300 (kg)
       Final Mass = 206.300 (kg)
       Duration = 5.000 (yr)
       Station-Kept = False
       Abandoned = True
       Long-Term Reentry = False

**OUTPUT**

       Collision Probability = 9.4144E-05
       Returned Message: Normal Processing
       Date Range Message: Normal Date Range
       Status = Pass

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

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

12 24 2025; 15:16:04PM       Project Data Saved To File
12 24 2025; 15:16:10PM       Requirement 4.5-2:  Compliant

=============== End of Requirement 4.5-2 ===============
```

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12 24 2025; 15:16:11PM       Processing Requirement 4.6   Return Status :  Passed

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

**INPUT**

       Space Structure Name = ANDURIL-216
       Space Structure Type = Payload

       Perigee Altitude = 570.000000 (km)
       Apogee Altitude = 570.000000 (km)
       Inclination = 97.700000 (deg)
       RAAN = 0.000000 (deg)
       Argument of Perigee = 0.000000 (deg)
       Mean Anomaly = 0.000000 (deg)
       Area-To-Mass Ratio = 0.014912 (m^2/kg)
       Start Year = 2026.500000 (yr)
       Initial Mass = 206.300000 (kg)
       Final Mass = 206.300000 (kg)
       Duration = 5.000000 (yr)
       Station Kept = False
       Abandoned = True
       PMD Perigee Altitude = 547.867769 (km)
       PMD Apogee Altitude = 548.195503 (km)
       PMD Inclination = 97.714497 (deg)
       PMD RAAN = 19.329304 (deg)
       PMD Argument of Perigee = 240.166740 (deg)
       PMD Mean Anomaly = 0.000000 (deg)
       Long-Term Reentry = False

**OUTPUT**

       Suggested Perigee Altitude = 547.867769 (km)
       Suggested Apogee Altitude = 548.195503 (km)
       Returned Error Message = Passes LEO reentry orbit criteria.

       Released Year = 2035 (yr)
       Requirement = 61
       Compliance Status = Pass

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

=============== End of Requirement 4.6 ===============
12 24 2025; 15:16:59PM       *********Processing Requirement 4.7-1
       Return Status :  Passed

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

name = ANDURIL-216
quantity = 1
```

```
parent = 0
materialID = 8
type = Box
Aero Mass = 206.300003
Thermal Mass = 206.300003
Diameter/Width = 1.179000
Length = 2.493000
Height = 0.733900

name = Apex Aries
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 260.939999
Thermal Mass = 131.500000
Diameter/Width = 1.171000
Length = 1.179000
Height = 0.424000

name = Battery
quantity = 1
parent = 2
materialID = 8
type = Box
Aero Mass = 16.299999
Thermal Mass = 16.299999
Diameter/Width = 0.303000
Length = 0.417000
Height = 0.132000

name = Solar Array Panel
quantity = 2
parent = 2
materialID = 8
type = Box
Aero Mass = 9.520000
Thermal Mass = 5.100000
Diameter/Width = 0.871000
Length = 1.171000
Height = 0.020000

name = Solar Array AL Structure
quantity = 2
parent = 4
materialID = 8
type = Box
Aero Mass = 3.350000
Thermal Mass = 3.350000
Diameter/Width = 0.871000
Length = 1.171000
Height = 0.020000

name = Solar Array Substrate
```

```
quantity = 2
parent = 4
materialID = 16
type = Box
Aero Mass = 0.820000
Thermal Mass = 0.820000
Diameter/Width = 0.871000
Length = 1.171000
Height = 0.000600

name = Solar Array Cell and CIC
quantity = 2
parent = 4
materialID = 27
type = Box
Aero Mass = 0.250000
Thermal Mass = 0.250000
Diameter/Width = 0.871000
Length = 1.136000
Height = 0.000300

name = PX Panel
quantity = 1
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 46.339100
Thermal Mass = 3.390000
Diameter/Width = 0.424000
Length = 1.179000

name = Center Cylinder
quantity = 1
parent = 8
materialID = 8
type = Cylinder
Aero Mass = 8.500000
Thermal Mass = 8.500000
Diameter/Width = 0.600000
Length = 0.325000

name = RWA Bracket
quantity = 4
parent = 8
materialID = 8
type = Box
Aero Mass = 0.200000
Thermal Mass = 0.200000
Diameter/Width = 0.136000
Length = 0.182000
Height = 0.095000

name = Avionics Tray
quantity = 1
```

```
parent = 8
materialID = 8
type = Flat Plate
Aero Mass = 6.000000
