# NOOR-1A and 1B Satellite  Technical Description

The overall goal of the NOOR-1 mission, is to test, develop, and demonstrate the efficacy and design of a nano-satellite network, including associated software applications and their ability to exchange encrypted data via crosslinks, relay store-and-forward requests, and reliably communicate with Stara's ground station.

The 2 satellites, NOOR-1A and NOOR-1B, will be launched aboard Rocket Lab Electron 8, from Launch Complex 1, Mahia, New Zealand, between June 15 and September 20, 2019.  It will be deployed into a sun synchronous orbit at 385 km apogee and 385 km perigee, on an inclination from the equator of 98 degrees. Transmission will begin 360 minutes after deploy, and cease 6 months later. Atmospheric friction will slow the satellite and reduce the altitude of the orbit, until de-orbiting occurs about 1 year after launch.  See the Orbital Debris Assessment Report for details.

The spacecraft are identical, using an Alba Orbital 3p PocketQube platform.  Each has the dimensions 8 x 6.9 x 19 cm stowed, and 44 x 7 x 18.5 cm with the solar panels deployed The total mass of each is about 0.75 Kg.

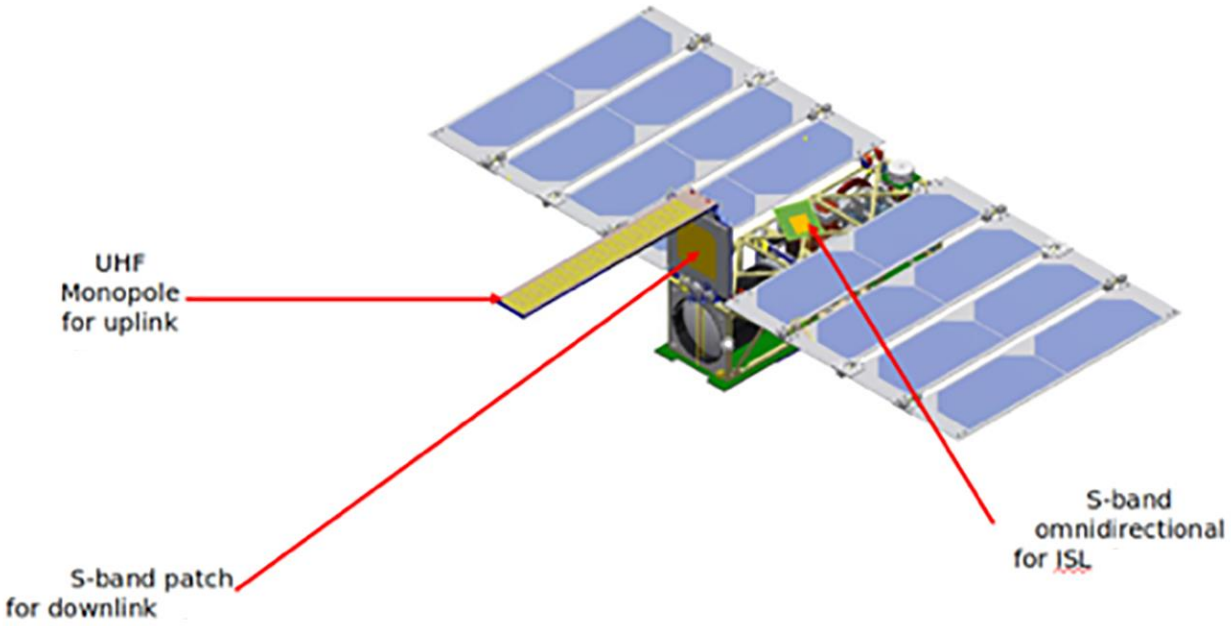


**Figure 1: A Noor-1 Unit, Configuration Solar Panels Deployed**

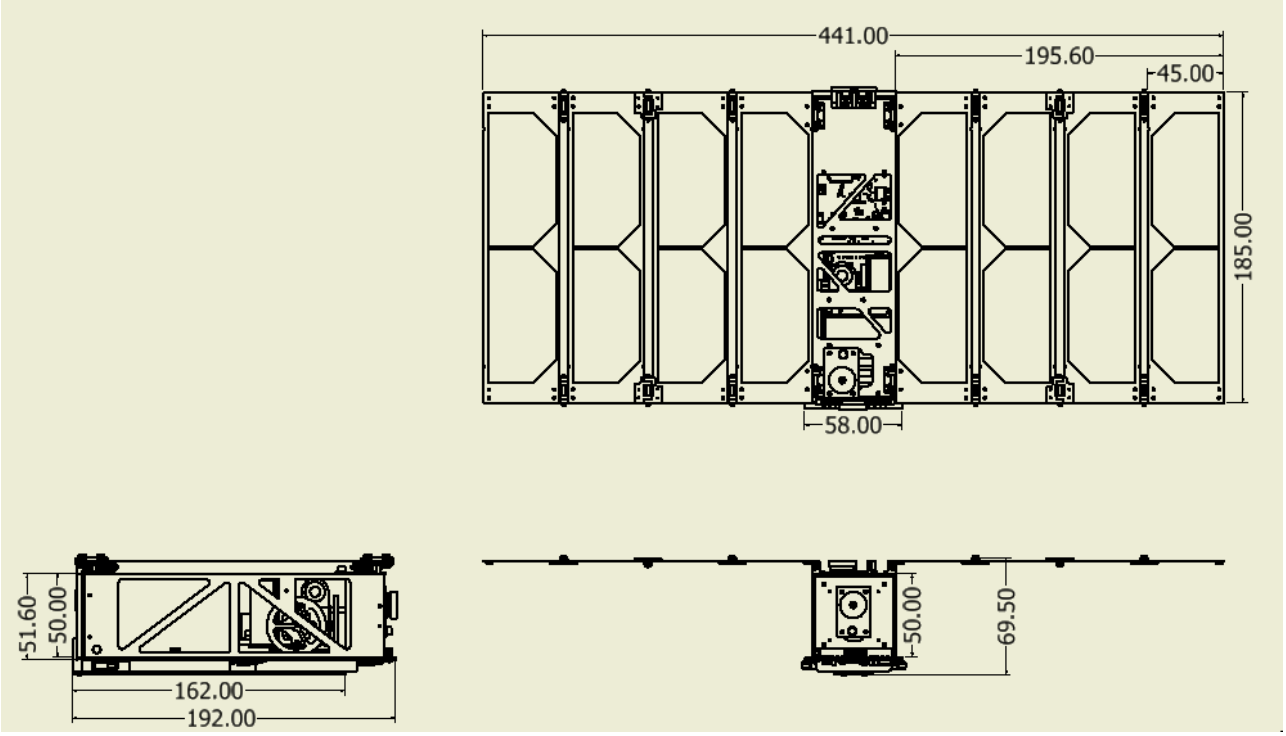


**Figure 2: A Noor-1 Unit, Dimension Drawing Solar Panels Deployed**

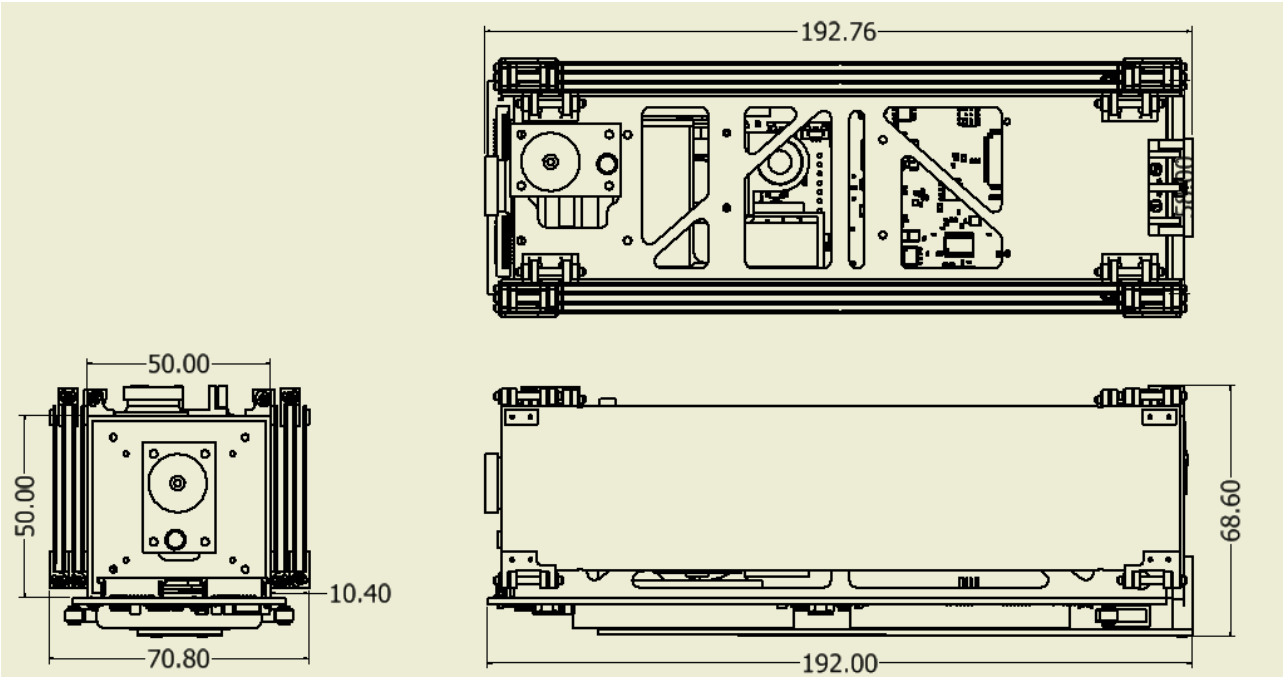


