WYOMING
NASA Space Grant Consortium

HIGH-ALTITUDE BALLOON NEWSLETTER

ISSUE 1 ▪ FALL 2022

Greetings and welcome to the very first issue of our *High-Altitude Balloon Newsletter*! If you are reading this, it's likely that you have participated in our balloon program at some point in the past. Or perhaps you are new to the program and simply want to learn more about what we do and how you can get involved. In either case, welcome!

This newsletter serves two main purposes. First, we hope that it will help to improve the visibility of our balloon program within the Wyoming educational community, potentially leading to new partnerships with K-12 educators and other educational groups throughout the state. Since 2014, we've conducted 69 high-altitude balloon launches with 45 separate educational groups, directly impacting more than 1,100 K-12 students, 100 college students, and 150 teachers. However, we still see lots of opportunity to reach new participants, especially students and teachers in more rural areas of the state. Second, we hope that the newsletter will help us maintain our connections with current and former ballooning partners by keeping them aware of our latest ballooning activities and future opportunities.

Going forward, we plan to release a newsletter twice a year, during the spring and fall semesters. Each issue will likely include the following types of content:

- Highlights from recent balloon launches
- Program updates and announcements
- Upcoming ballooning-related events and opportunities for students, educators, and other potential participants

Each newsletter will be posted on our website and to our social media channels. We will also send it out to our high-altitude balloon email list. Teachers and educators can subscribe to this email list on our website, when they submit a request for a balloon launch, or at some of our in-person events.

If you have any questions about our program or would like to reach us, please use the contact information provided at the end of the newsletter. Thanks again for reading and we hope you find this to be helpful and informative!

– Wyoming Space Grant Staff

BALLOONING BY THE NUMBERS

(As of August 2022)

Total balloon flights: 69
Launch observers: ~3,500
Direct participants: ~1,500
K-12 student participants: ~1,100
Average burst altitude: 93,970 ft
Highest burst altitude: 107,373 ft
Average flight distance: 50.7 miles
Longest flight distance: 122.2 miles

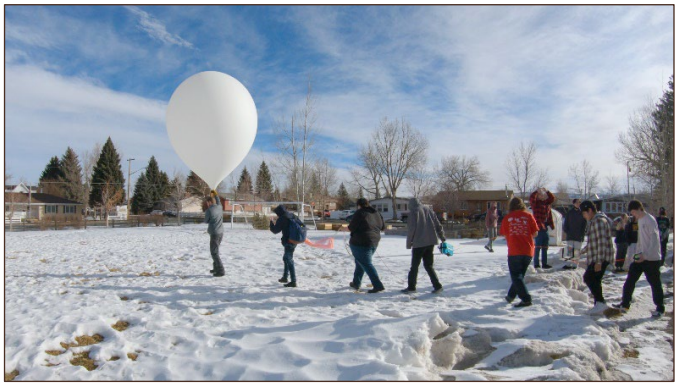
BALLOON LAUNCH HIGHLIGHTS

Our balloon program was quite active during the spring and summer of 2022, with five high-altitude balloon flights between February and July. Of these, three were with K-12 school groups—two in Laramie and one in Riverton. We also flew a balloon for a STEM summer camp in Cheyenne and another for a teacher workshop that we hosted over the summer in Laramie. Highlights from each flight are given below.

— Whiting High School (Laramie) —

In mid-February, we launched our first balloon of the year with a class of about 10 science students at Whiting High School in Laramie. The flight lasted 2 hours 3 minutes, during which the balloon drifted eastward, eventually bursting at 90,096 feet above sea level. After burst, the payload fell back to Earth and landed in a field just east of the Wyoming-Nebraska state line, about 14 miles north-northeast of Pine Bluffs—more than 83 miles from our launch point. The payload included several student experiments testing the how the harsh upper atmosphere affects plant cells, marshmallows, and the strength of metal. They also attempted to collect microbe samples in the stratosphere.

Watch Highlight Video / View Flight Tracker



— Riverton Middle School (Riverton) —

Toward the end of April, we traveled to Riverton to launch a balloon carrying payloads put together by students at Riverton Middle School. Most of the school came outside to watch the launch itself. The balloon ascended to a maximum altitude of 90,491 feet above sea level, traveling northeast past Shoshoni toward the Owl Creek Mountains. After a 1-hour 41-minute flight, the payload came to rest a very scenic hillside south of the mountain range, about 45 miles from Riverton. A few lucky students and a couple of their teachers joined us on the memorable payload recovery!

