



## **EDSN Formal Orbital Debris Assessment Report (ODAR)**

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

**Report Version: A PDR**  
**November 19, 2012**

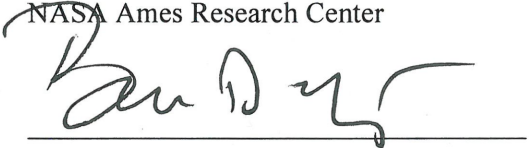
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**DAS Software Version Used In Analysis: v2.0.1**

**VERSION APPROVAL and/or FINAL APPROVAL\*:**

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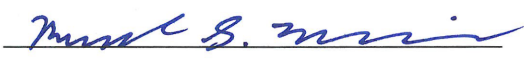

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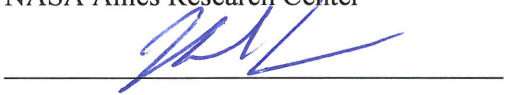

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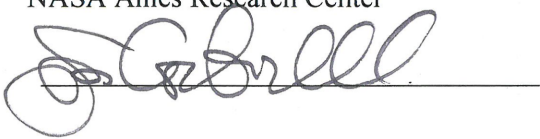
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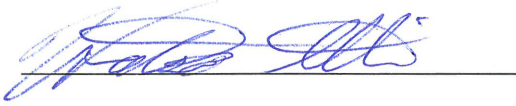
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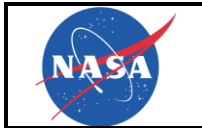
<b>Record of Revisions</b>				
REV	DATE	AFFECTED PAGES	DESCRIPTION OF CHANGE	AUTHOR (S)
-	8 August 2012	All	Initial PDR draft	Watson Attai
A	19 November 2012	All	Second PDR draft	Watson Attai

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**Self-assessment and OSMA assessment of the ODAR using the format in Appendix A.2 of NASA-STD-8719.14:**

A self assessment is provided below in accordance with the assessment format provided in Appendix A.2 of NASA-STD-8719.14. In the final ODAR document, this assessment will reflect any inputs received from OSMA as well.



**EDSN**  
Orbital Debris Assessment Report (ODAR)

**A.2.1.EDSN.ODAR**  
Rev A

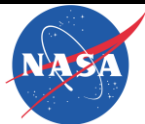
### Orbital Debris Self-Assessment Report Evaluation: EDSN Mission

Requirement #	Launch Vehicle				Spacecraft			Comments
	Compliant	Not Compliant	Incomplete	Standard Non Compliant	Compliant	Not Compliant	Incomplete	
4.3-1.a	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No Debris Released in LEO. See note 1.
4.3-1.b	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No Debris Released in LEO. See note 1.
4.3-2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No Debris Released in GEO. See note 1.
4.4-1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See note 1.
4.4-2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See note 1.
4.4-3	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No planned breakups. See note 1.
4.4-4	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No planned breakups. See note 1.
4.5-1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See note 1.
4.5-2					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No critical subsystems needed for EOM disposal
4.6-1(a)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See note 1.
4.6-1(b)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See note 1.
4.6-1(c)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See note 1.
4.6-2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See note 1.
4.6-3	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See note 1.
4.6-4	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See note 1.
4.6-5	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See note 1.
4.7-1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See note 1.
4.8-1					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No tethers used.

**Notes:**

- The primary payload belongs to the University of Hawaii. This is not a NASA primary mission. All of the other portions of the launch stack are non-NASA and EDSN is not the lead.

Once this document has been printed it will be considered an uncontrolled document.



## **Assessment Report Format:**

ODAR Technical Sections Format Requirements:

This ODAR follows the format in NASA-STD-8719.14, Appendix A.1 and includes the content indicated at a minimum in each section 2 through 8 below for the EDSN satellite. Sections 9 through 14 apply to the launch vehicle ODAR and are not covered here.

## **EDSN**

### **ODAR Section 1: Program Management and Mission Overview**

**Mission Directorate:** Office of Chief Technologist (OCT)

**Program Executive:** Andrew Petro, HQ

**Program/project manager:** Bruce Yost, Program, ARC / Stephan Ord, Project, ARC

**Senior Management:** Dave Korsmeyer, ARC

**Foreign government or space agency participation:** None.

**Summary of NASA's responsibility under the governing agreement(s):** None.

#### **Schedule of upcoming mission milestones:**

FRR:	June, 2013
Launch:	September, 2013

#### **Mission Overview:**

The EDSN mission is a group of eight 1.5U CubeSats that will launch as secondary payloads on the ORS-4 mission. A 1.5U CubeSat measures 10 cm x 10 cm x 15 cm in size, according to the CalPoly CubeSat specifications. Each weighs approximately 1.7kg. All eight satellites are identical.

EDSN is a technology demonstration of a swarm of eight low-cost CubeSats in Low Earth Orbit (LEO) with advanced cross-link and downlink communications capability, suitable as a platform for Space Weather or other science applications requiring geographically distributed, synchronized data acquisition. Each unit has identical hardware and software. The mission operations phase is planned to be 60 days.

All eight EDSN satellites are shipped to ORS facilities in Albuquerque to be integrated with the ORS-4 launch vehicle – a Super Strypi procured by ORS from Sandia National Labs. The eight EDSN satellites will be stowed in NASA NLAS dispensers that eject the satellites upon pre-set sequence controlled by the launch vehicle. Once ejected by the launch vehicle, the eight EDSN satellites will operate in the same elliptical orbit. The satellites have no propulsion systems, and therefore no station-keeping. The mission ends with natural atmospheric reentry of all eight satellites within 820 days from launch (see ODAR Section 6).

**Launch vehicle and launch site:** Super Strypi, Kauai Test Facility, Hawaii.

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**Proposed launch date:** 09/2013

**Mission duration:** 60 Days in LEO operations.

**Launch and deployment profile, including all parking, transfer, and operational orbits with apogee, perigee, and inclination:**

EDSN is a secondary payload on the ORS-4 mission.

The ORS-4 Super Strypi will launch into an elliptical orbit. All spacecraft will be deployed with a small delta-V in the plane normal to the launch vehicle upper stage final velocity vector. The deployment pattern will be such that NLASS deployment mechanisms will simultaneously eject 2 spacecraft on opposing sides of the launch vehicle upper stage, with a 30 second delay until the ejection of the remaining 4 spacecraft on opposing sides of the upper stage..

The nominal elliptical orbit will be:

**Apogee:** 525 km

**Perigee:** 450 km

**Inclination:** 97 degrees.

The EDSN satellites have no propulsion and therefore do not actively station keep. There is no parking or transfer orbit.

## **ODAR Section 2: Spacecraft Description**

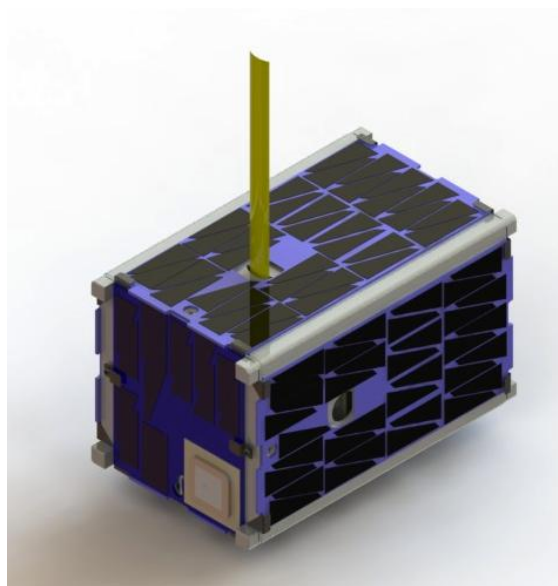
### **Physical description of the spacecraft:**

The EDSN mission consists of eight satellites. Each satellite is a standard 1.5U CubeSat form factor, 10cm x 10cm x 15cm. Each weighs approximately 1.7kg.

Each satellite has four Lithium-Ion batteries. Solar panels cover all 6 faces for battery charging. None of the satellites have titanium parts.

During the 60 day mission, each satellite in the network will use an average of 1.1 Watts. Following the 60-day mission, the satellites will be commanded to deplete the batteries by turning on all subsystems.

Each satellite has a short “tape measure” antenna, about 6 inches in length, deployed 30 minutes after the launch vehicle ejects the satellites into orbit. The tape-measure antenna is the only protrusion from the flat faces of the satellites (see Figure 2 below).



**Figure 2: EDSN Satellite**

**Total satellite mass (8 satellites) at launch, including all propellants and fluids: ~13.4416 kg**

Mercury Mass: ~1.6802 kg

Venus Mass: ~1.6802 kg

Earth Mass: ~1.6802 kg

Mars Mass: ~1.6802 kg

Jupiter Mass: ~1.6802 kg

Saturn Mass: ~1.6802 kg

Uranus Mass: ~1.6802 kg

Neptune Mass: ~1.6802 kg

**Dry mass of satellites at launch, excluding solid rocket motor propellants:**

The satellites have no propellants or fluids.

Mercury Mass: ~1.6802 kg

Venus Mass: ~1.6802 kg

Earth Mass: ~1.6802 kg

Mars Mass: ~1.6802 kg

Jupiter Mass: ~1.6802 kg

Saturn Mass: ~1.6802 kg

Uranus Mass: ~1.6802 kg

Neptune Mass: ~1.6802 kg

**Description of all propulsion systems (cold gas, mono-propellant, bi-propellant, electric, nuclear):** None.



**Identification, including mass and pressure, of all fluids (liquids and gases) planned to be on board and a description of the fluid loading plan or strategies, excluding fluids in sealed heat pipes:** None

**Fluids in Pressurized Batteries:** None. The EDSN satellites use unpressurized standard COTS Lithium-Ion battery cells.

**Description of attitude control system and indication of the normal attitude of the spacecraft with respect to the velocity vector:** All of the EDSN satellites have active three-axis attitude control by means of three orthogonal reaction wheels and three orthogonal sets of two magnetorquer coils. The EDSN satellites have three-axis attitude determination. The satellites are rectangular in shape consistent with 1.5U standard (10cmx10cmx15cm) – the four side surface areas (15cm x 10cm) are identical and the two end surface areas are identical (10cm x 10cm).

When passing over ground station at Santa Clara University at approx. 37.3 degrees N Latitude 121.9 degrees W Longitude, the satellites will be oriented with one square side pointed nadir. At other times, when communicating within the constellation, the satellites square side will be oriented at right angles to nadir. During scheduled periods of no active attitude control, the satellite will orient itself for minimal drag. Note for purposes of atmospheric re-entry modeling (Sect 6.4 of this report) a random attitude orientation is modeled.

**Description of any range safety or other pyrotechnic devices:** No pyrotechnic devices are used.

**Description of the electrical generation and storage system:** Standard COTS Lithium-Ion battery cells are charged before payload integration and provide electrical energy during the mission. For all EDSN satellites, the battery holder and protection circuit is a COTS item designed for the Lithium-Ion 18650 cell format batteries. For all EDSN satellites, the solar panels and charging circuit recharge the batteries. All EDSN satellites carry 4 Lithium-Ion battery cells in the 18650 cell format.