Thermal Mass = 6.000000
Diameter/Width = 0.350000
Length = 0.527000

name = Reaction Wheels
quantity = 4
parent = 8
materialID = 8
type = Cylinder
Aero Mass = 1.400000
Thermal Mass = 1.400000
Diameter/Width = 0.146000
Length = 0.045000

name = Torque Rods
quantity = 3
parent = 8
materialID = 8
type = Cylinder
Aero Mass = 0.539000
Thermal Mass = 0.539000
Diameter/Width = 0.050000
Length = 0.430000

name = Star Tracker
quantity = 2
parent = 8
materialID = 8
type = Box
Aero Mass = 0.270000
Thermal Mass = 0.270000
Diameter/Width = 0.050000
Length = 0.095000
Height = 0.044000

name = GNSS Receiver
quantity = 1
parent = 8
materialID = 8
type = Box
Aero Mass = 0.275000
Thermal Mass = 0.275000
Diameter/Width = 0.056000
Length = 0.094000
Height = 0.026000

name = GNSS L-Band Antenna
quantity = 2
parent = 8
materialID = 8
```

```
type = Cylinder
Aero Mass = 0.350000
Thermal Mass = 0.350000
Diameter/Width = 0.090000
Length = 0.027000

name = X-Band Transmitter - Secondary
quantity = 1
parent = 8
materialID = 8
type = Box
Aero Mass = 0.275000
Thermal Mass = 0.275000
Diameter/Width = 0.090000
Length = 0.095000
Height = 0.013000

name = X-Band Antenna
quantity = 2
parent = 8
materialID = 8
type = Flat Plate
Aero Mass = 0.005300
Thermal Mass = 0.005300
Diameter/Width = 0.024000
Length = 0.024000

name = S-Band Transceiver - Secondary
quantity = 1
parent = 8
materialID = 8
type = Box
Aero Mass = 0.191000
Thermal Mass = 0.191000
Diameter/Width = 0.089000
Length = 0.094000
Height = 0.018500

name = UHF Transceiver - Secondary
quantity = 1
parent = 8
materialID = 8
type = Box
Aero Mass = 0.095000
Thermal Mass = 0.095000
Diameter/Width = 0.089000
Length = 0.095000
Height = 0.011000

name = Ethernet Switch
quantity = 1
parent = 8
materialID = 8
type = Box
```

```
Aero Mass = 2.500000
Thermal Mass = 2.500000
Diameter/Width = 0.180000
Length = 0.230000
Height = 0.040000

name = Tank MLI
quantity = 3
parent = 8
materialID = 8
type = Flat Plate
Aero Mass = 0.400000
Thermal Mass = 0.400000
Diameter/Width = 1.000000
Length = 1.000000

name = PCDU
quantity = 1
parent = 8
materialID = 8
type = Box
Aero Mass = 1.500000
Thermal Mass = 1.500000
Diameter/Width = 0.114000
Length = 0.114000
Height = 0.050000

name = Flight Computer
quantity = 1
parent = 8
materialID = 8
type = Box
Aero Mass = 1.600000
Thermal Mass = 1.600000
Diameter/Width = 0.114000
Length = 0.114000
Height = 0.050000

name = Harness/Connectors
quantity = 1
parent = 8
materialID = 54
type = Cylinder
Aero Mass = 0.500000
Thermal Mass = 0.500000
Diameter/Width = 0.050000
Length = 0.100000

name = Payload closeout covers
quantity = 4
parent = 8
materialID = 8
type = Flat Plate
Aero Mass = 0.480000
```

```
Thermal Mass = 0.480000
Diameter/Width = 0.100000
Length = 0.100000

name = Heaters
quantity = 8
parent = 8
materialID = 8
type = Flat Plate
Aero Mass = 0.100000
Thermal Mass = 0.100000
Diameter/Width = 0.100000
Length = 0.100000

name = UHF Hybrid Coupler
quantity = 3
parent = 8
materialID = 8
type = Box
Aero Mass = 0.060000
Thermal Mass = 0.060000
Diameter/Width = 0.100000
Length = 0.100000
Height = 0.100000

name = COMM Carrier Board
quantity = 1
parent = 8
materialID = 8
type = Flat Plate
Aero Mass = 3.150000
Thermal Mass = 0.150000
Diameter/Width = 0.100000
Length = 0.100000

name = S-Band Radio PCB
quantity = 2
parent = 29
materialID = 8
type = Box
Aero Mass = 1.500000
Thermal Mass = 1.500000
Diameter/Width = 0.114000
Length = 0.114000
Height = 0.050000

name = Magnetometer
quantity = 1
parent = 8
materialID = 8
type = Box
Aero Mass = 0.083000
Thermal Mass = 0.083000
Diameter/Width = 0.100000
```

```
Length = 0.100000
Height = 0.050000

name = IMU
quantity = 1
parent = 8
materialID = 8
type = Box
Aero Mass = 0.137000
Thermal Mass = 0.137000
Diameter/Width = 0.050000
Length = 0.050000
Height = 0.050000

name = Solar Array HDRM Bracket
quantity = 1
parent = 8
materialID = 8
type = Box
Aero Mass = 0.250000
Thermal Mass = 0.250000
Diameter/Width = 0.100000
Length = 0.100000
Height = 0.100000

name = Solar Array mount brackets
quantity = 2
parent = 8
materialID = 8
type = Box
