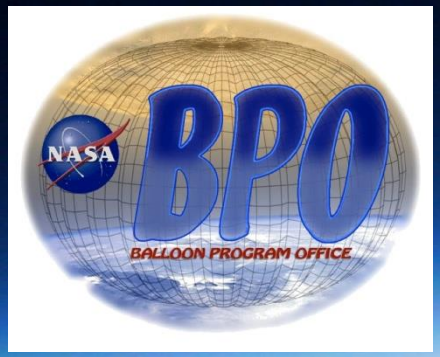
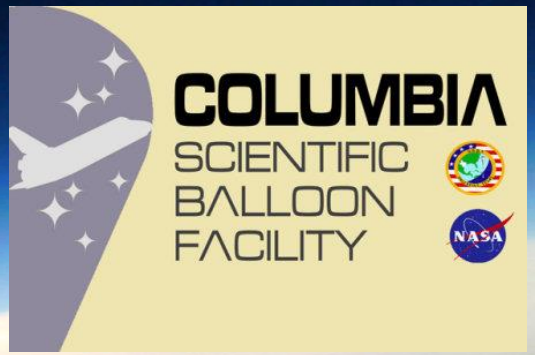




High Altitude Student Platform (HASP) 2017 Flights

T.G. Guzik, D. Granger

Louisiana Space Grant Consortium

Department of Physics & Astronomy

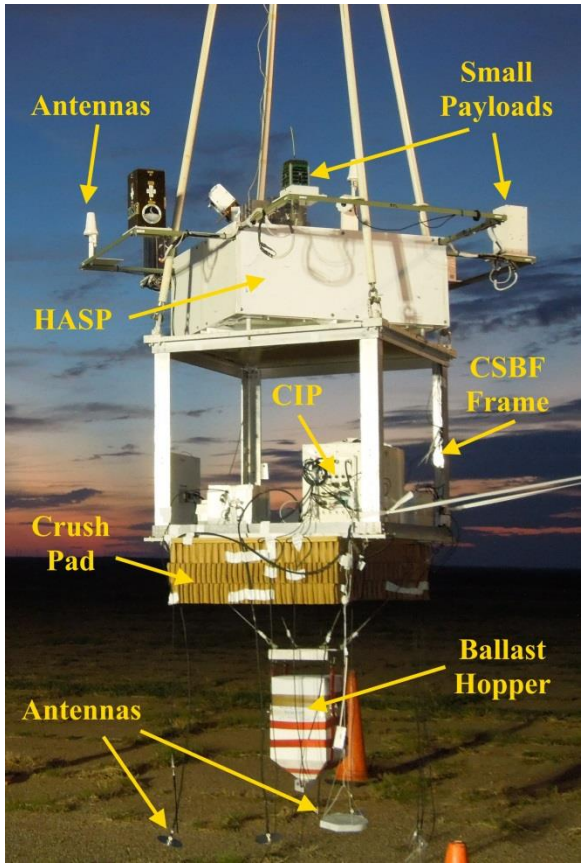
Louisiana State University

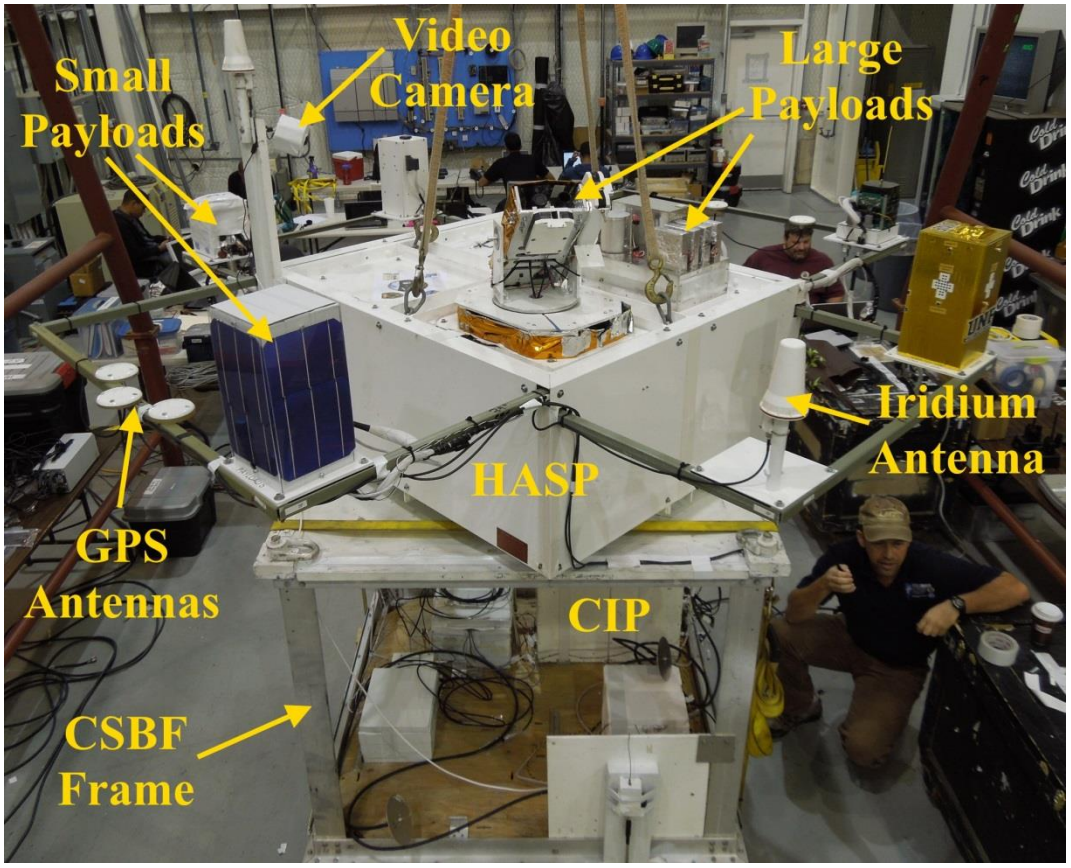
HASP is a partnership between a NASA center (Wallops Flight Facility) and Space Grant

- HASP is the first balloon carrier specifically designed with a standard interface to carry multiple experiments to high altitude for an extended period of time.
- Operates as a partnership between the **NASA Balloon Program Office** (BPO) at WFF and **Louisiana Space Grant** (LaSPACE)