**Identification of any other sources of stored energy not noted above:** None.

**Identification of any radioactive materials on board:** None.





### **ODAR Section 3: Assessment of Spacecraft Debris Released during Normal Operations**

**Identification of any object (>1 mm) expected to be released from the spacecraft any time after launch, including object dimensions, mass, and material:** There are no intentional releases.

**Rationale/necessity for release of each object:** N/A.

**Time of release of each object, relative to launch time:** N/A.

**Release velocity of each object with respect to spacecraft:** N/A.

**Expected orbital parameters (apogee, perigee, and inclination) of each object after release:** N/A.

**Calculated orbital lifetime of each object, including time spent in Low Earth Orbit (LEO):** N/A.

**Assessment of spacecraft compliance with Requirements 4.3-1 and 4.3-2 (per DAS v2.0.1)**

**4.3-1, Mission Related Debris Passing Through LEO:** COMPLIANT

**4.3-2, Mission Related Debris Passing Near GEO:** COMPLIANT

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

**Potential causes of spacecraft breakup during deployment and mission operations:**

There is no credible scenario that would result in spacecraft breakup during normal deployment and operations.

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

In-mission failure of a battery cell protection circuit could lead to a short circuit resulting in overheating and a very remote possibility of battery cell explosion. The battery safety systems discussed in the FMEA (see requirement 4.4-1 below) describe the combined faults that must occur for any of seven (7) independent, mutually exclusive failure modes to lead to explosion. The rationale is true for all batteries onboard the spacecraft.

There is no credible scenario in which the reaction wheel energy would exceed the breakup/explosion energy required for the reaction wheel material to breakup/explode. The supporting analysis is described in the FMEA below.

**Detailed plan for any designed spacecraft breakup, including explosions and intentional collisions:**

There are no planned breakups.



**List of components which shall be passivated at End of Mission (EOM) including method of passivation and amount which cannot be passivated:**

The EDSN satellites incorporate logic in the watchdog to turn on all subsystems at the completion of the mission to discharge the batteries. Ground tests indicate that the battery packs will be completely discharged within 3 days of turning on all subsystems.

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

There are no items that require passivation that , but cannot happen due to design.

**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) (Requirement 56449).

**Compliance statement:**

**Required Probability:** 0.001.

**Expected probability:** 0.000.

**Supporting Rationale and FMEA details:**

*Battery explosion:*

**Effect:** All failure modes below might result in battery explosion with the possibility of orbital debris generation. However, in the unlikely event that a battery cell does explosively rupture, the small size, mass, and potential energy, of these small batteries is such that while the spacecraft could be expected to vent gases, most debris from the battery rupture should be contained within the vessel due to the lack of penetration energy. The rationale is true for all batteries onboard the spacecrafts.

**Probability:** Very Low. It is believed to be less than 0.1% given that multiple independent (not common mode) faults must occur for each failure mode to cause the ultimate effect (explosion).

**Failure mode 1:** Internal short circuit.

**Mitigation 1:** Complete shock, vibration, thermal cycling, and vacuum tests followed by functional testing of the satellite to prove that no internal short circuit sensitivity exists.



*Combined faults required for realized failure:* Environmental testing **AND** functional tests must both be ineffective in discovery of the failure mode.

**Failure Mode 2:** Internal thermal rise due to high load discharge rate.

*Mitigation 2:* Cells were tested in lab for high load discharge rates in a variety of flight like configurations to determine if the feasibility of an out of control thermal rise in the cell. Cells were also tested in a hot environment to test the upper limit of the cells capability. No failures were seen. COTS 18650 lithium ion cells incorporate several features to protect against thermal runaway. First, they include a Positive Temperature Coefficient (PTC) polyswitch device that reduce current if temperature rises excessively. Second, these batteries should have a Current Interrupter Device (CID) which will disconnect the battery on overpressure and vent.

*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, AND battery PTC and CID devices 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 4:* This failure mode is negated by a) design of battery packs and insulators such that no contact with nearby board traces is possible without being caused by some other mechanical failure, b) use of the COTS battery protection circuit on the battery holder for the 18650 cell format Lithium-Ion batteries, c) obviation of such other mechanical failures by proto-qualification and acceptance environmental tests for (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, AND battery PTC and CID devices must all fail to result in this failure mode.

**Failure Mode 4:** Inoperable vents.

*Mitigation 5:* Battery vents are not inhibited by the battery holder design or the spacecraft.

*Combined effects required for realized failure:* The manufacturer fails to install proper venting.

**Failure Mode 5:** Crushing.

*Mitigation 6:* This mode is negated by spacecraft design. There are no moving parts in the proximity of the batteries.

*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 7:* These modes are negated by a) battery holder/case design made of non-conductive plastic, and b) operation in 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 failures in environmental tests must occur to result in this failure mode.

**Failure Mode 7:** Excess temperatures due to orbital environment and high discharge combined.

*Mitigation 8:* The spacecraft thermal design will negate this possibility. Thermal rise has been analyzed in combination with space environment temperatures showing that batteries do not exceed normal allowable operating temperatures which are well below temperatures of concern for explosions.

*Combined faults required for realized failure:* 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.

*Reaction wheel breakup/explosion:*

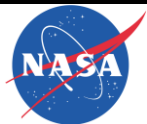
There is no credible scenario that would result in the reaction wheels to breakup during normal deployment and operations. Each of the three reaction wheels are COTS with a moment of inertia of  $81e-06 \text{ kg.m}^2$  and a maximum spin rate of 7000 RPM. The subsequent maximum stored energy in the Reaction Control System is 21.8 Joules; which is substantially less than the breakup/explosion energy required for a reaction wheel assembly breakup leading to material ejection. In addition, the Reaction Control System is encased by both the satellite shell and the solar panels.

**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 can not cause an explosion or deflagration large enough to release orbital debris or break up the spacecraft (Requirement 56450).

**Compliance statement:**

The batteries in the satellite will discharge and burn up upon de-orbit.



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

**Compliance statement:**

This requirement is not applicable. There are no planned breakups.

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

**Compliance statement:**

This requirement is not applicable. There are no planned breakups.



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

Assessment of spacecraft compliance with Requirements 4.5-1 and 4.5-2 (per DAS v2.0.1, and calculation methods provided in NASA-STD-8719.14, section 4.5.4):

*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 (Requirement 56506).

**Large Object Impact and Debris Generation Probability: COMPLIANT.**

*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 postmission disposal requirements is less than 0.01 (Requirement 56507).

- **Small Object Impact and Debris Generation Probability: COMPLIANT**
- **Identification of all systems or components required to accomplish any postmission disposal operation, including passivation and maneuvering:**

None.

## **ODAR Section 6: Assessment of Spacecraft Postmission Disposal Plans and Procedures**

**6.1 Description of spacecraft disposal option selected:** The satellite will de-orbit naturally by atmospheric re-entry. There is no propulsion system.

**6.2 Plan for any spacecraft maneuvers required to accomplish postmission disposal: NONE.**

**6.3 Calculation of area-to-mass ratio after postmission disposal, if the controlled reentry option is not selected:**

**Spacecraft Mass:** ~1.6802kg

**Cross-sectional Area:** 0.01 m<sup>2</sup> (Calculated by DAS 2.0.1).

**Area to mass ratio:** 0.01/1.6802 = 0.00595167241 m<sup>2</sup>/kg



**6.4 Assessment of spacecraft compliance with Requirements 4.6-1 through 4.6-5 (per DAS v 2.0.1 and NASA-STD-8719.14 section):**

**Requirement 4.6-1. Disposal for space structures passing through LEO:** A spacecraft or orbital stage with a perigee altitude below 2000 km shall be disposed of by one of three methods: (Requirement 56557)

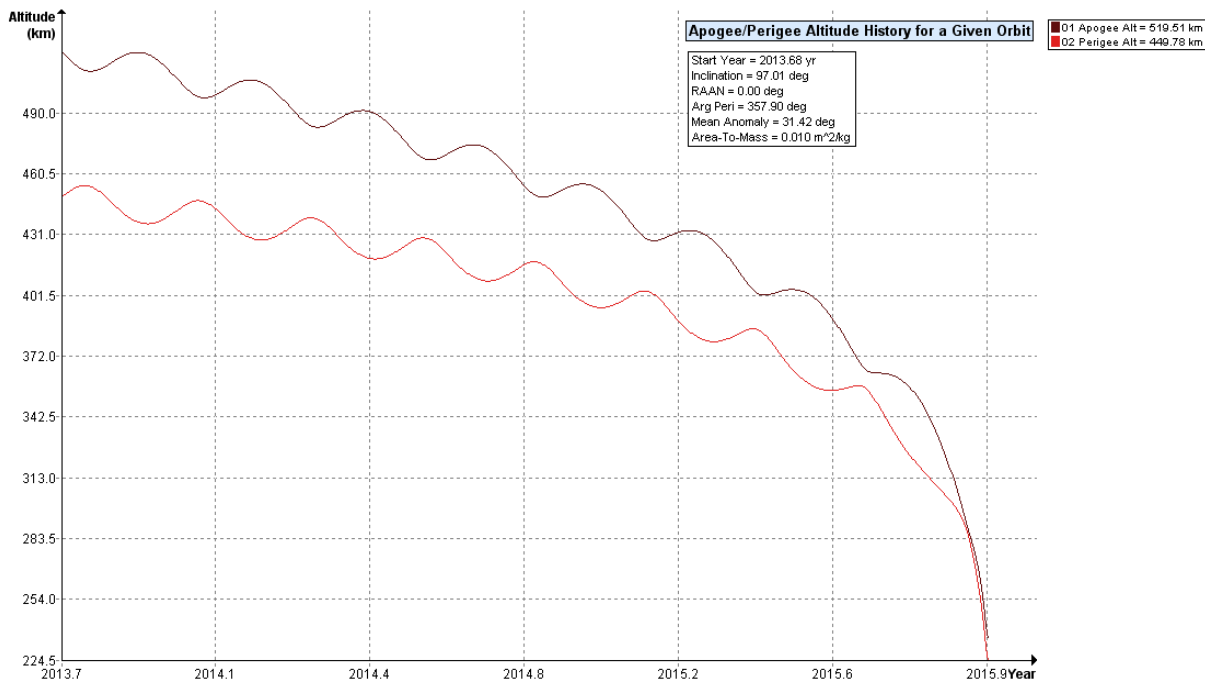
a. Atmospheric reentry option:

- Leave the space structure in an orbit in which natural forces will lead to atmospheric reentry within 25 years after the completion of mission but no more than 30 years after launch; or
- Maneuver the space structure into a controlled de-orbit trajectory as soon as practical after completion of mission.

b. Storage orbit option: Maneuver the space structure into an orbit with perigee altitude greater than 2000 km and apogee less than GEO - 500 km.

c. Direct retrieval: Retrieve the space structure and remove it from orbit within 10 years after completion of mission.