Aero Mass = 0.340000
Thermal Mass = 0.340000
Diameter/Width = 0.100000
Length = 0.100000
Height = 0.100000

name = S-band antenna bracket
quantity = 1
parent = 8
materialID = 8
type = Flat Plate
Aero Mass = 0.145500
Thermal Mass = 0.145500
Diameter/Width = 0.100000
Length = 0.100000

name = L-band antenna bracket
quantity = 1
parent = 8
materialID = 8
type = Flat Plate
Aero Mass = 0.200000
Thermal Mass = 0.200000
Diameter/Width = 0.100000
```

```
Length = 0.100000

name = Enclosures
quantity = 1
parent = 8
materialID = 8
type = Box
Aero Mass = 1.000000
Thermal Mass = 1.000000
Diameter/Width = 0.100000
Length = 0.100000
Height = 0.100000

name = USX radio
quantity = 1
parent = 8
materialID = 8
type = Box
Aero Mass = 1.000000
Thermal Mass = 1.000000
Diameter/Width = 0.150000
Length = 0.250000
Height = 0.100000

name = Harness interface box
quantity = 1
parent = 8
materialID = 8
type = Box
Aero Mass = 1.500000
Thermal Mass = 1.500000
Diameter/Width = 0.114000
Length = 0.114000
Height = 0.050000

name = NX Panel
quantity = 1
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 3.390000
Thermal Mass = 3.390000
Diameter/Width = 0.424000
Length = 1.179000

name = PY Panel
quantity = 1
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 0.885000
Thermal Mass = 0.885000
Diameter/Width = 0.424000
Length = 0.861000
```

```
name = NY Panel
quantity = 1
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 0.915000
Thermal Mass = 0.915000
Diameter/Width = 0.424000
Length = 0.861000

name = PZ Panel
quantity = 1
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 10.800000
Thermal Mass = 10.800000
Diameter/Width = 0.352000
Length = 0.854000

name = NZ Panel
quantity = 1
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 10.300000
Thermal Mass = 10.300000
Diameter/Width = 0.352000
Length = 0.854000

name = Sun Sensor Mount
quantity = 2
parent = 2
materialID = 8
type = Box
Aero Mass = 0.060000
Thermal Mass = 0.060000
Diameter/Width = 0.040000
Length = 0.052000
Height = 0.022000

name = Star Tracker Closeout Baffle and Bracket
quantity = 2
parent = 2
materialID = 50
type = Cylinder
Aero Mass = 1.700000
Thermal Mass = 1.700000
Diameter/Width = 0.100000
Length = 0.200000

name = Multi-Layer Insulation Blankets
quantity = 4
```

```
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 0.250000
Thermal Mass = 0.250000
Diameter/Width = 1.000000
Length = 1.000000

name = S-Band Antenna
quantity = 2
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 0.130000
Thermal Mass = 0.130000
Diameter/Width = 0.098000
Length = 0.098000

name = Separation System - Fly Away
quantity = 1
parent = 2
materialID = 8
type = Cylinder
Aero Mass = 3.550000
Thermal Mass = 3.550000
Diameter/Width = 0.150000
Length = 0.150000

name = Thermal blanketing
quantity = 1
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 0.500000
Thermal Mass = 0.500000
Diameter/Width = 1.000000
Length = 1.000000

name = 1/4-28 Fasteners
quantity = 100
parent = 2
materialID = 54
type = Cylinder
Aero Mass = 0.010000
Thermal Mass = 0.010000
Diameter/Width = 0.010000
Length = 0.100000

name = 440 fasteners
quantity = 100
parent = 2
materialID = 54
type = Cylinder
Aero Mass = 0.010000
```

```
Thermal Mass = 0.010000
Diameter/Width = 0.010000
Length = 0.100000

name = Heaters 2
quantity = 12
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 0.100000
Thermal Mass = 0.100000
Diameter/Width = 0.100000
Length = 0.100000

name = Temperature sensors
quantity = 12
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 0.100000
Thermal Mass = 0.100000
Diameter/Width = 0.100000
Length = 0.100000

name = UHF Antenna
quantity = 2
parent = 2
materialID = 54
type = Cylinder
Aero Mass = 0.100000
Thermal Mass = 0.100000
Diameter/Width = 0.050000
Length = 0.100000

name = Thermal Tape
quantity = 1
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 0.150000
Thermal Mass = 0.150000
Diameter/Width = 0.100000
Length = 0.100000

name = Heaters 2
quantity = 1
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 0.150000
Thermal Mass = 0.150000
Diameter/Width = 0.100000
Length = 0.100000
```

```
