National Aeronautics and Space Administration

The High Altitude Student Platform (HASP)

A Platform Dedicated for Training Future Scientists and Engineers

HASP, a collaborative venture of the NASA Balloon Program Office and Louisiana Space Consortium at Louisiana State University, provides a launch platform for a total of 12 student research payloads and is launched yearly in August/September from the NASA balloon launch facility at Fort Sumner, New Mexico. The Columbia Scientific Balloon Facility (CSBF) provides launch services and support. The project has a rich history spanning sixteen years of successful missions providing undergraduate and graduate students with real-world science and engineering project development experience. The High Altitude Student Platform (HASP) was conceived to provide students with flight opportunities on an intermediate platform between those available with small latex sounding balloons and Earth orbiting satellites. HASP is a support vehicle, based upon flight proven hardware and software designs that uses an 11 million cubic foot, thin film polyethylene, helium filled balloon to carry multiple student built payloads to altitudes of ~120,000 feet (~36km) at an ascent rate of 1000 feet per minute, for durations up to 20 hours.

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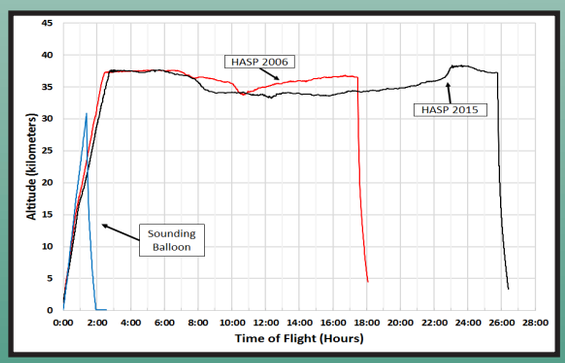
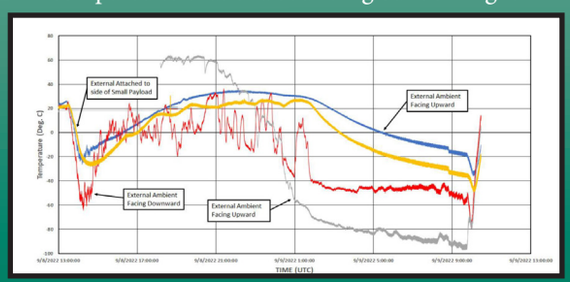
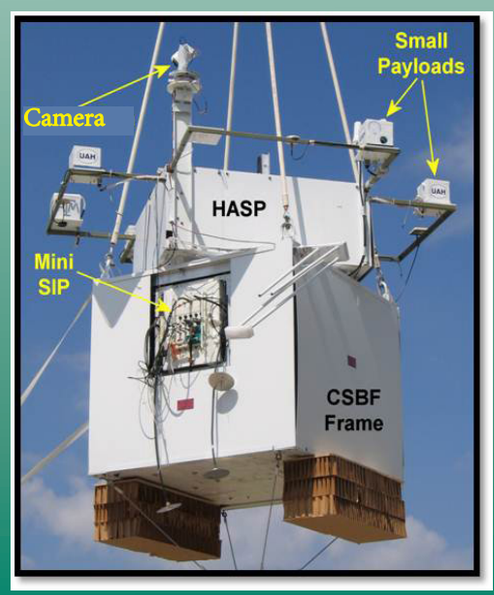


A typical altitude vs. time flight profile for HASP compared to that of a sounding balloon flight



