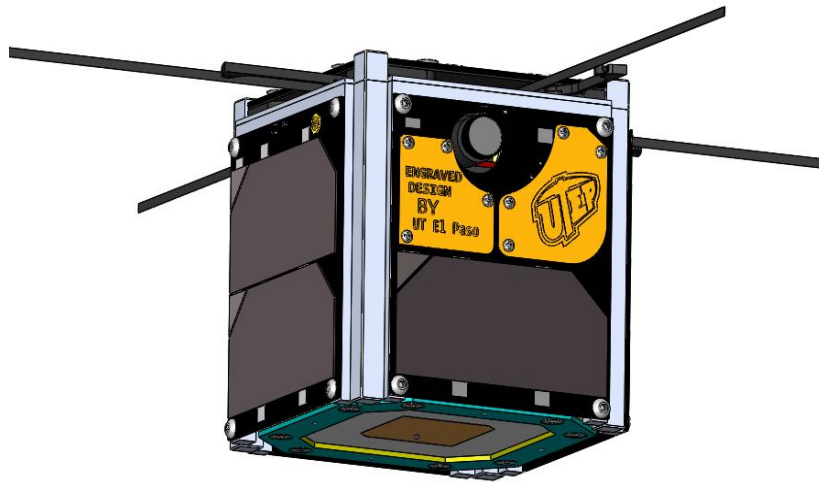


University of Texas El Paso Orbital Factory 2

Orbital Factory 2 (OF-2) is a 1U CubeSat. The primary payload is an experiment to test repair in orbit using additive manufacturing. Secondary payloads are an experimental S-band patch antenna, software methods for attitude control using magnetorquers and external camera to capture Earth images.

OF-2 will be launched in October 2019 from Wallops, VA into a 400 km Low Earth Orbit, onboard an Antares launch vehicle to the International Space Station (ISS), as part of a Cygnus resupply mission. Approximately 3 months after arrival at ISS, OF-2 will be deployed by the astronauts through the ISS Japanese Experiment Module (JEM) airlock. A ground station in El Paso will receive downlinked data, and provide command and control.

Figure 1 OF-2 Overview



The satellite contains the following systems:

Onboard Computer and Attitude Control:

OF-2 incorporates a high-performance computing platform manufactured by Endurosat. It is based on ARM Cortex M4 processor with frequency rate up to 180MHz. It comes with integrated double redundancy sensors: 3-Axis accelerometers and compass. PWM drivers for magnetorquers and inputs for sun sensors, temperature sensors and gyroscope allow the implementation of the attitude determination and control systems. The onboard computer controls rest of the modules establishing I2C communication using a shared PC104 bus connector.

Communications:

UHF Transceiver:

The UHF transceiver manufactured by Endurosat can be configured between 430 and 440 MHz. The transceiver works in half-duplex mode with configurable data rate and modulation index. It uses AX.25 protocol with GMSK modulation. The UHF antenna has four monopole antenna rods.

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S-Band Transceiver:

To test the experimental S-Band patch antenna, a custom S-Band transceiver also manufactured by Endurosat is used. The S band antenna is an experimental patch antenna design.

Both UHF and S-Band transceivers communicate with the ground station on the UT El Paso campus.

Electrical Power Subsystem (EPS):

OF-2's EPS includes Li-Po battery packs encapsulated in an aluminum box. The EPS, manufactured by Endurosat, It has three photovoltaic input channels for supplying the power from each axis of solar panels. The battery pack can provide up to 8A current total, to the 3.3V and 5V busses, with 95% efficiency. Two latch up protectors protect systems from overcurrent and overvoltage. OF-2 uses five EnduroSat Solar Panels, equipped with 2 CESI Solar cells each. They will provide up to 2.4 Watts per panel.

Structure Subsystem: The chassis is machined out of Aluminum 6061. It consists of a main body which contains all the modules, and two plates at the top and bottom.

Propulsion Subsystem: No propulsion subsystem is included.

3D Printer Experiment Payload:

OF-2's primary mission objective is to study additive manufacturing in microgravity. This will be accomplished by using the small printer to deposit electrically conductive ink on a printed circuit board. The board circuit will verify the conductivity on the trace once cured. The experiment aims to simulate the repair of solar arrays by adding the conductive trace across a tear on a solar panel.

A custom payload board will control the operation of printer module, and test continuity of the circuit trace printed.

An internal camera will record the printer operation. The internal camera is a 0.3 megapixel serial interface camera.

External Cameras Payload:

The external camera is a 5MP JPEG camera with a 3.6mm lens with color picture taking capability.