HASP Payload Specification and Integration Plan

Payload Title: Evaluation of Atmospheric Particle Collection Performance of Three Sampling Substrate at Different Layers of the Atmosphere (EAPCPTSSDLA)

Payload Class: [✓ Small] Large (circle one)

Payload ID: 06

Institution: **Inter-American University of Puerto Rico**

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Submit Date: December 18, 2015

I. Mechanical Specifications:

A. Measured weight of the payload (not including payload plate):

On Table 1 can be appreciate a mass budget for each components. Some of these components are calculated without the mass for small parts like screws, angular, nuts and other elements for a mechanism. Also the wires for the electronics part are not calculated until the final integration. For now the total weight is 2.2404 kg, this is expected to change because there are some minors components that weren't calculated completely. The mass budget table can be completed when we are close to the final integration plan.

Table 1Mass Budget

Mass Budget			
Components	**Weight (kg)**	**QTY.**	**Total Weight (kg)**
Arduino Mega 2560 (Measured)	0.0033	1	0.0033
785 Single Parallel Gear Rack Kit with	0.2087	3	0.6261

Servo included(Measured)			
Turnigy TGY-1501MG Servo for Closing the sponge hatch (Measured)	0.0600	3	0.1800
Electronic Equipment Housing (Estimated)	0.4510	1	0.4510
Sponges mechanism and holder with Sponges (Estimated)	0.3000	3	0.9000
Wire, electric components (Estimated)	0.0800	1	0.0800
Structure (Calculated)	0.2500	1	0.2500
EPS Board (Measured)	0.0970	1	0.0970
DAQ Board (Measured)	0.0350	1	0.0350
Total (kg)			2.6224

B. Provide a mechanical drawing detailing the major components of your payload and specifically how your payload is attached to the payload mounting plate:

For the moment, the mechanical and structure drawing are almost complete, we are coming with different ideas for the sponges mechanism and holder, this is why there will be a possible change on the design and only the circuit board is pending on the design. The payload will be attached to the mounting plate by a series of screws determined by research of previous HASP payload. As illustrated below in the Figure 1 the structure has change and this will be the final design. All that is missing is the servo motors.