**Analysis:** The EDSN satellites reentry is COMPLIANT using method “a.” The EDSN satellites will be left in a 440 km, 524 km elliptical orbit, reentering in 820 days after launch with orbit history as shown in Figure 3 (analysis assumes an approximate random tumbling behavior).



**Figure 3. EDSN Orbit History (Identical for all eight Satellites).**



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

**Analysis:** Not applicable. The satellite orbits are in LEO.

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

**Analysis:** Not applicable. The satellite orbits are in LEO.

**Requirement 4.6-4. Reliability of Postmission Disposal Operations**

**Analysis:** Not applicable. The satellites will reenter passively without post mission disposal operations within allowable timeframe.

**ODAR Section 7: Assessment of Spacecraft Reentry Hazards**

Assessment of spacecraft compliance with Requirement 4.7-1:

**Requirement 4.7-1. Limit the risk of human casualty:** The potential for human casualty is assumed for any object with an impacting kinetic energy in excess of 15 joules:

- a) For uncontrolled reentry, the risk of human casualty from surviving debris shall not exceed 0.0001 (1:10,000) (Requirement 56626).

**Summary Analysis Results:** DAS v2.0.1 reports that the EDSN satellites are compliant with the requirement. No components reach the ground. Total human casualty probability is reported by the DAS software as 1:0. This is an erroneous output, presumably meaning a probability of zero.

**Analysis (per DAS v2.0.1):**

10 01 2012; 14:11:46PM Mission Editor Changes Applied  
 10 01 2012; 14:12:00PM Processing Requirement 4.3-1: Return Status : Not Run

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

=====  
 End of Requirement 4.3-1 =====  
 10 01 2012; 14:12:05PM Processing Requirement 4.3-2: Return Status : Passed

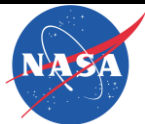
=====  
 No Project Data Available  
 =====

=====  
 End of Requirement 4.3-2 =====  
 10 01 2012; 14:12:11PM Requirement 4.4-3: Compliant

=====  
 End of Requirement 4.4-3 =====  
 10 01 2012; 14:12:27PM Processing Requirement 4.5-1: Return Status : Passed

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=====

Run Data

=====

\*\*INPUT\*\*

Space Structure Name = EDSN1  
Space Structure Type = Payload  
Perigee Altitude = 449.777279 (km)  
Apogee Altitude = 519.511885 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Final Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)  
Duration = 0.164384 (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)

\*\*OUTPUT\*\*

Collision Probability = 0.000000  
Returned Error Message: Normal Processing  
Date Range Error Message: Normal Date Range  
Status = Pass

=====

\*\*INPUT\*\*

Space Structure Name = EDSN2  
Space Structure Type = Payload  
Perigee Altitude = 449.765516 (km)  
Apogee Altitude = 519.523798 (km)  
Inclination = 97.011000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Final Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)

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Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)  
Duration = 0.164384 (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)

**\*\*OUTPUT\*\***

Collision Probability = 0.000000  
Returned Error Message: Normal Processing  
Date Range Error Message: Normal Date Range  
Status = Pass

=====

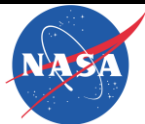
**\*\*INPUT\*\***

Space Structure Name = EDSN3  
Space Structure Type = Payload  
Perigee Altitude = 449.732219 (km)  
Apogee Altitude = 519.556885 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Final Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)  
Duration = 0.164384 (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)

**\*\*OUTPUT\*\***

Collision Probability = 0.000000  
Returned Error Message: Normal Processing  
Date Range Error Message: Normal Date Range

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Status = Pass

=====

**\*\*INPUT\*\***

Space Structure Name = EDSN4  
Space Structure Type = Payload  
Perigee Altitude = 449.719035 (km)  
Apogee Altitude = 519.570195 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Final Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)  
Duration = 0.164384 (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)

**\*\*OUTPUT\*\***

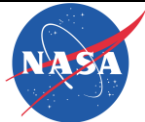
Collision Probability = 0.000000  
Returned Error Message: Normal Processing  
Date Range Error Message: Normal Date Range  
Status = Pass

=====

**\*\*INPUT\*\***

Space Structure Name = EDSN5  
Space Structure Type = Payload  
Perigee Altitude = 449.754677 (km)  
Apogee Altitude = 519.534615 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Final Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)

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Final Mass = 1.680200 (kg)  
Duration = 0.164384 (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)

**\*\*OUTPUT\*\***

Collision Probability = 0.000000  
Returned Error Message: Normal Processing  
Date Range Error Message: Normal Date Range  
Status = Pass

=====

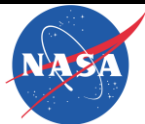
**\*\*INPUT\*\***

Space Structure Name = EDSN6  
Space Structure Type = Payload  
Perigee Altitude = 449.742201 (km)  
Apogee Altitude = 519.547230 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Final Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)  
Duration = 0.164384 (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)

**\*\*OUTPUT\*\***

Collision Probability = 0.000000  
Returned Error Message: Normal Processing  
Date Range Error Message: Normal Date Range  
Status = Pass

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=====

\*\*INPUT\*\*

Space Structure Name = EDSN7  
Space Structure Type = Payload  
Perigee Altitude = 449.710013 (km)  
Apogee Altitude = 519.579170 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Final Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)  
Duration = 0.164384 (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)

\*\*OUTPUT\*\*

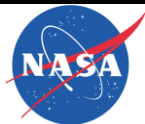
Collision Probability = 0.000000  
Returned Error Message: Normal Processing  
Date Range Error Message: Normal Date Range  
Status = Pass

=====

\*\*INPUT\*\*

Space Structure Name = EDSN8  
Space Structure Type = Payload  
Perigee Altitude = 449.696128 (km)  
Apogee Altitude = 519.593171 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Final Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)

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Duration = 0.164384 (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)

**\*\*OUTPUT\*\***

Collision Probability = 0.000000  
Returned Error Message: Normal Processing  
Date Range Error Message: Normal Date Range  
Status = Pass

=====

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

10 01 2012; 14:13:11PM Requirement 4.5-2: Compliant  
10 01 2012; 14:13:22PM Processing Requirement 4.6 Return Status : Passed

=====

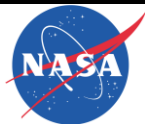
Project Data

=====

**\*\*INPUT\*\***

Space Structure Name = EDSN1  
Space Structure Type = Payload  
  
Perigee Altitude = 449.777279 (km)  
Apogee Altitude = 519.511885 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)  
Duration = 0.164384 (yr)  
Station Kept = False  
Abandoned = True  
PMD Perigee Altitude = 439.380482 (km)  
PMD Apogee Altitude = 518.624302 (km)  
PMD Inclination = 97.013499 (deg)  
PMD RAAN = 56.375774 (deg)  
PMD Argument of Perigee = 126.417556 (deg)

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PMD Mean Anomaly = 0.000000 (deg)

**\*\*OUTPUT\*\***

Suggested Perigee Altitude = 439.380482 (km)  
Suggested Apogee Altitude = 518.624302 (km)  
Returned Error Message = Passes LEO reentry orbit criteria.

Released Year = 2016 (yr)  
Requirement = 61  
Compliance Status = Pass

=====

**\*\*INPUT\*\***

Space Structure Name = EDSN2  
Space Structure Type = Payload

Perigee Altitude = 449.765516 (km)  
Apogee Altitude = 519.523798 (km)  
Inclination = 97.011000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)  
Duration = 0.164384 (yr)  
Station Kept = False  
Abandoned = True  
PMD Perigee Altitude = 439.370085 (km)  
PMD Apogee Altitude = 518.634338 (km)  
PMD Inclination = 97.014500 (deg)  
PMD RAAN = 56.383783 (deg)  
PMD Argument of Perigee = 126.427233 (deg)  
PMD Mean Anomaly = 0.000000 (deg)

**\*\*OUTPUT\*\***

Suggested Perigee Altitude = 439.370085 (km)  
Suggested Apogee Altitude = 518.634338 (km)  
Returned Error Message = Passes LEO reentry orbit criteria.

Released Year = 2016 (yr)  
Requirement = 61  
Compliance Status = Pass

=====

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Rev A

\*\*INPUT\*\*

Space Structure Name = EDSN3  
Space Structure Type = Payload  
  
Perigee Altitude = 449.732219 (km)  
Apogee Altitude = 519.556885 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)  
Duration = 0.164384 (yr)  
Station Kept = False  
Abandoned = True  
PMD Perigee Altitude = 439.339135 (km)  
PMD Apogee Altitude = 518.663679 (km)  
PMD Inclination = 97.013499 (deg)  
PMD RAAN = 56.375794 (deg)  
PMD Argument of Perigee = 126.438391 (deg)  
PMD Mean Anomaly = 0.000000 (deg)

\*\*OUTPUT\*\*

Suggested Perigee Altitude = 439.339135 (km)  
Suggested Apogee Altitude = 518.663679 (km)  
Returned Error Message = Passes LEO reentry orbit criteria.  
  
Released Year = 2016 (yr)  
Requirement = 61  
Compliance Status = Pass

=====

\*\*INPUT\*\*

Space Structure Name = EDSN4  
Space Structure Type = Payload  
  
Perigee Altitude = 449.719035 (km)  
Apogee Altitude = 519.570195 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)

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Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)  
Duration = 0.164384 (yr)  
Station Kept = False  
Abandoned = True  
PMD Perigee Altitude = 439.327048 (km)  
PMD Apogee Altitude = 518.675345 (km)  
PMD Inclination = 97.013499 (deg)  
PMD RAAN = 56.375798 (deg)  
PMD Argument of Perigee = 126.444520 (deg)  
PMD Mean Anomaly = 0.000000 (deg)

**\*\*OUTPUT\*\***

Suggested Perigee Altitude = 439.327048 (km)  
Suggested Apogee Altitude = 518.675345 (km)  
Returned Error Message = Passes LEO reentry orbit criteria.

Released Year = 2016 (yr)  
Requirement = 61  
Compliance Status = Pass

=====

**\*\*INPUT\*\***

Space Structure Name = EDSN5  
Space Structure Type = Payload  
  
Perigee Altitude = 449.754677 (km)  
Apogee Altitude = 519.534615 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)  
Duration = 0.164384 (yr)  
Station Kept = False  
Abandoned = True  
PMD Perigee Altitude = 439.359756 (km)  
PMD Apogee Altitude = 518.644210 (km)  
PMD Inclination = 97.013499 (deg)  
PMD RAAN = 56.375782 (deg)  
PMD Argument of Perigee = 126.428057 (deg)  
PMD Mean Anomaly = 0.000000 (deg)



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**\*\*OUTPUT\*\***

Suggested Perigee Altitude = 439.359756 (km)  
Suggested Apogee Altitude = 518.644210 (km)  
Returned Error Message = Passes LEO reentry orbit criteria.

