We take great pride in supporting local students on their innovative projects. We know the key to technological evolution is providing new generations with our support and sharing knowledge from the experienced we've gained along the way.

This newsletter is unique because it is not every day we see parts we've machined being launched to space, so thanks to the ORCASat project and the UVic Satellite design team.

THE PROJECT

The Optical Reference Calibration Satellite (ORCASat) project is a nanosatellite-class spacecraft designed and built at the University of Victoria (UVic)- Centre for Aerospace Research by the student engineering team UVic Satellite Design, in collaboration with the University of British Columbia.

The ORCASat mission is to provide an unmatched hands-on learning experience for undergraduate and graduate students and demonstrate a novel method of calibrating how we measure the light coming from space and telescopes used in astronomy.

The spacecraft is scheduled to launch in quarter four of 2022, and it will be carrying an in-situ-calibrated light source. This will assist with calibrating photometric references, best known as supernova stars used in astronomy.

Atmospheric and instrumental interference accounts for the largest sources of systematic uncertainties when measuring the universal expansion rate. A reference light source in orbit will 'zero out' interference and allow astronomers to make more precise measurements.

All light sources change their brightness due to temperature and aging over time. Therefore, calibrating it on the ground before its launch is not good enough; it must be calibrated when it is operating in orbit.

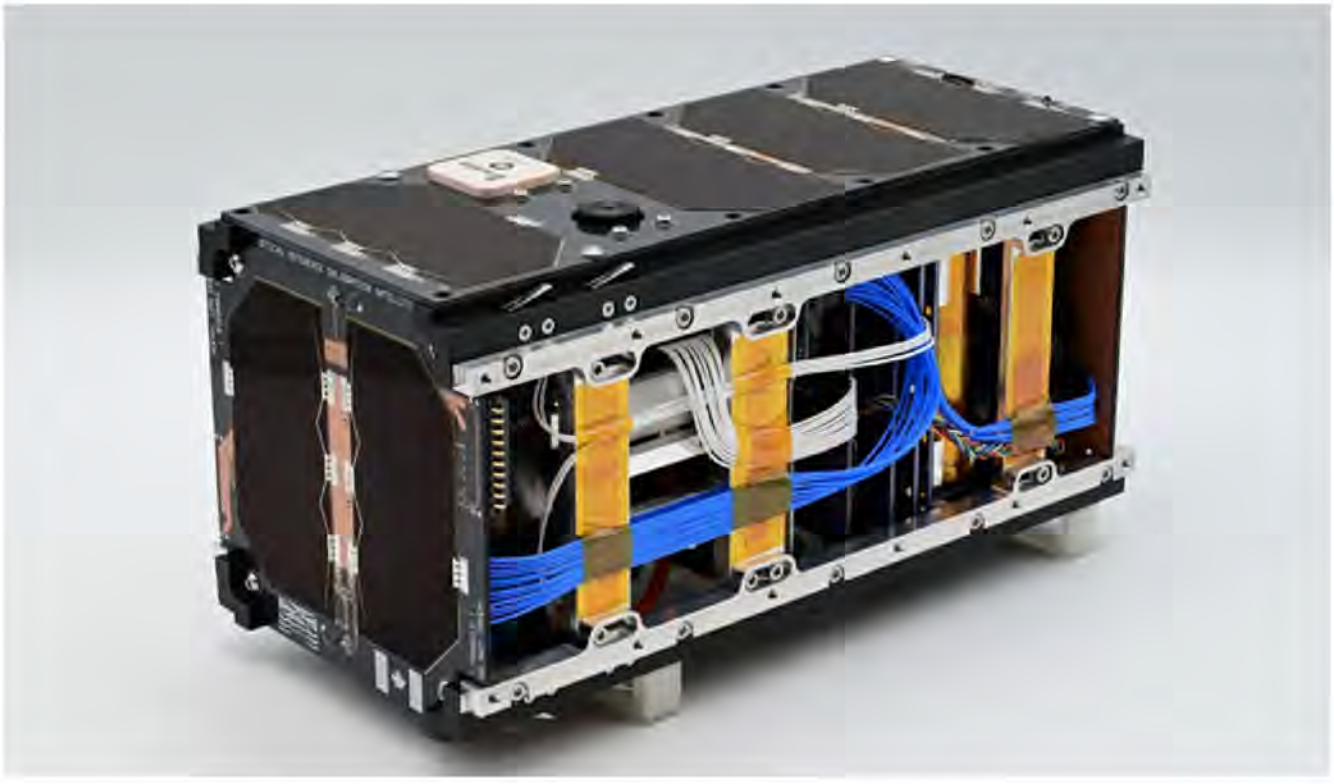
Photometric references are the brightness of every star compared to the brightness of a standard candle. Supernova stars are known as standard candles in which all photometry or brightness measurements are referenced.

HOW IT WORKS

ORCASat wants to demonstrate that an orbiting spacecraft can calibrate photometric references and telescopes. Once in space, astronomers will be able to observe the satellite as a star emitting light, and the satellite will also be measuring how much light it is emitting via calibrated photodetectors onboard the spacecraft.

After observation, the measurements taken by ORCASat will be downlinked to the ground station at UVic, where astronomers can now compare how bright ORCASat appeared to be vs how bright it actually was. The observations and data from this project will be used to calibrate photometric references and telescopes to account for the light lost in the atmosphere and telescope optics more accurately.