  - BPO provides balloon, launch and flight services
  - LaSPACE maintains HASP & supports the student payloads
- Developed in 2005 to address a looming crisis in training the next generation of aerospace scientists and engineers.
- Provides a regular flight opportunity for student groups across the world.
- Applications are due in December for flight on HASP the following September.

HASP is a Multi-Payload Balloon Platform

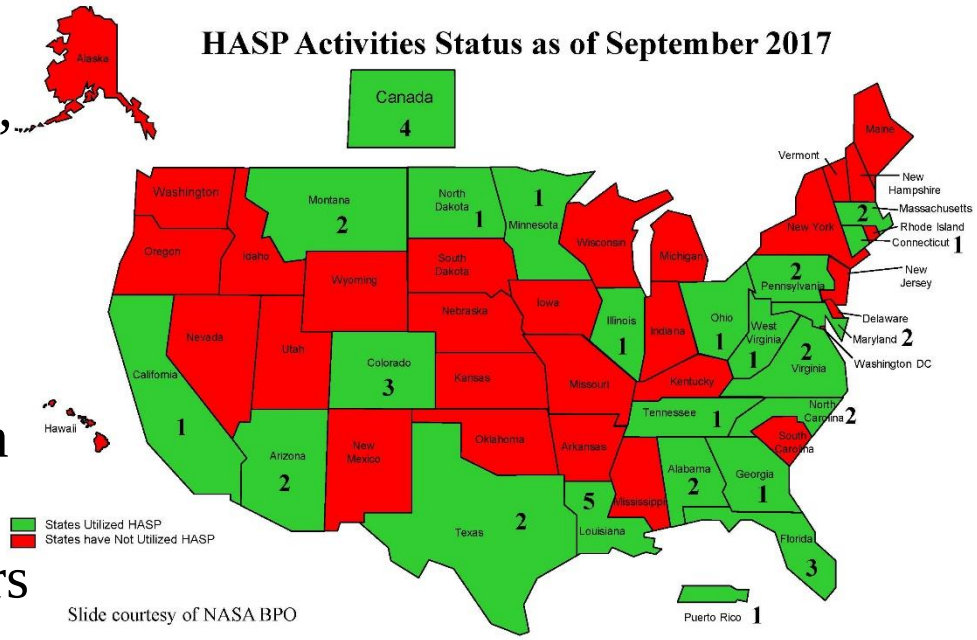
- Support up to eight payloads < 3 kg and four payloads < 20 kg per flight
- HASP supplies payloads with serial downlink & uplink in near real-time, 32 VDC @ 2.5 A power, discrete commands, analog downlink.
- Video cameras provide real-time imaging of payloads and environment





