Selection and Development of a Small Commercial Camera and Lighting System for Imaging in Space

Company: Astroscale Ltd (https://astroscale.com/)

Project open to: 3rd/4th year undergraduate, Final year undergraduate, and Masters students

Application closing date: 31st January 2022

Expected duration of project: 5-8 months

Latest start date: End of March 2022

Application link: https://forms.gle/CiVxdgTaf8WXMt6s8

Organisation description

Astroscale is the first private company with a vision to secure the safe and sustainable development of space for the benefit of future generations, and the only company dedicated to on-orbit servicing across all orbits.

Founded in 2013, Astroscale is developing innovative and scalable solutions across the spectrum of on-orbit servicing, including life extension, in situ space situational awareness, end of life, and active debris removal, to create sustainable space systems and mitigate the growing and hazardous buildup of debris in space. Astroscale is also defining business cases and working with government and commercial stakeholders to develop norms, regulations, and incentives for the responsible use of space.

Recently Astroscale has launched The End-of-Life Services (ELSA) program which is a spacecraft retrieval service for satellite operators. ELSA-d (demonstration) is the first mission to demonstrate the core technologies necessary for debris docking and removal which has already proven a success

Project description

Astroscale are putting together a new project that will actively collect and de-orbit client satellites that are deemed dangerous to other craft in their orbits. On the craft there is an opportunity to add two “off the shelf” commercial cameras. These cameras will not be actively used for any mission critical phases or involved with capture but more for publicity/commercial aspects of the mission i.e to capture video and pictures of the craft during docking to the client (i.e a selfie in space). The cameras will be placed in positions on the craft in such that aesthetic images of the capture can be obtained as well as pictures of the actual craft during its life.

Cameras in space are not a new thing but the traditional units tend to be heavy, expensive and draw a fair amount of power. For this project we are looking for the opposite, taking advantage of the ever-growing small commercial cameras that are low cost and low complexity due to their non-mission critical aspect. The cameras do need to be environmentally tested with the craft to ensure they meet the standard temperature and vibration mission needs and do not propagate a failure to the platform, but they won't be radiation tested as their failure won't affect the success of the mission. The camera and lens should be placed in its own protective housing (and attached to the craft) with the addition of an LED illumination system to help ensure pictures can be captured during eclipse orbits. The specs that these components (camera, lens, housing) need to reach will be specified to the students in a commercial statement of work set by Astroscale at the start of the project.

The aim for this project is for the students to select two options for a camera control unit, a camera lens and LED illumination subsystem that meets Astroscale's specification. The students are expected to select and test the hardware as well as write the software that will capture, save and distribute the images back to the main satellite on command. Astroscale will help guide the students in their selection, help with any interfacing issues as well as guide on what is expected from the software and its use in space.

Once the working units are ready, the students can visit the site, present the subsystem to the team, and possibly help with any integration and testing as it's incorporated into the main craft.

To give an idea, one option of a camera investigated so far is the Raspberry Pi Module zero with Raspberry PI high quality camera module.

The main aspect when looking and deciding on the choice of this camera comes from low cost as well as low weight and ease of use/connectivity. The camera modules will be accessed by the satellites on board computer via serial UART (RS422) or GPIO interfaces that will command the camera when to take pictures, start video and gather the image data back from the unit to be stored in mass memory units to be later sent down to ground when appropriate.

Person specification

We are looking for students who are working towards an engineering degree in electronics and/or software design. Ideally the student would be looking at this opportunity for their final year project or post grad project and would have the knowledge to select and use the hardware as well as write the image capture software to a high standard specification and set of requirements set by Astroscale.

We are looking for people who have a passion for space and wish to be involved in our companies' mission for pushing boundaries in the securing of a sustainable future and as an outcome your project will actually be flown and used to take pictures in space.