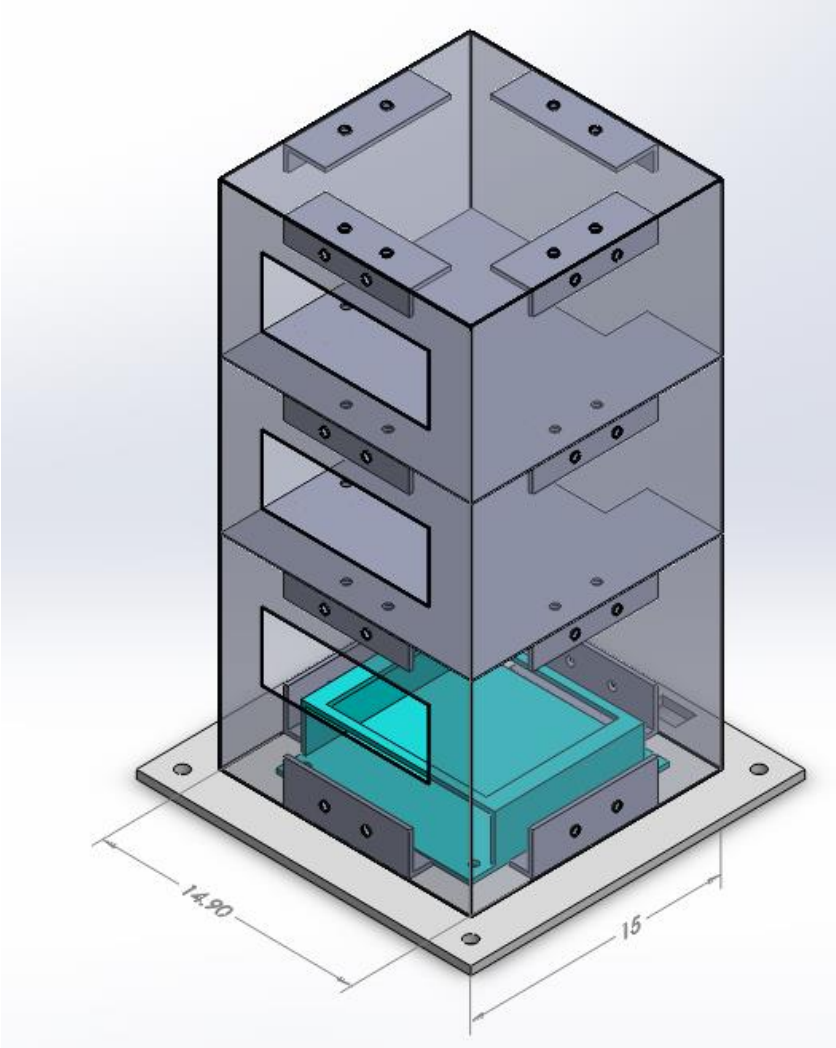

Figure 1EAPCPTSSDLA Final Design

This current design is pending for:

- Circuit Board wiring
- Servo motors
- Some minor changes on the compartments where the sponges will be located

In Figure 2 below we illustrate the EAPCPTSSDLA design measure to verify the parameters limitation of height from integration plate to top. The limitation of our payload is 30 cm, which we achieved to put it in the limit height. The payload is divided in four levels, the first level is composed by all electric wiring and components like the Arduino Mega 2560 and others more.

The second to the fourth level are the same, they contain a 785 Single Parallel Gear Rack Kit with servo to push the compartment out and it also contain another servo which it will open the compartment where the sponges are located. This design is subject to change in the future. The measurement in the figure below are shown in cm.

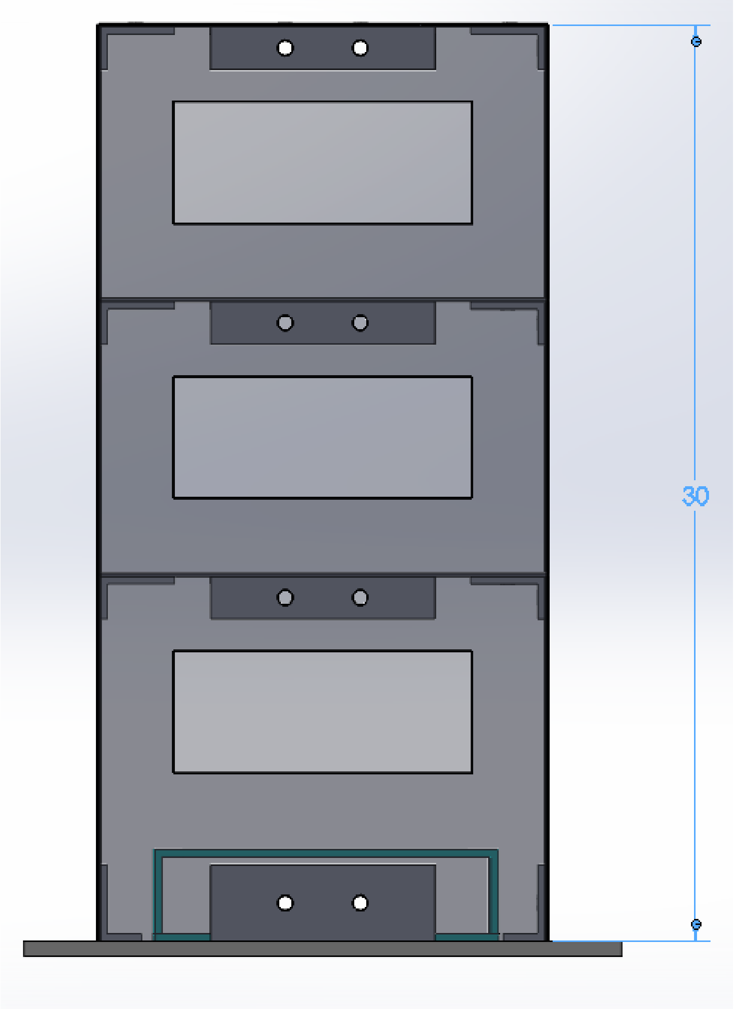

Figure 2EAPCPTSSDLA Design Measures

The structure of the EAPCPTSSDLA are fixed to the mounting plate with an angular L shape as shown in Figure 3. The screws that we are using are the M6 X 10mm. The measurements below are shown in cm.

