

	<i>EDSN</i> Orbital Debris Assessment Report (ODAR)	A.2.1.EDSN.ODAR Rev A
---	--	---

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

Document Data is Not Restricted.

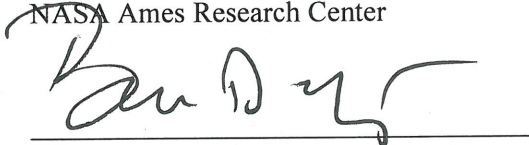
This document contains no proprietary, ITAR, or export controlled information.

DAS Software Version Used In Analysis: v2.0.1

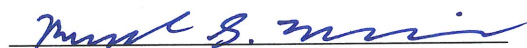
	EDSN Orbital Debris Assessment Report (ODAR)	A.2.1.EDSN.ODAR Rev A
--	---	--

VERSION APPROVAL and/or FINAL APPROVAL*:

Bruce Yost
SSTP Program Manager
NASA Ames Research Center



Richard Morrison
Safety and Mission Assurance Office
NASA Ames Research Center

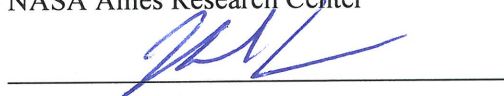


Suzanne Aleman
Safety and Mission Assurance Office
NASA Headquarters

Stephan Ord
EDSN Project Manager
NASA Ames Research Center



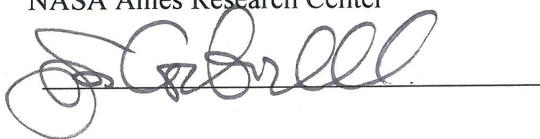
Michel Liu
Chief of Safety and Mission Assurance
NASA Ames Research Center



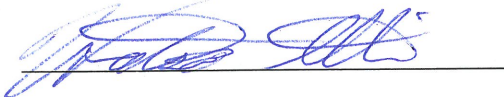
Terrence Wilcutt
Chief of Safety and Mission Assurance
NASA Headquarters

Prepared By:

James Cockrell
EDSN Systems Engineer
NASA Ames Research Center



Watson Attai
EDSN Test Engineer
NASA Ames Research Center



Record of Revisions				
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

Table of Contents

Self-assessment and OSMA assessment of the ODAR using the format in Appendix A.2 of NASA-STD-8719.14:	3
Comments	4
Assessment Report Format:	5
EDSN	5
ODAR Section 1: Program Management and Mission Overview	5
ODAR Section 2: Spacecraft Description	6
ODAR Section 3: Assessment of Spacecraft Debris Released during Normal Operations	9
ODAR Section 4: Assessment of Spacecraft Intentional Breakups and Potential for Explosions	9
ODAR Section 5: Assessment of Spacecraft Potential for On-Orbit Collisions	14
ODAR Section 6: Assessment of Spacecraft Postmission Disposal Plans and Procedures	14
ODAR Section 7: Assessment of Spacecraft Reentry Hazards	16
ODAR Section 8: Assessment for Tether Missions	82
Appendix A: Acronyms	84

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.

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	☐	☐	☒	☐	☒	☐	☐	No Debris Released in LEO. See note 1.
4.3-1.b	☐	☐	☒	☐	☒	☐	☐	No Debris Released in LEO. See note 1.
4.3-2	☐	☐	☒	☐	☒	☐	☐	No Debris Released in GEO. See note 1.
4.4-1	☐	☐	☒	☐	☒	☐	☐	See note 1.
4.4-2	☐	☐	☒	☐	☒	☐	☐	See note 1.
4.4-3	☐	☐	☒	☐	☒	☐	☐	No planned breakups. See note 1.
4.4-4	☐	☐	☒	☐	☒	☐	☐	No planned breakups. See note 1.
4.5-1	☐	☐	☒	☐	☒	☐	☐	See note 1.
4.5-2					☒	☐	☐	No critical subsystems needed for EOM disposal
4.6-1(a)	☐	☐	☒	☐	☒	☐	☐	See note 1.
4.6-1(b)	☐	☐	☒	☐	☒	☐	☐	See note 1.
4.6-1(c)	☐	☐	☒	☐	☒	☐	☐	See note 1.
4.6-2	☐	☐	☒	☐	☒	☐	☐	See note 1.
4.6-3	☐	☐	☒	☐	☒	☐	☐	See note 1.
4.6-4	☐	☐	☒	☐	☒	☐	☐	See note 1.
4.6-5	☐	☐	☒	☐	☒	☐	☐	See note 1.
4.7-1	☐	☐	☒	☐	☒	☐	☐	See note 1.
4.8-1					☒	☐	☐	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.



EDSN

Orbital Debris Assessment Report (ODAR)

A.2.1.EDSN.ODAR
Rev A

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.

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

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

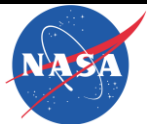
Physical description of the spacecraft:

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).