Released Year = 2016 (yr)  
Requirement = 61  
Compliance Status = Pass

=====

**\*\*INPUT\*\***

Space Structure Name = EDSN6  
Space Structure Type = Payload

Perigee Altitude = 449.742201 (km)  
Apogee Altitude = 519.547230 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)  
Duration = 0.164384 (yr)  
Station Kept = False  
Abandoned = True  
PMD Perigee Altitude = 439.348319 (km)  
PMD Apogee Altitude = 518.655266 (km)  
PMD Inclination = 97.013499 (deg)  
PMD RAAN = 56.375785 (deg)  
PMD Argument of Perigee = 126.433868 (deg)  
PMD Mean Anomaly = 0.000000 (deg)

**\*\*OUTPUT\*\***

Suggested Perigee Altitude = 439.348319 (km)  
Suggested Apogee Altitude = 518.655266 (km)  
Returned Error Message = Passes LEO reentry orbit criteria.

Released Year = 2016 (yr)  
Requirement = 61  
Compliance Status = Pass

=====

**\*\*INPUT\*\***

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Space Structure Name = EDSN7  
Space Structure Type = Payload  
  
Perigee Altitude = 449.710013 (km)  
Apogee Altitude = 519.579170 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)  
Final Mass = 1.680200 (kg)  
Duration = 0.164384 (yr)  
Station Kept = False  
Abandoned = True  
PMD Perigee Altitude = 439.318765 (km)  
PMD Apogee Altitude = 518.683194 (km)  
PMD Inclination = 97.013499 (deg)  
PMD RAAN = 56.375803 (deg)  
PMD Argument of Perigee = 126.448674 (deg)  
PMD Mean Anomaly = 0.000000 (deg)

**\*\*OUTPUT\*\***

Suggested Perigee Altitude = 439.318765 (km)  
Suggested Apogee Altitude = 518.683194 (km)  
Returned Error Message = Passes LEO reentry orbit criteria.

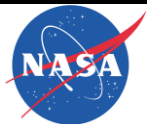
Released Year = 2016 (yr)  
Requirement = 61  
Compliance Status = Pass

=====

**\*\*INPUT\*\***

Space Structure Name = EDSN8  
Space Structure Type = Payload  
  
Perigee Altitude = 449.696128 (km)  
Apogee Altitude = 519.593171 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.000000 (deg)  
Argument of Perigee = 0.000000 (deg)  
Mean Anomaly = 0.000000 (deg)  
Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682192 (yr)  
Initial Mass = 1.680200 (kg)

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Final Mass = 1.680200 (kg)  
Duration = 0.164384 (yr)  
Station Kept = False  
Abandoned = True  
PMD Perigee Altitude = 439.306033 (km)  
PMD Apogee Altitude = 518.695465 (km)  
PMD Inclination = 97.013499 (deg)  
PMD RAAN = 56.375807 (deg)  
PMD Argument of Perigee = 126.455117 (deg)  
PMD Mean Anomaly = 0.000000 (deg)

**\*\*OUTPUT\*\***

Suggested Perigee Altitude = 439.306033 (km)  
Suggested Apogee Altitude = 518.695465 (km)  
Returned Error Message = Passes LEO reentry orbit criteria.

Released Year = 2016 (yr)  
Requirement = 61  
Compliance Status = Pass

=====

===== End of Requirement 4.6 =====  
10 01 2012; 14:14:32PM \*\*\*\*\*Processing Requirement 4.7-1  
Return Status : Passed

**\*\*\*\*\*INPUT\*\*\*\***

Item Number = 1

name = EDSN1  
quantity = 1  
parent = 0  
materialID = 54  
type = Box  
Aero Mass = 1.680200  
Thermal Mass = 1.680200  
Diameter/Width = 0.100000  
Length = 0.150000  
Height = 0.100000

name = EDSN1 Structure  
quantity = 1  
parent = 1  
materialID = 8  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.099900  
Length = 0.153000

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Height = 0.099830

name = EDSN1 Battery  
quantity = 4  
parent = 1  
materialID = 54  
type = Cylinder  
Aero Mass = 0.045500  
Thermal Mass = 0.045500  
Diameter/Width = 0.018070  
Length = 0.064820

name = EDSN1 Nexus S  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.020000  
Thermal Mass = 0.020000  
Diameter/Width = 0.056130  
Length = 0.109470

name = EDSN1 PCB  
quantity = 8  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035000  
Thermal Mass = 0.035000  
Diameter/Width = 0.081410  
Length = 0.104440

name = EDSN1 Battery holder  
quantity = 1  
parent = 1  
materialID = 76  
type = Box  
Aero Mass = 0.029800  
Thermal Mass = 0.029800  
Diameter/Width = 0.079680  
Length = 0.083400  
Height = 0.018570

name = EDSN1 Magnetorquer  
quantity = 6  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.027600  
Thermal Mass = 0.027600

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Diameter/Width = 0.051380  
Length = 0.074640

name = EDSN1 Reaction wheel  
quantity = 3  
parent = 1  
materialID = 14  
type = Cylinder  
Aero Mass = 0.019300  
Thermal Mass = 0.019300  
Diameter/Width = 0.025830  
Length = 0.010350

name = EDSN1 Reaction wheel mount  
quantity = 1  
parent = 1  
materialID = 76  
type = Box  
Aero Mass = 0.023500  
Thermal Mass = 0.023500  
Diameter/Width = 0.027070  
Length = 0.065920  
Height = 0.027070

name = EDSN1 MHX2420  
quantity = 1  
parent = 1  
materialID = 54  
type = Box  
Aero Mass = 0.044400  
Thermal Mass = 0.044400  
Diameter/Width = 0.053760  
Length = 0.095720  
Height = 0.016600

name = EDSN1 Solar Arrays side  
quantity = 4  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.054000  
Thermal Mass = 0.054000  
Diameter/Width = 0.081810  
Length = 0.150000

name = EDSN1 Solar Arrays top/bottom  
quantity = 2  
parent = 1  
materialID = 23  
type = Flat Plate

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Aero Mass = 0.035800  
Thermal Mass = 0.035800  
Diameter/Width = 0.081810  
Length = 0.100170

name = EDSN1 Heat sink  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.012400  
Thermal Mass = 0.012400  
Diameter/Width = 0.085250  
Length = 0.093510

name = EDSN1 Battery holder mount  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.055100  
Thermal Mass = 0.055100  
Diameter/Width = 0.091140  
Length = 0.095400

name = EDSN1 StenSat radio  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.023900  
Thermal Mass = 0.023900  
Diameter/Width = 0.044540  
Length = 0.078930

name = EDSN1 GPS  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.018300  
Thermal Mass = 0.018300  
Diameter/Width = 0.046000  
Length = 0.071860

name = EDSN1 MHX2420 antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Aero Mass = 0.009200  
Thermal Mass = 0.009200  
Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN1 GPS antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.009200  
Thermal Mass = 0.009200  
Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN1 StenSat antenna  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.005000  
Thermal Mass = 0.005000  
Diameter/Width = 0.012440  
Length = 0.177800

name = EDSN1 EPISEM  
quantity = 1  
parent = 1  
materialID = 23  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.943000  
Length = 0.955000  
Height = 0.170000

\*\*\*\*\*OUTPUT\*\*\*\*

Item Number = 1

name = EDSN1  
Demise Altitude = 77.999683  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 Structure  
Demise Altitude = 76.961949  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000





*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

\*\*\*\*\*

name = EDSN1 Battery  
Demise Altitude = 71.772917  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 Nexus S  
Demise Altitude = 77.567074  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 PCB  
Demise Altitude = 77.382035  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 Battery holder  
Demise Altitude = 77.861472  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 Magnetorquer  
Demise Altitude = 77.104168  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 Reaction wheel  
Demise Altitude = 76.014441  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 Reaction wheel mount  
Demise Altitude = 77.814535  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 MHX2420  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.433003  
Impact Kinetic Energy = 6.496058

\*\*\*\*\*

name = EDSN1 Solar Arrays side

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Demise Altitude = 77.320129  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 Solar Arrays top/bottom  
Demise Altitude = 77.343043  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 Heat sink  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.475113  
Impact Kinetic Energy = 0.314622

\*\*\*\*\*

name = EDSN1 Battery holder mount  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.480590  
Impact Kinetic Energy = 5.698823

\*\*\*\*\*

name = EDSN1 StenSat radio  
Demise Altitude = 77.183363  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 GPS  
Demise Altitude = 77.332972  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 MHX2420 antenna  
Demise Altitude = 77.658863  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 GPS antenna  
Demise Altitude = 77.658863  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN1 StenSat antenna  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.418648

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Impact Kinetic Energy = 0.184386

\*\*\*\*\*

name = EDSN1 EPISEM  
Demise Altitude = 0.000000  
Debris Casualty Area = 1.766271  
Impact Kinetic Energy = 0.413600

\*\*\*\*\*

\*\*\*\*\*INPUT\*\*\*\*

Item Number = 2

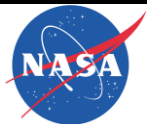
name = EDSN2  
quantity = 1  
parent = 0  
materialID = 54  
type = Box  
Aero Mass = 1.680200  
Thermal Mass = 1.680200  
Diameter/Width = 0.100000  
Length = 0.150000  
Height = 0.100000

name = EDSN2 Structure  
quantity = 1  
parent = 1  
materialID = 8  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.099900  
Length = 0.153000  
Height = 0.099830

name = EDSN2 Battery  
quantity = 4  
parent = 1  
materialID = 54  
type = Cylinder  
Aero Mass = 0.045500  
Thermal Mass = 0.045500  
Diameter/Width = 0.018070  
Length = 0.064820

name = EDSN2 Nexus S  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate

Once this document has been printed it will be considered an uncontrolled document.



