

# Semi-Autonomous collision avoidance for satellite capture system

**Company:** Space Forge Ltd (<https://spaceforge.co.uk>)

**Project open to:** Final year undergraduate and Masters students

**Application closing date:** 1st June 2021

**Expected duration of project:** 2-6 months (longer if part time)

**Latest start date:** Beginning of October 2021

**Application link:** <https://forms.gle/duZF6cViN9JDoM449>

## Organisation description

Space Forge Ltd is a UK start-up that is looking to lead the clean industrial revolution by harnessing space. We are developing fully reusable satellites, known as ForgeStars, that are designed for manufacturing next generation super materials in space for return to Earth to be used to help move to low carbon technologies. Space Forge is based in Cardiff, Wales and has a rapidly growing team who are focused on transforming the way we return to Earth.

## Project description

Space Forge is developing a satellite re-entry service that requires an ever increasing cadence of launch and re-entry; to support growing in-orbit manufacturing markets and the demand for space made materials. As part of this service, we are developing an uncrewed capture system that catches our ForgeStar satellites before they hit the sea.

This vehicle can be thought of as a more mobile version of SpaceX's first stage landing barges, where we move a net at high speed over the water to track down and catch the satellite before it can land in the sea and get contaminated with seawater; reducing the level of achievable reusability.

This capture system is uncrewed to save on cost and reduce the risk to operators, and our initial re-entry missions will happen in areas that are free of boats and aircraft. However, there are still navigation hazards like buoys and net markers that we will need to avoid. To help our remote operators, it would be advantageous to have a system that could spot, identify and potentially automatically avoid such hazards. In the future an advanced version of this system might be reliable enough to allow us to avoid boats, eliminating the need to clear all shipping from the area before the catch can take place, and allowing us to return to home faster with time sensitive payloads like organs and vaccines developed in space.

Therefore this project is about creating a lightweight and affordable collision avoidance system for our satellite catcher. We want students to research current approaches used on

boats, cars & UAVs, identify technologies used, trade-off old & new approaches, design one suited for our vehicle and build/test a prototype if time allows.

This project will start with a meeting with our engineering team so you can understand the requirements and constraints for the system, and you will be given an interface specification (mounting, power, mass, operating conditions, etc) to work to. The team will help you learn about the satellite catching process and what the system will be used for. As you move through the key stages of the project (research, trade-off, design, prototype) there will be opportunities to present your findings to the team to get feedback and learn about real space engineering.

At the end of the program you will present to the team your final design and any test/simulations results you may have generated, as well as your conclusions & recommendations on how the design could be taken forward.

The work should be able to be carried out using the systems and software of the student's choosing. We will deliver requirements in pdf format, and any presentations delivered should be in pptx, or google slides format. A final report should be delivered using gdocs, openoffice or microsoft office formats.

### **Person specification**

We are looking for students who are comfortable running a research and design project individually. Space Forge will be able to provide feedback at key points throughout the project, but the day to day activities will be set by you. We want people who are naturally curious and happy to learn the lessons of previous system designers, but be able to challenge historical assumptions about how something should be done. We expect someone studying a software, electronics or aerospace degree would be best suited, but we are open to other backgrounds as well.