FOSSA Systems

Satellite Mission Statement

# Our Vision

Our vision is to build a picosatellite and put it in orbit around the Earth to inspire a new generation of engineers and scientists by providing a means of deploying user developed code in space.

We aim to achieve this using a satellite that will be able to operate JavaScript programmes developed by school and university members. We plan to host an inter-school/university competition and the winners will have their programs loaded onto the satellite along with prizes. All participants will have their names recorded on the system as it circles the globe.

We hope this proposal provides a mechanism to engage students in a wide variety of STEM subjects, Physics and Computer Science.

The team is currently developing a prototype which will be ready by the end of 2018. The aim being to have it fully tested on a weather balloon as a proof of concept. Our approach is to have the satellite build plan verified and validated by experienced personnel before taking it to launch. This phase of the project is already partially funded.

However, we are currently looking for support from third parties to help;

1. Deployment of the satellite on a balloon to test operability in space-like conditions.
2. Support in the delivery of the competition media to engage schools and universities in the project.
3. Fund the launch into space which is estimated at a cost of £25,000.

In return sponsors will receive priority attention for advertisement during the competition.

# The Team

We are a young and international (Spanish and British) development team consisting of Julian Fernandez, Richard Bamford and James Bateman.

Julian develops the hardware, engineers the builds, manages the legislation of aerospace licenses and rules.

Richard is the software developer who is responsible for the Arduino (Atmega) chips on board and the public relations of the project.

James handles the branding and management of the project’s public appearance.

# Development

The picosatellite is a 5x5x5cm pocketqube called **“*FOSSASAT-1”***. It will be the first of its kind to feature deployable solar panels. Only 1 other picosatellite of this size has operated before.

We are confident that we can build a prototype that functions on a weather balloon. Once we have reached the limit of what we can do, we will contact Universities in Spain and Jodrell Bank Radio Telescope to hopefully get expert advice.

## Progress

Since the beginning of July 2018, we have already produced a prototype that will be tested onboard a weather balloon within the next month.

We blog all development progress on our website at <https://fossa.systems/news/>.

## Milestones

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| --- | --- | --- |
| Milestone | Description | Date (Completed) |
| Beacon Arduino C system | The beacon is functional, it relays all the information specified in the requirements specification. | 20/07/2018 |
| Ground station Arduino C system | The ground station is functional and can receive all information transmitted by the Beacon (above) and transmit its own commands to the satellite. | 22/07/2018 |
| Arduino payload | This will be programmed with the competition winners javascript programs, which will be manually transpiled into C and security vetted. |  |
| Weather balloon test | The first serious test requiring security permits will be this, it will be hosted in Spain with the regulations fulfilled by Julian. |  |
| Sponsors and contact input | At this milestone we will go to our expert contacts (professors and engineers) to validate the build and entire project plan. |  |

# Technical Details

The entire system consists of the picosatellite and ground stations.

## Picosatellite

The picosatellite has 2 main modules; beacon and education payload.

The beacon is the module that transmits the system information such as; battery charging current, solar panel input voltages, reset count and deployment status to the ground stations via a LoRa package.

The education payload is an Arduino atmega DIP which is connected to various sensors (TODO) that will have the competition winners code on it, which can also transmit and receive within the safety specifications. The programs will be analysed by our team and we will consult other experts to ensure safety and security.

## Ground station

The ground station will be a system consisting of a LoRa transceiver and IO hardware (TODO) which can downlink information from the picosatellite. No control is given to the ground stations other than pre-defined and security verified commands such as; ping.

# Finances

## Sponsors

So far, we have 2 sponsors able to supply us with PCBs:

1. PCBWay
2. JLCPCB

But we are looking to other companies to help with our budget.

## Budget

|  |  |
| --- | --- |
| Items | Amount |
| Research and development | $500 |
| Prototype construction | $900 |
| Licenses and general administration fees | $500 |
| Marketing and public relations | $500 |
| Launch | $25,000 |
| Total | **$27,400** |

# Development Ethics

Our focus as a development team is to engineer solutions that push our skills and the satellite to the limit, while retaining a KISS (keep it simple stupid) philosophy.

# Competition Plan

### Rules

1. Teams of any sizes are allowed.

### Prizes

We want to leverage our sponsors to help us provide some great prizes to the students that win the competition, currently we have no prizes to offer but these will be crucial rewards – along with the code on the satellite – for the competition.

### Programming Environment

Each participant will be able to run Javascript code on an online simulator. Once we have all the projects and their associated media like flyers, description or documentation we will then vet each submission and convert it to C code manually.