Many individual experiments have flown on HASP over the years

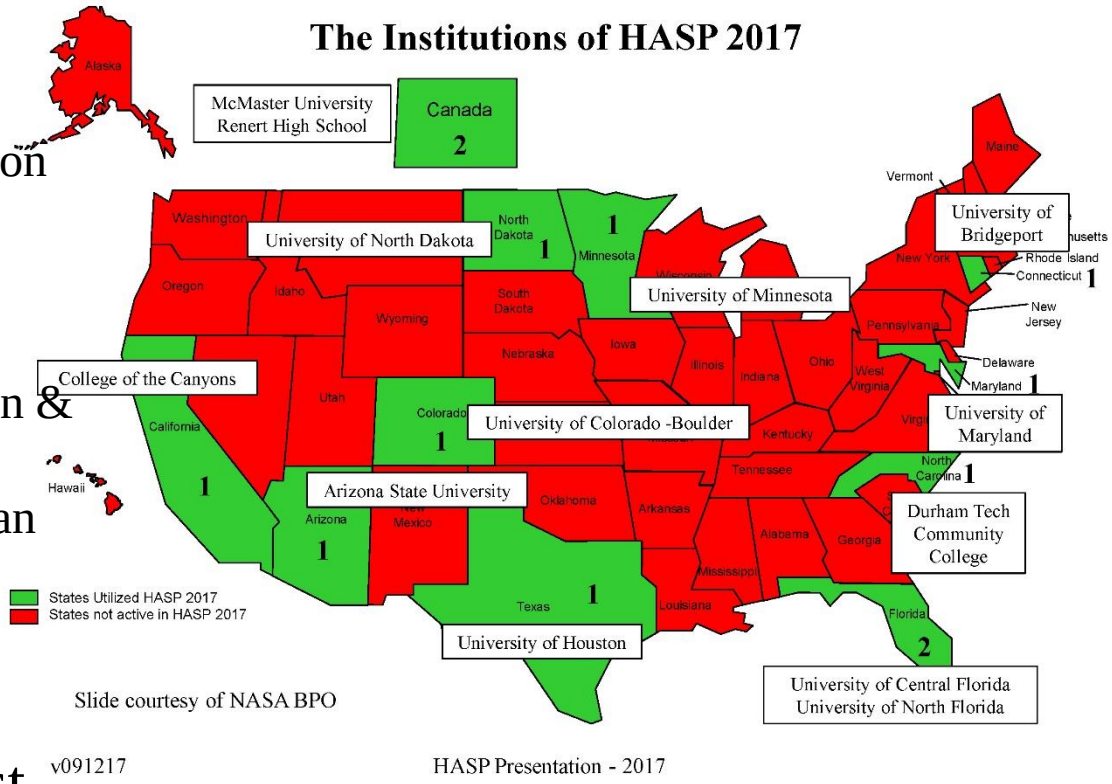
- HASP was flown twelve (12) missions from 2006 through 2017.
- Accumulated over one week (7 days) of flight time at altitudes in excess of 100,000 feet (i.e. at the very edge of space).
- 43 institutions, including universities, community colleges, and high schools, from 21 states plus Canada and Puerto Rico have participated in HASP.
- Close to 1100 students have flown more than 110 payloads on HASP.
- Success rate of 89% over 12 years



- LaSPACE and NASA BPO / CSBF are planning to continue flying HASP well into the near future.

Twelve Student Teams were selected for flight on HASP 2017

- Team flight application was due on December 16, 2016
- Applications were reviewed by both LaSPACE and BPO
- Selection announced mid-January 2017. Application comments distributed
- Teams are monitored / mentored from Jan. to Aug.
  - Required response to application comments
  - Monthly status reports
  - Monthly teleconference
  - Required Payload Specification & Integration Plan (PSIP)
  - Required FLight Operation Plan (FLOP)
- Integration & thermal / vacuum testing at CSBF during beginning of August