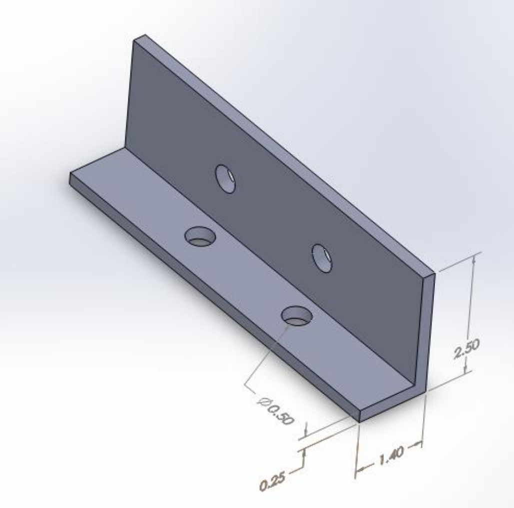

Figure 3Angular L shape

The compartment constructed to hold the sponges is illustrated in Figure 4. This compartment is one of the first ideas. The problem we have encounter with this part is that making it is heavy and it will make our payload heavier than the limitation of 3 kg. Right now we are working with a new idea that is lighter and efficient. The measurements below are shown in cm.

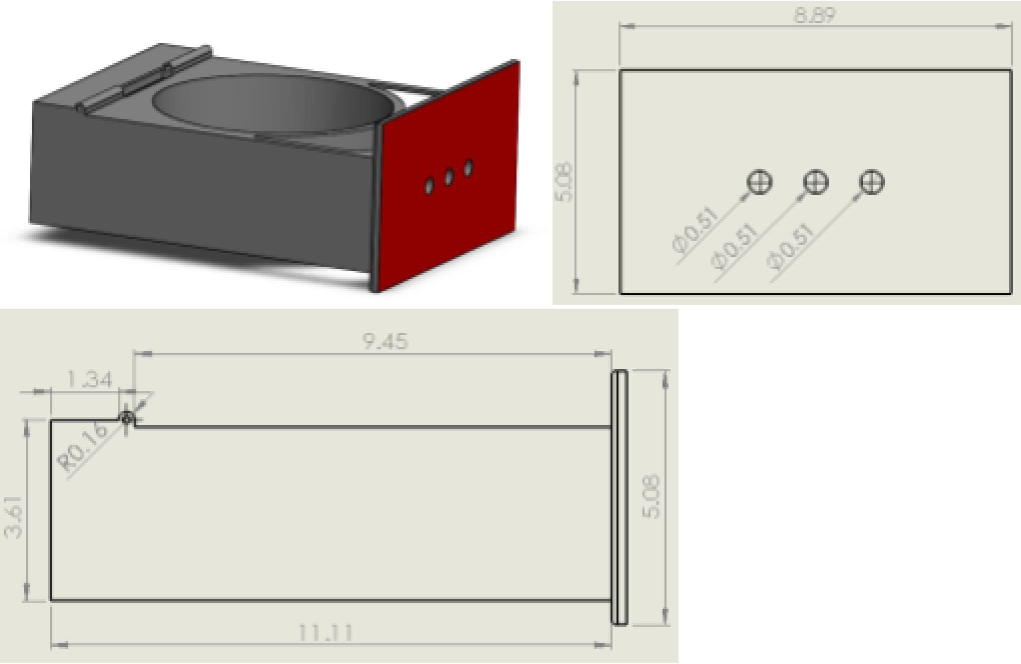

Figure 4 EAPCPTSSDLA Compartment

C. If you are flying anything that is potentially hazardous to HASP or the ground crew before or after launch, please supply all documentation provided with the hazardous components (i.e. pressurized containers, radioactive material, projectiles, rockets…)

N/A

D. Other relevant mechanical information:

N/A

II. Power Specifications:

A. Measured current draw at 30 VDC:

On the Table 2 below it illustrate the power budget for the EAPCPTSSDLA payload. The

Table below is subject to change through the changes that are going to be made.

