High Altitude Student Platform

Call for Payloads 2019

Issued October 08, 2018 by

Department of Physics & Astronomy
Louisiana State University
Baton Rouge, LA 70803-4001

and

Balloon Program Office
NASA Wallops Flight Facility
Wallops Island, VA

Q&A Teleconference: November 16, 2018
Application Due: December 14, 2018

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I. Introduction

The High Altitude Student Platform (HASP) was conceived to provide students with flight opportunities that are intermediate 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) for durations up to 20 hours. 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. **See the HASP website (http://laspace.lsu.edu/hasp/) for further information**

Construction of HASP was supported by the Louisiana Board of Regents, the Department of Physics and Astronomy at LSU and the Louisiana Space Grant Consortium (LaSPACE) program. The NASA Balloon Program Office, Wallops Flight Facility, and LaSPACE have committed to supporting one flight of HASP per year through 2021.

This Call for Payloads, jointly issued by the LaSPACE HASP team and the Balloon Program Office (BPO), solicits student groups to apply for a "seat" on the 2019 HASP flight. To apply, student groups will need to develop a proposal describing their payload, including science justification, principle of operation, team structure and management, as well as full payload specifications of weight, size, power consumption, mechanical interface, data requirements, orientation preference and drawings. The costs of hardware development and testing, travel to Palestine, TX or Fort Sumner, NM for interface verification and flight operations or any other student payload or team expenses are **not** covered by this application (see section XII).

This application will be due at the LaSPACE office on or before December 14, 2018. A teleconference to answer questions about the HASP program and application process will be held November 16, 2018. Preference will be given to payloads that are clearly demonstrated to be designed, built and operated by students. Notification of selection will occur during January 2019. The remainder of this document describes the HASP system, student payload interface, anticipated program schedule and how to prepare and submit your application.

II. Call for Payloads Summary

Q & A Teleconference:	**November 16, 2018**
Application due date:	**December 14, 2018**
Submit e-mail PDF version of application to:	laspace@lsu.edu
Or submit hardcopy application to:	T. Gregory Guzik Louisiana Space Consortium Department of Physics & Astronomy 364 Nicholson Hall Louisiana State University Baton Rouge, LA 70803-4001
Application contents:	See Section X.

III. The HASP Website

The website for the HASP program can be found at http://laspace.lsu.edu/hasp/. This website contains details about the overall program, brief descriptions of payloads that have flown on previous missions, news announcements, a calendar of events and technical documents. During a flight, the website also provides access to real-time imaging, positional tracking of HASP, housekeeping status information plus datasets downlinked from the student payloads. It is recommended that you review the information on the HASP website as you develop your flight application.

IV. HASP Description

Figure 1 shows an image of HASP prior to the 2006 launch with student payloads integrated. The four large payload positions 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 the Columbia Scientific Balloon Facility (CSBF) Frame (see Figure 2) which provides support for the CSBF vehicle control equipment and attach points for suspension cables, crush pads and the ballast hopper. Suspension cables run from each of the four corners of the CSBF Frame to a pin plate that attaches to the flight train. The CSBF control equipment provides control over the balloon systems, as well as HASP uplink and downlink telemetry.

Figure 1: The HASP configuration

The CSBF equipment passes uplinked commands to and downlinked telemetry from the HASP control system, which consists of the Flight Control Unit (FCU), the Serial Control Unit (SCU), and the Data Archive Unit (DAU) with associated on-board data storage. The hardware design and controlling software for the FCU, SCU, and DAU were developed under the NASA supported Advanced Thin Ionization Calorimeter (ATIC) long duration balloon project at Louisiana State University and have been adapted to HASP. Also mounted in the interior of the frame are the lithium cells that supply power to the HASP systems, student payloads and some CSBF electronics. Solar shields are mounted on the core frame to maintain the electronics and battery temperature as well as to thermally isolate the CSBF equipment from the rest of the HASP components.

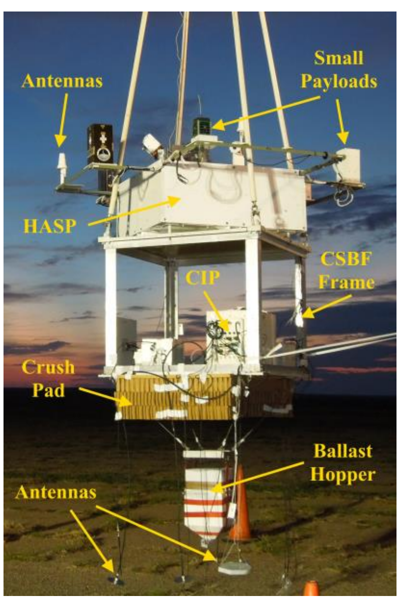

Figure 2: The HASP flight configuration

Attached to the core structural frame are four composite material braces that are used to support eight small student payloads. Each brace extends about 55 cm away from the aluminum frame and supports two small student payload mounting plates. These braces minimize interference between the metal frame and any student payloads that may exercise data transmitters during flight, as well as maximizing the unobstructed payload field of view (FOV). Mounting plates for four large student payloads are located on the top of the HASP aluminum frame structure. Specific details about the payload mounting plates and the student payload interface are provided in the next section.