Characteristic temperatures outside HASP during the 2022 flight

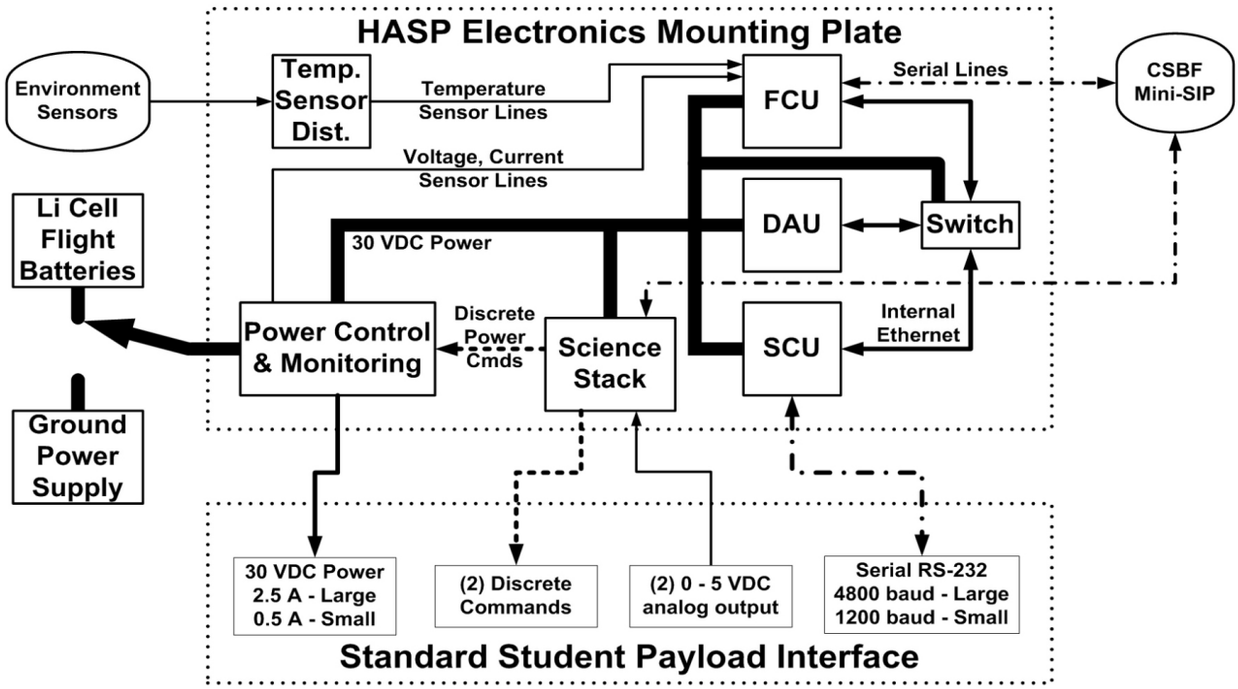


The HASP payload as configured for a typical flight (SIP: Support Instrumentation Package)

www.nasa.gov

HASP Configuration and System Description

The platform is currently designed to support eight small payloads of ~3 kg weight and four large payloads of ~20 kg weight (i.e. 12 experiment "seats"). A standard interface is provided for each student payload that includes power, serial telemetry, discrete commands and analog output. HASP will archive student payload data on-board as well as telemeter the stream to the ground for real-time access.

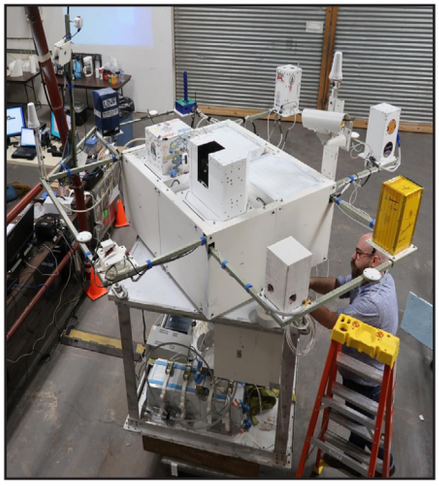


HASP flight electronics system and student payload interface

The four large payload seats are on the top of the central structure while the eight small payloads are mounted on fiberglass outrigger booms. The small payloads may be mounted for nadir pointing. The core structure of the platform is a welded aluminum gondola frame with dimensions of 112 cm long, 91.5 cm wide, 51 cm tall. For flight, HASP is attached to a Columbia Scientific Balloon Facility (CSBF) frame which provides support for the CSBF vehicle control equipment and attach points for suspension cables, crush pads and the ballast hopper.

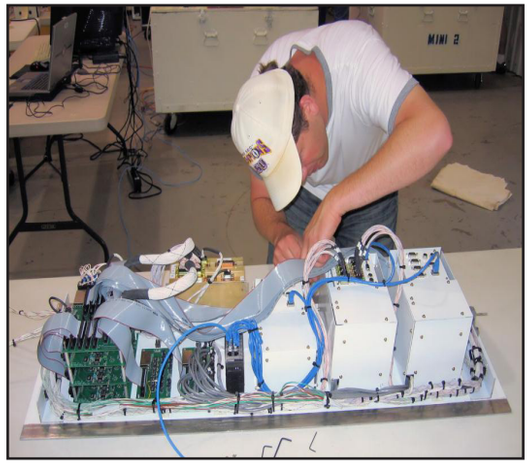
The HASP command and control subsystem provides the means for receiving and processing uplinked commands, acquiring and archiving the payload data, downlinking status information and controlling the student payloads. There are three primary modules in the subsystem; the Flight Control Unit (FCU) which manages communications, the Serial Control Unit (SCU) which provides a serial communication link to each of the individual student payloads, and the Data Archive Unit (DAU), recording in-flight data. The primary power source for HASP will be 11 cell lithium battery packs, eight of which will supply ~29 to 32 Volts for ~270 Ahr @ +20^{O}C.

Specifications for the mechanical, electrical and data interface between HASP and a student payload are provided in the latest version of the document "HASP – Student Payload Interface Manual" which can be obtained from the Participant Information page http://laspace.lsu.edu/hasp/Participantinfo.php or the Technical Documents page http://laspace.lsu.edu/hasp/Documentation.php of the HASP website.



