

OPEN SPACE NETWORKS

APPLICATION FOR SPECIAL TEMPORARY AUTHORITY

ATTACHMENT 1

Open Space Networks Satellite 1 (OSNSat) is a lightweight prototype satellite to evaluate spread spectrum communications in the 900 MHz ISM band. OSNSat is a tubesat weighing approximately .75 Kg built, owned and operated by OpenSpace Networks, a California corporation. OSNSat will be packaged, along with another tubesat in a Tubesat PicoSatellite Orbital Deployer (TuPOD). This second tubesat and the TuPOD are both built and operated by an entity other than OSN. The TuPOD containing both tubesats will be carried on a Japanese Space Agency resupply mission to the ISS, expected to be launched approximately September 1, 2016.

The TuPOD will be ejected from the ISS subsequent to its arrival there. The TuPOD will drift for three days to gain separation from the ISS, after which time both tubesats will be deployed using a spring mechanism contained in the deployer.

OSNSat has no propulsion system, and no solar cells. It is powered by ten primary lithium ion batteries **approved for use on the ISS**. OSNSat has two system components: a payload consisting of an Arduino micro controller managing a smart spread spectrum digital radio, and an Arduino micro controller based ground station to manage a ground based smart spread spectrum digital radio and the bidirectional communications with the OSNSat-1 payload and to subsequently record and store the results of these measurements. All hardware in both the satellite and ground station are Commercial Off The Shelf parts.

The OSNSat transceiver will be in acquisition mode, unless and until it receives a beacon from one of the three OSN base stations, and will then only transmit while over the United States and in range of a base station. The OSNSat-1 software (in both payload and ground station) will manage the sequence of measurements to evaluate the communications link during each orbit pass and will manage a shutdown protocol in the payload to minimize battery consumption between communications windows.

No debris is planned to be released during normal operation. OSNSat's low earth orbit will degrade quickly and the tubesat will be completely destroyed in the earth's atmosphere. Damage will not cause loss of control that would prevent post-mission disposal.

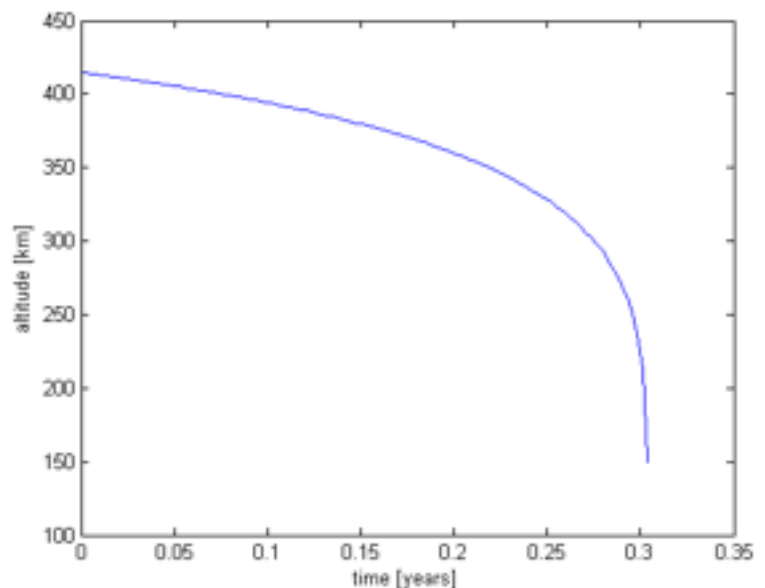
OpenSpace Networks has assessed and limited the possibility of accidental explosions during and after the completion of mission operations. OSNSat contains no fuel, propulsion system or pressurized systems of any kind. Its only source of power on-board are ten 9 volt batteries. **These batteries are protected using blocking diodes to prevent reverse flow and bypass diodes to prevent from over discharge. The power circuit is designed with a protection device in addition to the batteries' self-contained fuses. The batteries are expected to be depleted or nearly depleted at end of mission.**

OSNSat's diminutive size and limited time to self-destruction limits the probability of becoming a source of debris by collisions with large debris or other operational spacecraft. Although OSNSat will be in an ISS-similar orbit, the three day delay before OSN's release from the TuPOD limits the possibility of an in-orbit collision.

OSNSat's anticipated orbital evolution is shown in the following graphics showing the expected time in orbit to be from .35 to .85 year.

415 km - Minimum De-Orbit Time ~0.35 Year

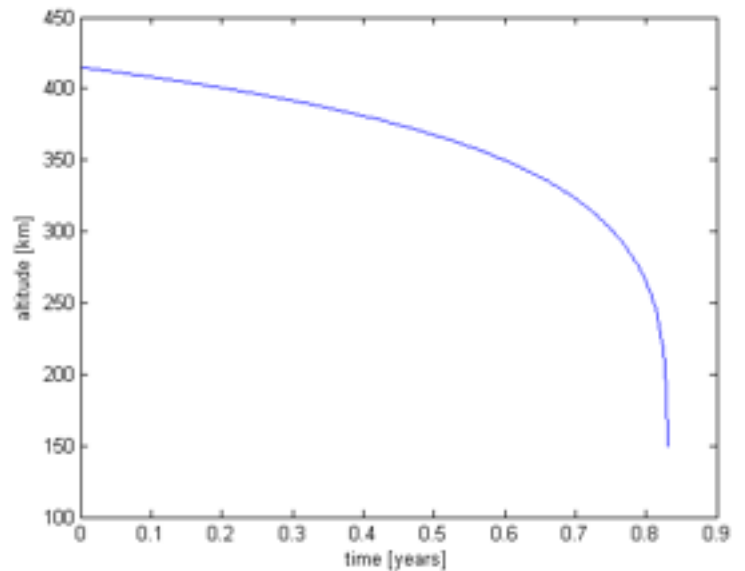
- Uncontrolled Tubesat, modeled as constantly at average area
- $C_D = 2.2$
- Area = .0137 cm²
- Mass = .75 kg



- Starting Alt=450km

415 km - Maximum De-Orbit Time ~0.85 Year

- Uncontrolled Tubesat, modeled as constantly at average area
- $C_D = 2.2$
- Area = .005cm²
- Mass = .75kg
- Starting Alt=450km



No part of OSNSat will survive atmospheric re-entry to reach the earth, and there is no probability of human casualty as a result.