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), the Serial Control Unit (SCU), and the Data Archive Unit (DAU). The FCU "manages" the subsystem; decoding commands received from the CSBF supplied Mini-SIP and distributing them, watching for units that may need to be reset, and collecting status data for downlink. In addition, the FCU also monitors the power system, collects pressure and temperature information for housekeeping records and sends the student payload serial data to CSBF control for downlink to the ground system. The SCU provides a serial communication link to each of the student payloads including collecting a telemetry bit stream from each payload and distributing uplinked payload serial commands as appropriate. The DAU controls the on-board recording of all data to a multi gigabyte compact flash drive. The existing design, including the CSBF equipment, supports a ~36 kilobit per second downlink rate, which should be sufficient to telemeter all student payload and HASP status data during the flight. During a flight, the downlinked data is made available through the HASP website. In addition, on-board recording of these same data to the archive compact flash drive is a backup in case the Line-of-Sight (LOS) link is lost for any reason.

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° C. The HASP power system closely follows the Advanced Thin Ionization Calorimeter (ATIC) experiment design so subsystem components can be readily reproduced. In this concept, the 30 V bus is run through the gondola and required voltages are converted locally. This approach simplifies the gondola wiring and minimizes power loss. Each supply in the power system includes a relay to control the flow of power via discrete on and off commands, an appropriate DC-DC converter and voltage / current sensors that are used to monitor the state of the power system. Voltage / current sensors are also placed on the main 30 V bus. Each student payload will have similar on/off control and voltage / current monitoring, but main bus power of 30 V will be supplied and the student payload will need to do local conversion as required. ***Note that while we refer to this power bus as "30 V", the actual supply from the batteries is closer to 32 V to 33 V at the beginning of the flight, decreasing to 29 V to 30 V toward the end.***

HASP will be flown, with the support of the Columbia Scientific Balloon Facility, from the ConUS launch site in Ft. Sumner, New Mexico once a year. Launch will be scheduled for early morning (i.e. dawn) when surface winds are calm. The balloon will be inflated such that the ascent rate will be about 1000 feet per minute. Thus, ascent to the float altitude of about 120,000 feet will take roughly 2 hours. The time at float will then directly depend upon the strength and direction of the high altitude winds. Typically, the vehicle can stay at altitude for 5 to 15 hours, possibly longer under certain situations, before the flight must be terminated to parachute HASP into a safe landing zone. Recovery of the full vehicle usually takes less than one day. The actual

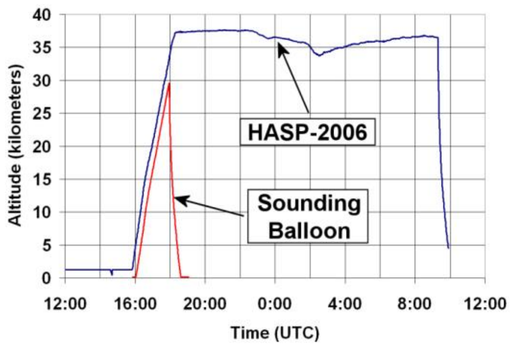

Figure 3: The HASP flight profile.

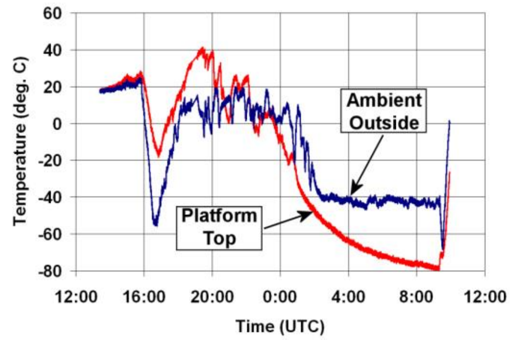

Figure 4: Typical temperatures during flight.

flight profile (altitude vs. time) for the 2006 HASP flight is shown in Figure 3 (blue curve) compared with the profile for a typical latex, sounding balloon flight. Temperatures encountered during the HASP 2006 flight are shown in Figure 4. The red curve is from a sensor placed in the location of a large payload and the blue curve is the temperature at a small payload. The dip in both curves at about 17:00 is due to passage through the tropopause, but the temperature will warm once float altitude is reached. After sunset, at about 2:00 UTC in the plot, temperatures again dip to very low values. Further, at float altitude the ambient pressure is 5 – 10 millibars. Your payload must be designed to survive and operate under these conditions.

