EDSN - Edison Demonstration for SmallSat Networks

EDSN Overview

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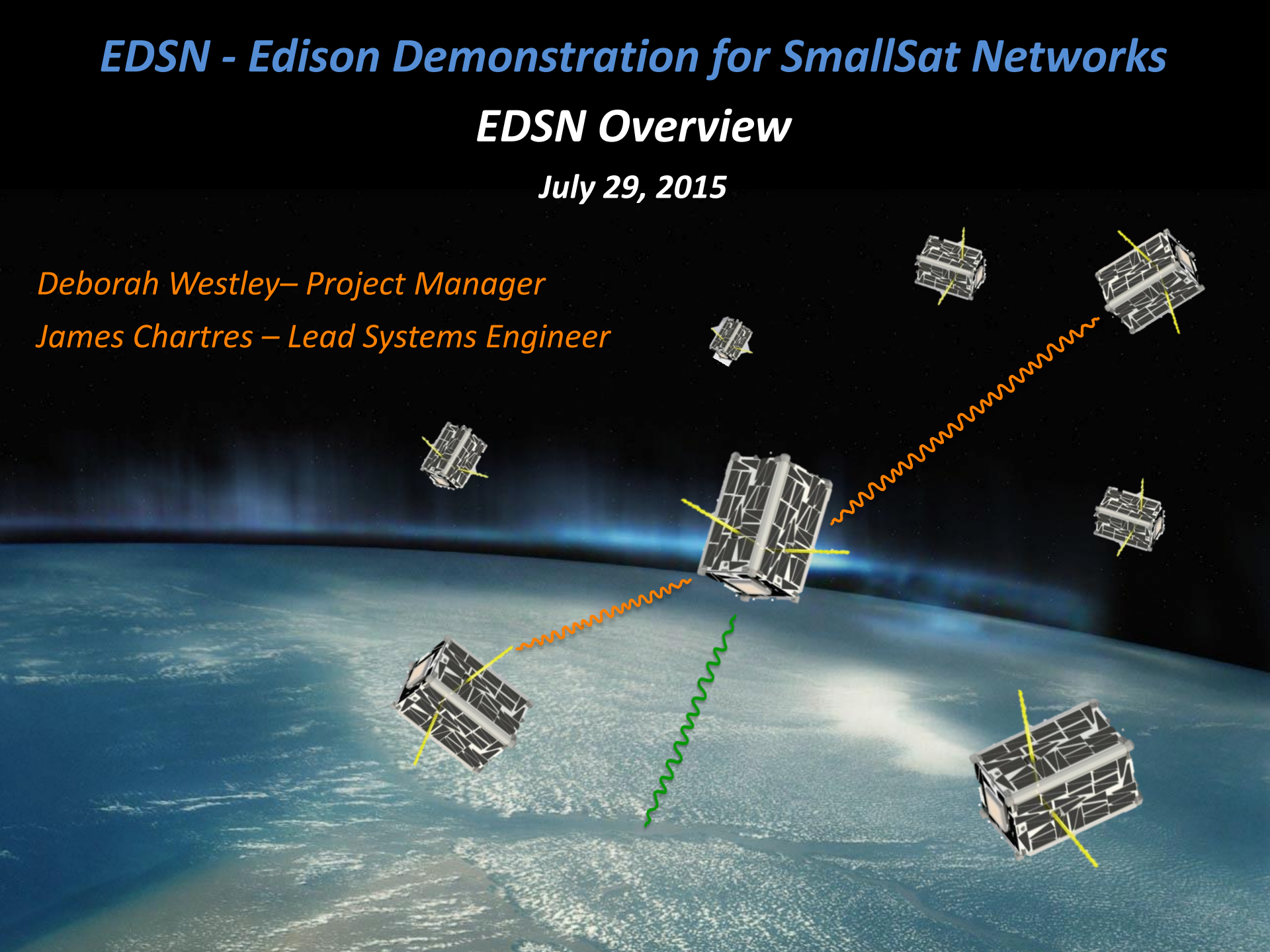
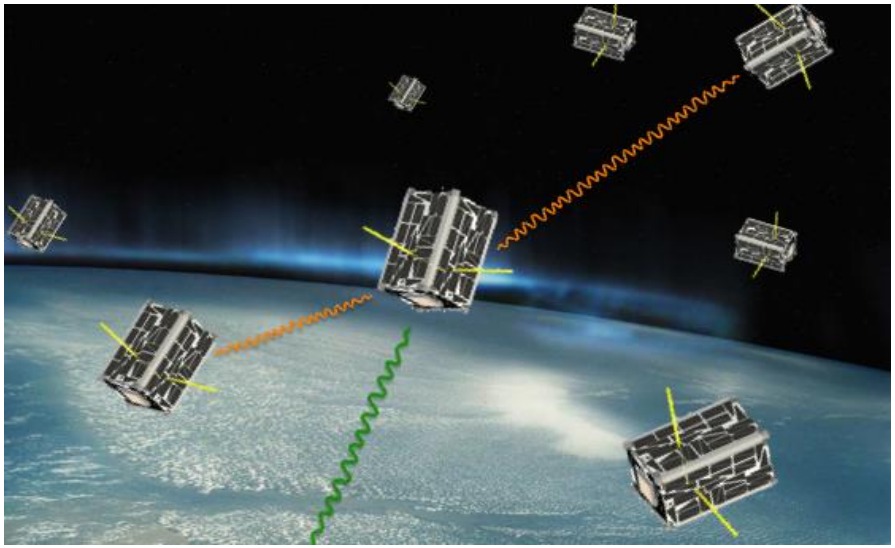


