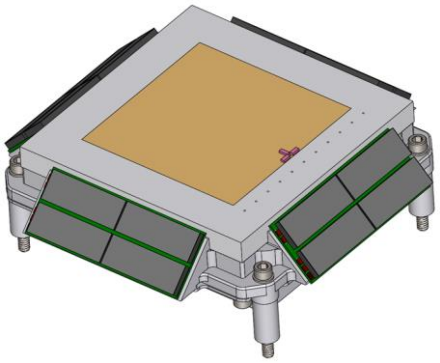
SOARS Experiment Technical Description

The overall goal of the Space Object Automated Reporting System (SOARS) combines space-object "beacons"; automated, low-cost, ground collection sites; and a control center which together provide near-real time 24/7 space situational awareness. Developed initially through an SBIR, and subsequent follow on program, the current effort facilitates the development and validation of a second generation, space object identification Beacon and its viability to transmit from space.

The experiment will be launched as a hosted payload on a launch vehicle upper stage, in February 2020. It will orbit at 450 km apogee and 450 km perigee, on an inclination from the equator of 97 degrees. Operation will begin within one day of launch, when the first command is received by the beacon, from a SOARS Mission Control station, and operation will cease less than 6 months later. The launch vehicle is expected to remain in orbit for 2 years or more. See the Orbital Debris Assessment Report for details.

The experiment is a single unit with the dimensions of 10 cm X 10 cm X 3.1 cm. The total mass is about 200g.

Figure: SOARS Beacon



The experiment contains the following systems:

Example follows:

Command and Data Handling (CDH) Subsystem: The CDH subsystem is contained in an MSP430F5328 micro-controller. The subsystem controls the timing windows for communication modes, powering off devices to achieve duty cycles that will preserve battery life. It also generates relevant experiment condition data (temperature, voltages, sensor data) that is transmitted.

Communications Subsystem: The communications subsystem is based around an AXSEM AX5243 transceiver. The transceiver operates in the 400-401MHz range. All communications are FSK digitally modulated and at 1 kpbs. The system has an RF switch to put an RF amplifier in the antenna connection for transmit mode, and bypass the amp when in receive mode. It uses is a single, quarter-wave patch antenna designed by Tiger Innovations, for both transmit and receive.

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Electrical Power Subsystem (EPS): The EPS consists of 16 IXYS solar cells, 4 high-capacity "Super" Capacitors, and 4 primary cell batteries. The Solar Cells directly power the super caps in the presence of sunlight. When not in sunlight, the subsystem voltage sags, and it draws charge from the primary cell batteries. All of this provides power to charge the super capacitors, which power all of the electronics on the beacon.

Structure Subsystem The structure is fabricated principally of coated Aluminum 6061-T651 per QQ-A-250/11, with hardware made of A286 Stainless Steel, and 304 Stainless Steel. The antenna on the top surface (made of TMM13i, gold, and copper) also makes up a significant portion of the mass.