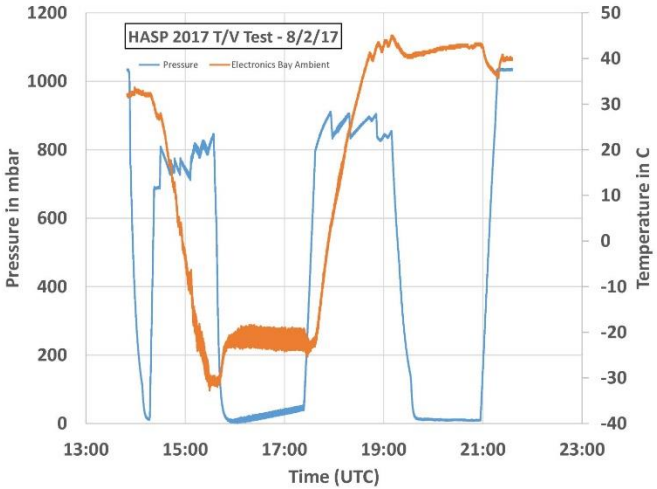
HASP 2017 Student Payload Topics

Institution	Topic
University of Minnesota (MN)	Flight Test of GRID on the High Altitude X-Ray/Gamma-Ray Detector Testbed (HAXDT)
College of the Canyons (CA) (c.c.)	Electrostatic Cosmic Dust Collector
McMaster University (Canada)*	Stratospheric Measurements of Charged and Neutral Radiation
Renert School (Canada) (h.s.)*	High Altitude Launch 9000 (HAL9000)
University of Maryland (MD)	High Altitude Atmospheric Turbulence – Triggered Release Information Carrier (HAAT-TRIC)
Durham Tech Community College (NC) (c.c.)*	The Greenhouse, Ozone and Atmospheric Trace gas (GOAT)
University of North Dakota (ND), University of North Florida (FL)	Ozone Sensors Payload
University of Bridgeport (CT)	Near Space CubeSat Test
University of Central Florida (FL)	Hazardous Gases for Harsh Environments LED Sensor
University of Houston (TX)*	SORA – Stratospheric Organisms and Radiation Analyzer
University of Colorado - Boulder (CO)	Expandable Soft-Shell Structure - Miura
Arizona State Univesity (AZ)	High Altitude Light Intensity Analysis (HALIA) Experiment

c.c. – community college; h.s. – high school; * -- new HASP institution for 2017

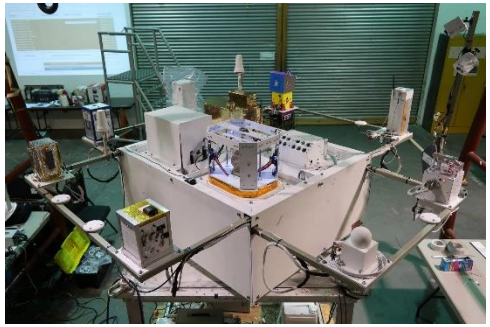
HASP 2017 Integration & System Testing

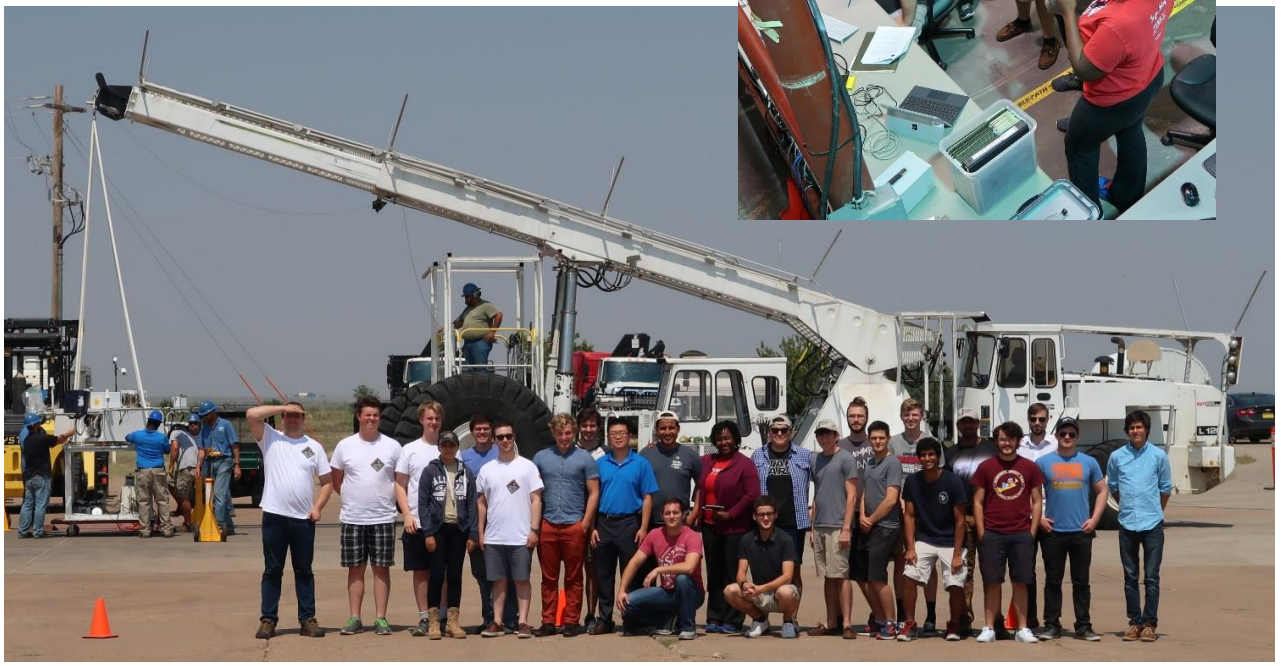
- A pre-flight comprehensive test of the student payloads took place at the NASA Columbia Scientific Balloon Facility (CSBF) in Palestine, TX from July 31 through August 4, 2017.
- First two days are for payload integration.
- Third day is the first T/V test.
- Student then have the fourth day to fix problems.
- Final T/V test on fifth day.



