

Investigations Overview

Engineering

The engineering tasks ensure that the balloon is launched safely and the payload works as planned during the mission.

Activity 1: A Safe Flight Path

A number of factors need to be taken into account to ensure the safe and successful launch and completion of the mission. To ensure that the balloon does not provide a flight hazard to other aircraft, the position and flight times of aircraft need to be established, and a suitable launch time and safe flight path for the balloon determined.

Activity 2: Weather Conditions

The success of the balloon's launch and flight is dependent on the prevailing weather conditions. Remote sensing observations require minimal cloud cover. Researching historical weather data will help to determine the launch window (which is the range of dates for the most suitable launch). Once a launch window is selected, it will still be necessary to use the 1-7 day forecasts as provided by the Bureau of Meteorology to confirm the launch date and time.

Since the balloon could potentially fly as high as 35km, upper atmospheric data such as the Jet Stream also needs to be investigated.

Activity 3: Balloon Altitude and Flight Time

Since the balloon can travel a long distance from launch it is vital to predict the path of the balloon, taking into account the amount of helium used, and at what altitude the balloon is likely to burst before parachuting to the ground. This will aid in the successful recovery of the payload. This investigation will look at a number of tools to help predict the balloon's path.

Activity 4: The Importance of Data Storage

Data is not transmitted during the mission, but is stored and retrieved for analysis after the mission. Therefore data storage and rates of data collection must be sufficient to cover the time of the balloon flight.

Activity 5: Battery Analysis

As part of the design process, different alternatives for a particular component can be investigated ensuring that the most suitable component is selected. This can take into account issues such as reliability, weight and cost. There are two alternatives for the GoPro battery. This investigation looks at the alternatives and will recommend the most suitable. Note: this is different to testing. It is looking at alternatives to come up with a design.

Testing/space qualification checks that it works as designed, and this point should be highlighted in the presentation.

Scientific Investigations

Even though it is vital that the balloon and payload works correctly, the mission is to undertake appropriate experiments that may improve our scientific understanding.

Activity 6: Remote Sensing – Land Use under the Flight Path

Remote sensing is an important part of satellite investigations and can be used for a range of applications including land use, identification of mineral deposits, weather forecasting and disaster management. This activity looks at using remote sensing data to investigate land use under the path of the balloon. The team will need to recommend the appropriate orientation of the camera, and whether high-resolution photographs or video would supply the most useful data.

Activity 7: Atmospheric Investigations – Temperature and Pressure

A range of measurements can be collected while the balloon travels through the atmosphere, including in this instance temperature and air pressure. This activity will investigate why such measurements can be useful.

Activity 8: Distance to the Horizon

A range of physical earth measurements and observations can often be done in satellite observations, depending on the sensors available. If the camera is arranged in the correct way, we can use the photographs from the GoPro camera to calculate the distance to the horizon and investigate the curvature of the earth. The team will need to recommend the appropriate orientations of the camera for these observations.

Note: The activities may not all take the same time to develop. The team and sub-team leaders may need to guide students who have finished their design brief to assist other teams. Depending on the number of groups some activities (eg scientific activities 7 and 8) could be potentially combined.