During the flight we intend to maintain LOS (line-of-sight) telemetry. The HASP ground system will receive and display the downlinked housekeeping status information and will archive the student payload serial data into disk files. Files with UTC time stamped GPS position and altitude information will also be generated. Student teams will be able to download these files from the HASP website in order to monitor their payload status in near real-time. In addition, HASP will fly a video camera system that provides real-time views of the student payloads, the balloon and the Earth during launch, flight and termination (see Figure 5). If your payload undergoes a visible configuration change (i.e. you have moving parts or external indicator lights), an onboard video camera can be used to monitor these changes throughout the flight. Student payloads will also have limited commanding capability during flight. This will include a limited number of discrete commands plus 2 byte serial commands (defined as desired). Prior to flight, the student team will provide HASP operations with a listing of all commands, which will then be issued upon request by HASP flight support personnel. Following recovery, copies will be made of all the flight datasets and distributed to each group for their science data analysis.

Figure 5: Live video camera view during the HASP 2017 flight

V. Student Payload Interface

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. It is highly recommended that you download and review this document prior to developing your payload application. A brief summary of the payload constraints and interface is provided in Table 1 and below. ***Note that the HASP Interface Manual is updated periodically. In the event of conflicting information between this "Call for Payloads" and the "Interface Manual" the most recent document should be used.***

Mechanical: HASP supports two classes of student payloads. **Small** payloads have a maximum weight of 3 kg and are located on the HASP "outrigger" braces. **Large** payloads can weigh up to 20 kg and are located on the top of the HASP aluminum frame. In your payload application you will need to indicate your payload class as either small or large. **The total weight of all components associated with your payload must not be greater than the class mass limits.** Payload groups requesting the placement of payload components anywhere other than on a designated payload seat are required to submit a special request which can be included as a part of the application and must receive a waiver granting approval from LSU HASP Management, CSBF and BPO. This approval may include additional paperwork including flight safety documentation and analysis. See section VIII for more information regarding special requests. If your application is accepted for flight your team will be sent the payload mounting plate appropriate for your class. These plates, shown in Figure 6, are constructed from ¼" thick PVC, include wiring for the electrical / data connections and are marked to indicate the allowed footprint for your payload. Within the allowed region the plate can be modified for payload support structure and, if needed, downward pointing apertures. [Note that located immediately below each large payload will be the HASP thermal and EM insulation plates, so downward pointing apertures would not be appropriate.] Note that any intrusion of any part of your payload into the "KEEP OUT AREA" might result in your payload being disqualified from flight. All components attached to the mounting plate by the student team (e.g. payload, support structure, bolts, DC converters, antennas, etc.) must be included in the weight budget and total less than the maximum allowed for the payload class. The size of the allowed footprint and payload height is given in Table 1.

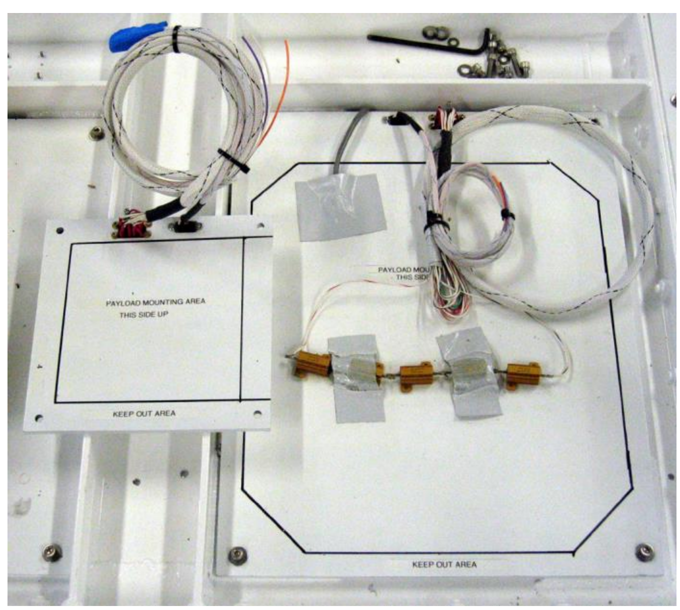

Figure 6: The small (left) and large (right) student payload mounting plates.

Note that the payload must be secured so that it remains intact and attached to the mounting plate under a 10 g vertical and 5 g horizontal shock. It is advised that appropriate analyses and/or test data be collected to provide evidence that your payload and mounting will satisfy this requirement.

Electrical: A twenty pin EDAC 516 (manufacture number 516-020-000-301) will be used to interface with HASP system power and analog downlink channels. Power is supplied as +30 VDC with a maximum current draw for small payload limited to 0.5 amps, and for large payloads to 2.5 amps at all times. **(Note that the power supply to your payload is fused and exceeding the current limit stated above for any length of time could result in a blown fuse. Blowing your HASP power supply fuse at any time may result in your payload being disqualified for flight.)** It will be the responsibility of the payload to convert internally the +30 VDC to whatever voltages are required. In addition, two 0 to 5 VDC analog channels will be accessible through the EDAC 516 connector. These channels are digitized and transmitted by the Mini-SIP systems every minute to provide real-time monitoring of two key payload parameters. Discrete commands are transmitted to and routed through the ballooncraft via highly reliable systems and are generally used to control critical, basic functions. Every payload will already have one pair of discrete commands assigned to turn on and off the payload power.