Watch Highlight Video / View Flight Tracker

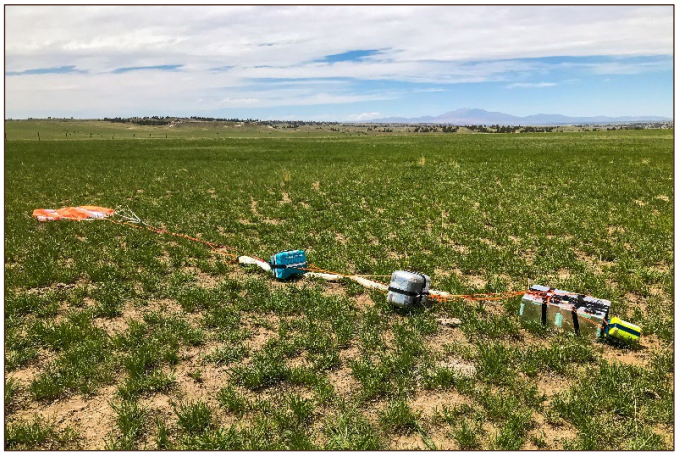
— Albany County Homeschoolers (Laramie) —

In early May, a small group of homeschoolers from the Laramie area launched a balloon with us from one of the city parks. The students helped us test a new activity that we hope to eventually make available to other teachers. For the activity, the students followed instructions to build an Arduino payload that measures radiation from outer space. However, there's a twist: they also had to build a shield to protect the payload from that radiation. The goal was to see if the students could create a shield that

works. This mimics the real challenge of protecting astronauts from dangerous high-energy cosmic rays during space travel.

As for the flight, the balloon slowly ascended to its maximum altitude of 92,792 feet above sea level in about 93 minutes. The payload was on the ground 32 minutes later for a total flight time of just under 2 hours 6 minutes. Jet stream winds of up to 113 mph helped transport the balloon and payload more than 74 miles northeast, where the payload eventually landed in a pasture about 9 miles west of Guernsey. The students were able to help recover the payload.

Watch Highlight Video / View Fight Tracker

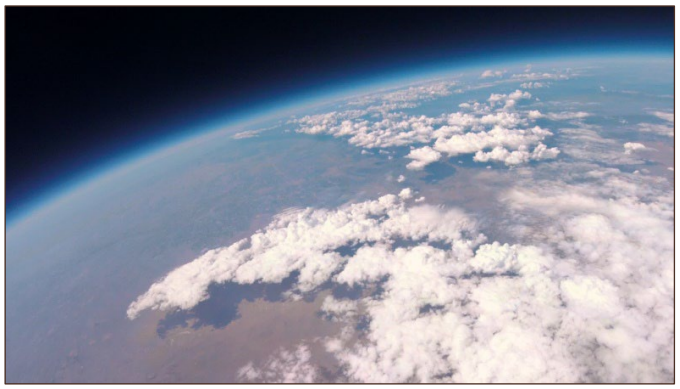


— BEAST Foundation STEM Camp (Cheyenne) —

We were back on the road in early July to launch a balloon in Cheyenne with summer STEM campers at the BEAST Foundation. Although they didn't get to build their own payloads, the students were active participants in the launch and payload recovery. The balloon zig-zagged its way southeast, northeast, and then northwest as it climbed through the atmosphere to its burst altitude of 98,613 feet above sea level. After 2 hours 3 minutes of flight time, the payload landed on a small ranch only about 12 miles north of Cheyenne. The ranch owner was kind enough to escort us into his field to recover the payload.

About a week later, we returned to the BEAST Foundation to follow up with the students and analyze the data. We watched video footage from the launch, examined different types of graphs, and discussed subjects like atmospheric layers and radiation. Students recounted their experience and shared what they learned.