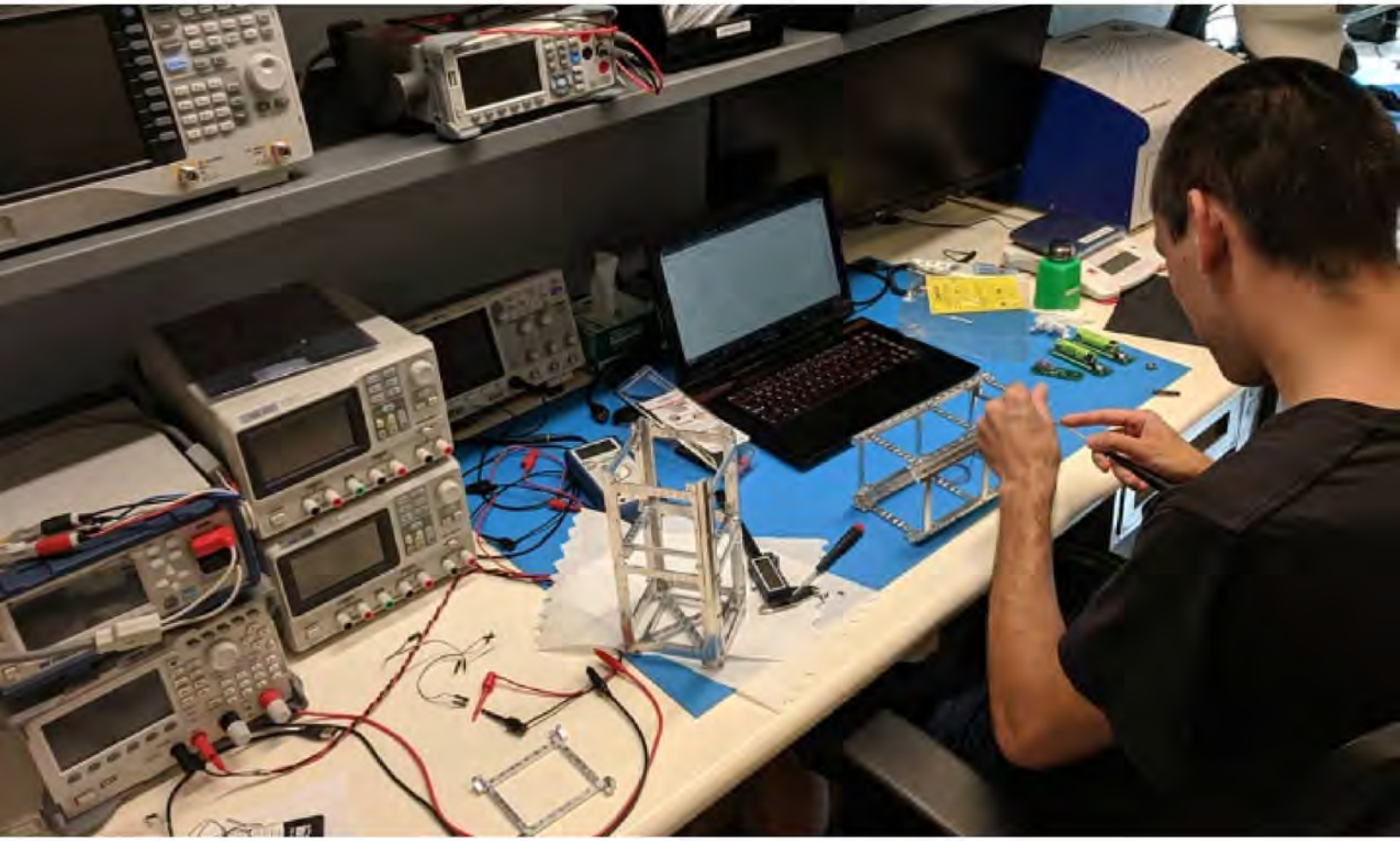
This light source will also help demonstrate that photometric reference calibration can be performed with better precision than previous methods. In addition to the payload ORCASat is carrying, it will demonstrate the complete end-to-end operations for missions of this nature, including precise scheduling of the light source illumination, collecting of measurements, data downlink, and data distribution.



Final assembly of the spacecraft with a solar panel removed.

HOW IT HELPS THE FUTURE

The entirety of the spacecraft was designed in-house by students and full-time researchers, with the majority of the subsystems and components being developed, manufactured, and tested in-house at UVic and UBC. Students involved do not only get hands-on experience with mission design, systems engineering, and mission operations, but the entirety of the low-level mechanical, electrical, and software engineering of the spacecraft components.



All designs, test data, and flight telemetry will be published free to use during the mission to encourage reuse and community involvement in future CubeSat missions.

The ORCASat project strives to reach as many students as possible, working with students from local high schools, colleges, and universities in British Columbia to offer an unmatched opportunity for learning by doing.

RAINHOUSE AND ORCASat

Rainhouse has helped the ORCASat project by sponsoring the manufacturing time of several critical spacecraft components including the spacecraft rail panels and integrating sphere fronts, and other several minor components.

Rail panels are the black components (due to being hard anodized) that along with the side panels (bare aluminum components) form the spacecraft structure

The rail panels are one of the two components that constitute the core spacecraft structure or chassis. The rail panels have demanding tolerances to ensure the fit spacecraft structure is a perfect fit with the launch vehicle.

The integrating sphere is a critical component of the spacecraft payload and mission as it allows ORCASat to emit light and measure it with multiple photodetectors simultaneously, while also having a large viewing angle.

Fully assembled payload, the integrating sphere front is clearly shown with its key features.

The ORCASat team shared their gratitude for our contributions and Alex Adoknjas stated "With the support in manufacturing these components, ORCASat would not be possible. Rainhouse has always been friendly and supportive of the ORCASat project since its inception and continued to provide support right up until the final stages of assembly, integration, and testing of the flight spacecraft."

With the ORCASat project as an example, we want to show our support and encourage all teams and engineering groups to continue working on their passions and innovations. As a community, we believe we can work together to achieve great results.