Data: Serial communications use a DB9 connector with pins 2 (receive / transmit), 3 (transmit / receive) and 5 (signal ground) connected. The protocol is RS232 and the port setup is

Table 1: Payload Interface Specifications (v2016)

Small Student Payloads:

Total number of positions available:	8
Maximum Total Payload weight: (sum of **ALL** payload components)	3 kg (6.6 lbs)
Maximum footprint (must include mounting structure):	15 cm x 15 cm (~6" x 6")
Maximum height (may need to be negotiated with neighbor payloads):	30 cm (~12")
Supplied voltage:	29 - 33 VDC
Available current:	0.5 Amps @ 30 VDC
Maximum serial downlink (bit stream):	<1200 bps
Serial uplink:	2 bytes per command
Serial interface:	1200 baud, RS232 protocol, DB9 connector
Analog downlink:	two channels in range 0 to 5 VDC
Discrete commands:	Power On, Power Off
	(It may be possible to negotiate up to 2 additional commands; i.e. F1 on, F1 off)
Analog & discrete interface:	EDAC 516-020

Large Student Payloads:

Total number of positions available:	4
Maximum Total Payload weight: (sum of **ALL** payload components)	20 kg (44 lbs)
Maximum footprint (must include mounting structure):	38 cm x 30 cm (~15" x 12")
Maximum height (may need to be negotiated with neighbor payloads):	~30 cm (~12")
Supplied voltage:	29 - 33 VDC
Available current:	2.5 Amps @ 30 VDC
Maximum serial downlink (bit stream):	<4800 bps
Serial uplink:	2 bytes per command
Serial interface:	4800 baud, RS232 protocol, DB9 connector
Analog downlink:	two channels in range 0 to 5 VDC
Discrete commands:	Power On, Power Off
	(It may also be possible to negotiate up to 4 additional commands; i.e. F1 on, F1 off)
Analog & discrete interface:	EDAC 516-020

8 data bits, no parity, 1 stop bit and no flow control. The serial port is set to 1200 baud for small payloads and 4800 baud for large payloads. *[Note that the term "baud" is used to designate the timing between bits on the serial link and is* ***not*** *necessarily your "bit rate". Your "bit rate" is determined by the amount of data (the number of bits) you are transmitting on the serial line per unit time. In addition, your "bit rate" cannot exceed the "baud" rate. For example, suppose you have a small payload and are sending to HASP a data record of 45 bytes each minute. Your bit rate would be 6 bps (bits per second) and each bit would be sent at a "speed" of 1200 baud.]* HASP will collect data from the student payload as a bit stream: listening for and receiving data until the internal buffers fill, then packaging this buffer as a record for on-board archiving and telemetry to the ground system. On the ground, the HASP records will be unwrapped and written to disk in the order the bits were received from the payload. It is quite feasible that payload records can be split across HASP buffers and that, on occasion, a transmitted packet can be corrupted. Therefore, it is strongly advised that the payload adopt a record structure of its own that includes a unique header identification, record byte count and checksum. A suggested record format is provided in the "HASP – Student Payload Interface Manual".

It will also be feasible to uplink a two-byte serial command to your payload. Any number of two-byte commands can be defined, but each command will need to be entered into the ground system and uplinked separately by a HASP operator. As the same serial port will be used for both downlink and uplink, the payload will need to periodically check the port to determine if any commands are being uploaded from the HASP SCU. Every time a command for a particular payload is identified, that two byte command regardless of content will be passed to the student payload. Therefore, it is the responsibility of the payload to determine the validity and contents of the serial command. Uplink commanding can be unreliable and you should minimize the number of commands you plan to use during flight. The format of the command string sent to a student payload as well as suggestions on how to improve commanding reliability is provided in the "HASP – Student Payload Interface Manual".

Integration and Flight Commanding: Individual payload commanding during both integration and flight are handled using an interactive google sheets documents. Each payload is given a unique account that is coded to allow that group to send commands and other comments to the HASP Management. The HASP management team can then send the commands and update the payload group as to the command status. The entire system is both color-coded and numerically keyed to ensure that all parties are aware of the status of payload commanding.

Thermal: The HASP platform provides **no** thermal control to the student payloads. It is the responsibility of the payload developers to ensure that their experiment will remain within acceptable temperature limits.

Vacuum: During flight your payload will need to operate at very low ambient pressures of 5 to 10 mbar. In such a vacuum, convection is not very efficient in transferring heat loads and, without adequate protection, high voltage systems can discharge and arc leading to electronics damage or blowing the fuse on the HASP power supply for your payload. It is the responsibility of the payload developers to ensure that their experiment will operate correctly in a low pressure environment.

