HASP Payload Specification and Integration Plan

Payload Title: Maximum-Altitude Dust Aerogel Collection (M.A.D.A.C.)

Payload Class: Small Large (circle one)

Payload ID: 2014-03

Institution: Arizona State University

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Contact Phone: 1 (480) 727-0023

Contact E-mail: srikanth.saripalli@asu.edu

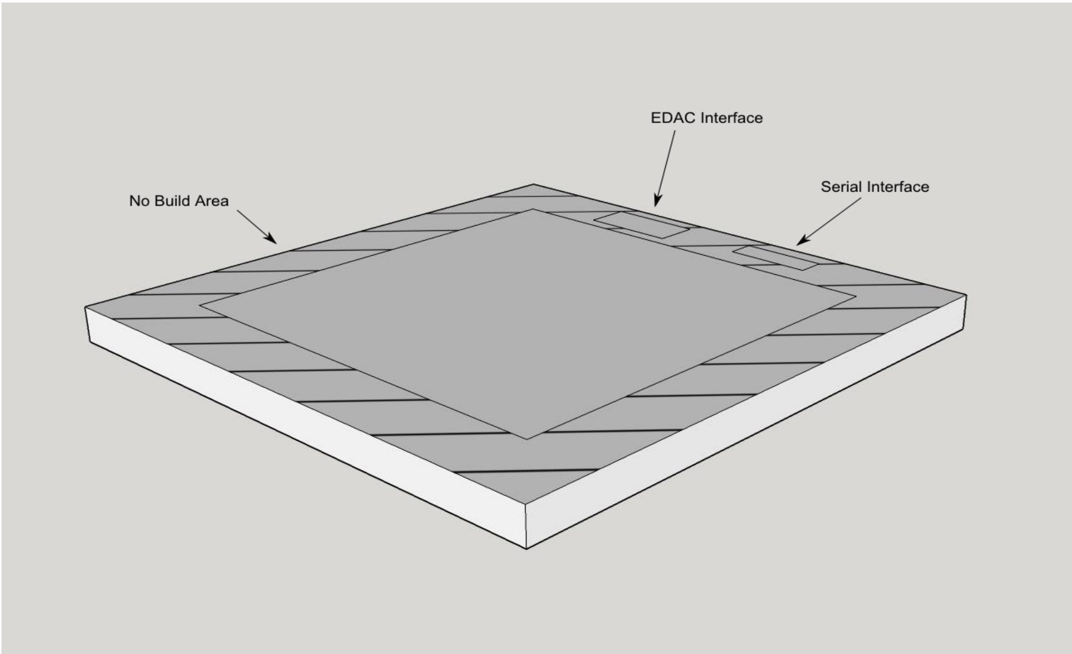
Submit Date: June 28, 2014

I. Mechanical Specifications:

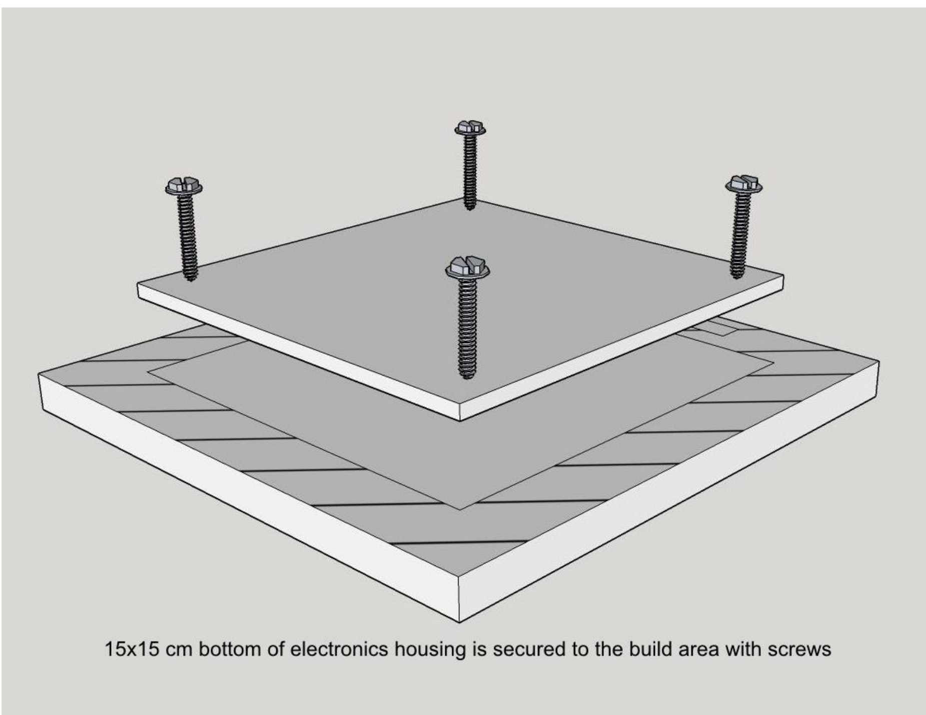
A. Measured weight of the payload (not including payload plate)