Flight Operations in Fort Sumner, NM

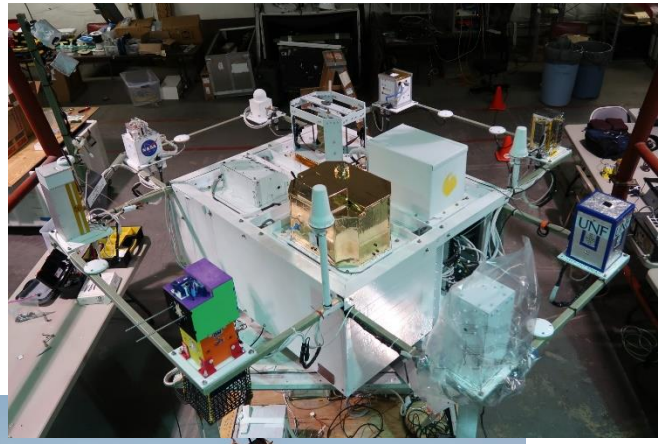
- Flight operations began at the NASA balloon flight facility in Fort Sumner, NM on August 30, 2017.
- Assemble HASP, integration with CSBF equipment, mount student payloads, full test of HASP and payload systems.
- Complete end-to-end compatibility “hang” test on September 3, 2017 followed by FRR.

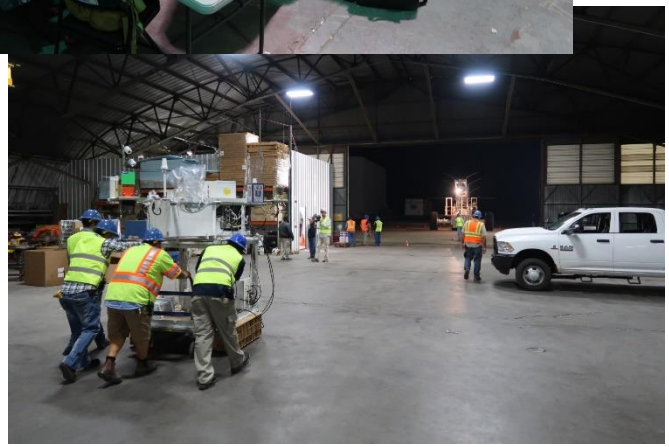


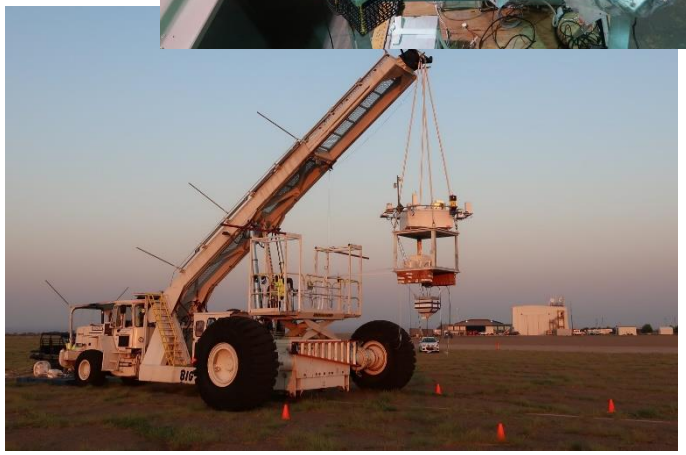


Launch Opportunity Identified for 9/4/17

- For a launch at 7:30 am everyone shows at about 3:00 am.
- HASP is rolled out and hung on the “Big Bill” launch vehicle.
- Next we wait for the ground and low altitude winds to settle out.