Top view of HASP showing a collection of small and large pay-

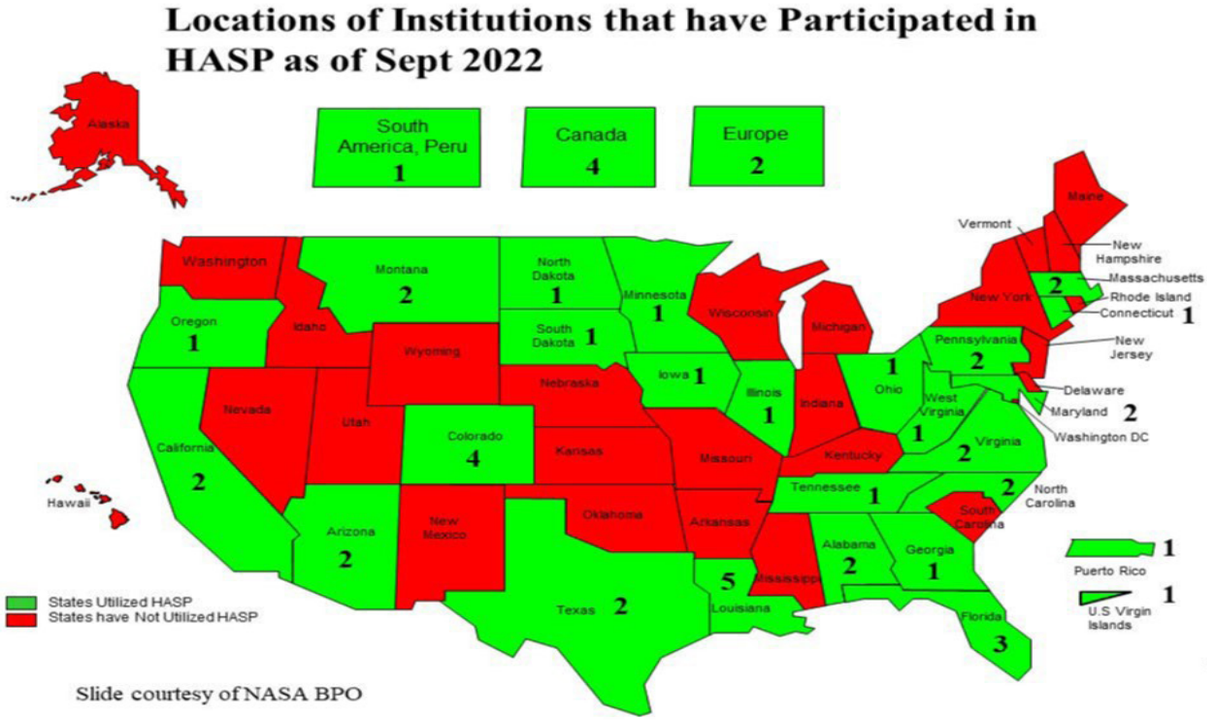
Some students and faculty team members with HASP 2022



Desktop servicing of the HASP electronics mounting plate

HASP Flight History

Since 2006, HASP has flown 174 student-built payloads engaging close to 1600 undergraduate and graduate students. Participating students represented 52 universities and colleges, including minority serving institutions and community colleges, located across 26 continental U.S. states and territories, including Puerto Rico and the US Virgin Islands. International student teams from Belgium, Canada, Peru, and United Kingdom have also flown with HASP. We've launched 16 HASP flights with a total float time of 221 hours. The figure below shows the geographical distribution of these student teams.



Geographic distribution of institutions which have flown payloads on HASP, shown in green

HASP Highlights

- The High Altitude Student Platform supports advanced student-built payloads
  - Regular schedule of launches once per year
  - Provides high altitude (~36 km) and reasonable duration (~15 to 20 hours)
  - Flight tests student-built satellites
  - Flies payloads too heavy for sounding balloons
- Existing flight designs and experience minimize cost of development and operation
  - Flight proven hardware and software
  - Use time-tested CSBF balloon vehicle hardware
  - Capitalize on decades of CSBF experience with flight operations
- Could be easily adapted for Long Duration Balloon (LDB) (~15 – 30 days) flights
- Could become a major part of aerospace workforce development

HASP payload undergoing compatability testing

Participation and Application Process

Students from all universities are invited to apply for a HASP flight opportunity. Flight opportunities on HASP are offered annually in the fall. The application deadlines change slightly from year to year, but typically the Call for Proposal is scheduled to be released at the end of October in the year preceding the HASP flight. A Notice of Intent is required for HASP proposals and must be submitted to laspace@lsu.edu in November and a completed application will be due in early January. The NOI and deadline will be preceded by an informational Q&A teleconference and a Technical Q&A. Final selections for participating payloads will be made by the end January. Student teams must provide their own funds for payload development and travel to integration and flight operations. Application details, document templates, and other resources can be found at the HASP website (http://laspace.lsu.edu/hasp/).

For more information on HASP, please contact Doug Granger (hasp@lsu.edu), Louisiana Space Consortium, 364 Nicholson Hall / Tower Drive, Department of Physics & Astronomy, Louisiana State University, Baton Rouge, LA 70803-4001.

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