Hazards: The NASA Balloon Program Office (BPO) and the Columbia Scientific Balloon Facility (CSBF) lists particular items that are hazardous to personnel and/or the flight systems. These include radioactive materials, lasers, cryogenic materials, pressure vessels, high voltage, magnets, pyrotechnics, biological samples, intentionally dropped components and chemicals that are environmentally hazardous. All potential hazards need to be clearly identified in the HASP application and, if the payload is accepted for flight, the student team must provide all documentation, testing and mitigation plans required by the BPO and CSBF prior to integration with HASP. **Note that pyrotechnics of any sort are not allowed on a HASP student payload, the use of radioactive materials for ground or in-flight calibration is STRONGLY discouraged and it is recommended that you avoid using a pressure vessel. Note also that any radio transmitter incorporated into the payload must undergo full compatibility testing at the discretion of CSBF. Any issues uncovered during compatibility testing may require the radio transmitter to be disabled or removed prior to flight.** Further, student team leaders and faculty advisors should be aware that providing the documentation, certification, and plans required by BPO and/or CSBF for assessment of any identified hazards could consume considerable resources. It is, therefore, our advice that student teams should not incorporate any hazard identified in the section.

VI. Anticipated Schedule

The anticipated schedule for the upcoming HASP campaign is illustrated in Table 2. The dates in this table are approximate and are subject to change. The payload selection for this flight will be announced about January 14, 2019. Our comments on your application including requests for further information will be forwarded to you shortly following the selection announcement. A response to these comments should be submitted by your team within the following two weeks. You will be required to submit a brief status report each month and participate in a monthly teleconference. The status report will be due on the last Friday of each month and the teleconference will be held on the first Friday of each month. Details about the status reports and teleconference participation can be found below under "Deliverables" (Section VII).

Figure 7: Student teams at the HASP 2017 integration and system test.

Figure 8: HASP and student payloads in the CSBF BEMCO chamber in preparation for thermal / vacuum testing.

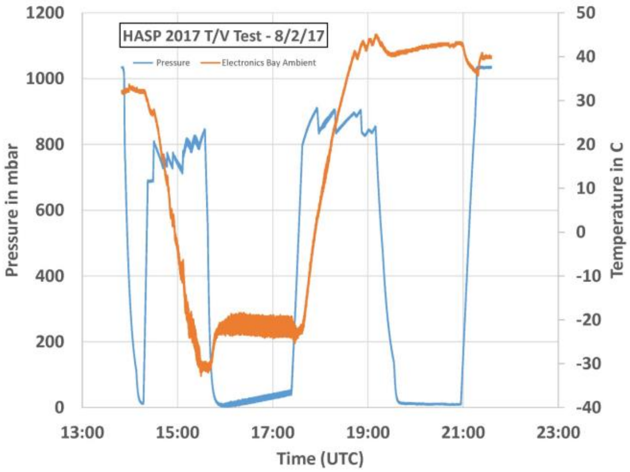

Figure 9: A typical temperature (orange) and pressure (blue) profile for a HASP thermal / vacuum test.

A *NASA On-site Security Clearance Document* listing all participants going to the CSBF facilities at Palestine, Tx and Ft Sumner, NM must be provided to the HASP management team by April 15, 2019. A description of this requirements for this list can be found in "Deliverables" (Section VII) and in the Appendix. The template for this list will be available on the Participant Info section of the HASP website.

A preliminary version of your *Payload Specification and Integration Plan (PSIP)* will be due in April and a description of the document can be found in "Deliverables" (Section VII). We will provide you with comments on your preliminary PSIP which should then be considered when completing the final version of the document (due in June).

Student payload integration with HASP will take place the first week in August at the CSBF and will include thermal / vacuum testing to simulate the temperature and pressure extremes that your payload will experience during a HASP flight (see Figures 7, 8, and 9). During the integration process you will need to successfully satisfy the HASP serial communication, power and mechanical interface requirements plus prove that your payload operates correctly during one of the two thermal / vacuum test opportunities offered. In addition, your final *Flight Operations Plan (FLOP)* will also be due. Upon successful integration the team will be issued a *Payload Integration Certification (PIC) with flight certification*. The flight certification is useful for justifying flight operation support from your funding agency. If issues are uncovered and not resolved during integration then you will likely be issued a *PIC without flight certification*. There will be about two to three weeks prior to flight to correct problems. However, on the flight-line there will be no pre-launch testing and little flexibility to resolve any problems. Thus, the decision to participate in the HASP mission without flight certification will need to be considered between your funding agency and your team.

