

# Dove 1 Satellite Technical Description

Cosmogia Inc.

The Dove 1 mission is a technology demonstration to: a) test the basic capabilities of the low-cost bus built from non-space, Commercial Off-the-Shelf (COTS) components; b) show that a bus constrained to the 3U cubesat form factor can host a small payload; and c) demonstrate the ability to design, produce and operate satellites on short schedules and low cost. Dove 1 will do this by transmitting health and payload data to the ground.

The satellite will be launched as a secondary payload on the maiden flight of the Taurus II from Wallops Flight Facility, currently scheduled for February 2012. It will be inserted into a nearly circular orbit at 280 km, on an inclination from the equator of 55 degrees. Due to the extremely low altitude of the orbit, the satellite is expected to decay and completely burn up in the Earth's atmosphere approximately 2 weeks after launch. See the Orbital Debris Assessment for further details.

Amateur beacon transmissions on 145.825 MHz will commence upon deployment of the satellites and a half-duplex, spread spectrum radio in the 2.4 GHz ISM band will be used for main payload downlink and telecommand uplink.

The dimensions of the spacecraft are consistent with CubeSat and P-POD standards. It is a single unit with the dimensions of 10 cm X 10 cm X 30 cm. The total mass is about 5 kg.

The satellite contains the following systems:

## **Command & Data Handling**

Command and data handling is controlled by the single board computer. Additionally there will be a discrete watchdog board that will be able to reboot the flight computer in the event of errors.

## **Power Subsystem**

The bus provides central power control through a power supply to the camera, the flight computer and the magnetorquers. The power supply regulates the voltages and ensures a stable power supply to each component. Power storage is provided by 8 Lithium-Ion cells, providing 20Ah of charge at full capacity. The batteries will be recharged by body mounted Triangular Advanced Solar Cells (TASC).

## **Attitude Determination and Control Subsystem**

Dove-1 attitude has an attitude determination system and will be controlled by a magnetorquers. The B-dot controller makes use of the B field to reduce the angular rate of the satellite. In this control mode, Dove-1 therefore behaves as a permanent magnet, remaining locked and axis aligned to the earth's magnetic field - Dove-1 will be nadir pointing twice per orbit. The alignment of the magnetic field is known to about 1 degree at any point.

## **Communications Subsystem**

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The communication subsystem consists of a VHF radio beacon for transmitting telemetry and an S-band frequency hopping spread spectrum modem for two-way communication and as the primary radio for data downloading. After powering up, the first mission event is to transmit telemetry data over the VHF beacon. The beacon will transmit health packets (including temp/power supply/current/RSSI/solar vector/acceleration) at 1200 baud AFSK approximately every 30 seconds. The beacon can transmit at up to 1W and will use a quarter wave monopole antenna cut from tape measure. The S-band radio will operate in the 2.4 GHz ISM band at a wireless link rate of 115 kbps using a patch antenna.