**Figure 3: A Noor-1 Unit, Dimension Drawing Solar Panels Stowed**

# NOOR-1A and 1B Satellite Technical Description

The satellite contains the following systems:

**Attitude Determination and Control System:** The ADCS subsystem includes the attitude sensors (3 axis Gyroscope, 3 axis magnetometer, 2 orthogonal sun sensors and 6 light sensors); the MCU that process the data from the sensors and the orbit data from the ground station; a clock; and a set of actuators (3 inertia wheels and 3 magnetorquers)

This ADCS subsystem will detumble the satellite after the deployment from the launch vehicle and control the attitude relative to the Earth. Also it can put the satellite in low air drag mode or high air drag mode, to affect the rate of orbital decay of the satellite.

**On-Board Computer Subsystem (OBCS):** This subsystem is responsible for the data exchange between the radio, the payload, the data storage, the ADCS and the EPS. This is integrated into a single PCB, sharing this PCB with some parts of the ADCS, the EPS and the data storage.

**Electrical Power Subsystem (EPS)**: The EPS is a direct energy transfer system, using a solar array producing approximately 19W of orbit average power to charge the 2 A-hr battery system. The solar arrays utilize standard AzurSpace photovoltaic cells; the batteries are COTS RS 125-1266 cells.

The solar panels are stowed before launch, and at a predetermined interval after deployment of the spacecraft from the launch vehicle, they will extend.

**Communications Subsystem (COMMS):**

Each spacecraft includes a S band transmitter for the ground link, an S band transceiver for the cross link, and a UHF transceiver for up and down linking. The radios are supplied by Alba Orbital, based on the SEMTECH transceiver chipset SX1276. They will use GFSK modulation. The 3 antennas are stowed for launch and will extend after deployment of the spacecraft from the launch vehicle.

**Thermal Control Subsystem (TCS):** The TCS uses both passive and active control. The passive control is to cover the parts of the spacecraft with a thermal tape, in order to reject radiant heat from the Sun and Earth. The active control uses resistance heaters attached to the main backplane and the batteries. Thermal control algorithms running on the OBCS control the heaters based on feedback from temperature sensors on the backplane board.

**Structure Subsystem:** The structure is fabricated of AL6061 T6.

**Propulsion Subsystem:** No propulsion subsystem is included.

**Payload Subsystem:** The payload of this mission is the Inter Satellite Link (ISL) communication system between Noor-1A and Noor-1B, and related software. The quality of the link between two satellites will be characterized as part of the experiment.