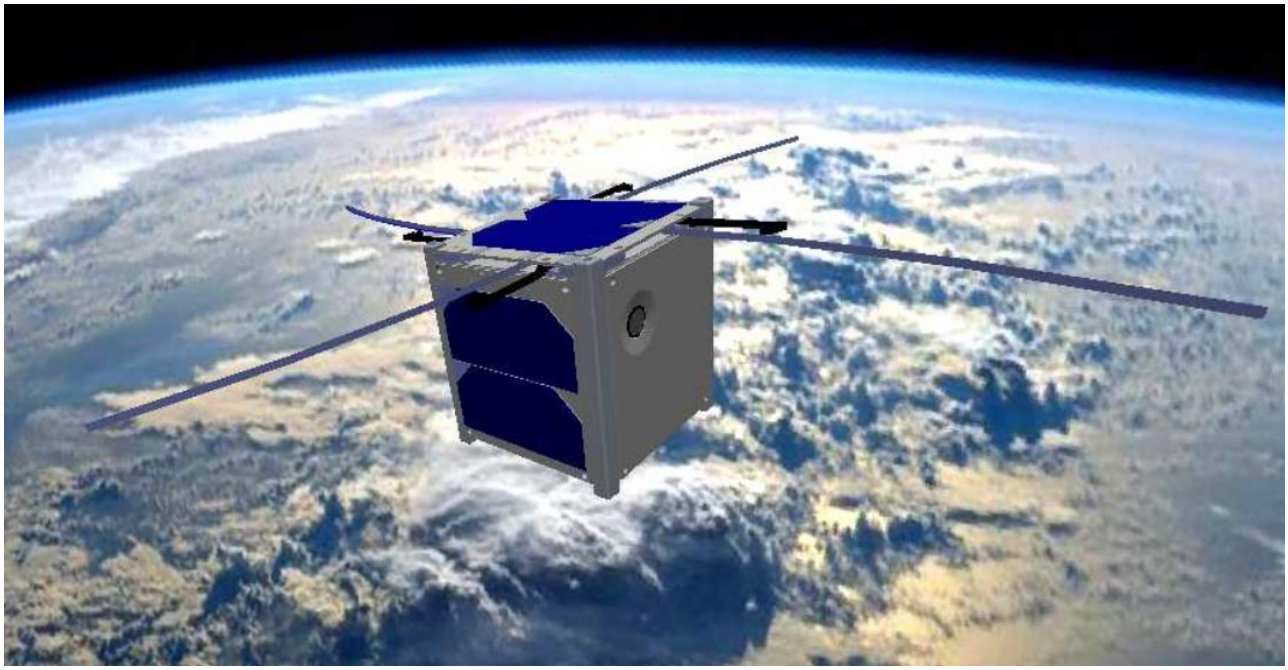
Argus-02 Satellite Technical Description

Argus-02 will characterize the performance of modern electronics in the space environment. Argus-02 is a reflight of the Argus-01 mission, which was lost in the launch failure of ORS-4 Super Strypi. It is owned and operated by Saint Louis University. The primary mission of Argus-02 is to characterize the effects of space radiation on modern SRAM. Argus-02 has a secondary mission to investigate the ability of on-board software and a commercial imager to detect natural events such as auroras and lightning strikes.

The satellite will be turned over for integration August 1, 2019, and launched as a secondary payload aboard NG-12, from Wallops Flight Facility, October 15, 2019, and carried to the ISS as cargo. It will deploy from the ISS around January 2020. Transmission will begin 30 minutes after deployment, and cease 12 months later. Atmospheric friction will slow the satellite and reduce the altitude of the orbit, until de-orbiting occurs about 18 months after launch. See the Orbital Debris Assessment Report for details.

The spacecraft is a single unit (1U) 10 cm X 10 cm X 11.35 cm CubeSat module. The total mass is about 1.1 Kg.

Figure 1 Argus-02 In-Flight Configuration



The satellite contains the following systems (Figure 2):

Attitude Determination and Control (ADC) Subsystem: The spacecraft contains hysteresis rods and permanent magnets which perform detumbling and passive attitude control. The flight software uses the current data from the solar panels to determine the sun vector and thus, orientation.

Communications System (Comms): Argus-02 uses a half-duplex communications module that operates in the 430-440 MHz band. The radio has a maximum output power of 1W over an omnidirectional, deployable antenna. The ground station is on campus in St. Louis, MO, and it will transmit on the same frequency as the spacecraft.

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Command and Data Handling (CDH) Subsystem: The on-board flight computer is a Raspberry Pi Zero W that runs the ARES Mission Software, written in Python. There is also a custom interface board for the Pi that interfaces the computer to various devices (including a watchdog timer and real-time clock) and holds connectors for hardware interfaces.

Power Subsystem (PWR): The spacecraft uses an electrical power module which harvests about 2.5 W-hrs per orbit from four body mounted solar panels. The energy is stored in a 10.4 W-hrs lithium ion battery, that includes battery protection circuits with built in latch up protection.

Structure Subsystem (STR): The structure and faceplates are fabricated of black anodized 6061 aluminum. An internal payload bay is made of 3D printed ABS.

Payload Subsystem (PLD): The payload includes 1 camera, a flash memory module, and the ARES software. The payload has two functions. One is to test the volatility of flash memory in space due to radiation, and the other is to test the ARES software framework.

Figure 2 Interior Layout of Argus-02 Components