We strongly urge all student teams to perform some level of thermal/vacuum testing of your payload prior to arriving at CSBF for HASP integration. Performing a thermal/vacuum test will enable you to identify potential flight issues with your payload early and still have several months to correct these issues prior to HASP integration. Note that student teams that do not have local access to such testing facility can contact Doug Granger (dgrang2@lsu.edu) to determine if testing using the LSU Bemco Balloon Environment chamber would be feasible. You should contact Doug at least 30 days prior to any anticipated test and scheduling a test will be considered as time and resources permit.

Flight operations are planned for Ft. Sumner, New Mexico during late August/early September. The HASP vehicle and support crew will be arriving on site in late-August. Any student payloads that have already integrated with HASP (i.e. in early August) can be flown without any further intervention by the student team. Data during the flight will be available for access via the HASP website. The payload will be returned to the group following the flight using your supplied container and pre-paid shipping label. **(Note that if a shipping container and pre-paid shipping label is not supplied by the time of HASP recovery return of your payload may be significantly delayed and you may need to travel to CSBF or LSU to pick up your payload.)** If the full dataset is desired it will be in zipped format on the HASP website sometime after the flight. (If the raw data from HASP's flight disks is desired, you will need to request a copy.)

Exact launch dates are impossible to predict, and are highly dependent upon the local weather conditions and the number of experimenters waiting for launch. At this time we are targeting early September, but this could easily be one week earlier or several weeks later.

Note that on-site participation by the student team during Integration and System Testing at CSBF in Palestine, Texas and during Flight operations in Fort Sumner, New Mexico is **not required** provided you have fully and accurately completed the PSIP and FLOP deliverables (see section VII) and supply a flight ready and tested payload. The PSIP and FLOP document all your payload interfaces to HASP, as well as, fully describe your data interface, data format, commands and payload test and verification procedures. With these documents HASP management should be able to understand how your payload is supposed to operate. Further, your flight data during integration and flight operations is available online for you to verify at your home institution and command requests can be delivered to the remote operation site. However, HASP management will not take responsibility for interpreting documentation, diagnosing issues, or modifying / repairing payload problems. HASP Management will also not take responsibility for any integration, pre-launch or flight operation procedures other than a simple power up and power down. Any payload supplied with incomplete documentation, that encounters a problem during integration or pre-launch or that requires complex preparation, without student team personnel on-site to address issues, will not be flown and will merely be returned to the responsible institution. Plan accordingly!

Table 2: Anticipated HASP 2018-2019 Schedule

November 16, 2018	Q & A Teleconference
December 14, 2018	Application due date
~**January 14, 2019**	Announce student payload selection
January –April 2019	Monthly status reports and teleconferences
April 15, 2019	NASA On-site Security Clearance Document due
April 26, 2019	Preliminary PSIP document due
June 28, 2019	Final PSIP document due
May – August 2019	Monthly status reports and teleconferences
July 19, 2019	Final FLOP document due
July 15 – July 19, 2019	Student payload integration at CSBF *
August 25 – August 29, 2019	HASP flight preparation *
August 30, 2019	Target flight ready *
September 2, 2019	Target launch date and flight operations *
September 5 – Sept 8, 2019	Recovery, packing and return shipping *
September – November 2019	Monthly status reports and teleconferences
December 6, 2019	Final Flight / Science Report due

* These dates are preliminary and subject to change

VII. Deliverables

Even if your payload application is accepted, your seat on the next HASP flight is contingent on providing status reports, documentation describing your payload as well as your plans for integration and flight operations plus participating in the monthly teleconferences. In addition, application for a future HASP flight will be contingent on delivery of a *Final Flight /*

Science Report. These documents are described below and templates are available on the HASP website. *Note that filling out these documents are not necessary for your application, but they will give you an idea of the kind of information that you might include in your application and what we will require once your payload is developed.*

Monthly Status Reports: A status report from the student team lead will be due on the last Friday of the month from January through November. This is a brief report, no longer than one or two pages, that describes for the month 1) activities of the team members, 2) issues encountered during payload design / development, 3) milestones achieved and 4) current team members, demographics and leaders. The report should be e-mailed to guzik@phunds.phys.lsu.edu and can be in either MS Word or PDF format.

Monthly Teleconference Meetings: A teleconference will be held on the first Friday of the month from February through December. At least the Faculty Advisor and Team Leader should be present at the teleconference, but we encourage all team members to participate. These teleconferences will be used to 1) announce upcoming events and schedules, 2) provide feedback on the monthly status reports, 3) answer questions on the HASP interface, 4) provide expert advice on payload development and 5) share experiences among HASP participants. Details about the teleconference call-in line and procedure will be announced at a later date.

Payload Specification & Integration Plan (PSIP): This document provides technical details on the final flight configuration of your payload including measured weight, measured current draw (@30 VDC), downlink data format and rate, uplink commands, analog output usage, discrete command usage, and dimensioned mechanical drawings. In addition, your plans for integration with HASP should be detailed including, at least, all test procedures and test procedure validation results, requested test equipment, schedule and personnel participating in integration. A preliminary version of this document will be due April 26, 2019 and the final version will be due June 28, 2019.