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Aero Mass = 0.020000  
Thermal Mass = 0.020000  
Diameter/Width = 0.056130  
Length = 0.109470

name = EDSN2 PCB  
quantity = 8  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035000  
Thermal Mass = 0.035000  
Diameter/Width = 0.081410  
Length = 0.104440

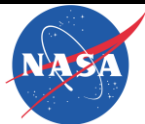
name = EDSN2 Battery holder  
quantity = 1  
parent = 1  
materialID = 76  
type = Box  
Aero Mass = 0.029800  
Thermal Mass = 0.029800  
Diameter/Width = 0.079680  
Length = 0.083400  
Height = 0.018570

name = EDSN2 Magnetorquer  
quantity = 6  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.027600  
Thermal Mass = 0.027600  
Diameter/Width = 0.051380  
Length = 0.074640

name = EDSN2 Reaction wheel  
quantity = 3  
parent = 1  
materialID = 14  
type = Cylinder  
Aero Mass = 0.019300  
Thermal Mass = 0.019300  
Diameter/Width = 0.025830  
Length = 0.010350

name = EDSN2 Reaction wheel holder  
quantity = 1  
parent = 1  
materialID = 76

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

type = Box

Aero Mass = 0.023500

Thermal Mass = 0.023500

Diameter/Width = 0.027070

Length = 0.065920

Height = 0.027070

name = EDSN2 MHX2420

quantity = 1

parent = 1

materialID = 54

type = Box

Aero Mass = 0.044400

Thermal Mass = 0.044400

Diameter/Width = 0.053760

Length = 0.095720

Height = 0.016600

name = EDSN2 Solar Arrays side

quantity = 4

parent = 1

materialID = 23

type = Flat Plate

Aero Mass = 0.054000

Thermal Mass = 0.054000

Diameter/Width = 0.081810

Length = 0.150000

name = EDSN2 Solar Arrays top/bottom

quantity = 2

parent = 1

materialID = 23

type = Flat Plate

Aero Mass = 0.035800

Thermal Mass = 0.035800

Diameter/Width = 0.081810

Length = 0.100170

name = EDSN2 Heat sink

quantity = 1

parent = 1

materialID = 54

type = Flat Plate

Aero Mass = 0.012400

Thermal Mass = 0.012400

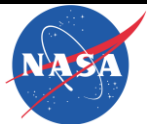
Diameter/Width = 0.085250

Length = 0.093510

name = EDSN2 Battery holder mount

quantity = 1

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.055100  
Thermal Mass = 0.055100  
Diameter/Width = 0.091140  
Length = 0.095400

name = EDSN2 StenSat radio  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.023900  
Thermal Mass = 0.023900  
Diameter/Width = 0.044540  
Length = 0.078930

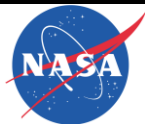
name = EDSN2 GPS  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.018300  
Thermal Mass = 0.018300  
Diameter/Width = 0.046000  
Length = 0.071860

name = EDSN2 MHX2420 antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.009200  
Thermal Mass = 0.009200  
Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN2 GPS antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.009200  
Thermal Mass = 0.009200  
Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN2 StenSat antenna  
quantity = 1

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*EDSN*  
Orbital Debris Assessment Report (ODAR)

A.2.1.EDSN.ODAR  
Rev A

parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.005000  
Thermal Mass = 0.005000  
Diameter/Width = 0.012440  
Length = 0.177800

name = EDSN2 EPISEM  
quantity = 1  
parent = 1  
materialID = 23  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.943000  
Length = 0.955000  
Height = 0.170000

\*\*\*\*\*OUTPUT\*\*\*\*

Item Number = 2

name = EDSN2  
Demise Altitude = 77.995590  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN2 Structure  
Demise Altitude = 76.957660  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN2 Battery  
Demise Altitude = 71.767550  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

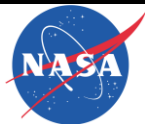
\*\*\*\*\*

name = EDSN2 Nexus S  
Demise Altitude = 77.562894  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN2 PCB  
Demise Altitude = 77.377824  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

\*\*\*\*\*

name = EDSN2 Battery holder  
Demise Altitude = 77.857355  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN2 Magnetorquer  
Demise Altitude = 77.099902  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN2 Reaction wheel  
Demise Altitude = 76.018355  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN2 Reaction wheel holder  
Demise Altitude = 77.810402  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN2 MHX2420  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.433003  
Impact Kinetic Energy = 6.496129

\*\*\*\*\*

name = EDSN2 Solar Arrays side  
Demise Altitude = 77.315902  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN2 Solar Arrays top/bottom  
Demise Altitude = 77.338824  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN2 Heat sink  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.475113  
Impact Kinetic Energy = 0.314629

\*\*\*\*\*

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

name = EDSN2 Battery holder mount  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.480590  
Impact Kinetic Energy = 5.699077

\*\*\*\*\*

name = EDSN2 StenSat radio  
Demise Altitude = 77.179113  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN2 GPS  
Demise Altitude = 77.328754  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN2 MHX2420 antenna  
Demise Altitude = 77.654707  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN2 GPS antenna  
Demise Altitude = 77.654707  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN2 StenSat antenna  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.418648  
Impact Kinetic Energy = 0.184384

\*\*\*\*\*

name = EDSN2 EPISEM  
Demise Altitude = 0.000000  
Debris Casualty Area = 1.766271  
Impact Kinetic Energy = 0.413599

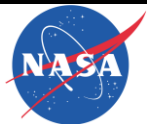
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\*\*\*\*\*INPUT\*\*\*\*

Item Number = 3

name = EDSN3  
quantity = 1  
parent = 0  
materialID = 54

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
Rev A

type = Box  
Aero Mass = 1.680200  
Thermal Mass = 1.680200  
Diameter/Width = 0.100000  
Length = 0.150000  
Height = 0.100000

name = EDSN3 Structure  
quantity = 1  
parent = 1  
materialID = 8  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.099900  
Length = 0.153000  
Height = 0.099830

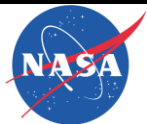
name = EDSN3 Battery  
quantity = 4  
parent = 1  
materialID = 54  
type = Cylinder  
Aero Mass = 0.045500  
Thermal Mass = 0.045500  
Diameter/Width = 0.018070  
Length = 0.064820

name = EDSN3 Nexus S  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.020000  
Thermal Mass = 0.020000  
Diameter/Width = 0.056130  
Length = 0.109470

name = EDSN3 PCB  
quantity = 8  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035000  
Thermal Mass = 0.035000  
Diameter/Width = 0.081410  
Length = 0.104440

name = EDSN3 Battery holder  
quantity = 1

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

parent = 1  
materialID = 76  
type = Box  
Aero Mass = 0.029800  
Thermal Mass = 0.029800  
Diameter/Width = 0.079680  
Length = 0.083400  
Height = 0.018570

name = EDSN3 Magnetorquer  
quantity = 6  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.027600  
Thermal Mass = 0.027600  
Diameter/Width = 0.051380  
Length = 0.074640

name = EDSN3 Reaction wheel  
quantity = 3  
parent = 1  
materialID = 14  
type = Cylinder  
Aero Mass = 0.019300  
Thermal Mass = 0.019300  
Diameter/Width = 0.025830  
Length = 0.010350

name = EDSN3 Reaction wheel holder  
quantity = 1  
parent = 1  
materialID = 76  
type = Box  
Aero Mass = 0.023500  
Thermal Mass = 0.023500  
Diameter/Width = 0.027070  
Length = 0.065920  
Height = 0.027070

name = EDSN3 MHX2420  
quantity = 1  
parent = 1  
materialID = 54  
type = Box  
Aero Mass = 0.044400  
Thermal Mass = 0.044400  
Diameter/Width = 0.053760  
Length = 0.095720  
Height = 0.016600

Once this document has been printed it will be considered an uncontrolled document.



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

name = EDSN3 Solar Arrays side  
quantity = 4  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.054000  
Thermal Mass = 0.054000  
Diameter/Width = 0.081810  
Length = 0.150000

name = EDSN3 Solar Arrays top/bottom  
quantity = 2  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035800  
Thermal Mass = 0.035800  
Diameter/Width = 0.081810  
Length = 0.100170

name = EDSN3 Heat sink  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.012400  
Thermal Mass = 0.012400  
Diameter/Width = 0.085250  
Length = 0.093510

name = EDSN3 Battery holder mount  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.055100  
Thermal Mass = 0.055100  
Diameter/Width = 0.091140  
Length = 0.095400

name = EDSN3 StenSat radio  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.023900  
Thermal Mass = 0.023900  
Diameter/Width = 0.044540  
Length = 0.078930



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

name = EDSN3 GPS  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.018300  
Thermal Mass = 0.018300  
Diameter/Width = 0.046000  
Length = 0.071860

name = EDSN3 MHX2420 antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.009200  
Thermal Mass = 0.009200  
Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN3 GPS antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.009200  
Thermal Mass = 0.009200  
Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN3 StenSat antenna  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.005000  
Thermal Mass = 0.005000  
Diameter/Width = 0.012440  
Length = 0.177800

name = EDSN3 EPISEM  
quantity = 1  
parent = 1  
materialID = 23  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.943000  
Length = 0.955000



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Height = 0.170000

\*\*\*\*\*OUTPUT\*\*\*\*

Item Number = 3

name = EDSN3  
Demise Altitude = 77.999683  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

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name = EDSN3 Structure  
Demise Altitude = 76.961949  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN3 Battery  
Demise Altitude = 71.772917  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN3 Nexus S  
Demise Altitude = 77.567074  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN3 PCB  
Demise Altitude = 77.382035  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN3 Battery holder  
Demise Altitude = 77.861472  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN3 Magnetorquer  
Demise Altitude = 77.104168  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN3 Reaction wheel  
Demise Altitude = 76.014441  
Debris Casualty Area = 0.000000

Once this document has been printed it will be considered an uncontrolled document.



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN3 Reaction wheel holder  
Demise Altitude = 77.814535  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN3 MHX2420  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.433003  
Impact Kinetic Energy = 6.496058

\*\*\*\*\*

name = EDSN3 Solar Arrays side  
Demise Altitude = 77.320129  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN3 Solar Arrays top/bottom  
Demise Altitude = 77.343043  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN3 Heat sink  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.475113  
Impact Kinetic Energy = 0.314622

\*\*\*\*\*

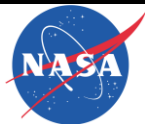
name = EDSN3 Battery holder mount  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.480590  
Impact Kinetic Energy = 5.698823

\*\*\*\*\*

name = EDSN3 StenSat radio  
Demise Altitude = 77.183363  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN3 GPS  
Demise Altitude = 77.332972  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

\*\*\*\*\*

name = EDSN3 MHX2420 antenna  
Demise Altitude = 77.658863  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN3 GPS antenna  
Demise Altitude = 77.658863  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN3 StenSat antenna  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.418648  
Impact Kinetic Energy = 0.184386

\*\*\*\*\*

name = EDSN3 EPISEM  
Demise Altitude = 0.000000  
Debris Casualty Area = 1.766271  
Impact Kinetic Energy = 0.413600

\*\*\*\*\*

\*\*\*\*\*INPUT\*\*\*\*

Item Number = 4

name = EDSN4  
quantity = 1  
parent = 0  
materialID = 54  
type = Box  
Aero Mass = 1.680200  
Thermal Mass = 1.680200  
Diameter/Width = 0.100000  
Length = 0.150000  
Height = 0.100000

name = EDSN4 Structure  
quantity = 1  
parent = 1  
materialID = 8  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.099900  
Length = 0.153000  
Height = 0.099830

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*EDSN*  
Orbital Debris Assessment Report (ODAR)

