Request For Proposal for Oregon Satellite Science Payload

2016-08-31

Overview

Oregon's first educational nanosatellite is looking for an Oregon-based science payload to fly in low earth orbit in the next 2-3 years.

Background

The Oregon Small Satellite Project (OSSP) is an open source, crowdfunded project with the goal of creating and flying Oregon's first satellite. Currently being managed at Portland State University by the Portland State Aerospace Society (PSAS - see http://psas.pdx.edu/), OSSP is a loose consortium of Oregon higher educational institutions. The current project, dubbed "OreSat", is a standard "CubeSat"-class satellite that is being built to fly in low earth orbit. OreSat is intended to be flown via the NASA CubeSat Launch Initiative (CSLI), which provides a free flight opportunity (launch) for selected satellites. To date there have been no CubeSats flown from the state of Oregon.

The current OreSat mission is a space-based "STEM" outreach to Oregon middle and high schools. Schools around Oregon will build their own low-cost, 3D-printed ground stations and be able to download live high-definition video directly from space via OreSat's on board camera. OreSat also includes open source space technologies being developed at PSAS.

For more information, please see the OreSat website at http://oresat.org/.

Request for Proposal

The NASA CubeSat Launch Initiative (CSLI) selection process weighs each application against three NASA strategic goals: scientific research, technological development and educational engagement. The current design for OreSat addresses the technological and educational directorates, but does not yet include a science mission. OSSP is requesting proposals for Oregon-based science payloads to be incorporated into OreSat and be part of the CSLI application submitted in November 2016.

Decision Criteria

The choice of science payloads will be decided by OSSP based on the following criteria:

- Maximizes science returns
  - OreSat is an fully open source project with strong roots in citizen science. OSSP is interested in maximizing the amount of open science returns from OreSat, with the largest possible impact for Oregonians. Science payloads that could involve Oregon middle and high schools for "ground truth" measurements are highly encouraged.
- Compatible orbital requirements
  - OreSat's orbit will be determined by the launch manifest chosen by NASA. OSSP has very little control over the final orbital parameters, but a low earth orbit (LEO) between 300 - 500 km (e.g., the International Space Station orbit) with a variable inclination will be our orbital request. Payloads with loose orbital requirements will be heavily favored.
- Attitude control requirements
  - OreSat will have a rough attitude determination and control system with accuracies on the order of ± 5°. The accuracy may be able to be increased, but at a large cost in money, power, volume and time. Payloads that do not require precise pointing are heavily preferred.
- Power requirements
  - OreSat will mostly like have 3 - 5W of total continuous power available. Science payloads

should minimize their required power consumption.

- Volume / mass requirements
    - CubeSats have strict design specifications including a volume restriction of 1,000 cm^3 per unit (U) and a weight restriction 1.3 kg per U. The current OreSat design requires a volume of 1.5U out of a maximum of 3U and is well within the weight guidelines. This leaves 0.5U (for a 2U satellite) to 1.5 U (for a 3U satellite) of available space.
- Data downlink requirements
    - OreSat has two radio systems: a high availability, low speed (9600 bps) UHF command and control radio, and a high speed (2 Mbps) downlink that will mostly be available while over Oregon. The availability and frequency of ground stations able to download data will be highly variable and depend on OreSat's final orbit. The science payload should minimize the amount of data it needs to downlink over the two radio links.
- Electrical interface requirements
    - OreSat's electrical system (satellite "bus") uses standard communication interfaces, including serial ports, parallel ports, and high speed serial interfaces such as Ethernet and CAN. The science payload should utilize standard electrical interfaces if possible.
- Self-funded
    - OSSP will not be able to provide funds for the science payload or its integration into OreSat. Science payloads will need to provide their own funding for research and development.
- Self-built
    - OSSP will most likely not be able to design and build the science payload. That said, OSSP is more than willing to provide engineering expertise for the science payload. OreSat requires at least two built full science payload systems built: an engineering model used for integration and testing, and a flight model that will fly on the CubeSat. Existing prototypes of science payloads will be heavily weighted over more "powerpoint" payloads.
- Space and launch vehicle requirements (according to NASA LSP -Req-317.01)
    - The science payload must be physically able to withstand a 10 g launch, high vibration loads, extreme temperatures from - 50 to +100 ℃, not excessively outgas, and survive the vacuum of space. While OSSP can help with the engineering required to meet these stringent requirements, science payloads that are conducive to survive these environments are preferred.

Submission information and timeline

October 1st, 2016	Science RFPs due. Please send submissions to info@psas.pdx.edu.
November 1st, 2016	Science payload decision made.
November 22nd, 2016	CubeSat Launch Initiative (CSLI) proposals due, including section on science payload.
February 2017	CSLI announcements
2017 - 2018	Science payload integration and testing in OreSat prototypes, including sounding rockets, balloon launches, thermal vacuum tests, etc.
2018	Request launch manifest
2019-2020	Launch!
T+9 to T+12 months	OreSat operations before re-entry.

For more information

Please send submissions to info@psas.pdx.edu. For questions and or comments, please contact:

Andrew Greenberg
Portland State University ECE Adjunct Faculty
adg@ece.pdx.edu
503-708-7711