name = Temp Sensor 2
quantity = 1
parent = 2
materialID = 8
type = Box
Aero Mass = 0.150000
Thermal Mass = 0.150000
Diameter/Width = 0.050000
Length = 0.050000
Height = 0.050000

name = Strut body
quantity = 4
parent = 2
materialID = 8
type = Cylinder
Aero Mass = 0.170000
Thermal Mass = 0.170000
Diameter/Width = 0.100000
Length = 0.050000

name = Side panel closeout survival array
quantity = 2
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 1.000000
Thermal Mass = 1.000000
Diameter/Width = 0.200000
Length = 0.400000

name = Payload plate
quantity = 1
parent = 2
materialID = 8
type = Flat Plate
Aero Mass = 0.910900
Thermal Mass = 0.910900
Diameter/Width = 0.200000
Length = 0.200000

name = Fastener Shipset
quantity = 100
parent = 2
materialID = 54
type = Cylinder
Aero Mass = 0.040000
Thermal Mass = 0.040000
Diameter/Width = 0.050000
Length = 0.050000

name = Payloads
quantity = 1
parent = 1
```

```
materialID = 8
type = Box
Aero Mass = 172.807598
Thermal Mass = 78.500000
Diameter/Width = 0.309900
Length = 0.453700
Height = 0.301200

name = MDP
quantity = 1
parent = 63
materialID = 8
type = Box
Aero Mass = 10.480000
Thermal Mass = 10.480000
Diameter/Width = 0.224200
Length = 0.302500
Height = 0.148400

name = FPAC
quantity = 1
parent = 63
materialID = 8
type = Box
Aero Mass = 10.240000
Thermal Mass = 10.240000
Diameter/Width = 0.228600
Length = 0.228600
Height = 0.129000

name = PEM
quantity = 1
parent = 63
materialID = 8
type = Box
Aero Mass = 3.050000
Thermal Mass = 3.050000
Diameter/Width = 0.116900
Length = 0.132200
Height = 0.103900

name = LWIR
quantity = 1
parent = 63
materialID = 8
type = Box
Aero Mass = 18.320000
Thermal Mass = 18.320000
Diameter/Width = 0.231000
Length = 0.309900
Height = 0.218600

name = V10
quantity = 1
```

```
parent = 63
materialID = 7
type = Cylinder
Aero Mass = 38.539999
Thermal Mass = 20.459999
Diameter/Width = 0.453700
Length = 0.301700

name = V10 Optic
quantity = 1
parent = 68
materialID = -1
type = Cylinder
Aero Mass = 10.600000
Thermal Mass = 10.600000
Diameter/Width = 0.270000
Length = 0.123000

name = V10 Optic Housing
quantity = 1
parent = 68
materialID = 16
type = Box
Aero Mass = 0.550000
Thermal Mass = 0.550000
Diameter/Width = 0.155000
Length = 0.155000
Height = 0.140000

name = V10 Heat Strap
quantity = 1
parent = 68
materialID = 19
type = Box
Aero Mass = 0.310000
Thermal Mass = 0.310000
Diameter/Width = 0.053000
Length = 0.063000
Height = 0.032000

name = V10 Focus Motor
quantity = 1
parent = 68
materialID = 19
type = Box
Aero Mass = 0.500000
Thermal Mass = 0.500000
Diameter/Width = 0.046000
Length = 0.087000
Height = 0.042500

name = V10 Baffle
quantity = 1
parent = 68
```

```
materialID = 8
type = Cylinder
Aero Mass = 4.000000
Thermal Mass = 4.000000
Diameter/Width = 0.300000
Length = 0.250000

name = V10 Shroud
quantity = 1
parent = 68
materialID = 7
type = Box
Aero Mass = 2.120000
Thermal Mass = 2.120000
Diameter/Width = 0.352000
Length = 0.375000
Height = 0.352000

name = V3
quantity = 1
parent = 63
materialID = 7
type = Cylinder
Aero Mass = 5.437600
Thermal Mass = 2.720000
Diameter/Width = 0.148700
Length = 0.132100

name = V3 Optic
quantity = 1
parent = 75
materialID = -1
type = Cylinder
Aero Mass = 0.780000
Thermal Mass = 0.780000
Diameter/Width = 0.090000
Length = 0.063000

name = Heat Strap
quantity = 1
parent = 75
materialID = 19
type = Box
Aero Mass = 0.310000
Thermal Mass = 0.310000
Diameter/Width = 0.053000
Length = 0.063000
Height = 0.032000

name = Backplate
quantity = 1
parent = 75
materialID = 72
type = Box
```

```
Aero Mass = 0.210000
Thermal Mass = 0.210000
Diameter/Width = 0.093500
Length = 0.093500
Height = 0.016800

name = Adapter Bracket
quantity = 2
parent = 75
materialID = 9
type = Box
Aero Mass = 0.250000
Thermal Mass = 0.250000
Diameter/Width = 0.113400
Length = 0.122300
Height = 0.045000

name = Optic Housing
quantity = 1
parent = 75
materialID = 16
type = Box
Aero Mass = 0.135000
Thermal Mass = 0.135000
Diameter/Width = 0.093500
Length = 0.097800
Height = 0.061800

name = Bracket Support
quantity = 2
parent = 75
materialID = 9
type = Box
Aero Mass = 0.063300