NASA On-site Security Clearance Documentation: This document provides required information to CSBF and Wallops Flight Facility that is necessary for an individual to be allowed onsite at both the Columbia Scientific Balloon Facility in Palestine, TX and the HASP launch site in Ft Sumner, NM. This information is time sensitive and must be provided up to 3 months in advance of the onsite visit. This document must be completed by April 15, 2019. See Appendix A for more information.

Flight Ready Payload: This is your instrument that satisfies all the interface requirements specified in the *HASP—Student Payload Interface Manual*, is fully described in the PSIP, with flight operations documented in the FLOP, as well as satisfying the science objectives described in your HASP application and has been tested to prove that all such requirements have been met. The Flight Ready Payload is delivered prior to HASP integration and system testing at CSBF in August and will be returned to the responsible institution following the flight.

Payload Integration Certification (PIC): At integration all interfaces will be documented and validated, correct operation of the payload will be verified and any issues identified will be detailed. This certification will be handled by HASP management during integration. A sample form, customized for your payload, will be sent to you following receipt of your Payload Specification & Integration Plan. Note that you will not be certified to fly until the PIC is complete.

FLight Operation Plan (FLOP): This document will detail procedures for flight line setup, pre-launch checkout, flight operations, error recovery, pre-terminate procedure and payload recovery including a timeline showing specific events relative to launch at T=0 and identifying personnel participating in flight operations. Note that any payload operations to be performed other than power-up ~one hour prior to launch (T – 1 hr) and power down prior to terminate must be specified in this document. This document is due during HASP integration.

Final Flight / Science Report: A final report on the results from the flight of your payload is due by December 06, 2019. This report should include an assessment of the payload performance, problems encountered, lessons learned as well as the science / technical results from the flight plus demographics of all participants in your project.

VIII. Special Requests

We will entertain requests for your payload to exceed one or more of the constraints on weight, dimensions, telemetry. All waiver requests **MUST** be fully described including a weight table, power table, dimensioned mechanical drawings, power supply schematic, etc. AND must clearly justify how the waiver will impact your science. Such applications will be accepted **only** if we feel that the request is fully justified and if we feel that we can provide the additional resource. Thus, it is strongly advised that if you decide to make a special request, you should also include a section discussing the implications if your request is not granted. Note that a statement that the modification will enable you to acquire more data is not sufficient to justify exceeding a constraint. You must **prove how a major scientific objective will be lost** if your request is not granted. Finally, even if a waiver is granted the student team will need to assume all risk associated with exceeding a HASP constraint including possible rejection of the payload by CSBF following compatibility testing, damage to or loss of the payload and loss of payload data.

IX. Q&A Teleconference

A special “meet-me” teleconference will be held on **Friday November 16, 2018 at 10:00 am (central time)** for groups planning to submit a HASP application. During the teleconference we will present a brief description of the HASP program, what we expect to see in your application and will address any questions you may have. Groups who have previously flown on HASP as well as new organizations should plan on attending this teleconference. To participate dial in to **1-844-467-4685** a few minutes prior to the conference time. When requested enter the **Conference ID number 780290 followed by the # key.**

X. Application Preparation and Submission

For the 2019 HASP flight, eight small and four large payload seats will be available for student groups. To be considered for the 2019 HASP flight, all teams must submit a complete payload application on, or before, **December 14, 2018.** These applications will be reviewed and seat awards will be announced by about January 14, 2019.

The application package consists of a standard HASP application cover sheet, payload description, team management and structure, payload interface specifications and preliminary drawings. It can be submitted in either MS Word or PDF, or in hardcopy format.

The **cover sheet** form is attached here. The boxes on the cover sheet should be self-descriptive with the following exception. Identify in "Payload Class:" whether you are applying for a **small** or **large** payload seat. The "Project Abstract" is limited to 200 words and should provide a brief summary of your payload "science" objectives, team structure and interface requirements. If your team has a name different from the project name you can enter it in the "Team Name" box, otherwise enter the payload acronym or leave blank. If your team or project has a website enter the URL in the next box. Finally, we will need full contact information for the faculty advisor and the student who will be the interface between the student team and HASP management. The cover sheet is limited to one page.

The **payload description** provides a one to two page summary of your scientific objectives, a high level review of your payload systems plus a statement of the principle of operation of your experiment. This section should provide the reader with a reasonable understanding of the "why, what and how" of your payload. Be sure to include a thermal control 'plan'.

The application should also include a description of **how your team is structured and managed**. This could include an organization chart and / or a listing of the team leads. Full contact information (including e-mail address) should be provided for the principle team leads plus faculty advisors. Also include a description of how the team effort is organized and managed as well as a preliminary timeline, with milestones, leading to integration with HASP and flight operations. We will also need to know how many personnel are anticipated to participate in the integration at CSBF and flight operations at Ft. Sumner.

