

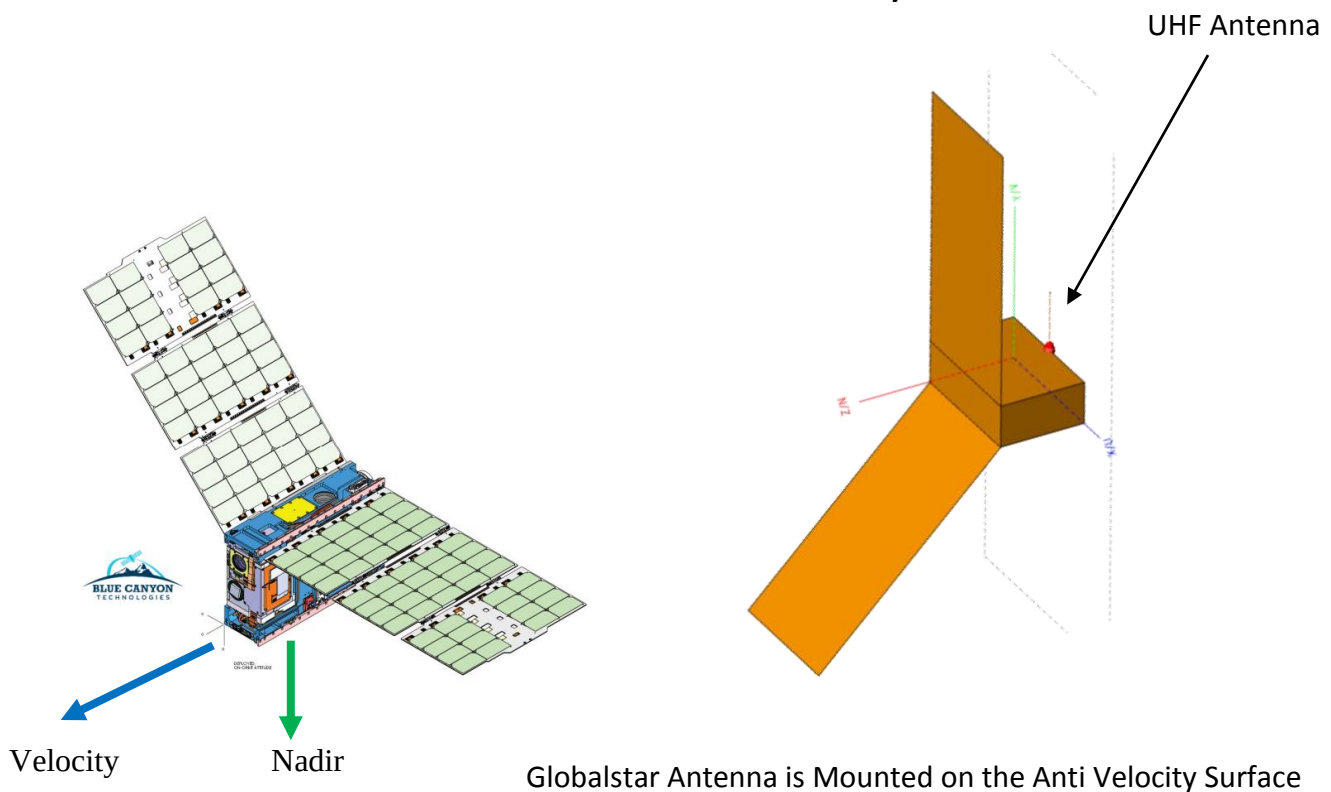
CIRiS Satellite Technical Description

The Compact Infrared Radiometer in Space (CIRiS) is a thermal infrared radiometric instrument. The mission objective is technology demonstration for improved on-orbit radiometric calibration. CubeSat constellations of CIRiS and derivative instruments would offer an affordable approach in the future to achieving revisit times as short as one day for diverse applications, including water resource and drought management, cloud, aerosol, and dust studies, and land use and vegetation monitoring.

The satellite will be launched aboard the NG-11 Antares launcher, from the Mid-Atlantic Regional Spaceport at NASA Wallops Flight Facility, no earlier than March 1, 2019. It will be carried to the International Space Station (ISS) as cargo, and then deployed from the ISS into an orbit approximately 408 km apogee and 401 km perigee, on an inclination from the equator of 51.6 degrees. After deployment from the ISS, the spacecraft will deploy solar arrays and enable communications. The UHF Radio will be activated and able to transmit only upon command from the ground. During the first passes over the ground station, the operators will establish communications to perform checkouts of the spacecraft. Several days after launch, payload tests will begin and continue for one year. See the Orbital Debris Assessment Report for details.

The spacecraft is a 6U CubeSat unit with the dimensions 11.3 cm x 23.9 cm x 36.6 cm. The total mass is 10.7 kg.

Figure 1. CIRiS Overview
Globalstar antenna is anti-velocity.



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The satellite contains the following systems.

Guidance, Navigation and Control (GNC) Subsystem: Two star trackers provide primary attitude determination, supported by an IMU, sun sensors, and magnetometer. Reaction wheels provide torque control and momentum storage, and magnetic torque rods provide momentum control. The nominal orientation points the UHF communications antenna to nadir.

Command and Data Handling (CDH) Subsystem: The flight computer is a single-board computer that is always operating.

Communications Subsystem (Comms): The Primary Comms channel is a Cadet U UHF transceiver, 450.1 MHz uplink, 468 MHz downlink. Spacecraft antenna is a custom monopole. Ground station is Wallops Flight Facility, 18-m UHF dish with SDL-owned custom radio equipment.

The secondary Comms channel is a Globalstar GSP-1720 duplex transceiver operating on Globalstar channels 5 and 6 only. The Globalstar antenna is a GAT-17PP passive patch with the shell removed, oriented with the main lobe in the anti-velocity direction.

Electrical Power Subsystem (EPS): The electrical power system uses 5 deployable solar panels which will generate up to 90 W in sunlight. A maximum power point tracker (MPPT) efficiently charges the batteries, that distribute nominal 5V and 3.3V output to the spacecraft.

The EPS is a direct energy transfer system using a solar array producing approximately 1.4W of orbit average power to charge the 194 W-hr battery system. The solar arrays utilize standard solar cells (Spectrolab, AzurSpace or SolAero); the batteries are COTS LG MJ1 18650 UL listed cells.

Thermal Control Subsystem (TCS): The system is cold biased with thermal coatings. 12 temperature sensors control trim heaters. The heaters have good thermal contact to the instrument structure and a heated calibration source. The combined average heater power is <1.5W for the planned orbit.

Structure Subsystem: The structure is fabricated of aluminum. The 6U structure includes access panels, inhibit switches, and antenna mounts.

Propulsion Subsystem: CIRiS has no propulsion subsystems.

Payload Subsystem: The payload is a thermal infrared radiometric instrument.