

UBSEDS

University of Bristol Students for the
Exploration and Development of Space

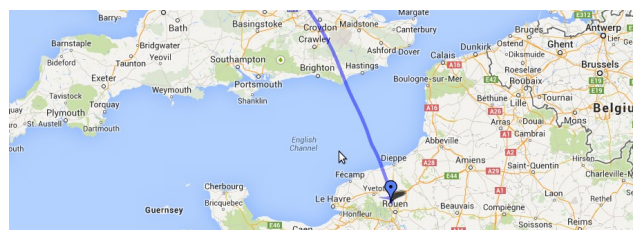
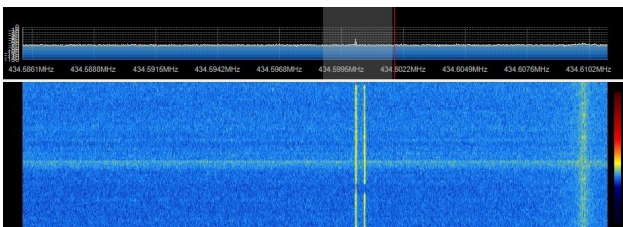
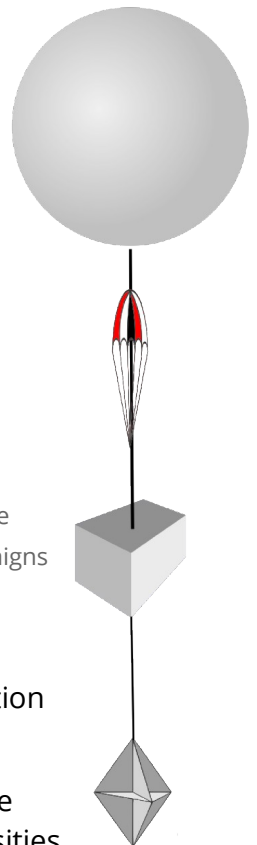
Project Proposal: High Altitude Balloon Receiver

Last year UBSEDS launched its own High Altitude Balloon, which reached an altitude of 32km before bursting and falling back to earth. We designed the GPS tracker - one of the most important components - but used a group of volunteer receiver stations to receive its signal. These stations are usually set up by individuals after a request to the [UK High Altitude Society \(UKHAS\)](#) mailing list.

We'd like an autonomous station to receive data from High Altitude Balloons (HABs). This would benefit experimental HAB launches across the UK as well as our own. HAB are filled with helium and attached to a payload that is to be carried to the stratosphere. They are used for scientific experiments, communication research and [STEM](#) outreach by students at other universities (such as [SUSF](#), [CUSF](#), and [EARS](#)) as well as by schools, scout groups and individuals.

Outcomes What will this project achieve?

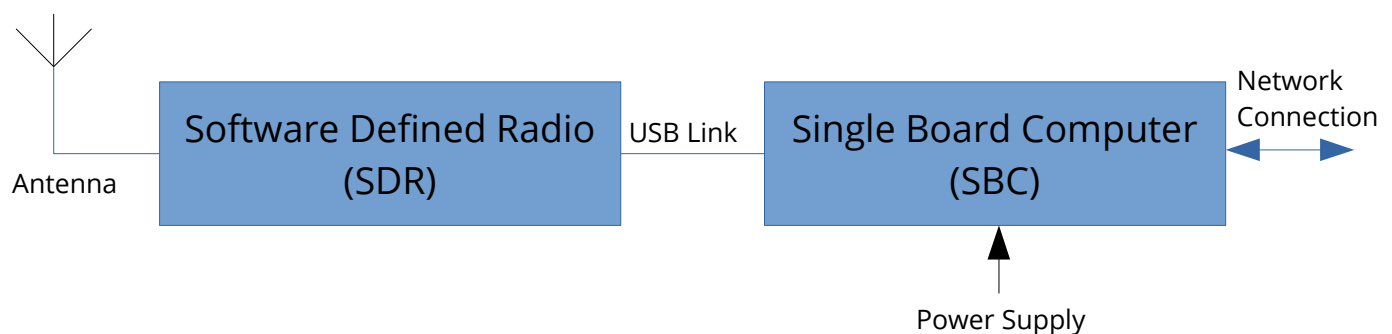
- The receiver will improve and complement the current volunteer network by:
 - Allowing Bristol SEDS to track our own launches expanding our capabilities
 - Being available continuously for launches during the working week
 - Tuning to new balloon launches automatically to be useful without constant maintenance
 - Tracking multiple balloons at the same time for more complex payloads or launch campaigns
 - Having a good view of the horizon to provide a larger coverage area
 - Being quickly reprogrammable for communications research or photo / video downlink
- The receiver will enable future activities for the society, such as launches in conjunction with schools and experimental payloads.
- The development of the receiver will be well documented, so that more copies of the receiver can be built by others. This could include UKSEDS branches at other universities.



