



Balloon Sat Program

Exciting STEM Education opportunities to send your student experiments to the edge of space!



Photo from OLHZN-8 | August 1, 2017
www.OverlookHorizon.com/flight-8

Who is OLHZN High Altitude Balloons?

Overlook Horizon (OLHZN) High Altitude Balloons is a 501(c)(3) non-profit educational charity organization with the goal of educating and inspiring the next generation of scientists and engineers to shape our world. We fly high altitude weather balloons for science and fun!

www.OverlookHorizon.com

What is a BalloonSat?

A BalloonSat is a high-altitude science experiment that is flown to the edge of space aboard one of our regularly scheduled high altitude weather balloon payload system to an altitude around 90,000 FT. to 140,000 FT. You send us your experiment... we fly it, recover it and send it back!

Who can participate?

Anyone! BalloonSats are open to anyone wishing to launch a high-flying experiment to the edge of space. Most BalloonSats are flown by students ranging anywhere from elementary age to college age, but anyone with an experiment idea can ride along onboard one of our flights.

Why fly a BalloonSat?

BalloonSats provide an exciting educational opportunity for students that they don't get to experience every day. They provide an opportunity to learn about a large spectrum of topics that go in to launch, tracking and recovering a flight. Students can learn about Technology, Computing, Engineering, Software, Mathematics, Life Sciences, Earth Science, Meteorology, Physics, Space and more!

Where are BalloonSats flown?

Our BalloonSat flights are typically launched from the Finger Lakes Region in Upstate New York. Our home base is out of Canandaigua, NY. Students do not need to be geographically located in our area, though. Experiments that conform to our specifications can be sent to us, launched, recovered, and sent back. Most launches are performed at public locations, but not always. If it's a public launch, you're certainly welcome to attend and observe the launch of your flight at our location. You would not be able to directly participate in the launch or recovery efforts and would only be an observer. Our launches and recovery efforts are live broadcast on Facebook and YouTube throughout the flight day which is usually the best way to follow along with the flight progress for BalloonSat flights.

What is the cost to fly?

BalloonSats can be launched aboard one of our scheduled flights at a cost of \$1.00 USD per gram, plus the cost of return shipping. The average BalloonSat is around 85 grams, but they can be smaller or larger at your discretion. Most experiments are encased inside a ping pong ball, tennis ball, empty soda can or Styrofoam cooler, but nearly any design is acceptable if we can mount it to the flight payload safely. If you're able to attain one, you can also have a corporate or private sponsor pay the cost to reduce your expense.

How does it work?

The first step to sending your BalloonSat(s) on a flight is to contact us and let us know that you wish to participate in the BalloonSat program. E-mail is preferred (Info@OverlookHorizon.com). If a class or other group is involved please give us a single contact person to represent all the students/experimenters.

To be scheduled to a flight, a \$20 deposit is required to reserve your spot. Once the deposit has been received, your spot will be reserved on an upcoming scheduled BalloonSat flight. We generally work to ensure that groups will have their BalloonSat experiments flown together. Flights typically occur in the Spring and Summer between March and September, but they can occur outside of these months if enough interest is available for a full flight. We typically schedule flights at least 60 days in advance. When your BalloonSat experiment is manifested for a flight, you will receive an email mission briefing.

Each individual BalloonSat experiment will be issued an ID number. You should write, stamp or label your experiment on the outside with this number. Make sure it's permanent as well as heat, cold and water resistant.

No less than sixty (60) days prior to the flight, a description of the BalloonSat Experiment must be sent to us. This description can range from a few simple sentences to a complex technical description depending on the complexity of the BalloonSat experiment. Final experiments & payment must be received 30 days prior to the flight.

After the end of the flight the BalloonSat experiments will be mailed back to you along with mission data collected from the flight sensors. The experiments can range from plant seeds to complete upper atmosphere labs with over a dozen sensors and a data logger. BalloonSat experiments have been used for basic science inspiration and for class research.

BalloonSat Experiment Restrictions

- No payloads can contain vertebrates.
- Anything that sticks out of a BalloonSat experiment must be preapproved
- No volatile chemicals
- No combustion
- 1800g maximum weight for experiment, carrier and mounting equipment
- Experiments over 450g must be preapproved
- Any device that emits a radio signal must be preapproved
- All electronic devices must not emit electromagnetic interference, particularly with GPS signals which are very sensitive to interference. You can download an Android app called "**GPS Status & Toolbox**" to test & monitor for possible electronic interference.
- No items may be dropped from an experiment.
- Must have a mounting point above and below experiment to attach to the payload train. Smaller experiments may utilize our Styrofoam carrier boxes or our mesh bag for things like ping pong balls or tennis balls. Contact us if you wish to use these as your carrier.
- **All BalloonSat experiments are subject to inspection and alteration**