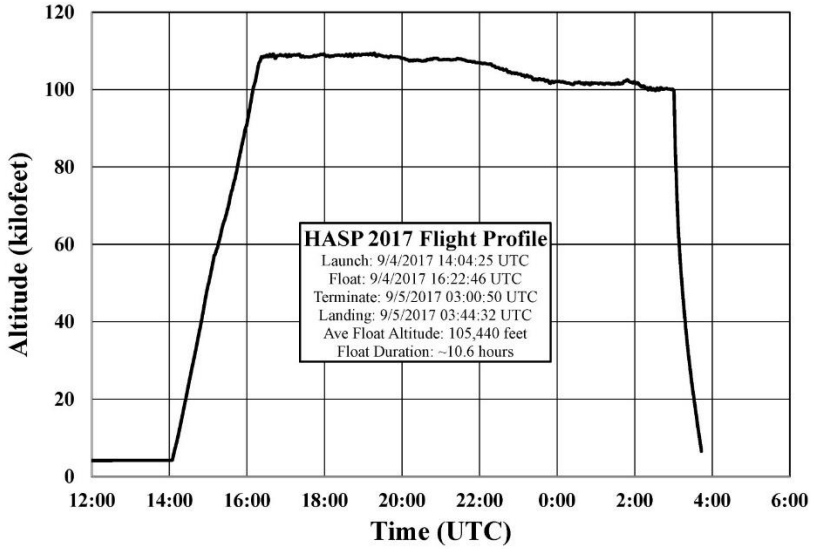


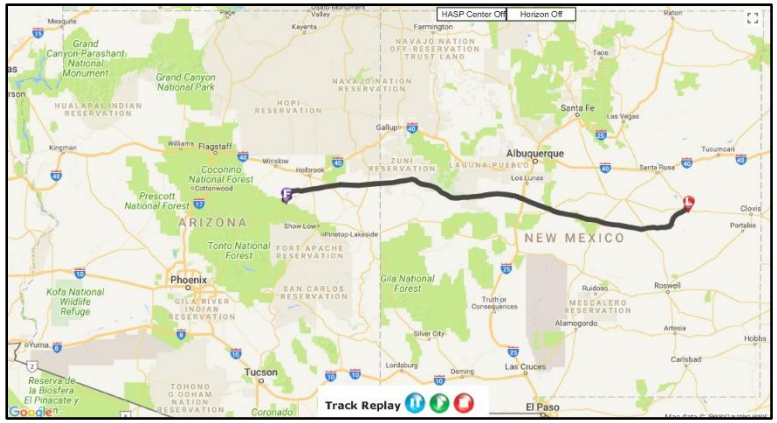




If all goes well we then have this …

The flight lasted ~13.7 hours with 10.6 hours above 100,000 feet.





Launch: 9/4/17 14:04 UTC

Float: 9/4/17 16:22 UTC

Terminate: 9/5/17 03:00 UTC

Landing: 9/5/17 03:40 UTC

Recovery was relatively easy with little damage to most of the student payloads

Be careful what you 3D print!

Houston had a very successful flight!

2017 was a very successful program year for HASP

- Twelve payloads from 10 states plus Canada were selected for flight.
  - Two community colleges
  - One high school (mentored by previous HASP participants)
  - Two new universities and one returning university
- All 12 payloads made it through development, integration and system testing to fly on HASP.
- Further, all 12 payloads had some level of success during the flight.
- To date, over 130 students have participated in HASP 2017
  - About 60 came to integration
  - About 30 came to the flight
- "Science" report due on 12/8/17

HASP 2018 Call for Payloads

CFP document and application materials is available on the "Participant Info" tab of the HASP website

http://laspace.lsu.edu/hasp/Participantinfo.php

Q&A Teleconference **November 17, 2017** at 10 am (central time)

Dial 1-866-467-4685, ID 780290

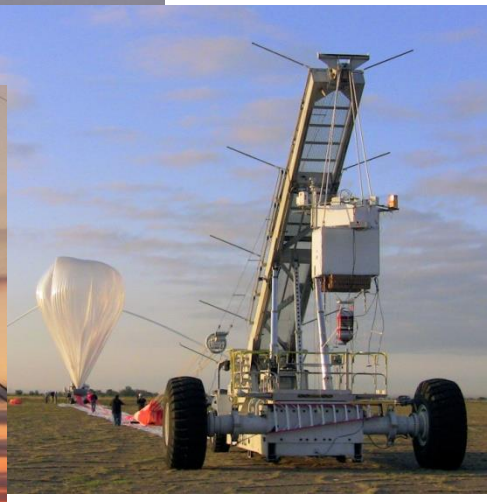
Email PDF version of application by 11:59 pm (central time) on **December 15, 2017** to laspace@lsu.edu