A.2.1.EDSN.ODAR  
Rev A

name = EDSN4 Battery  
quantity = 4  
parent = 1  
materialID = 54  
type = Cylinder  
Aero Mass = 0.045500  
Thermal Mass = 0.045500  
Diameter/Width = 0.018070  
Length = 0.064820

name = EDSN4 Nexus S  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.020000  
Thermal Mass = 0.020000  
Diameter/Width = 0.056130  
Length = 0.109470

name = EDSN4 PCB  
quantity = 8  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035000  
Thermal Mass = 0.035000  
Diameter/Width = 0.081410  
Length = 0.104440

name = EDSN4 Battery holder  
quantity = 1  
parent = 1  
materialID = 76  
type = Box  
Aero Mass = 0.029800  
Thermal Mass = 0.029800  
Diameter/Width = 0.079680  
Length = 0.083400  
Height = 0.018570

name = EDSN4 Magnetorquer  
quantity = 6  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.027600  
Thermal Mass = 0.027600  
Diameter/Width = 0.051380

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Length = 0.074640

name = EDSN4 Reaction wheel  
quantity = 3  
parent = 1  
materialID = 14  
type = Cylinder  
Aero Mass = 0.019300  
Thermal Mass = 0.019300  
Diameter/Width = 0.025830  
Length = 0.010350

name = EDSN4 Reaction wheel holder  
quantity = 1  
parent = 1  
materialID = 76  
type = Box  
Aero Mass = 0.023500  
Thermal Mass = 0.023500  
Diameter/Width = 0.027070  
Length = 0.065920  
Height = 0.027070

name = EDSN4 MHX2420  
quantity = 1  
parent = 1  
materialID = 54  
type = Box  
Aero Mass = 0.044400  
Thermal Mass = 0.044400  
Diameter/Width = 0.053760  
Length = 0.095720  
Height = 0.016600

name = EDSN4 Solar Arrays side  
quantity = 4  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.054000  
Thermal Mass = 0.054000  
Diameter/Width = 0.081810  
Length = 0.150000

name = EDSN4 Solar Arrays top/bottom  
quantity = 2  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035800

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Thermal Mass = 0.035800  
Diameter/Width = 0.081810  
Length = 0.100170

name = EDSN4 Heat sink  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.012400  
Thermal Mass = 0.012400  
Diameter/Width = 0.085250  
Length = 0.093510

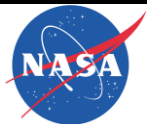
name = EDSN4 Battery holder mount  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.055100  
Thermal Mass = 0.055100  
Diameter/Width = 0.091140  
Length = 0.095400

name = EDSN4 StenSat radio  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.023900  
Thermal Mass = 0.023900  
Diameter/Width = 0.044540  
Length = 0.078930

name = EDSN4 GPS  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.018300  
Thermal Mass = 0.018300  
Diameter/Width = 0.046000  
Length = 0.071860

name = EDSN4 MHX2420 antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.009200

Once this document has been printed it will be considered an uncontrolled document.



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Thermal Mass = 0.009200  
Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN4 GPS antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.009200  
Thermal Mass = 0.009200  
Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN4 StenSat antenna  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.005000  
Thermal Mass = 0.005000  
Diameter/Width = 0.012440  
Length = 0.177800

name = EDSN4 EPISEM  
quantity = 1  
parent = 1  
materialID = 23  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.943000  
Length = 0.955000  
Height = 0.170000

\*\*\*\*\*OUTPUT\*\*\*\*  
Item Number = 4

name = EDSN4  
Demise Altitude = 77.999683  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*  
name = EDSN4 Structure  
Demise Altitude = 76.961949  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

name = EDSN4 Battery  
Demise Altitude = 71.772917  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN4 Nexus S  
Demise Altitude = 77.567074  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN4 PCB  
Demise Altitude = 77.382035  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN4 Battery holder  
Demise Altitude = 77.861472  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN4 Magnetorquer  
Demise Altitude = 77.104168  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN4 Reaction wheel  
Demise Altitude = 76.014441  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN4 Reaction wheel holder  
Demise Altitude = 77.814535  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN4 MHX2420  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.433003  
Impact Kinetic Energy = 6.496058

\*\*\*\*\*

name = EDSN4 Solar Arrays side  
Demise Altitude = 77.320129

Once this document has been printed it will be considered an uncontrolled document.



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN4 Solar Arrays top/bottom  
Demise Altitude = 77.343043  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN4 Heat sink  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.475113  
Impact Kinetic Energy = 0.314622

\*\*\*\*\*

name = EDSN4 Battery holder mount  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.480590  
Impact Kinetic Energy = 5.698823

\*\*\*\*\*

name = EDSN4 StenSat radio  
Demise Altitude = 77.183363  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN4 GPS  
Demise Altitude = 77.332972  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN4 MHX2420 antenna  
Demise Altitude = 77.658863  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

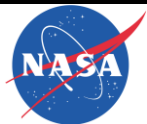
\*\*\*\*\*

name = EDSN4 GPS antenna  
Demise Altitude = 77.658863  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN4 StenSat antenna  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.418648  
Impact Kinetic Energy = 0.184386

Once this document has been printed it will be considered an uncontrolled document.



*EDSN*  
Orbital Debris Assessment Report (ODAR)

A.2.1.EDSN.ODAR  
Rev A

\*\*\*\*\*

name = EDSN4 EPISEM  
Demise Altitude = 0.000000  
Debris Casualty Area = 1.766271  
Impact Kinetic Energy = 0.413600

\*\*\*\*\*

\*\*\*\*\*INPUT\*\*\*\*\*

Item Number = 5

name = EDSN5  
quantity = 1  
parent = 0  
materialID = 54  
type = Box  
Aero Mass = 1.680200  
Thermal Mass = 1.680200  
Diameter/Width = 0.100000  
Length = 0.150000  
Height = 0.100000

name = EDSN5 Structure  
quantity = 1  
parent = 1  
materialID = 8  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.099900  
Length = 0.153000  
Height = 0.099830

name = EDSN5 Battery  
quantity = 4  
parent = 1  
materialID = 54  
type = Cylinder  
Aero Mass = 0.045500  
Thermal Mass = 0.045500  
Diameter/Width = 0.018070  
Length = 0.064820

name = EDSN5 Nexus S  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.020000

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Thermal Mass = 0.020000  
Diameter/Width = 0.056130  
Length = 0.109470

name = EDSN5 PCB  
quantity = 8  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035000  
Thermal Mass = 0.035000  
Diameter/Width = 0.081410  
Length = 0.104440

name = EDSN5 Battery holder  
quantity = 1  
parent = 1  
materialID = 76  
type = Box  
Aero Mass = 0.029800  
Thermal Mass = 0.029800  
Diameter/Width = 0.079680  
Length = 0.083400  
Height = 0.018570

name = EDSN5 Magnetorquer  
quantity = 6  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.027600  
Thermal Mass = 0.027600  
Diameter/Width = 0.051380  
Length = 0.074640

name = EDSN5 Reaction wheel  
quantity = 3  
parent = 1  
materialID = 14  
type = Cylinder  
Aero Mass = 0.019300  
Thermal Mass = 0.019300  
Diameter/Width = 0.025830  
Length = 0.010350

name = EDSN5 Reaction wheel holder  
quantity = 1  
parent = 1  
materialID = 76  
type = Box

Once this document has been printed it will be considered an uncontrolled document.





*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Aero Mass = 0.023500  
Thermal Mass = 0.023500  
Diameter/Width = 0.027070  
Length = 0.065920  
Height = 0.027070

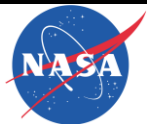
name = EDSN5 MHX2420  
quantity = 1  
parent = 1  
materialID = 54  
type = Box  
Aero Mass = 0.044400  
Thermal Mass = 0.044400  
Diameter/Width = 0.053760  
Length = 0.095720  
Height = 0.016600

name = EDSN5 Solar Arrays side  
quantity = 4  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.054000  
Thermal Mass = 0.054000  
Diameter/Width = 0.081810  
Length = 0.150000

name = EDSN5 Solar Arrays top/bottom  
quantity = 2  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035800  
Thermal Mass = 0.035800  
Diameter/Width = 0.081810  
Length = 0.100170

name = EDSN5 Heat sink  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.012400  
Thermal Mass = 0.012400  
Diameter/Width = 0.085250  
Length = 0.093510

name = EDSN5 Battery holder mount  
quantity = 1  
parent = 1



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

materialID = 54  
type = Flat Plate  
Aero Mass = 0.055100  
Thermal Mass = 0.055100  
Diameter/Width = 0.091140  
Length = 0.095400

name = EDSN5 StenSat radio  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.023900  
Thermal Mass = 0.023900  
Diameter/Width = 0.044540  
Length = 0.078930

name = EDSN5 GPS  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.018300  
Thermal Mass = 0.018300  
Diameter/Width = 0.046000  
Length = 0.071860

name = EDSN5 MHX2420 antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.009200  
Thermal Mass = 0.009200  
Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN5 GPS antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.009200  
Thermal Mass = 0.009200  
Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN5 StenSat antenna  
quantity = 1  
parent = 1

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
Rev A

materialID = 54  
type = Flat Plate  
Aero Mass = 0.005000  
Thermal Mass = 0.005000  
Diameter/Width = 0.012440  
Length = 0.177800

name = EDSN5 EPISEM  
quantity = 1  
parent = 1  
materialID = 23  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.943000  
Length = 0.955000  
Height = 0.170000

\*\*\*\*\*OUTPUT\*\*\*\*

Item Number = 5

name = EDSN5  
Demise Altitude = 77.999683  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 Structure  
Demise Altitude = 76.961949  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 Battery  
Demise Altitude = 71.772917  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 Nexus S  
Demise Altitude = 77.567074  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 PCB  
Demise Altitude = 77.382035  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

\*\*\*\*\*

name = EDSN5 Battery holder  
Demise Altitude = 77.861472  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 Magnetorquer  
Demise Altitude = 77.104168  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 Reaction wheel  
Demise Altitude = 76.014441  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 Reaction wheel holder  
Demise Altitude = 77.814535  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 MHX2420  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.433003  
Impact Kinetic Energy = 6.496058

\*\*\*\*\*

name = EDSN5 Solar Arrays side  
Demise Altitude = 77.320129  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 Solar Arrays top/bottom  
Demise Altitude = 77.343043  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 Heat sink  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.475113  
Impact Kinetic Energy = 0.314622

\*\*\*\*\*

name = EDSN5 Battery holder mount

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Demise Altitude = 0.000000  
Debris Casualty Area = 0.480590  
Impact Kinetic Energy = 5.698823

\*\*\*\*\*

name = EDSN5 StenSat radio  
Demise Altitude = 77.183363  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 GPS  
Demise Altitude = 77.332972  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 MHX2420 antenna  
Demise Altitude = 77.658863  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 GPS antenna  
Demise Altitude = 77.658863  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN5 StenSat antenna  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.418648  
Impact Kinetic Energy = 0.184386

\*\*\*\*\*

name = EDSN5 EPISEM  
Demise Altitude = 0.000000  
Debris Casualty Area = 1.766271  
Impact Kinetic Energy = 0.413600