EDSN Overview

Project Office: NASA Ames Research Center
Industry Partners:
Montana State University – Science/Payload (EPISEM)
Santa Clara University – Ground Station/Mission Operations
Mission Goal: Demonstrate that a swarm of satellites is capable of collecting multi-point science data and transferring the data to the ground.
Science: Temporal and spatially distributed Energetic Particle monitoring at the South Atlantic Anomaly and Northern Latitudes
Launch: Oct 2015 on Super-Strypi (ORS-4)
Orbit: 430 km x 505 km @ 94.8˚ inc
Mission Lifetime: 60 days



Objectives:

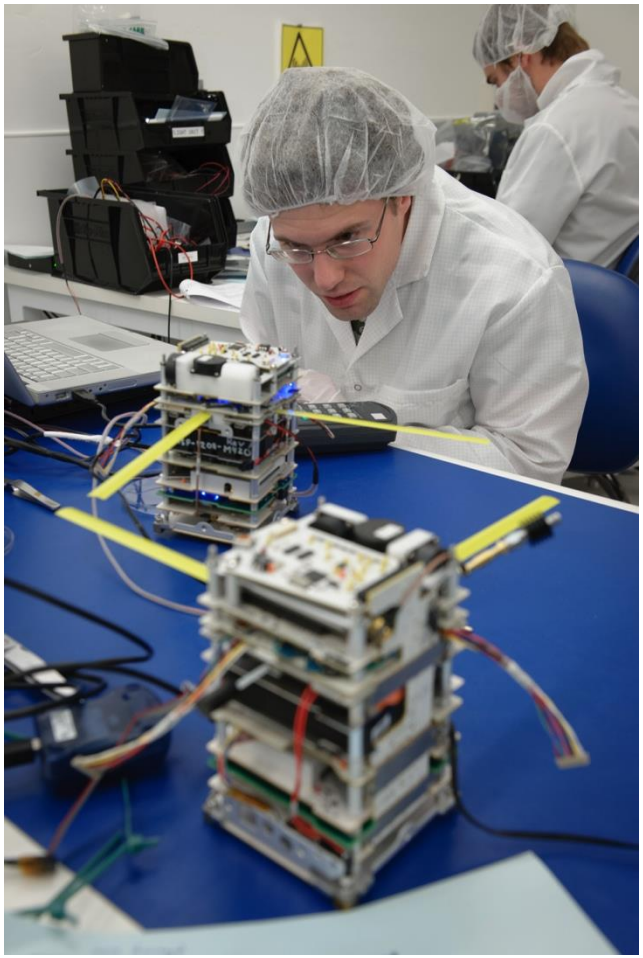
1. Flight demonstrate one-way space-to-space data transfer whereby at least 2 satellites transfer data to a third satellite, which then transfers the data to the ground
2. Flight demonstrate a system to collect multi-point science measurements, transfer science measurements to another satellite and transfer to the ground
3. Flight demonstrate a reaction wheel based pointing system
4. Assess the viability of satellites built with Commercial Off The Shelf (COTS) components to operate for 60 days

