

## TBEX CubeSat Mission Description

### Organizations:

University of Michigan

SRI International

National Aeronautics and Space Administration Science Mission Directorate (NASA SMD)

Air Force Research Laboratory (AFRL)

Air Force Space and Missile Systems Center (AF SMC)

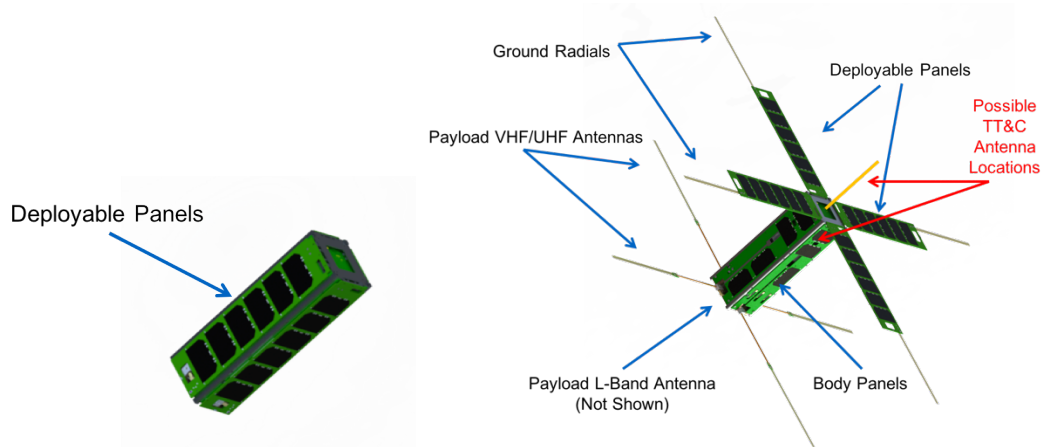


Figure 1a: TBEX - Stowed Configuration

Figure 1b: TBEX - Deployed Configuration

The TBEX science mission will consist of a tandem pair of 3U CubeSats, each carrying tri-frequency radio beacons, in near-identical, low-inclination orbits, and a cluster of diagnostic sensors on five islands in the Central Pacific sector, all with the objective of discovering how the dynamics and processes in the troposphere can act to cause variability in the behavior of the upper atmosphere and ionosphere and to understand the plasma-neutral coupling processes that give rise to local, regional, and global-scale structures and dynamics in the atmosphere-ionosphere-magnetosphere system.

The TBEX mission will continue the C/NOFS-type measurements (Communications / Navigation Outage Forecasting System) of plasma perturbations through L-band, UHF, and VHF scintillations, but with expanded capabilities, and do so during a different portion of the solar cycle. These measurements require two points of measurement, so two CubeSats will be utilized.

The TBEX spacecraft will be launched as part of the Space Test Program (STP-2). Both CubeSats will be deployed within minutes of each other. Each CubeSat will deploy its solar panels and power on. Sometime later, the CubeSats will begin UHF beaconing, ground contact will be established, subsystem checkouts will be made, and post-ejection high data rate telemetry will be downlinked. In the next phase of the mission, one of the CubeSats will alter its attitude inducing additional air drag and causing the two CubeSats to drift into unique orbits. When the second spacecraft drifts far enough apart from the first one, such that the apparent ground period separating the two CubeSats' orbits reaches 15 minutes, both CubeSats will point to nadir, and commence science measurements. As experiments are run, TBEX data will be downlinked.

The CubeSat structure (Figure 2) is made of Aluminum 6061-T6. It contains mostly standard commercial off the shelf (COTS) materials, electrical components, PCBs and solar cells.

There are no pressure vessels, hazardous or exotic materials.

The electrical power storage system consists of two Panasonic lithium-ion batteries (18650) with over-charge/current protection circuitry.

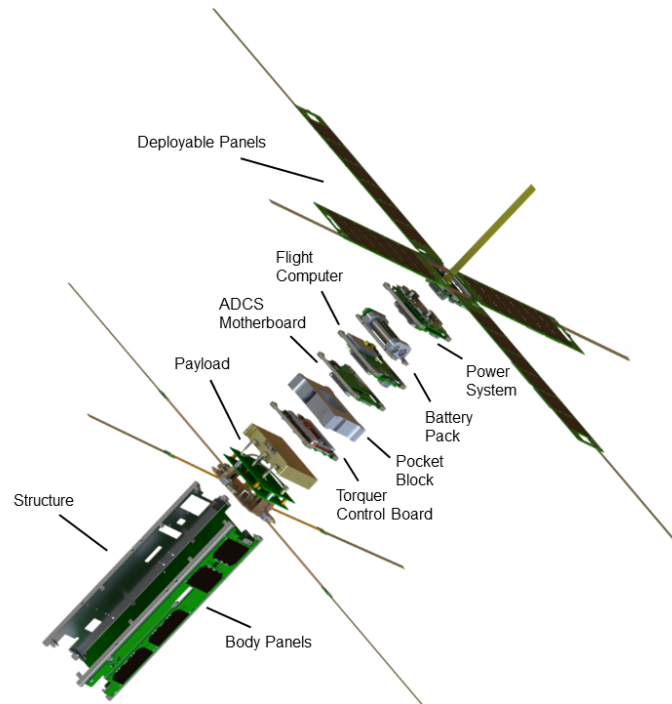


Figure 2: TBEX CubeSat Subsystem View