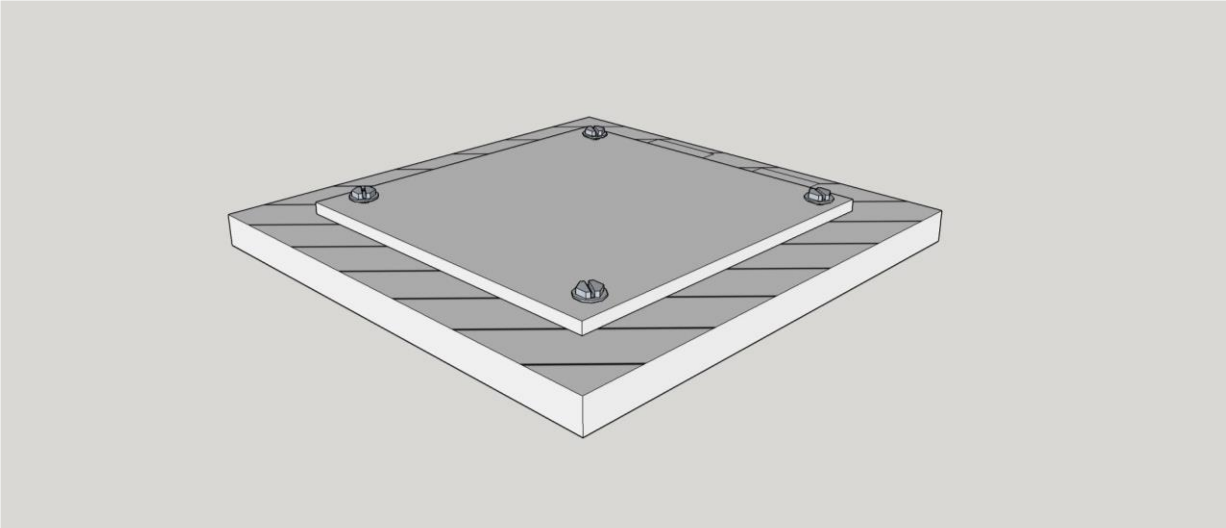
Subsystem	Mass (g)
Servo	45.5
Temp/Humidity Sensor	10.0
GPS with Shield	32.5
Data Logger	22.0
GPS Antenna	99.0
Arduino	28.0
Capsule and Frame	900.0
Breadboard	15.0
	1152.0

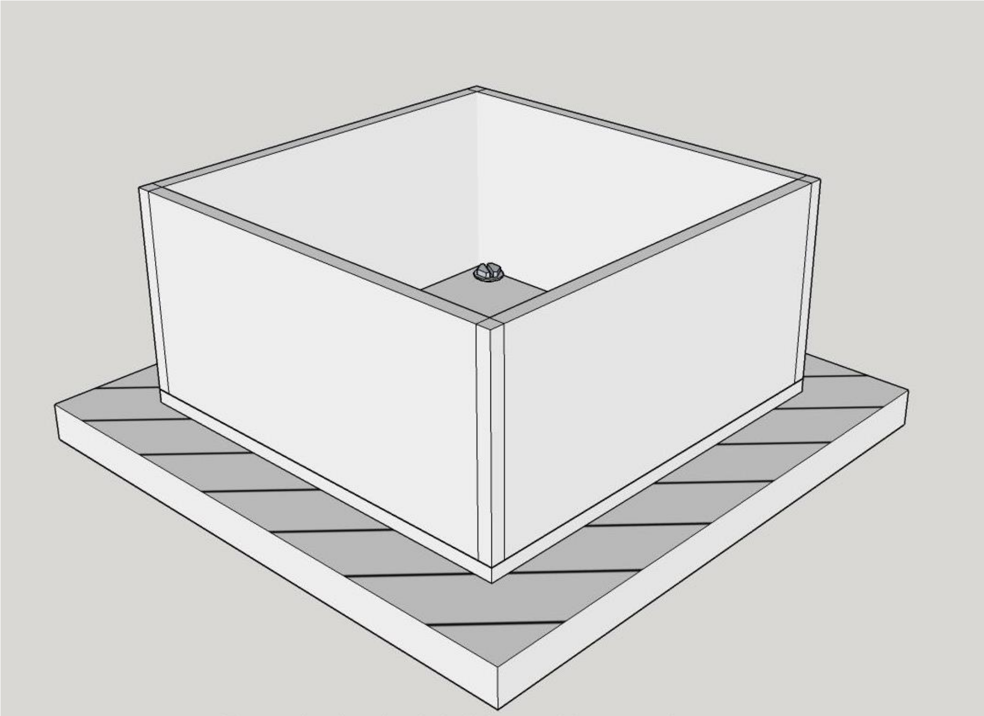
B. Provide a mechanical drawing detailing the major components of your payload and specifically how your payload is attached to the payload mounting plate