Experiment Ideas

What can you do onboard a weather balloon? Plenty! The possibilities are endless, but here are just a few ideas:

- **Plant seeds:** compare the growth of plants grown from seeds flown to the edge of space vs. seeds left behind.
- **Bubble Wrap:** Will it pop? Is the low pressure enough to do the job?
- **Small Electronics:** Raspberry Pi or Arduino experiments work great!
- **Photo film & cosmic rays:** undeveloped camera film will often contain white streaks when developed after being exposed to cosmic rays at high altitude
- **Wet Sponge:** would the water in a wet sponge boil off due to the lack of pressure?
- **Two-Way Electronics:** send up two experiments and have one “beep” and the other listen.
- **Mini-Marshmallows:** Will they expand from the low pressure?
- **Clocks:** Get two matching inexpensive digital clocks (the type found in \$2 to \$6 dollar watches). Launch one watch and use the other as a control. After the flight, compare the time on clocks. See if the cold temperature affected the clock.
- **Stamp Computers:** Wind flow or other measurements.
- **Temperature Experiments:** Temperatures reach as low as -70° F, try sending up paper that changes color with temperature
- **Solar Power:** charge a small battery with a small solar panel
- **Volume Experiments:** How well can sound be heard in the thinning atmosphere?
- **Pressure Experiments:** See how low pressure affects all sorts of objects.
- **Bounce Test:** Send up a tennis ball or ping pong ball and compare the before and after bounce performance.
- **Biology Experiments:** Water bears or Tardigrades are eight-legged micro-animals. They are known to live through all sorts of environments and scenarios. Can they survive?
- **High-Flying Egg Drop:** Many students have done the classic egg drop physics experiment, but how about designing a protective egg carrier that must survive the edge of space?! Note: All items travel and remain with the rest of the payload. Separating & dropping items from the payload is not permitted.

The Environment at High Altitude

Your BalloonSat experiment will typically ascend to somewhere between 90,000 FT. and 115,000 FT. At this altitude, your BalloonSat experiment will be exposed to temperatures down to -70° F and pressure down to just 10 millibars. It can frequently experience speeds up to 150 mph and acceleration between 5 and 10 G's when the balloon bursts. At peak altitude, near vacuum conditions exist. Cosmic rays will occasionally strike at 100,000 feet. The environment nearly simulates that found in space. The air pressure is only 1/100th of that at sea level. This near vacuum pressure and temperature has dramatic effects on materials. Your experiment may also encounter moisture while ascending and descending. It may also encounter water upon landing so you should try to make your experiment as water resistant as possible. The payload descent occurs rapidly from frigid temperatures down to much warmer temperatures. It is very common to see ice or condensation on surfaces upon landing.

Designing your BalloonSat

You BalloonSat can take on numerous shapes and sizes, but we do have some recommendations, particularly when it comes to the carrier that will transport your experiment to the edge of space. There are four common containers that are used by BalloonSat experiments: Ping Pong Balls, Tennis Balls and Soda/Pop Cans work great for smaller BalloonSat projects. Small Styrofoam packaging coolers work well for larger projects, particularly ones that incorporate electronics. All of these containers have smooth edges and can easily be placed inside our carrier that is suspended below our balloon. Most BalloonSat experiments will be flown with other BalloonSat experiments and may be placed in very close proximity to other experiments. If you wish to have your experiment placed independently of others or if you're using a Styrofoam cooler carrier, please contact us ahead of time. Generally, these experiments must provide their own mounting points above and payload the experiment to attach to the payload train.

Experiment Risks

BalloonSat experiments are often flown on research and development missions with experimental tracking systems. High altitude payloads will parachute safely back to Earth after reaching the top of the atmosphere, however, there are hazards that can be encountered, although they are rare. Entire payloads can be lost due to electronic interference, poor radio reception as well as failed or malfunctioning tracking systems. Entire payloads can also be lost due to a hazardous landing site such as power lines, tall trees, water/lakes, swamps or just a land owner that refuses access to their property. Nearly all payloads can be recovered, but it is not guaranteed. A lost payload doesn't necessarily end the learning experience, though, and can be a valuable teaching tool on what can go wrong when engineering high altitude ballooning systems. If this occurs, we will "re-fly" a new BalloonSat experiment for you, although we will not be responsible for reimbursing the costs associated with the lost or replicated BalloonSat experiment.

Post-Flight

BalloonSat experiments will be returned to you by mail. Detailed information about the flight will be included as well as any onboard sensor data we collected as part of our electronics package. Each participant will receive a certificate to show they traveled to the edge of space and most flights will also include photo and video footage of the flight from onboard cameras that we typically include on our flight package. We also typically record and provide video footage of the moment we open and recover the payload so you can see the condition of your experiment as we found it at the landing site. This moment is usually shown on our live flight day broadcasts as well, if there is sufficient mobile bandwidth at the landing site.