Thermal Mass = 0.063300
Diameter/Width = 0.063300
Length = 0.090000
Height = 0.010000

name = Sensor Mount
quantity = 1
parent = 75
materialID = 72
type = Box
Aero Mass = 0.051000
Thermal Mass = 0.051000
Diameter/Width = 0.034400
Length = 0.043500
Height = 0.016400

name = Backplate Heat Strap
quantity = 1
parent = 75
materialID = 19
```

```
type = Box
Aero Mass = 0.055000
Thermal Mass = 0.055000
Diameter/Width = 0.053000
Length = 0.063000
Height = 0.032000

name = V3 Shroud
quantity = 1
parent = 75
materialID = 7
type = Box
Aero Mass = 0.550000
Thermal Mass = 0.550000
Diameter/Width = 0.166000
Length = 0.183000
Height = 0.166000

name = Pallet
quantity = 1
parent = 63
materialID = 8
type = Box
Aero Mass = 8.240000
Thermal Mass = 8.240000
Diameter/Width = 0.788000
Length = 0.874000
Height = 0.025400

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

name = ANDURIL-216
Demise Altitude = 77.993976
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

************************************
name = Apex Aries
Demise Altitude = 66.576960
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

************************************
name = Battery
Demise Altitude = 59.740651
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

************************************
name = Solar Array Panel
Demise Altitude = 65.821231
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000
```

```
************************************
name = Solar Array AL Structure
Demise Altitude = 65.320203
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

************************************
name = Solar Array Substrate
Demise Altitude = 0.000000
Debris Casualty Area = 3.561198
Impact Kinetic Energy = 14.807577

************************************
name = Solar Array Cell and CIC
Demise Altitude = 65.736356
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

************************************
name = PX Panel
Demise Altitude = 65.856994
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

************************************
name = Center Cylinder
Demise Altitude = 63.789212
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

************************************
name = RWA Bracket
Demise Altitude = 65.704719
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

************************************
name = Avionics Tray
Demise Altitude = 62.600435
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

************************************
name = Reaction Wheels
Demise Altitude = 62.782010
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

************************************
name = Torque Rods
Demise Altitude = 65.110937
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000
```

```
**********************************
name = Star Tracker
Demise Altitude = 64.933901
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = GNSS Receiver
Demise Altitude = 64.700912
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = GNSS L-Band Antenna
Demise Altitude = 63.960149
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = X-Band Transmitter - Secondary
Demise Altitude = 64.662277
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = X-Band Antenna
Demise Altitude = 65.641689
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = S-Band Transceiver - Secondary
Demise Altitude = 65.067169
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = UHF Transceiver - Secondary
Demise Altitude = 65.430007
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Ethernet Switch
Demise Altitude = 62.814844
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Tank MLI
Demise Altitude = 65.785308
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000
```

```
**********************************
name = PCDU
Demise Altitude = 62.317243
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Flight Computer
Demise Altitude = 62.099161
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Harness/Connectors
Demise Altitude = 58.842255
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Payload closeout covers
Demise Altitude = 63.580073