Table 2 Power Budget

Power Budget			
Components:	Voltage (V):	Current (mA):	Power (W):
Servo motors (6)	10	660	6.6
Boards and micro	3.3	60.60	0.2
EPS Board	5	600	3
DAQ Board	5	100	0.5
Power Consumption (nominal)	---	---	---
Power Consumption (max)	---	---	---
Power Consumption (estimated)	30	340 (Estimated, calculated)	10.3
Power Limit	30	500	15
Power Margin	30	---	4.7

B. If HASP is providing power to your payload, provide a power system wiring diagram starting from pins on the student payload interface plate EDAC 516 connector through your power conversion to the voltages required by your subsystems.

Below in the Figure 5, it illustrate the EAPCPTSSDLA Power Wiring Diagram. The Wiring Diagram is subject to change. The EAPCPTSSDLA will use the HASP platform power source, consisting of 30 V and 0.5 Amps. It will be connected by an EDAC 516 connector by an EDAC 516 connector. We will be using the A, B, C and D wires for the +30 V and the W, T, U and X for the ground connected respectively together. For the servos motors will use the 6V DC/DC converter, for the EPS and DAQ Board will use a 5V DC/DC converter and for the boards and micro will use the 3.3V DC/DC converter. The power converters that we will be using for now are the LM 317 and the 2N305.