Implementation:

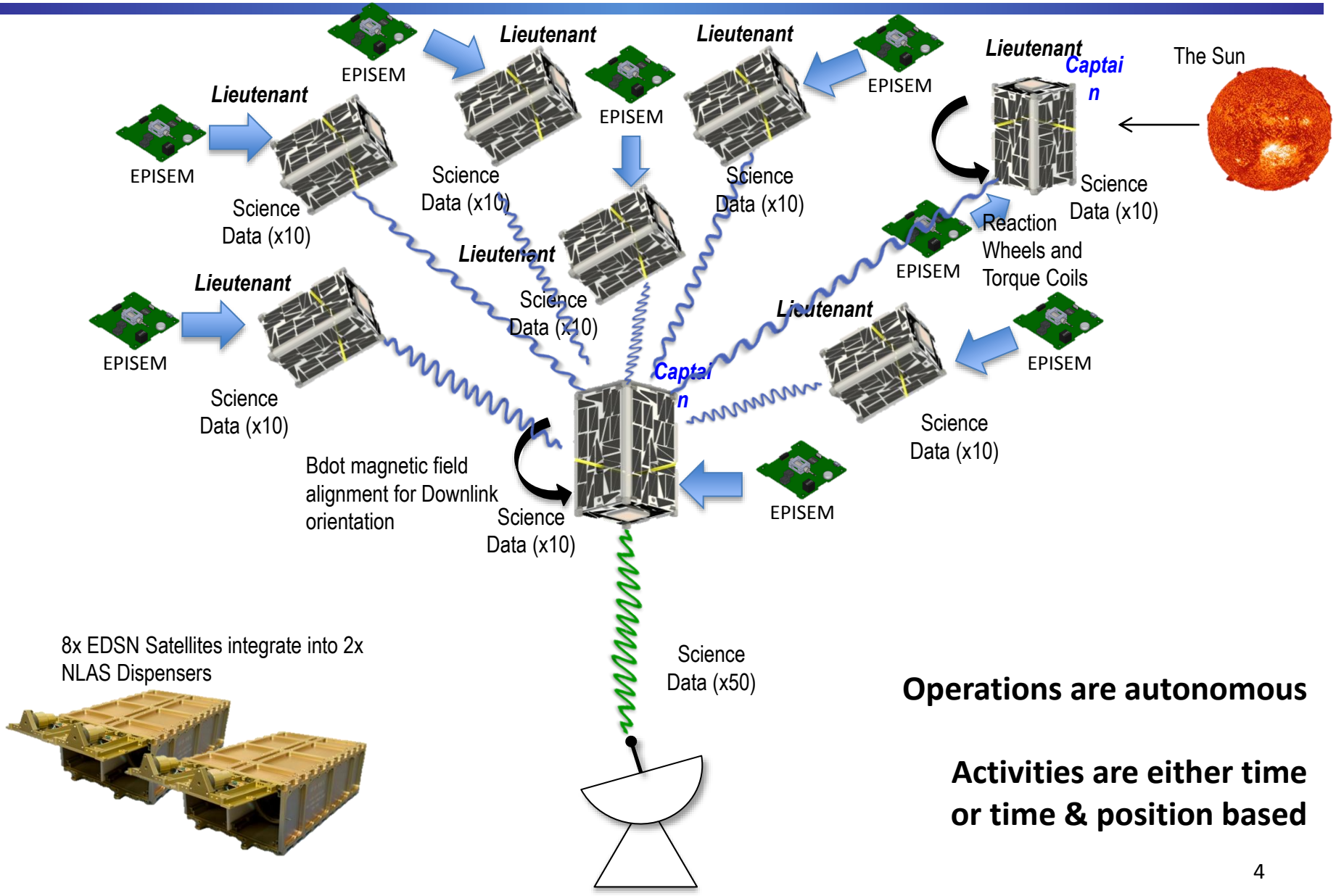
- Eight identical 1.5U Cubesats with crosslink, downlink and science collection capabilities
- Tech Demo with risk reduction and redundancy through numbers
- Augmented Phonesat 2.0 architecture with Payload, GPS and enhanced FSW and fault management