\*\*\*\*\*

\*\*\*\*\*INPUT\*\*\*\*

Item Number = 6

name = EDSN6  
quantity = 1  
parent = 0  
materialID = 54  
type = Box

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Aero Mass = 1.680200  
Thermal Mass = 1.680200  
Diameter/Width = 0.100000  
Length = 0.150000  
Height = 0.100000

name = EDSN6 Structure  
quantity = 1  
parent = 1  
materialID = 8  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.099900  
Length = 0.153000  
Height = 0.099830

name = EDSN6 Battery  
quantity = 4  
parent = 1  
materialID = 54  
type = Cylinder  
Aero Mass = 0.045500  
Thermal Mass = 0.045500  
Diameter/Width = 0.018070  
Length = 0.064820

name = EDSN6 Nexus S  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.020000  
Thermal Mass = 0.020000  
Diameter/Width = 0.056130  
Length = 0.109470

name = EDSN6 PCB  
quantity = 8  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035000  
Thermal Mass = 0.035000  
Diameter/Width = 0.081410  
Length = 0.104440

name = EDSN6 Battery holder  
quantity = 1  
parent = 1

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
Rev A

materialID = 76  
type = Box  
Aero Mass = 0.029800  
Thermal Mass = 0.029800  
Diameter/Width = 0.079680  
Length = 0.083400  
Height = 0.018570

name = EDSN6 Magnetorquer  
quantity = 6  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.027600  
Thermal Mass = 0.027600  
Diameter/Width = 0.051380  
Length = 0.074640

name = EDSN6 Reaction wheel  
quantity = 3  
parent = 1  
materialID = 14  
type = Cylinder  
Aero Mass = 0.019300  
Thermal Mass = 0.019300  
Diameter/Width = 0.025830  
Length = 0.010350

name = EDSN6 Reaction wheel holder  
quantity = 1  
parent = 1  
materialID = 76  
type = Box  
Aero Mass = 0.023500  
Thermal Mass = 0.023500  
Diameter/Width = 0.027070  
Length = 0.065920  
Height = 0.027070

name = EDSN6 MHX2420  
quantity = 1  
parent = 1  
materialID = 54  
type = Box  
Aero Mass = 0.044400  
Thermal Mass = 0.044400  
Diameter/Width = 0.053760  
Length = 0.095720  
Height = 0.016600



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

name = EDSN6 Solar Arrays side  
quantity = 4  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.054000  
Thermal Mass = 0.054000  
Diameter/Width = 0.081810  
Length = 0.150000

name = EDSN6 Solar Arrays top/bottom  
quantity = 2  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035800  
Thermal Mass = 0.035800  
Diameter/Width = 0.081810  
Length = 0.100170

name = EDSN6 Heat sink  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.012400  
Thermal Mass = 0.012400  
Diameter/Width = 0.085250  
Length = 0.093510

name = EDSN6 Battery holder mount  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.055100  
Thermal Mass = 0.055100  
Diameter/Width = 0.091140  
Length = 0.095400

name = EDSN6 StenSat radio  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.023900  
Thermal Mass = 0.023900  
Diameter/Width = 0.044540  
Length = 0.078930





*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

name = EDSN 6 GPS

quantity = 1

parent = 1

materialID = 23

type = Flat Plate

Aero Mass = 0.018300

Thermal Mass = 0.018300

Diameter/Width = 0.046000

Length = 0.071860

name = EDSN6 MHX2420 antenna

quantity = 1

parent = 1

materialID = 23

type = Flat Plate

Aero Mass = 0.009200

Thermal Mass = 0.009200

Diameter/Width = 0.034940

Length = 0.895000

name = EDSN6 GPS antenna

quantity = 1

parent = 1

materialID = 23

type = Flat Plate

Aero Mass = 0.009200

Thermal Mass = 0.009200

Diameter/Width = 0.034940

Length = 0.089500

name = EDSN6 StenSat antenna

quantity = 1

parent = 1

materialID = 54

type = Flat Plate

Aero Mass = 0.005000

Thermal Mass = 0.005000

Diameter/Width = 0.012440

Length = 0.177800

name = EDSN6 EPISEM

quantity = 1

parent = 1

materialID = 23

type = Box

Aero Mass = 0.150000

Thermal Mass = 0.150000

Diameter/Width = 0.943000

Length = 0.955000

Height = 0.170000

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
Rev A

\*\*\*\*\*OUTPUT\*\*\*\*

Item Number = 6

name = EDSN6  
Demise Altitude = 77.999683  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN6 Structure  
Demise Altitude = 76.961949  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN6 Battery  
Demise Altitude = 71.772917  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN6 Nexus S  
Demise Altitude = 77.567074  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN6 PCB  
Demise Altitude = 77.382035  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN6 Battery holder  
Demise Altitude = 77.861472  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

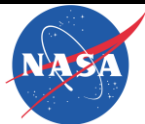
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name = EDSN6 Magnetorquer  
Demise Altitude = 77.104168  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN6 Reaction wheel  
Demise Altitude = 76.014441  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

Once this document has been printed it will be considered an uncontrolled document.



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

\*\*\*\*\*

name = EDSN6 Reaction wheel holder  
Demise Altitude = 77.814535  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN6 MHX2420  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.433003  
Impact Kinetic Energy = 6.496058

\*\*\*\*\*

name = EDSN6 Solar Arrays side  
Demise Altitude = 77.320129  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN6 Solar Arrays top/bottom  
Demise Altitude = 77.343043  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN6 Heat sink  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.475113  
Impact Kinetic Energy = 0.314622

\*\*\*\*\*

name = EDSN6 Battery holder mount  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.480590  
Impact Kinetic Energy = 5.698823

\*\*\*\*\*

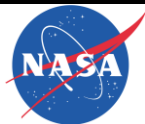
name = EDSN6 StenSat radio  
Demise Altitude = 77.183363  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN 6 GPS  
Demise Altitude = 77.332972  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
Rev A

name = EDSN6 MHX2420 antenna  
Demise Altitude = 77.962332  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN6 GPS antenna  
Demise Altitude = 77.658863  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN6 StenSat antenna  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.418648  
Impact Kinetic Energy = 0.184386

\*\*\*\*\*

name = EDSN6 EPISEM  
Demise Altitude = 0.000000  
Debris Casualty Area = 1.766271  
Impact Kinetic Energy = 0.413600

\*\*\*\*\*

\*\*\*\*\*INPUT\*\*\*\*

Item Number = 7

name = EDSN7  
quantity = 1  
parent = 0  
materialID = 54  
type = Box  
Aero Mass = 1.680200  
Thermal Mass = 1.680200  
Diameter/Width = 0.100000  
Length = 0.150000  
Height = 0.100000

name = EDSN7 Structure  
quantity = 1  
parent = 1  
materialID = 8  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.099900  
Length = 0.153000  
Height = 0.099830



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

name = EDSN7 Battery  
quantity = 4  
parent = 1  
materialID = 54  
type = Cylinder  
Aero Mass = 0.045500  
Thermal Mass = 0.045500  
Diameter/Width = 0.018070  
Length = 0.064820

name = EDSN7 Nexus S  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.020000  
Thermal Mass = 0.020000  
Diameter/Width = 0.056130  
Length = 0.109470

name = EDSN7 PCB  
quantity = 8  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035000  
Thermal Mass = 0.035000  
Diameter/Width = 0.081410  
Length = 0.104440

name = EDSN7 Battery holder  
quantity = 1  
parent = 1  
materialID = 76  
type = Box  
Aero Mass = 0.029800  
Thermal Mass = 0.029800  
Diameter/Width = 0.079680  
Length = 0.083400  
Height = 0.018570

name = EDSN7 Magnetorquer  
quantity = 6  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.027600  
Thermal Mass = 0.027600  
Diameter/Width = 0.051380  
Length = 0.074640

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

name = EDSN7 Reaction wheel  
quantity = 3  
parent = 1  
materialID = 14  
type = Cylinder  
Aero Mass = 0.019300  
Thermal Mass = 0.019300  
Diameter/Width = 0.025830  
Length = 0.010350

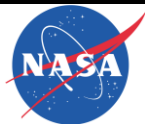
name = EDSN7 Reaction wheel holder  
quantity = 1  
parent = 1  
materialID = 76  
type = Box  
Aero Mass = 0.023500  
Thermal Mass = 0.023500  
Diameter/Width = 0.027070  
Length = 0.065920  
Height = 0.027070

name = EDSN7 MHX2420  
quantity = 1  
parent = 1  
materialID = 54  
type = Box  
Aero Mass = 0.044400  
Thermal Mass = 0.044400  
Diameter/Width = 0.053760  
Length = 0.095720  
Height = 0.016600

name = EDSN7 Solar Arrays side  
quantity = 4  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.054000  
Thermal Mass = 0.054000  
Diameter/Width = 0.081810  
Length = 0.150000

name = EDSN7 Solar Arrays top/bottom  
quantity = 2  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035800  
Thermal Mass = 0.035800

Once this document has been printed it will be considered an uncontrolled document.



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Diameter/Width = 0.081810  
Length = 0.100170

name = EDSN7 Heat sink  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.012400  
Thermal Mass = 0.012400  
Diameter/Width = 0.085250  
Length = 0.093510

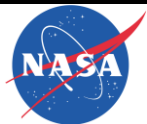
name = EDSN7 Battery holder mount  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.055100  
Thermal Mass = 0.055100  
Diameter/Width = 0.091140  
Length = 0.095400

name = EDSN7 StenSat radio  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.023900  
Thermal Mass = 0.023900  
Diameter/Width = 0.044540  
Length = 0.078930

name = EDSN7 GPS  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.018300  
Thermal Mass = 0.018300  
Diameter/Width = 0.046000  
Length = 0.071860

name = EDSN7 MHX2420 antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.009200  
Thermal Mass = 0.009200

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN7 GPS antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.009200  
Thermal Mass = 0.009200  
Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN7 StenSat antenna  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.005000  
Thermal Mass = 0.005000  
Diameter/Width = 0.012440  
Length = 0.177800

name = EDSN7 EPISEM  
quantity = 1  
parent = 1  
materialID = 23  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.943000  
Length = 0.955000  
Height = 0.170000

\*\*\*\*\*OUTPUT\*\*\*\*\*  
Item Number = 7

name = EDSN7  
Demise Altitude = 77.999683  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*  
name = EDSN7 Structure  
Demise Altitude = 76.961949  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*  
name = EDSN7 Battery

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Demise Altitude = 71.772917  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN7 Nexus S  
Demise Altitude = 77.567074  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN7 PCB  
Demise Altitude = 77.382035  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN7 Battery holder  
Demise Altitude = 77.861472  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN7 Magnetorquer  
Demise Altitude = 77.104168  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN7 Reaction wheel  
Demise Altitude = 76.014441  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN7 Reaction wheel holder  
Demise Altitude = 77.814535  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN7 MHX2420  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.433003  
Impact Kinetic Energy = 6.496058

\*\*\*\*\*

name = EDSN7 Solar Arrays side  
Demise Altitude = 77.320129  
Debris Casualty Area = 0.000000

