

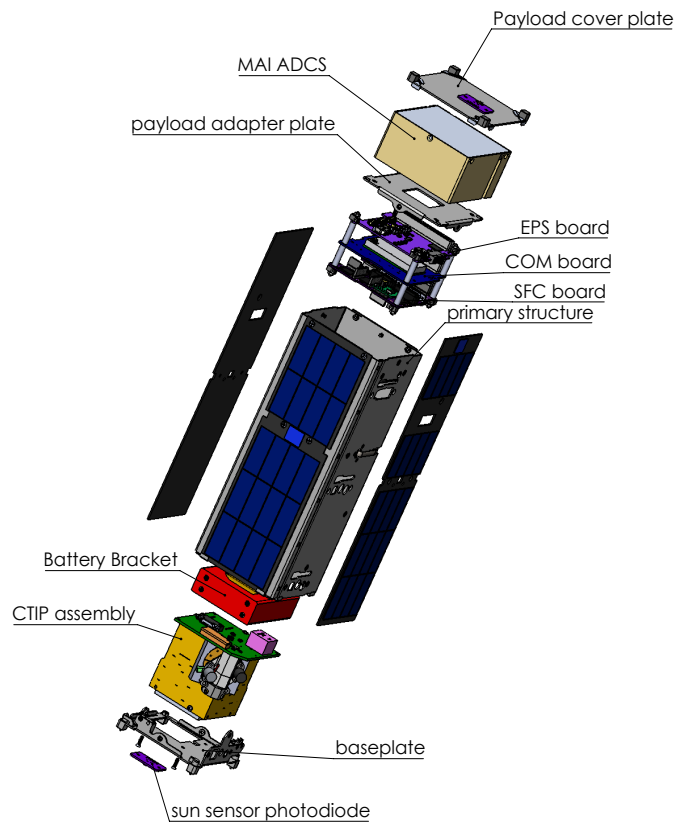


Figure 2: IT-SPINS Expanded View

Overview: The Ionospheric-Thermospheric Scanning Photometer for Ion-Neutral Studies (IT-SPINS) mission's aim is to provide the first two-dimensional (2D) tomographic imaging from a 3U research CubeSat, addressing the basic nature of the nocturnal ionosphere. This nominal 6-month mission (post-commissioning) aims to strengthen our fundamental understanding for development of ion gradient structures in two places:

1. In the topside of the Earth's ionosphere
2. Within regional phenomena such as equatorial plasma bubbles (EPBs) or polar patches.

The IT-SPINS spacecraft will rotate at 2 RPM about orbit normal while acquiring 135.6-nm nightglow (from O⁺/electron recombination) along multiple intersecting ray-paths, above and below the spacecraft, using the same high-sensitivity UV photometer currently in orbit on the USAF's first operational space weather CubeSat mission. Half-second integrations will yield sufficient photometric sensitivity and spatial resolution to enable unambiguous identification of topside and EPB/patch gradient structures. Closed-loop kinematic simulation of IT-SPINS attitude control indicates that the high-heritage axisymmetric spacecraft will have sufficient pointing authority and knowledge precision to meet all science requirements with generous system margins for mass, power, and telemetry.

This mission is managed and built at Montana State University with payload development by SRI International. John Hopkins University will provide the data processing and tomographic analysis.

CONOPS: Upon deployment from the P-POD, IT-SPINS will power up and start the mission elapsed timer to sequence the antenna deployment and activation of the tracking beacon at deployment plus 60 minutes. Following a one to two week commissioning phase to flush out the performance of the ADCS, the payload sun shade will be deployed prior to starting nominal payload operations.

Materials: The CubeSat structural components are made of the following aluminum alloys: 5052-H32, 7075-T6, and 6061-T6. It contains all standard commercial off the shelf (COTS) materials, electrical components, PCBs and solar cells. The UHF antenna is made of spring steel.

Hazards: There are no pressure vessels, hazardous or exotic materials.

Batteries: Characteristics of the batteries are shown in Table 1. The Tenergy 18650P-5200 battery pack contains four 18650-2600 Li-Ion cells. The pack includes integrated overcharge/over current/undercurrent circuitry protection. They are Underwriters' Laboratories (UL) recognized, as shown in Table 1. There are no modifications to the cell cases as tested by UL and they are considered safe for travel.