Technology Demonstration

- Proof of concept for Swarms architectures
- Autonomous satellite operations without ground commanding
- Decoupled mission objectives
- Multiple attempts at technology demonstration
- Technology demonstration versus optimization/high efficiency
- Redundancy through number of units
- Consumer grade COTS components
- Tailored Class D approach with system level testing
- Focus on testing versus design analysis
- Redundancy in system architecture allows for individual satellite upsets



Baseline Mission



8x EDSN Satellites integrate into 2x NLAS Dispensers

Operations are autonomous

Activities are either time or time & position based

EDSN Satellite Overview

1.5U solid Pumpkin Chassis

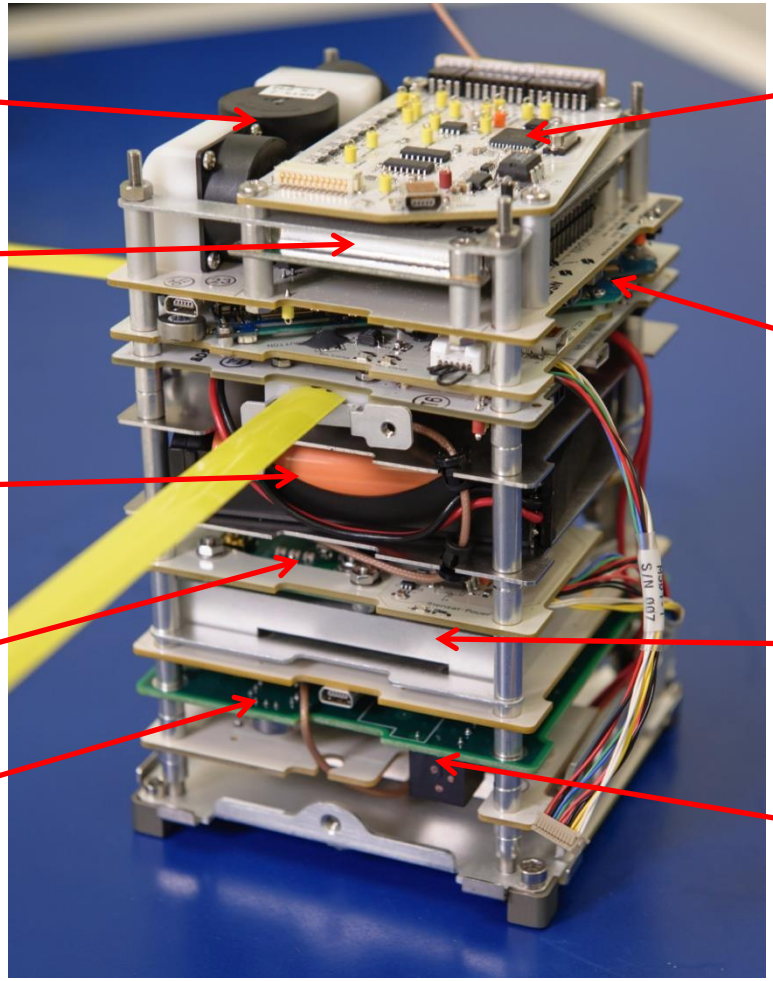
3 orthogonal reaction wheels

MicroHard MHX2420 for S-band downlink

4x 18650 2800mAh Li-Ion Batteries

StenSat UHF transmitter

EPISEM radiation monitoring payload



Parallax P8X32A Propeller chip for data & command routing

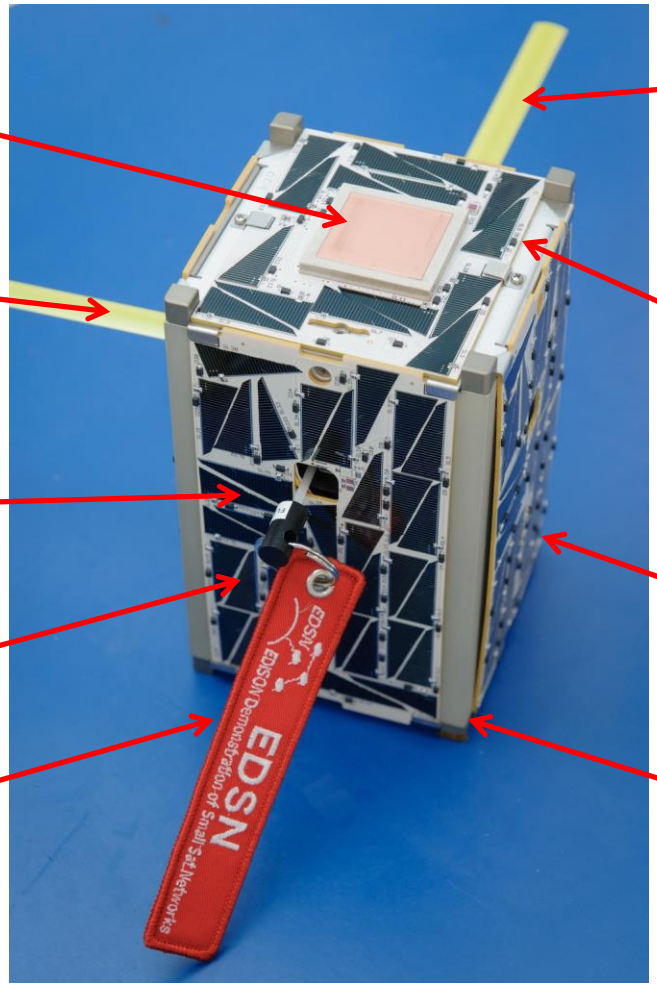
Nexus S Smartphone as main processor

Novatel OEMV-1 GPS receiver

AstroDev Li-1 UHF transceiver for crosslink

9 electrical subassemblies inter-connected via a single backplane PCB

EDSN Satellite Overview



S-band patch antenna for downlink

UHF whip antenna for crosslink transmissions

4x 1.5U Solar Panels with 35 cells

Triangular Advanced Solar Cells (TASC)