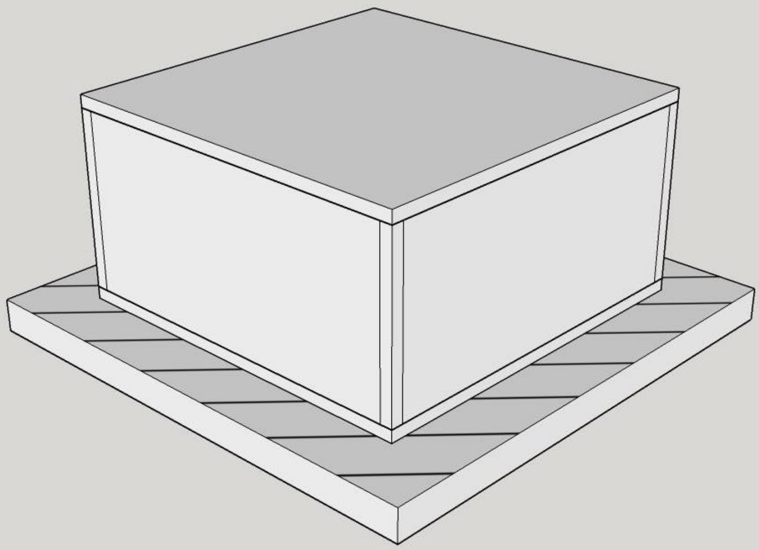
15 x 15 Mounting plate
The dashed area represents no build zone