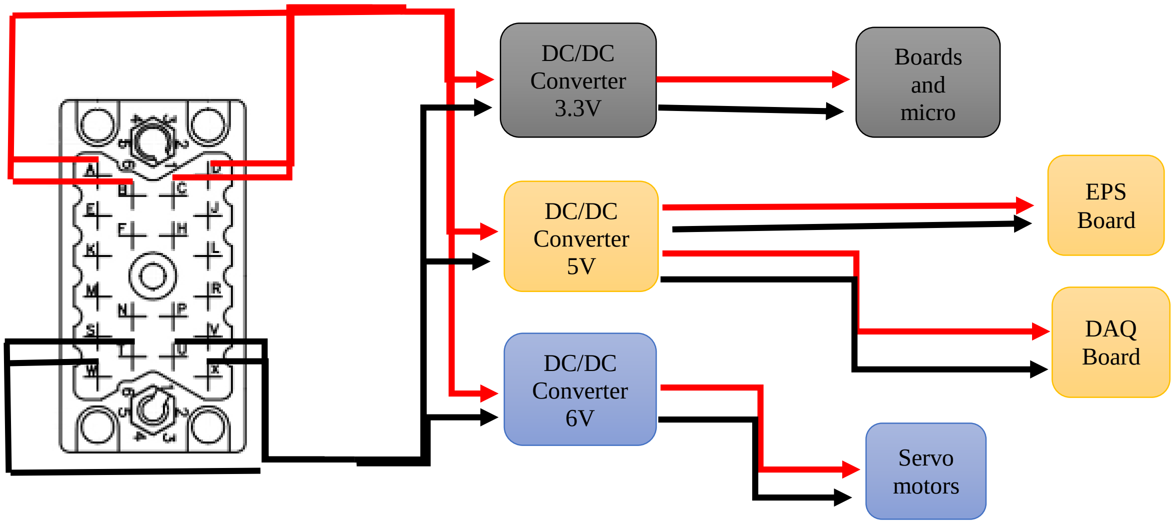

Figure 5 Wiring Diagram

C. Other relevant power information

N/A

III. Downlink Telemetry Specifications:

A. Serial data downlink format: Stream Packetized (circle one)

- We are not using any Downlink Telemetry

B. Approximate serial downlink rate (in bits per second)

C. Specify your serial data record including record length and information contained in each record byte.

D. Number of analog channels being used:

E. If analog channels are being used, what are they being used for?

F. Number of discrete lines being used:

G. If discrete lines are being used what are they being used for?

H. Are there any on-board transmitters? If so, list the frequencies being used and the transmitted power.

I. Other relevant downlink telemetry information.

IV. Uplink Commanding Specifications:

A. Command uplink capability required: Yes [✓ No] (circle one)

B. If so, will commands be uplinked in regular intervals: Yes No (circle one)

C. How many commands do you expect to uplink during the flight (can be an absolute number or a rate, i.e. *n commands per hour*)

D. Provide a table of all of the commands that you will be up linking00 to your payload

E. Are there any on-board receivers? If so, list the frequencies being used.

F. Other relevant uplink commanding information.

V. Integration and Logistics

A. Date and Time of your arrival for integration:

The EAPCPTSSDLA integration team will be arriving July 29, 2016 to Palestine, Texas. The time of arrival will be around noon, but it will depend on the flight schedule. Possible change may occur in the future.

B. Approximate amount of time required for integration:

The approximate amount of time for the successful integration of the EAPCPTSSDLA team payload will be no more than two (2) hours. The reason we ask this mush time is because we are new to HASP and we want to take time to make our integration successful.

C. Name of the integration team leader:

William E. Roman Nevarez

D. Email address of the integration team leader:

william_e_roman@hotmail.com

E. List **ALL** integration participants (first and last names) who will be present for integration with their email addresses:

In the Table 2 as illustrated below it shows the participant of the integration team for the EAPCPTSSDLA payload. These table is subject to change through the project.

Table 3 Integration Participant

Integration Participant	
Participants Name:	**Participants Email:**
William E. Roman Nevarez	william_e_roman@hotmail.com
Euric H. Payano Quezada	euric.payano27@gmail.com
Asuwie Serrano Lugo	asuwie1@outlook.com
Jose M. Alma Hernandez	josealma@yahoo.com
Emanuel Chavez Torres	ema.chaves@live.com

F. Define a successful integration of your payload:

A successful integration plan for the EAPCPTSSDLA team is that the payload meets all HASP requirements for a small payload. This requirements are a total current draw of, no more than, 0.5 Amps @ 30VDC and the weight does not exceed 3 kg. Other important factors such as check that there is no electrical problems present on our payload and check the mechanism that are working fine, for these factors may come to problem if not checked correctly. In addition, the payload dimensions have to be equal or smaller than 15 x 15 x 30 cm.

G. List all expected integration steps:

1. Weight the payload and verify that is within the HASP requirements.
2. Check if the Payload successfully complete the thermal vacuum test.
3. Provide detailed drawing with payload description and measurements.
4. Attach the payload efficiently to the mounting plate and the HASP platform.
5. Power up the payload for a power consumption analysis of not exceeding HASP requirements.
6. Provide a detailed wiring diagram.
7. Check all wiring and electrical components are working fine with no problem.

H. List all checks that will determine a successful integration:

Check list

Integration Step:	**Requirements:**	**Check:**
Weight of the payload	3 kg or less.	
Vacuum Test	Check if the payload succesfull pass the test.	
Payload Drawing	Detail drawing of the structure with the mayor components dimensions and attachment to the mounting plate.	
Power Consumption	No more than 0.5 Amps @ 30 VDC.	
Wiring and Electrical components	Check that everything is working as it is supposed to.	
Con - Ops	EAPCPTSSDLA mission plan	

I. List any additional LSU personnel support needed for a successful integration other than directly related to the HASP integration (i.e. lifting, moving equipment, hotel information/arrangements, any special delivery needs…):

N/A

J. List any LSU supplied equipment that may be needed for a successful integration:

- Power supply 30 V @ 3A (with cables)
- 3 Mustimeters (with cables)

- Oscilloscope (with cables)
- Soldering iron
- Disordering pump
- Drill
- Screwdrivers
- Tweezers
- Pliers
- Hex Tools