



# 2018 High Altitude Balloon Launch

## Experiment Submission Packet



### **Science Heads Inc.**

A 501(c)(3) non-profit organization  
22365 El Toro Rd #185  
Lake Forest, CA 92630

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# 1. Introduction

Science Heads Inc. is a Lake Forest California based non-profit organization whose mission is to support STEM education and raise science literacy in our local communities.

The High Altitude Balloon (HAB) STEM program is an initiative designed to give Middle and High School students real life experience designing, carrying out and evaluating the results of scientific experiments. The HAB will carry student designed experiments to the edge of space where the atmosphere is extremely thin, temperatures very cold and the level of solar radiation is similar to the surface of Mars.

The cost of launching the HAB is being financed with donations given to Science Heads. Schools that submit experiment proposals should be prepared to cover the cost of their own experiment (typically less than \$50).

## 2. Objective

The objective of the HAB program is to give students the opportunity to apply what they have learned about the “scientific method” by documenting and carrying out an experiment of their own design. Experiments from all scientific fields of study will be considered as long as they are appropriate for the environmental conditions expected at the upper atmosphere and meet the requirements listed in this document.

## 3. Experiment Design

There are a number of limitations of the launch vehicle that will affect the design of experiments including:

- a. Number of experimental slots in the payload: 5.
- b. Weight allocated for each experiment slot:  $\leq 1$  lb each.
- d. Excluded Items: Hazardous, explosive or radioactive materials and live animals.

- e. Environmental Conditions: Experiments should be designed to withstand typical conditions at 100,000 feet in altitude which include:
  - Atmospheric Pressure: 0.162 psia
  - Temperature: -50 degrees F
  - Galactic radiation exposure: > 8.85 microsieverts (60,000 feet for 1 hour)<sup>1</sup>
  - UV radiation is 30 x greater than at the Earth's surface<sup>2</sup>

### **Experiments Must:**

- f. Be delivered pre-packaged, assembled and “ready to fly”. Packaging must be approved by Science Heads. Acceptable packaging includes envelopes, cardboard boxes and sheets of cardboard or foamboard enclosed in plastic. A pre-approved zip lock bag with a cardboard insert will be provided for your use.
- g. Fit within the following slot dimensions: 6 in x 6 in x 1.25 in.
- h. Be self-powered (e.g. include batteries, solar panel etc.) if needed for the experiment. Please note that batteries do not function well at very low temperatures and may need an external heat source ( e.g., hand warmer) to operate as intended.
- i. Liquids must be contained in leak proof containers so as to not contaminate other experiments.
- j. Sensors, power sources or other parts which are intended to be mounted on the exterior of the payload must be pre-approved by Science Heads.

## **4. Proposal Submissions**

### **Due Date**

- A) Proposals will be accepted from Friday, March 2, 2018 until 5:00 pm PT Friday, March 9, 2018.
- B) All experiment proposals should be submitted electronically as Microsoft Word, PowerPoint or PDF files and can be submitted via e-mail, thumb drive or CDROM to the following addresses:

Richard@scienceheads.org (Use “HAB Experiment Proposal” in the subject the line)

or, HAB Experiment Proposal, c/o Science Heads, 22365 El Toro Rd #185, Lake Forest CA 92630

- C) All experiment proposals must be submitted by an adult educator on the behalf of their student group.
- D) The experiment proposal should be developed interactively with the educator and their student group.
- E) Experiment proposals should be limited to no more than 7 pages in length

## **Format**

**The following information is required on the first page of the experiment proposal:**

- Title of proposal.
- Name of educator submitting proposal.
- Grade level of the student group submitting the experiment proposal.
- The number of students in the group.
- School name and postal address.
- Educator's contact phone number.
- Educator's contact email address.

**The following details must be provided on subsequent pages of the proposal:**

- 1) Subject of the experimental investigation.
- 2) Hypothesis of the expected outcome.
- 3) List of all materials to be used in the experiment (pre-flight, during flight and post flight).
- 4) Weight of each material/item to be included in the payload for the experiment.
- 5) References used for experiment development.