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN7 Solar Arrays top/bottom  
Demise Altitude = 77.343043  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN7 Heat sink  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.475113  
Impact Kinetic Energy = 0.314622

\*\*\*\*\*

name = EDSN7 Battery holder mount  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.480590  
Impact Kinetic Energy = 5.698823

\*\*\*\*\*

name = EDSN7 StenSat radio  
Demise Altitude = 77.183363  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN7 GPS  
Demise Altitude = 77.332972  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

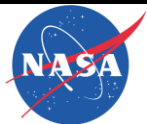
name = EDSN7 MHX2420 antenna  
Demise Altitude = 77.658863  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN7 GPS antenna  
Demise Altitude = 77.658863  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN7 StenSat antenna  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.418648  
Impact Kinetic Energy = 0.184386



*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

\*\*\*\*\*  
name = EDSN7 EPISEM  
Demise Altitude = 0.000000  
Debris Casualty Area = 1.766271  
Impact Kinetic Energy = 0.413600

\*\*\*\*\*

\*\*\*\*\*INPUT\*\*\*\*

Item Number = 8

name = EDSN8  
quantity = 1  
parent = 0  
materialID = 54  
type = Box  
Aero Mass = 1.680200  
Thermal Mass = 1.680200  
Diameter/Width = 0.100000  
Length = 0.150000  
Height = 0.100000

name = EDSN8 Structure  
quantity = 1  
parent = 1  
materialID = 8  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.099900  
Length = 0.153000  
Height = 0.099830

name = EDSN8 Battery  
quantity = 4  
parent = 1  
materialID = 54  
type = Cylinder  
Aero Mass = 0.045500  
Thermal Mass = 0.045500  
Diameter/Width = 0.018070  
Length = 0.064820

name = EDSN8 Nexus S  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.020000  
Thermal Mass = 0.020000

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Diameter/Width = 0.056130  
Length = 0.109470

name = EDSN8 PCB  
quantity = 8  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035000  
Thermal Mass = 0.035000  
Diameter/Width = 0.081410  
Length = 0.104440

name = EDSN8 Battery holder  
quantity = 1  
parent = 1  
materialID = 76  
type = Box  
Aero Mass = 0.029800  
Thermal Mass = 0.029800  
Diameter/Width = 0.079680  
Length = 0.083400  
Height = 0.018570

name = EDSN8 Magnetorquer  
quantity = 6  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.027600  
Thermal Mass = 0.027600  
Diameter/Width = 0.051380  
Length = 0.074640

name = EDSN8 Reaction wheel  
quantity = 3  
parent = 1  
materialID = 14  
type = Cylinder  
Aero Mass = 0.019300  
Thermal Mass = 0.019300  
Diameter/Width = 0.025830  
Length = 0.010350

name = EDSN8 Reaction wheel holder  
quantity = 1  
parent = 1  
materialID = 76  
type = Box  
Aero Mass = 0.023500

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

Thermal Mass = 0.023500  
Diameter/Width = 0.027070  
Length = 0.065920  
Height = 0.027070

name = EDSN8 MHX2420  
quantity = 1  
parent = 1  
materialID = 54  
type = Box  
Aero Mass = 0.044400  
Thermal Mass = 0.044400  
Diameter/Width = 0.053760  
Length = 0.095720  
Height = 0.016600

name = EDSN8 Solar Arrays side  
quantity = 4  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.054000  
Thermal Mass = 0.054000  
Diameter/Width = 0.081810  
Length = 0.150000

name = EDSN8 Solar Arrays top/bottom  
quantity = 2  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.035800  
Thermal Mass = 0.035800  
Diameter/Width = 0.081810  
Length = 0.100170

name = EDSN8 Heat sink  
quantity = 1  
parent = 1  
materialID = 54  
type = Flat Plate  
Aero Mass = 0.012400  
Thermal Mass = 0.012400  
Diameter/Width = 0.085250  
Length = 0.093510

name = EDSN8 Battery holder mount  
quantity = 1  
parent = 1  
materialID = 54

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*EDSN*  
**Orbital Debris Assessment Report (ODAR)**

**A.2.1.EDSN.ODAR**  
**Rev A**

type = Flat Plate  
Aero Mass = 0.055100  
Thermal Mass = 0.055100  
Diameter/Width = 0.091140  
Length = 0.095400

name = EDSN8 StenSat radio  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.023900  
Thermal Mass = 0.023900  
Diameter/Width = 0.044540  
Length = 0.078930

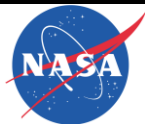
name = EDSN8 GPS  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.018300  
Thermal Mass = 0.018300  
Diameter/Width = 0.046000  
Length = 0.071860

name = EDSN8 MHX2420 antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.009200  
Thermal Mass = 0.009200  
Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN8 GPS antenna  
quantity = 1  
parent = 1  
materialID = 23  
type = Flat Plate  
Aero Mass = 0.009200  
Thermal Mass = 0.009200  
Diameter/Width = 0.034940  
Length = 0.089500

name = EDSN8 StenSat antenna  
quantity = 1  
parent = 1  
materialID = 54

Once this document has been printed it will be considered an uncontrolled document.



*EDSN*  
Orbital Debris Assessment Report (ODAR)

**A.2.1.EDSN.ODAR**  
Rev A

type = Flat Plate  
Aero Mass = 0.005000  
Thermal Mass = 0.005000  
Diameter/Width = 0.012440  
Length = 0.177800

name = EDSN8 EPISEM  
quantity = 1  
parent = 1  
materialID = 23  
type = Box  
Aero Mass = 0.150000  
Thermal Mass = 0.150000  
Diameter/Width = 0.943000  
Length = 0.955000  
Height = 0.170000

\*\*\*\*\*OUTPUT\*\*\*\*

Item Number = 8

name = EDSN8  
Demise Altitude = 77.999683  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 Structure  
Demise Altitude = 76.961949  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 Battery  
Demise Altitude = 71.772917  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 Nexus S  
Demise Altitude = 77.567074  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 PCB  
Demise Altitude = 77.382035  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

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name = EDSN8 Battery holder  
Demise Altitude = 77.861472  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 Magnetorquer  
Demise Altitude = 77.104168  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 Reaction wheel  
Demise Altitude = 76.014441  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 Reaction wheel holder  
Demise Altitude = 77.814535  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 MHX2420  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.433003  
Impact Kinetic Energy = 6.496058

\*\*\*\*\*

name = EDSN8 Solar Arrays side  
Demise Altitude = 77.320129  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 Solar Arrays top/bottom  
Demise Altitude = 77.343043  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 Heat sink  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.475113  
Impact Kinetic Energy = 0.314622

\*\*\*\*\*

name = EDSN8 Battery holder mount  
Demise Altitude = 0.000000





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Debris Casualty Area = 0.480590  
Impact Kinetic Energy = 5.698823

\*\*\*\*\*

name = EDSN8 StenSat radio  
Demise Altitude = 77.183363  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 GPS  
Demise Altitude = 77.332972  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 MHX2420 antenna  
Demise Altitude = 77.658863  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 GPS antenna  
Demise Altitude = 77.658863  
Debris Casualty Area = 0.000000  
Impact Kinetic Energy = 0.000000

\*\*\*\*\*

name = EDSN8 StenSat antenna  
Demise Altitude = 0.000000  
Debris Casualty Area = 0.418648  
Impact Kinetic Energy = 0.184386

\*\*\*\*\*

name = EDSN8 EPISEM  
Demise Altitude = 0.000000  
Debris Casualty Area = 1.766271  
Impact Kinetic Energy = 0.413600

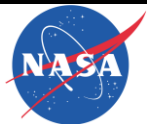
\*\*\*\*\*

=====  
10 01 2012; 15:48:54PM Science and Engineering - Orbit Lifetime/Dwell Time

\*\*INPUT\*\*

Start Year = 2013.682000 (yr)  
Perigee Altitude = 449.777279 (km)  
Apogee Altitude = 519.511885 (km)  
Inclination = 97.010000 (deg)

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RAAN = 0.004000 (deg)  
Argument of Perigee = 357.900000 (deg)  
Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)

**\*\*OUTPUT\*\***

Orbital Lifetime from Startyr = 2.245038 (yr)  
Time Spent in LEO during Lifetime = 2.245038 (yr)  
Last year of Propagation = 2015 (yr)  
Returned Error Message: Object reentered

10 01 2012; 15:58:39PM Science and Engineering - Apogee/Perigee History for a Given Orbit

**\*\*INPUT\*\***

Perigee Altitude = 449.777279 (km)  
Apogee Altitude = 519.511885 (km)  
Inclination = 97.010000 (deg)  
RAAN = 0.004000 (deg)  
Argument of Perigee = 357.900000 (deg)  
Mean Anomaly = 31.418000 (deg)  
Area-To-Mass Ratio = 0.010000 (m<sup>2</sup>/kg)  
Start Year = 2013.682000 (yr)  
Integration Time = 2.245000 (yr)

**\*\*OUTPUT\*\***

Plot

Requirements 4.7-1b, and 4.7-1c below are non-applicable requirements because EDSN does not use controlled reentry.

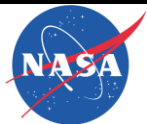
4.7-1, b) **NOT APPLICABLE.** For controlled reentry, the selected trajectory shall ensure that no surviving debris impact with a kinetic energy greater than 15 joules is closer than 370 km from foreign landmasses, or is within 50 km from the continental U.S., territories of the U.S., and the permanent ice pack of Antarctica (Requirement 56627).

4.7-1 c) **NOT APPLICABLE.** For controlled reentries, the product of the probability of failure of the reentry burn (from Requirement 4.6-4.b) and the risk of human casualty assuming uncontrolled reentry shall not exceed 0.0001 (1:10,000) (Requirement 56628).

## **ODAR Section 8: Assessment for Tether Missions**

Not applicable. There are no tethers in the EDSN mission.

**END of ODAR for EDSN.**



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**Appendix A: Acronyms**

ARC	Ames Research Center
Arg peri	Argument of Perigee
CDR	Critical Design Review
cm	centimeter
COTS	Commercial Off-The-Shelf (items)
DAS	Debris Assessment Software
EOM	End Of Mission
FRR	Flight Readiness Review
GEO	Geosynchronous Earth Orbit
ITAR	International Traffic In Arms Regulations
kg	kilogram
km	kilometer
LEO	Low Earth Orbit
Li-Ion	Lithium Ion
m <sup>2</sup>	Meters squared
ml	milliliter
mm	millimeter
N/A	Not Applicable.
NLAS	Nanosatellite Launch Adapter System
ODAR	Orbital Debris Assessment Report
ORS	Operationally Responsive Space program office –Kirtland AFB
OSMA	Office of Safety and Mission Assurance
PDR	Preliminary Design Review
PL	Payload
ISIPOD	ISIS CubeSat Deployer
PSIa	Pounds Per Square Inch, absolute
RAAN	Right Ascension of the Ascending Node
SMA	Safety and Mission Assurance
Ti	Titanium
USAF	United States Air Force
yr	year