Remove before flight inhibit

UHF whip antenna for beacon transmissions

2x 1U Solar Panels with 15 cells

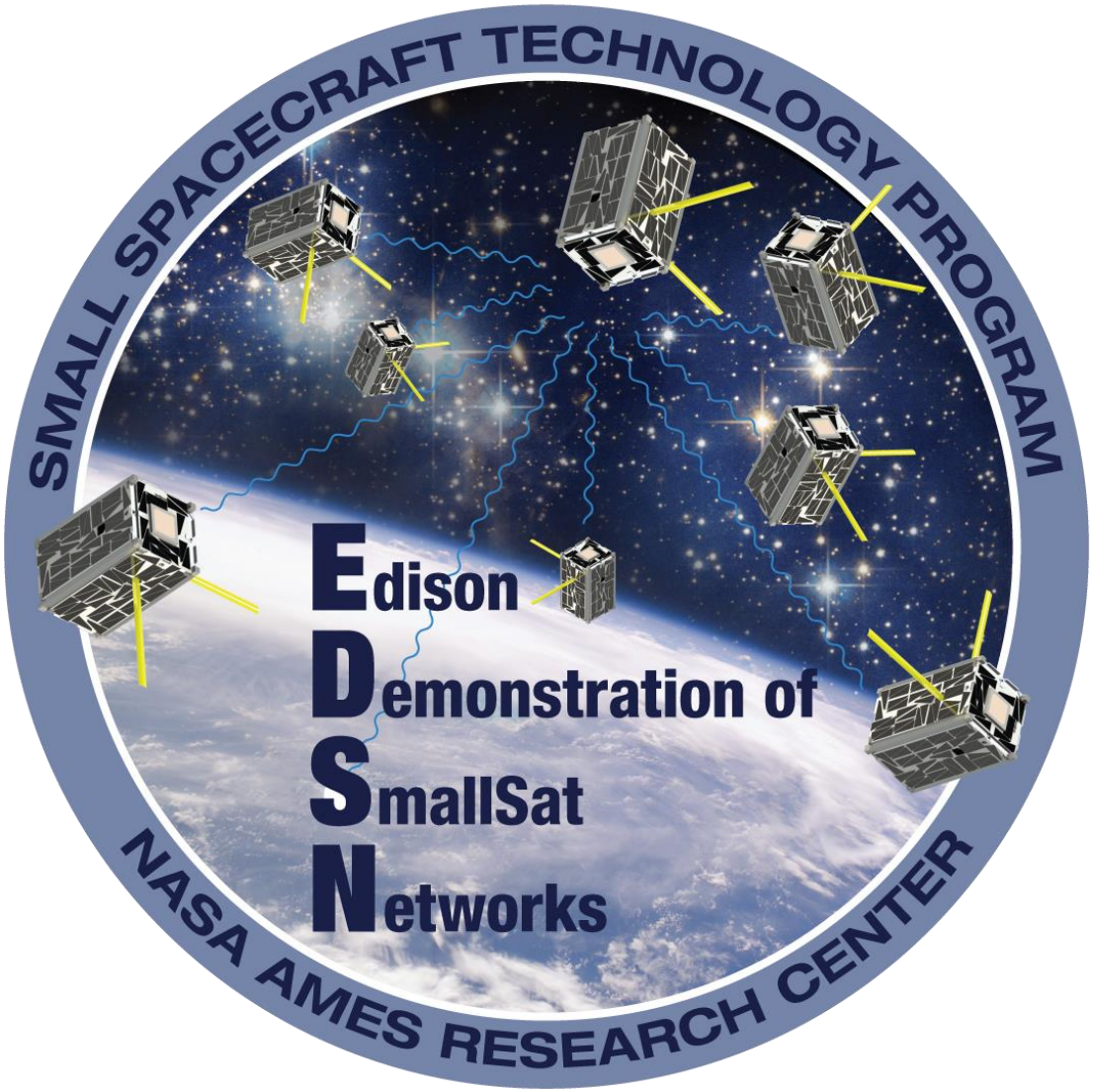
Torque coils imbedded in solar panels

GPS patch antenna underside

1.5U solid Pumpkin Chassis

Swarm Technologies

- Large Swarms of interacting satellites would enable an unprecedented amount of sensors, communications and computing capability in low-Earth orbit and beyond
- Swarm technologies have the potential to enable:
  - Flexible data correlation and distribution
  - System redundancy
  - Simplification of satellite operations
  - New multi-satellite science investigations
  - Distributed architectures
  - Sensor webs
  - Disaggregated systems
- Swarm missions can provide enhanced scientific data collection for industry, researchers and NASA scientists
- EDSN is funded by NASA's Small Spacecraft Technology Program (SSTP)
- SSTP is one of nine programs within NASA's Space Technology Mission Directorate (STMD)


SMALL SPACECRAFT TECHNOLOGY PROGRAM
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Demonstration of
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