

HOW TO INSPIRE STUDENTS with a high-altitude balloon

Educational Benefits

Practical activities related to the construction and flight of the balloon are an excellent opportunity to apply the knowledge gained at school and develop the students' practical skills. Most importantly, to be successful you need to build an interdisciplinary team, so you can involve students interested in different fields of science - not just engineering, but also biology, computer science and management.

Building a balloon is a multi-stage endeavor, taking at least several weeks of work. We have prepared a road map that allows us to organize the activities and smooth transitions between stages. During the project, lessons can be implemented to develop theory about the current stage. We have provided sample lesson topics below.

First and foremost, building a high altitude balloon allows students to develop practical skills related to building and solving problems that may be encountered during balloon construction (although we tried to limit possible unpleasant surprises by preparing complete guides for each stage). The balloon, created at little cost, allows students to touch the edge of space - and makes them realize that space is within their reach.

Basic Lesson Topics

To launch a balloon with minimal resources, you need a balloon with instrumentation and three electronic components - a pressure sensor to measure flight altitude, a GPS to determine position, and a radio transmitter to transmit data to a ground station.

- Conduct a lesson on the standard atmosphere and the physical phenomena affecting the balloon. Our site provides the ability to conduct accurate simulations of balloon flight and the forces acting on the balloon during flight.
- Lessons on electronic components can be divided into three topics or all components can be covered in one lesson. Discuss the operation of pressure sensors along with a model of the standard atmosphere to understand the concept of barometric altitude measurement. Introduce the operation of GPS and radio communications. Each of these topics can be presented at varying degrees of complexity depending on your level of education.

Remember to refer to the theory presented in class when assembling the balloon components. From our experience as aerospace students, we can say that the greatest benefit comes from project-based classes that allow you to apply your theoretical knowledge to practical applications. Before the flight, test the components on site - collect data from the pressure sensor by walking up the stairs and then check the accuracy of the altitude readings. Use the GPS receiver to record the route of your walk around the school. You will become familiar with the accuracy of the sensors, learn about noise levels, and analyze the collected data.

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Unleash their imagination

We prepared the main microprocessor board in such a way that it is possible to connect any sensors communicating via SPI or I2C bus. We adapted it to the most popular standards for connecting ready made sensor modules - Gravity, Grove and Qwiic and we used gold pin type connectors, so it is possible to connect any sensor. In this way, any measurements and experiments are possible.

- Want to measure the level of pollutants in the atmosphere? Attach a carbon dioxide and gas sensor.
- To check the level of UV radiation, simply attach the appropriate sensor and bring it outside the enclosure.
- Curious about cosmic radiation levels? Nothing simpler - pack a Geiger sensor to the balloon.
- Measuring wind speed? Nothing simpler! Use GPS data to estimate wind direction and speed.
- By adding an ozone sensor you can check the concentration of ozone in the upper parts of the atmosphere.
- Additional possibilities are provided by the option of installing a camera, which saves pictures on an SD card. By properly adjusting the lens, you can check the behavior of the payload or prove that the Earth isn't flat!

An important aspect of stratospheric missions is to test the impact of space conditions on the operation and condition of any objects. You can pack biological or chemical samples into the cargo capsule and check the influence of low temperature, pressure and cosmic radiation on their condition or test the durability of any electronic parts.