Steps How do we propose to complete this project?

- Split up the range of different tasks between team members.
- Produce a viable and optimum design for the receiver.
- Secure funding for the project.
- Evaluate and purchase components.
- Secure an antenna site with power and network connections.
- Develop software to meet the aims listed above.
- Test the receiver in an accessible location.
- Install the receiver into a secure enclosure.
- Install the receiver and antenna at the receive site.

Basic Design How is this possible?



A Software Defined Radio (SDR) is a radio where tuning and demodulation are controlled by a software program, rather than being defined by the circuit design. This will allow us to buy a tried-and-tested piece of hardware and quickly adapt it to our needs. It can be easily connected to a Single Board Computer (SBC) over USB, and this can then be used to process the data. This should allow us to complete the project without expensive and time consuming hardware development.

We will need to investigate various options from both devices, and decide which is most appropriate for our needs. Some of the options are:

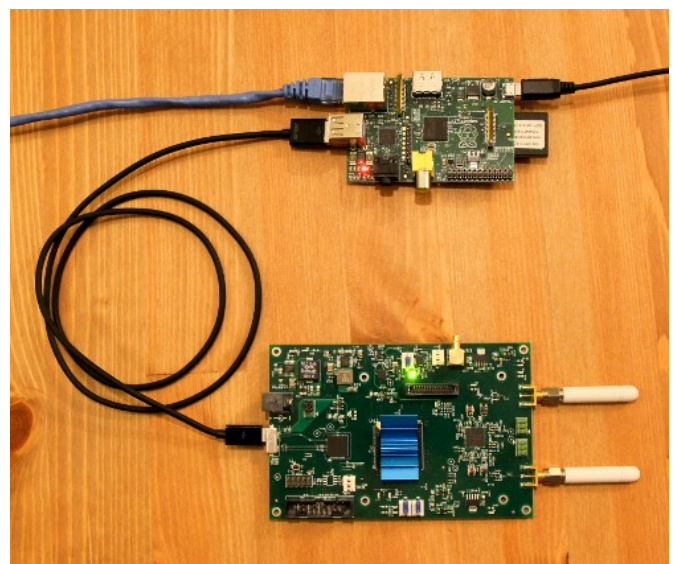
For the SDR:

- [RTL-SDR](#)
- [Fun Cube Dongle](#)
- [HackRF](#)
- [BladeRF](#)
- [USRP](#)

For the SBC:

- [Raspberry Pi](#)
- [Beagle Board Black](#)

We don't expect prospective team members to be familiar with these boards initially, and so the committee will be on hand to share their technical expertise.



One of the options would be a BladeRF combined with a Raspberry Pi

Roles Who do we need in our team for this project?

Each role is going to require a commitment of several hours per week. This will comprise of working on a particular section of the project, communicating during team meetings and ensuring all parts of the project are being pushed forward.

We're looking for undergraduate and postgraduate students who would like to be part of this project! This is an excellent opportunity to gain technical abilities that are sought by employers, as well as communication and teamwork skills. It would be particularly relevant to anyone perusing a career in the space industry! Please go to <http://goo.gl/forms/S1TDhaFcEu> to register your interest.

Role	Responsibility	Skills
Site	Responsible for finding a site for the receiver, ensuring that site has network and power connections, and communicating any requirements of the site to the rest of the team.	Negotiation, ability to communicate the project's aims.
Funding	Managing the total cost of the project, applying to potential sources of funding	Able to communicate what the project is about, and why it should be funded.
Publicity and Outreach	Ensuring that all the technical developments from the project are well documented and publicly available.	Good communication skills.
Mechanical	Creating an enclosure for the project that meets the need of the site and electronics while still looking good!	Creative, workshop skills
Single Board Computer (SBC)	Selecting a single board computer for the project, installing and updating Linux, and ensuring it has remote access and power.	Basic Linux Skills (such as having used a Raspberry Pi) and some knowledge of computer networks
Software Defined Radio (SDR)	Selecting a SDR and antenna for the project, and configuring it to receive various radio protocols.	Some knowledge of radio communications protocols, and low-level programming (i.e. C) skills
Data Processing	Responsible for the processing of received data and upload to a central repository (i.e. habhub.org)	Knowledge of internet protocols (such as http). Programming experience in a relevant language (node, python, ruby) would be a bonus.

The project team will be guided and assisted by the UBSEDS committee who have experience in most of the technical skills required for the project (signal processing, linux, embedded development, NoSQL databases). Therefore anyone who would like to work on this project should not be put off by a lack of experience! The most important thing is enthusiasm and willingness to work in a team.