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Heaters
Demise Altitude = 65.383692
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = UHF Hybrid Coupler
Demise Altitude = 65.771886
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = COMM Carrier Board
Demise Altitude = 65.194949
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = S-Band Radio PCB
Demise Altitude = 61.687082
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Magnetometer
Demise Altitude = 65.692108
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000
```

```
**********************************
name = IMU
Demise Altitude = 65.108550
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Solar Array HDRM Bracket
Demise Altitude = 65.368875
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Solar Array mount brackets
Demise Altitude = 65.199525
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = S-band antenna bracket
Demise Altitude = 65.155612
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = L-band antenna bracket
Demise Altitude = 64.900197
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Enclosures
Demise Altitude = 63.928177
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = USX radio
Demise Altitude = 64.996211
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Harness interface box
Demise Altitude = 62.317243
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = NX Panel
Demise Altitude = 65.736391
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000
```

```
**********************************
name = PY Panel
Demise Altitude = 66.355736
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = NY Panel
Demise Altitude = 66.351389
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = PZ Panel
Demise Altitude = 62.675481
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = NZ Panel
Demise Altitude = 62.859242
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Sun Sensor Mount
Demise Altitude = 66.092443
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Star Tracker Closeout Baffle and Bracket
Demise Altitude = 63.412947
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Multi-Layer Insulation Blankets
Demise Altitude = 66.535034
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = S-Band Antenna
Demise Altitude = 65.946125
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Separation System - Fly Away
Demise Altitude = 62.845336
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000
```

```
**********************************
name = Thermal blanketing
Demise Altitude = 66.495513
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = 1/4-28 Fasteners
Demise Altitude = 66.070852
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = 440 fasteners
Demise Altitude = 66.070852
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Heaters 2
Demise Altitude = 66.099984
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Temperature sensors
Demise Altitude = 66.099984
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = UHF Antenna
Demise Altitude = 64.766202
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Thermal Tape
Demise Altitude = 65.863478
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Heaters 2
Demise Altitude = 65.863478
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Temp Sensor 2
Demise Altitude = 65.769451
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000
```

```
***********************************
name = Strut body
Demise Altitude = 66.000060
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

***********************************
name = Side panel closeout survival array
Demise Altitude = 65.652302
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

***********************************
name = Payload plate
Demise Altitude = 64.976969
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

***********************************
name = Fastener Shipset
Demise Altitude = 65.382551
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

***********************************
name = Payloads
Demise Altitude = 60.437114
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

***********************************
name = MDP