Notification of successful applicants by mid-January 2018

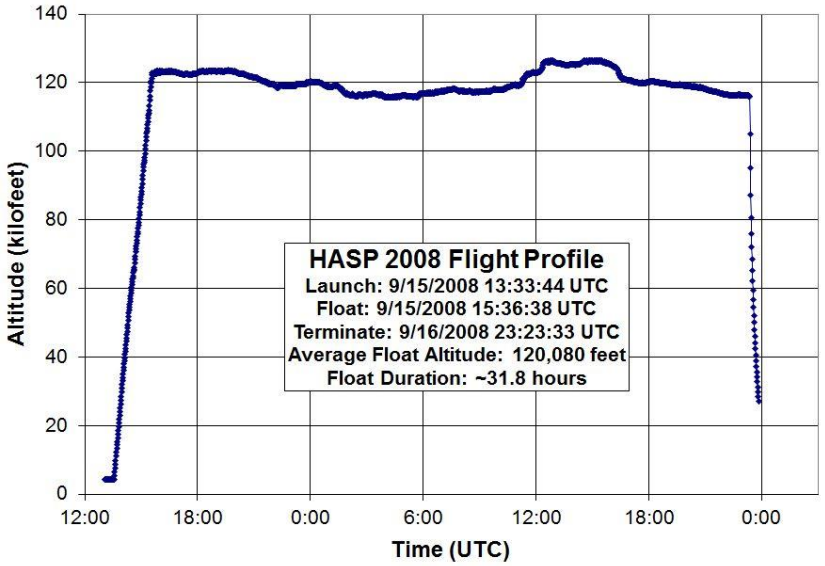
ConUS flights launched from Ft. Sumner NM