EDSN
Orbital Debris Assessment Report (ODAR)

A.2.1.EDSN.ODAR
Rev A

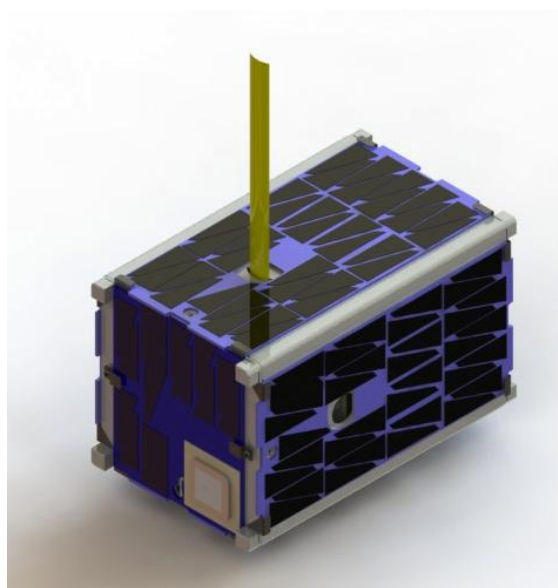


Figure 2: EDSN Satellite

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

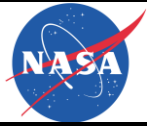
Saturn Mass: ~1.6802 kg

Uranus Mass: ~1.6802 kg

Neptune Mass: ~1.6802 kg

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

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

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.



EDSN
Orbital Debris Assessment Report (ODAR)

A.2.1.EDSN.ODAR
Rev A

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.



EDSN
Orbital Debris Assessment Report (ODAR)

A.2.1.EDSN.ODAR
Rev A

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:

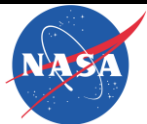
There is no credible scenario that would result in the reaction wheels to breakup during normal deployment and operations. Each of the three reaction wheels are COTS with a moment of inertia of $81\text{e-}06 \text{ kg.m}^2$ and a maximum spin rate of 7000 RPM. The subsequent maximum stored energy in 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.



EDSN
Orbital Debris Assessment Report (ODAR)

A.2.1.EDSN.ODAR
Rev A

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.

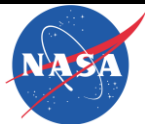
6.2 Plan for any spacecraft maneuvers required to accomplish postmission disposal: NONE.

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 m² (Calculated by DAS 2.0.1).

Area to mass ratio: 0.01/1.6802 = 0.00595167241 m²/kg



EDSN

Orbital Debris Assessment Report (ODAR)

A.2.1.EDSN.ODAR
Rev A

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).

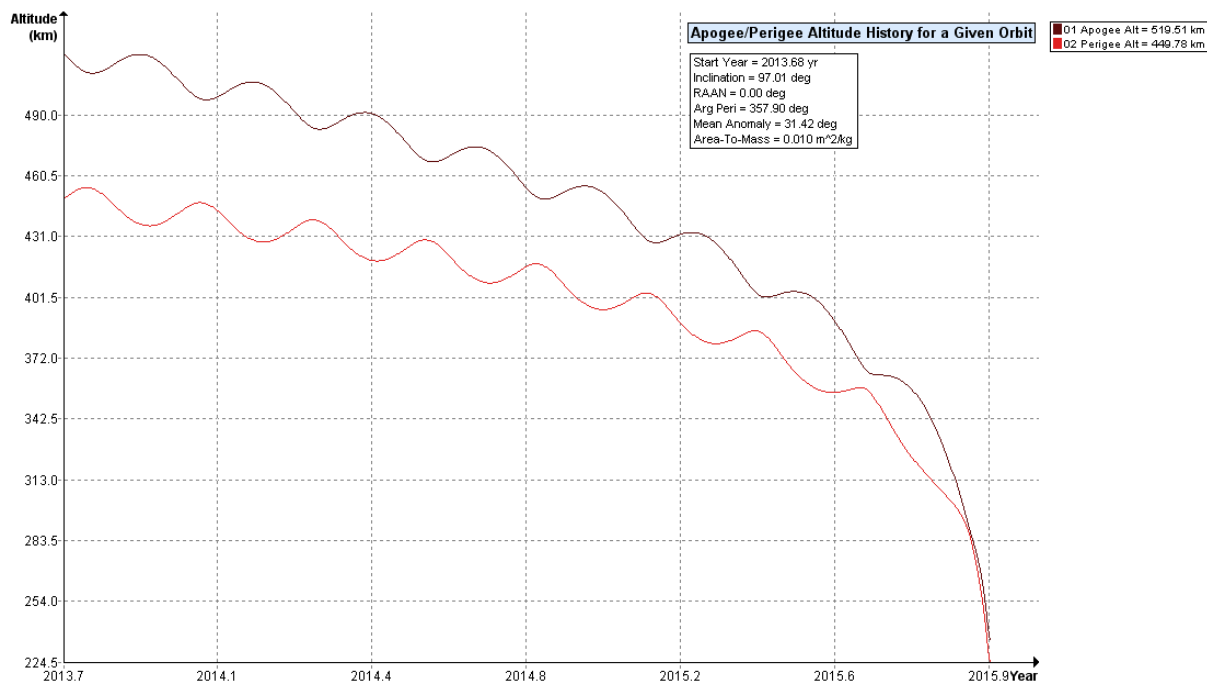
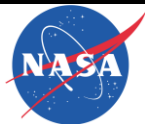


Figure 3. EDSN Orbit History (Identical for all eight Satellites).