View Flight Tracker



SUMMER TEACHER WORKSHOP

For the first time in many years, we hosted a small group of Wyoming educators for a high-altitude balloon workshop at the University of Wyoming in July. Spanning three days, the workshop gave attendees an in-depth look into our program. We covered everything from the history of the program to more practical information about conducting balloon flights, our equipment, how to implement high-altitude ballooning in a K-12 classroom, and data analysis. To highlight the workshop, we flew a high-altitude balloon to the edge of space!

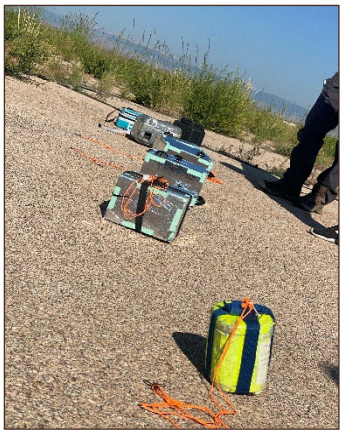
During the workshop, the attendees worked in teams to build Arduino payloads capable of measuring various types of radiation coming

from outer space. However, each team also had to build a shield to protect their sensors from this radiation. The radiation measurements could then be compared with each other and with an unshielded control payload to see whose payload shield performed the best. The entire activity, geared toward high school students, involved a little bit of coding, electronics, and engineering.

Once the payloads were finished, it was time to fly. We all gathered early the next morning, inflated a balloon with helium, and launched the payload into the stratosphere. Over the next 84 minutes, the balloon ascended to its burst altitude of 90,576 feet. The payload took about half an hour to parachute back to earth where it landed on private property south of Laramie. Fortunately, we were able to obtain permission to retrieve the payload later that afternoon.

The next day, we analyzed the flight data. Attendees learned about various ways the data could be interpreted to explore topics such as atmospheric layers, air density, and even G-forces. They also found that the radiation measurements did not match their expectations and hypotheses! They left the workshop with a better understanding of what our program is all about. Whether they utilize our program in the future or conduct their own balloon flights, they are now equipped with the information needed to get started. We hope to do more workshops like this in the years to come, perhaps every summer or every other summer, so stay tuned!

View Flight Tracker



FUTURE CHANGES TO PROGRAM

— Student Payloads —

Since the start of our balloon program almost a decade ago, we've employed a one-size-fits-all approach to our K-12 student payloads. Before each balloon launch, we send the teacher a set of payload boxes to be flown with the balloon. The students get to decide (with input from their teacher) what to put in those boxes, with only a few restrictions based on safety and weight limits. This works well for some groups, especially younger students just beginning to learn about science. However, we feel that the expectations for middle school and especially high school groups could be a bit higher.

Our current approach described above does not provide teachers with much guidance for how to help their students develop good payloads. Also, there are no expectations that students will document their payloads or develop hypotheses about what will happen to their payloads during the flight. They should be asking questions like "Why am I including this in the payload box?", "What do I think will happen to it?", or "How will I be able to find out?".

To address this, we are currently developing new expectations for our K-12 payloads. These will be "tiered" by age group, with higher expectations for middle and high school groups. We would also like to eventually create additional resources to help teachers guide their students toward building successful payloads. We hope to roll this out over the next few years.

— College and Science Fair Flights —

Did you know that college and science fair students in Wyoming can request a balloon flight for their projects? In fact, we've been willing to do this for quite some time and have flown balloons for a few college groups already. We're currently updating our website to provide these students with a way to formally request a flight by submitting a short proposal. Expect to see this go live in the next 6–12 months!

UPCOMING OPPORTUNITIES

— Balloon Launches —

As of this writing, we still have room for one more balloon launch in Spring 2023. If you're interested in hosting a K-12 balloon launch, please check out our Balloon Launch Request Form. For all non-K-12 balloon launch requests, please email us (wsgc@uwyo.edu).

— Undergraduate Eclipse Project —

We are recruiting undergraduate students to take part in the upcoming Nationwide Eclipse Ballooning Project. Our team of students will fly weather balloons from within the path of totality during the April 2024 eclipse in an attempt to detect various atmospheric phenomena. The project is open to students from all majors who will be enrolled full-time at UW or the Laramie Campus of Laramie County Community College (LCCC) through at least May 2024. To learn more, visit the application page on our website. The deadline to apply is November 16, 2022.

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