Demise Altitude = 56.495547
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

***********************************
name = FPAC
Demise Altitude = 55.201262
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

***********************************
name = PEM
Demise Altitude = 57.496252
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

***********************************
name = LWIR
Demise Altitude = 55.066575
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000
```

```
************************************
name = V10
Demise Altitude = 49.970564
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

************************************
name = V10 Optic
Demise Altitude = 0.000000
Debris Casualty Area = 0.563984
Impact Kinetic Energy = 25692.360530

************************************
name = V10 Optic Housing
Demise Altitude = 0.000000
Debris Casualty Area = 0.510510
Impact Kinetic Energy = 101.238647

************************************
name = V10 Heat Strap
Demise Altitude = 0.000000
Debris Casualty Area = 0.352107
Impact Kinetic Energy = 329.569379

************************************
name = V10 Focus Motor
Demise Altitude = 42.247666
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

************************************
name = V10 Baffle
Demise Altitude = 0.000000
Debris Casualty Area = 0.733105
Impact Kinetic Energy = 1885.704515

************************************
name = V10 Shroud
Demise Altitude = 0.000000
Debris Casualty Area = 0.914423
Impact Kinetic Energy = 269.492668

************************************
name = V3
Demise Altitude = 55.430890
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

************************************
name = V3 Optic
Demise Altitude = 46.508581
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000
```

```
**********************************
name = Heat Strap
Demise Altitude = 53.161743
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Backplate
Demise Altitude = 0.000000
Debris Casualty Area = 0.382469
Impact Kinetic Energy = 83.957216

**********************************
name = Adapter Bracket
Demise Altitude = 54.661376
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Optic Housing
Demise Altitude = 0.000000
Debris Casualty Area = 0.406219
Impact Kinetic Energy = 19.954369

**********************************
name = Bracket Support
Demise Altitude = 54.908791
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Sensor Mount
Demise Altitude = 54.200667
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Backplate Heat Strap
Demise Altitude = 55.108632
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = V3 Shroud
Demise Altitude = 54.684691
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

**********************************
name = Pallet
Demise Altitude = 59.511345
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000
```

```
**********************************

=============== End of Requirement 4.7-1 ===============
12 24 2025; 15:16:59PM       Project Data Saved To File
12 24 2025; 15:18:34PM       Science and Engineering - Apogee/Perigee History for a Given Orbit

**INPUT**

       Perigee Altitude = 570.000000 (km)
       Apogee Altitude = 570.000000 (km)
       Inclination = 97.700000 (deg)
       RAAN = 0.000000 (deg)
       Argument of Perigee = 0.000000 (deg)
       Mean Anomaly = 0.000000 (deg)
       Area-To-Mass Ratio = 0.014912 (m^2/kg)
       Start Year = 2026.500000 (yr)
       Integration Time = 10.000000 (yr)

**OUTPUT**

       Plot
12 24 2025; 15:18:50PM       Science and Engineering - Orbit Lifetime/Dwell Time

**INPUT**

       Start Year = 2026.500000 (yr)
       Perigee Altitude = 570.000000 (km)
       Apogee Altitude = 570.000000 (km)
       Inclination = 97.700000 (deg)
       RAAN = 0.000000 (deg)
       Argument of Perigee = 0.000000 (deg)
       Area-To-Mass Ratio = 0.014912 (m^2/kg)

**OUTPUT**

       Orbital Lifetime from Startyr = 9.158299 (yr)
       Time Spent in LEO during Lifetime  = 9.158299 (yr)
       Last year of Propagation = 2035 (yr)
       Returned Error Message: Object reentered
```