The **payload specifications** section should describe what HASP resources you will use and how your payload will fit within the HASP constraints. This section should include your weight budget with uncertainties, mounting plate footprint, payload height, power budget, downlink serial telemetry rate, uplink serial command rate, anticipated use of analog downlink channels or additional discrete commands as well as the desired payload location and orientation and potential hazards. Also include a brief description of your anticipated procedures during integration with HASP and flight operations. You may also request resources that somewhat exceed those specified for your payload class or those that are not mentioned in this document. See Section VIII for what should be included in a waiver request. Payloads that are significantly impacted by the limited resources available are unlikely to be good candidates for a HASP flight.

Finally, a collection of **preliminary drawings** illustrating particular aspects of your payload will be needed. Typical items to include here would be a dimensioned drawing of your payload, power circuit diagram showing wiring to the EDAC connector and all voltage converters, anticipated modifications to the payload mounting plate, sketches of your mounting structure, and illustrations of your preferred payload orientation and location on HASP.

An example HASP Student Payload Application is provided on the HASP website along with this CFP and the application cover page in MS Word format. The example application is from a previous student team that provided most of the information we want to see in a HASP application. We strongly advise that ALL members of student teams considering applying for a HASP seat download and read the current HASP CFP, the example application and the HASP Student Payload Interface Manual. All of these documents can be found on the HASP "Participant Information" page http://laspace.lsu.edu/hasp/Participantinfo.php.

Once completed your application should be submitted electronically as a fully searchable PDF or MS Word or in hardcopy to the address listed in section XI by December 14, 2018. As the applications are reviewed, priority will be given to those payloads that are clearly student designed, built, managed and operated, but projects with only a partial student component are also welcome to apply. The application will be reviewed for completeness, consistency, scientific or technical justification, and ability to fit within the HASP constraints. Seat awards will be announced by about January 14, 2019.

XI. Submission of Application

Your completed application should be **submitted electronically by 11:59 pm of Friday December 14, 2018 (Central Time) to the Louisiana Space Grant Consortium at laspace@lsu.edu.** Electronic applications received after this deadline will be reviewed only after on-time applications and only on a space-available basis. The electronic copy should be formatted as a fully searchable PDF file (preferred) or as a Microsoft Word document. For any other formats your application will be returned unreviewed. You will receive an acknowledgement that your application was received.

Alternatively you can submit a hardcopy of your application by the due date / time given above to the following address:

Dr. T. Gregory Guzik
Louisiana Space Grant Consortium
364 Nicholson Hall / Tower Drive
Department of Physics & Astronomy
Louisiana State University
Baton Rouge, LA 70803-4001

Note that as long as your electronic copy is submitted on time, there is no need to submit a hardcopy application.

XII. Financial Support

Each applicant for a HASP seat must provide their own financial support for payload development, testing, integration in Palestine, TX, flight operations in New Mexico and subsequent data analysis. Such financial support, for example, is needed for, but is not limited to, purchase of supplies, sensors, lab equipment, student salaries, test facility fees, faculty advisor support, travel expenses, special services, shipping, structural materials, electronic components and other similar items. It is **highly** recommended that a team seek / develop the needed financial resources at the same time as completing this application.

HASP Student Payload Application for 2019

Payload Title:		
Institution:		
Payload Class (Enter SMALL, or LARGE):		Submit Date:
Project Abstract:		
Team Name:		Team or Project Website:
	Student Leader Contact Information:	Faculty Advisor Contact Information:
Name:		
Department:		
Mailing Address:		
City, State, Zip code:		
e-mail:		
Office Telephone:		
Mobile Telephone:		

Appendix A: NASA On-Site Security Clearance Requirements

If the Applicant is a US citizen;

1. If the site visit is less than 29 days
   a. No background investigation is required
   b. Government issued identification is required to access CSBF sites (PSN, FTS, etc)

2. If the site visit is greater than 29 days.
   a. Background investigation is required
   b. Required to fill out forms to be assigned a NASA identity.

If Applicant is a Foreign National,

1. If applicant has been assigned a US Green Card, see requirements listed above for US Citizens.

2. If applicant does not have a Green Card and is from a Non-designated Country
   a. Notify CSBF of individual, email address, affiliation institution
   b. Applicant must create a NASA profile
   c. ESTA, Passport, VISA, I94, etc potentially required
   d. WFF will perform a background check

3. If applicant does not have a Green Card and is from a US-Designated Country
   a. Notify CSBF of individual, email address, affiliation intuition
   b. Applicant must create a NASA profile
   c. ESTA, Passport, VISA, I94, etc potentially required
   d. WFF will perform a background check
   e. More information may be required during the checks
   f. An escort will be required whenever the approved applicant is on NASA premises

For more information on US Designated Countries, please go to this site -- https://oiir.hq.nasa.gov/nasaecp/.