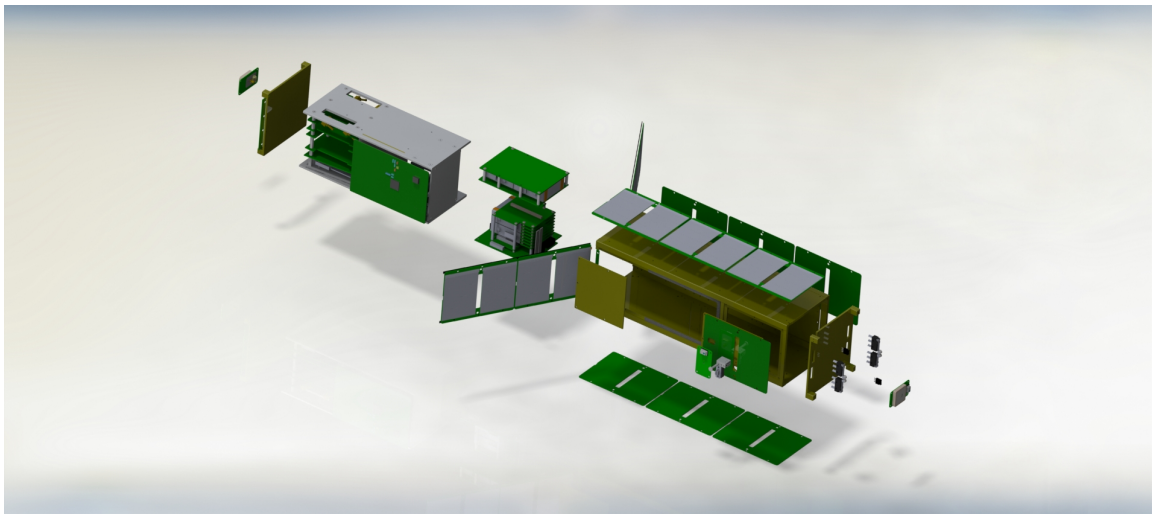
NNU Revision Matrix

Revision 1	10/4/2018	Added Deployable Materials

ELaNa # ODAR

RFTSat – Northwest Nazarene University – 3U



The goal of the Radio Frequency Tag Satellite (RFTSat) mission is to develop and demonstrate the first space-based 5.8GHz RF backscattering communications system. It will allow a wireless passive RF tag to harvest RF energy transmitted through space from an RF reader on the spacecraft, store that energy in a supercapacitor, and power an MCU and various sensors on the tag. Then the collected sensor data will be transmitted back to the reader by modulating this information on the backscattered RF signal. This tag will be mounted at the end of an unfurling carbon fiber boom and will be used to measure accelerations, temperature, and radiation TID at a distance of about 1 m from the reader. All data will be downlinked to earth via GlobalStar satellite network.

Upon deployment, RFTSat will power up and start a 50 minute countdown timer. At 50 minutes, the GlobalStar radio will activate and send health beacon data every 90 minutes. During the first week of operation, the attitude control (magnets and mu-metal) system will detumble the spacecraft. During weeks 2 and 3 of the mission, the deployables will deploy from the sides of the craft, allowing the carbon fiber boom and RF tag to incrementally deploy to 0.6 meters away from the spacecraft, where the boom then locks into place. During this time, RF tag data will be measured at each increment. From week 4 to the end of the mission, the frequency of measurement and GlobalStar transmission to earth will be reduced by 90%, in addition to continuing health beacons every 90 minutes.

The RFTSat structure is made of Aluminum 6061-T6 and contains standard commercial-off-the-shelf (COTS) materials, electrical components, PCBs, and solar cells. The GlobalStar radio uses 3 ceramic patch antennas. The uplink frequency is 2.4 GHz and the downlink frequency is 1.6 GHz. The 5.8 GHz RF reader/tag system uses 4 PCB microstrip antennas.

There are no pressure vessels, hazardous or exotic materials.

The electrical power storage system consists of common lithium-polymer batteries with over-charge/current protection circuitry. The lithium batteries and circuitry are ISS approved with previous flight heritage. The lithium batteries carry the UL-listing number BBCV.MH48285.