EDSN
Orbital Debris Assessment Report (ODAR)

A.2.1.EDSN.ODAR
Rev A

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
=====

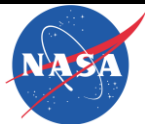
=====
End of Requirement 4.3-1 =====
10 01 2012; 14:12:05PM Processing Requirement 4.3-2: Return Status : Passed

=====
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

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

=====

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 (m²/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 (m²/kg)
Start Year = 2013.682192 (yr)

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

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 (m²/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

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

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 (m²/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****

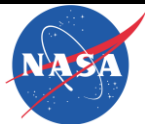
Collision Probability = 0.000000
Returned Error Message: Normal Processing
Date Range Error Message: Normal Date Range
Status = Pass

=====

****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 (m²/kg)
Start Year = 2013.682192 (yr)
Initial Mass = 1.680200 (kg)

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

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

=====

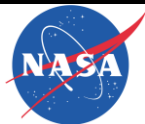
****INPUT****

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 (m²/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

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

=====

****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 (m²/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 (m²/kg)
Start Year = 2013.682192 (yr)
Initial Mass = 1.680200 (kg)
Final Mass = 1.680200 (kg)

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

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

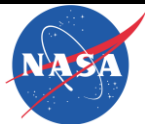
=====

****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 (m²/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)

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

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 (m²/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

=====

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

****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 (m²/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

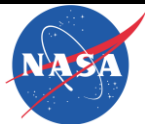
=====

****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 (m²/kg)

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

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.

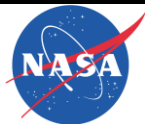
Released Year = 2016 (yr)
Requirement = 61
Compliance Status = Pass

=====

****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 (m²/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)



EDSN
Orbital Debris Assessment Report (ODAR)

A.2.1.EDSN.ODAR
Rev A

****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 (m²/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****

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

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 (m²/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

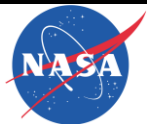
=====

****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 (m²/kg)
Start Year = 2013.682192 (yr)
Initial Mass = 1.680200 (kg)

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

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

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

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

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 = 0.051380
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

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 = 0.035800
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

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 = 0.009200
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

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

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

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 = 0.184386

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

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 = 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

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

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

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

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

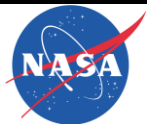
name = EDSN2 Structure
Demise Altitude = 76.957660
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

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

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 = 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

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 = 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

*****INPUT****
Item Number = 3

name = EDSN3
quantity = 1
parent = 0
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 = 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

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

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

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

Height = 0.170000

*****OUTPUT****

Item Number = 3

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

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

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 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

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

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

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 = 0.035800
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

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 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

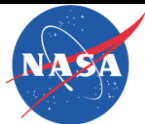
name = EDSN4 Reaction wheel
Demise Altitude = 76.014441
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

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

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 = 0.020000
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

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

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

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

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

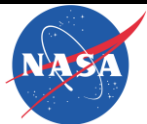
name = EDSN5 Solar Arrays side
Demise Altitude = 77.320129
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

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

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

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

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 = 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

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

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

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

*****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

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

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 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

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 = 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

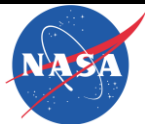
name = EDSN7 Reaction wheel holder
quantity = 1
parent = 1
materialID = 76
type = Box
Aero Mass = 0.023500
Thermal Mass = 0.023500
Diameter/Width = 0.027070
Length = 0.065920
Height = 0.027070

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

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 = 0.034940
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

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

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

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 = 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

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 = 0.056130
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

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 = 0.023500
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

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 = 0.055100
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

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 = 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

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 = 0.480590
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

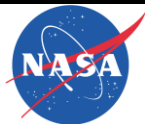
name = EDSN8 EPISEM
Demise Altitude = 0.000000
Debris Casualty Area = 1.766271
Impact Kinetic Energy = 0.413600

===== End of Requirement 4.7-1 =====
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)

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

RAAN = 0.004000 (deg)
Argument of Perigee = 357.900000 (deg)
Area-To-Mass Ratio = 0.010000 (m²/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 (m²/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).

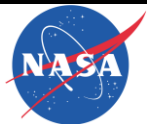
4.7-1 c) **NOT APPLICABLE.** For controlled reentries, the product of the probability of failure of the reentry burn (from Requirement 4.6-4.b) and the risk of human casualty assuming uncontrolled reentry shall not exceed 0.0001 (1:10,000) (Requirement 56628).

ODAR Section 8: Assessment for Tether Missions

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

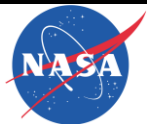
END of ODAR for EDSN.

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



EDSN
Orbital Debris Assessment Report (ODAR)

A.2.1.EDSN.ODAR
Rev A

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 ²	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