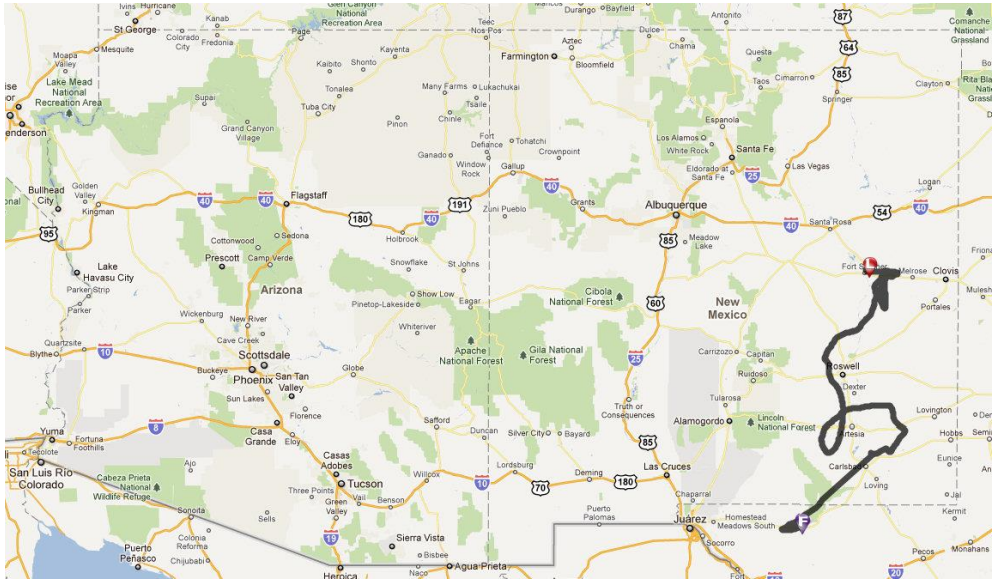
Typical Pre-launch Preparation

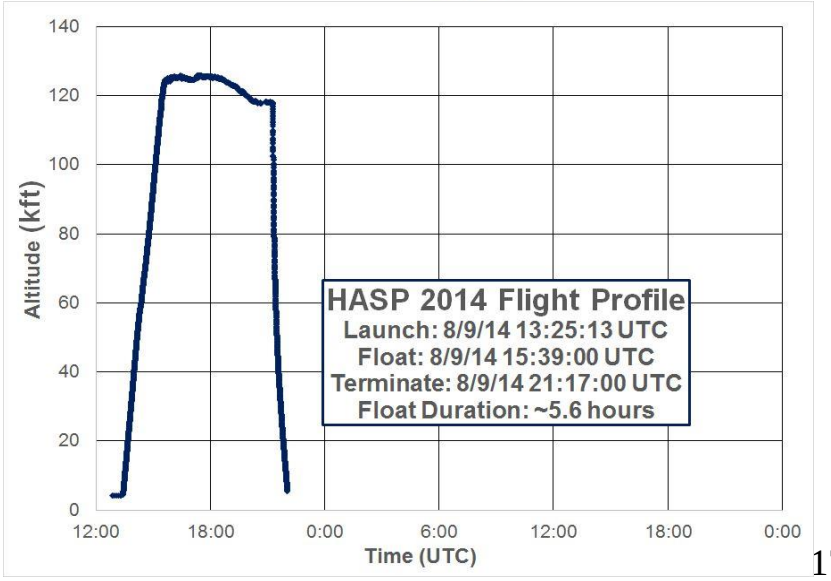
HASP Launch Preparation

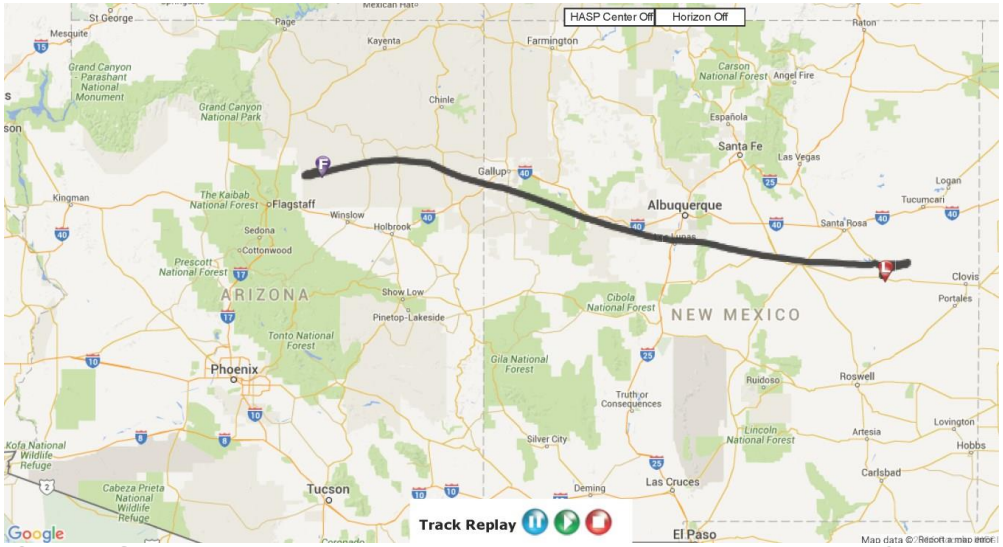


Longest in 2008, Shortest in 2014









HASP Typical Weight and Power

Item	Pounds
HASP Structure	202
HASP Electronics	77
HASP batteries	99
Real-time Camera	15
Student Payloads	75
Total HASP	**468**
CSBF MIP	110
CSBF Frame	246
Aux test articles	90
Ballast	617
Parachute, UTP etc	469
Total Suspended	**2000**

Item	Watts
HASP Computers	29.0
Network, Power Cntl	2.5
Science Stack	1.5
Total HASP	**33.0**
Real-time Camera	11.2
Student Payloads	60.0
Total Power	**104.0**

Use B7901-11 battery packs

2 packs power the HASP system for about 48 hours

6 packs power the payloads for about 30 hours

Many individual experiments have flown on HASP over the years

- HASP was flown 12 missions from 2006 through 2017
- Close to 1100 students from 43 institutions across 21 states plus Puerto Rico and Canada have been involved in developing a HASP experiment.

Payloads Involved with HASP Since 2006						
Year	Launch Date	Float Duration (hours)	Students	Payloads		
				Accepted	Flown	Success
2006	9/4/06	15.0	25	8	8	6
2007	9/2/07	16.5	70	11	10	8
2008	9/15/08	31.8	96	13	12	6
2009	9/11/09	12.0	50	10	6	6
2010	8/31/11	8.0	78	11	8	8
2011	9/8/11	15.7	117	11	5	5
2012	9/1/12	8.8	93	14	11	10
2013	9/2/13	10.5	101	12	10	10
2014	8/9/14	5.6	103	10	7	7
2015	9/7/15	23.1	107	12	10	9
2016	9/1/16	15.2	121	12	12	12
2017	9/4/17	10.6	131	12	12	12
Total 06 to 17		**172.8**	**1092**	**136**	**111**	**99**