## **Telemetry**

Science Heads is providing an APRS transmitter and a GoPro camera for the HAB payload. The transmitter will provide temperature, pressure and altitude

data and GPS coordinates at 1 minute intervals during the flight. The GoPro camera will capture a video looking out from the payload during the entire flight. Science Heads will collect and make this data available post flight to all experiment groups for incorporation into their data sets.

## **Submission Accuracy**

By submitting an experiment proposal, the adult educator is certifying that all proposal data submitted is accurate. Experiments that are selected but later found to vary significantly from the submitted proposal may be excluded from the flight payload at the discretion of Science Heads.

## **5. Proposal Selection**

It is expected that 5 experiments for the 5 payload slots will be selected from the submission pool. If space and weight allow - additional experiments may be selected.

The Science Heads selection committee will announce the winning proposals on Monday, March 19<sup>th</sup> at 3 PT on the [www.ScienceHeads.org](http://www.ScienceHeads.org) web site.

### **The criteria for acceptance include:**

- a) Design and objective of the experiment.
- b) Application of the Scientific Method.
- c) Compatibility with HAB requirements/limitations.
- d) Likelihood that the experiment will produce intended data.

## **6. Day of Launch**

The HAB and its payload will be launched from a site open to the public in Orange County. The launch is planned to take place around 11 am on Saturday April 21<sup>st</sup> from a public park in Orange County. The HAB is expected to possibly reach an altitude of 100,000 feet and the flight is expected to last 2 - 3 hours.

The launch date, time and location are subject to change based upon weather, regulatory approvals and other factors.

Schools are encouraged to invite their students, parents and supporters to witness the launch and support their experiment teams. Attendance and parking may be limited– so please plan to communicate with Science Heads a week before launch to confirm the number of people expected to attend from your school.

## 7. Payload/Experiment Retrieval

Science Heads volunteers will do their best to retrieve the HAB payload. Considering that the payload may float down many tens of miles from the launch site and may land on private property, the roof of buildings, get snared in trees etc. – it may take several days to retrieve the payload and return your experiments.

On the day of the launch several volunteers will fan out in chase vehicles in directions consistent with the projected flight and landing profile. HAM operators will use amateur radios in these vehicles to communicate with the HAB Operations Center at the launch site. The APRS transmitter aboard the payload will transmit the HAB's GPS coordinates to the command center and this information will be relayed to the chase teams.

There is a very real possibility that the payload will not be retrieved. Experimenters should understand that their experiment may be lost or damaged. Science Heads is not responsible for any lost or damaged experiments.

Credit for the launch and HAB project should be made to “Science Heads Inc., a 501(c)(3) non-profit based in Lake Forest California” in articles that you submit for publication about your experiment.

## 8. Where to Address Questions

Questions about this project can be addressed by contacting:

Richard Stember, Executive Director, Science Heads Inc.

Email: [richard@scienceheads.org](mailto:richard@scienceheads.org)

Phone: (949) 616-9481

Address: 22365 El Toro Rd, # 185  
Lake Forest CA 92630

## 9. Glossary

- APRS** Automatic Packet Reporting System - an amateur radio based system for real time data acquisition.
- GPS** Global Positioning System - provides accurate location data.
- HAB** High Altitude Balloon (aka Weather Balloon)
- Payload** Scientific experiments, telemetry equipment and video cameras housed in an insulated box carried by the HAB.

## 10. Resources

Experiment Idea Resources:

- <https://www.sciencebuddies.org>
- <https://www.education.com>
- <https://www.sciencenewsforstudents.org/blog/eureka-lab/teachers-launch-weather-balloons-and-passion-science>
- <http://www.juliantrubin.com/fairprojects/earthsciences/meteorology.html>

## 11. References

- <sup>1</sup> FAA CARI-6 software flight dose calculator  
[https://www.faa.gov/data\\_research/research/med\\_humanfacs/aeromedical/radiobiology/](https://www.faa.gov/data_research/research/med_humanfacs/aeromedical/radiobiology/)
- <sup>2</sup> World Health Organization. [www.who.int/uv/uv\\_and\\_health/en/](http://www.who.int/uv/uv_and_health/en/)