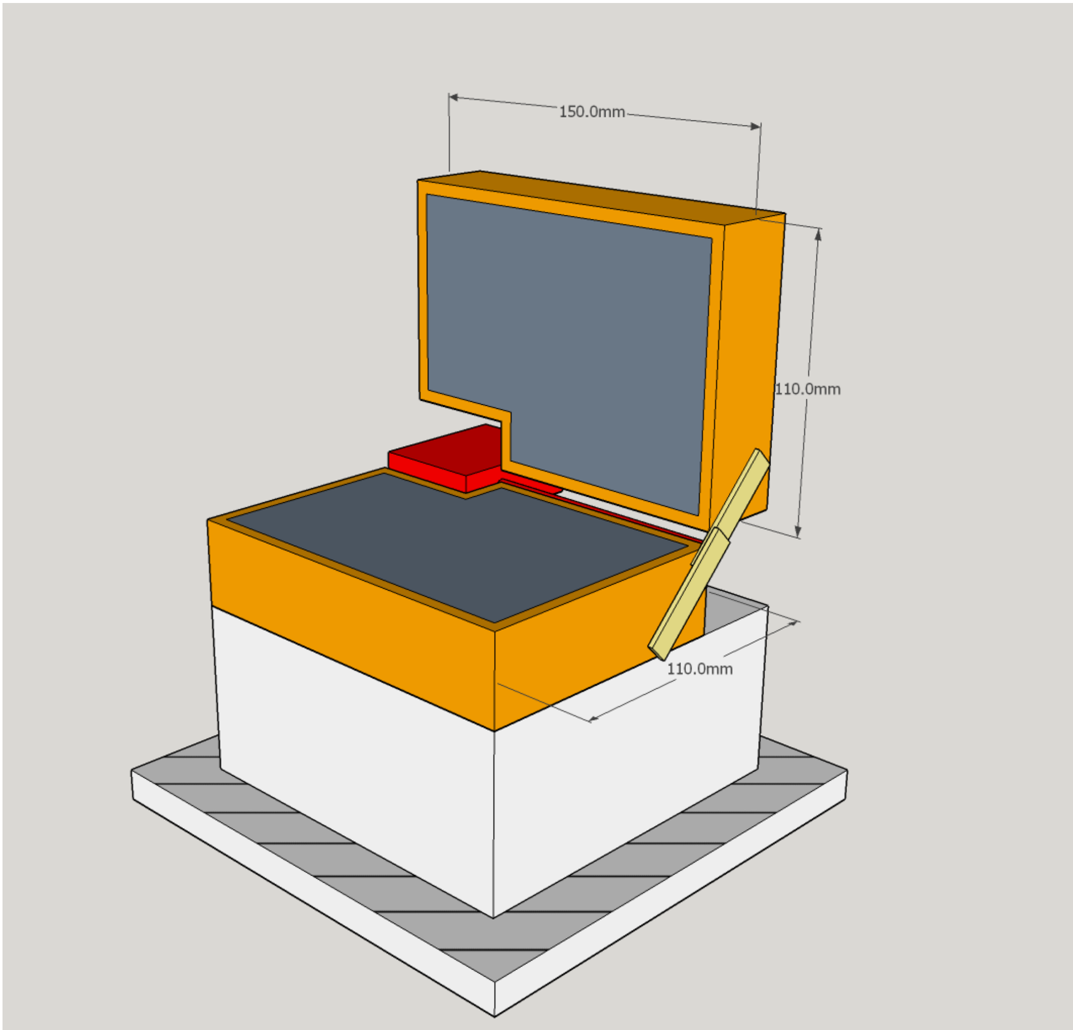


Electronics housing is build around the mounting screws



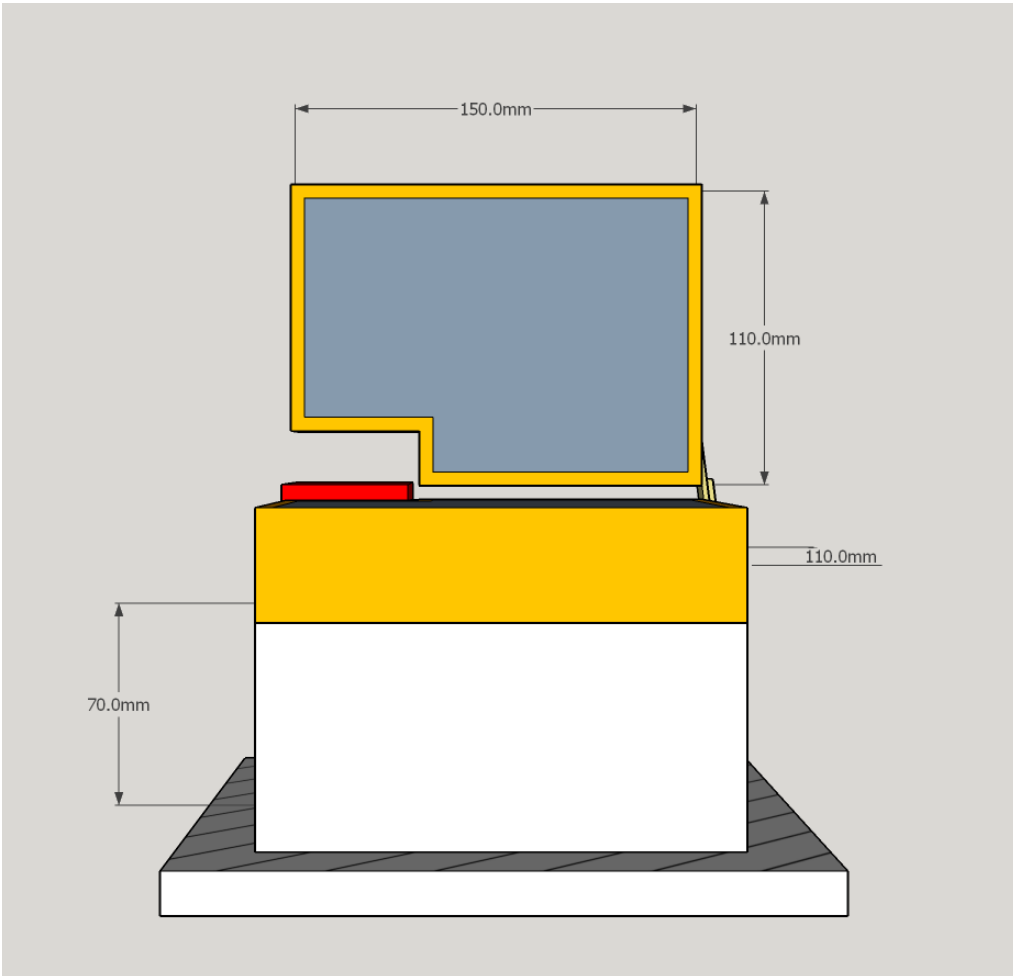
Closed electronics housing mounted to HASP plate

MADAC Payload

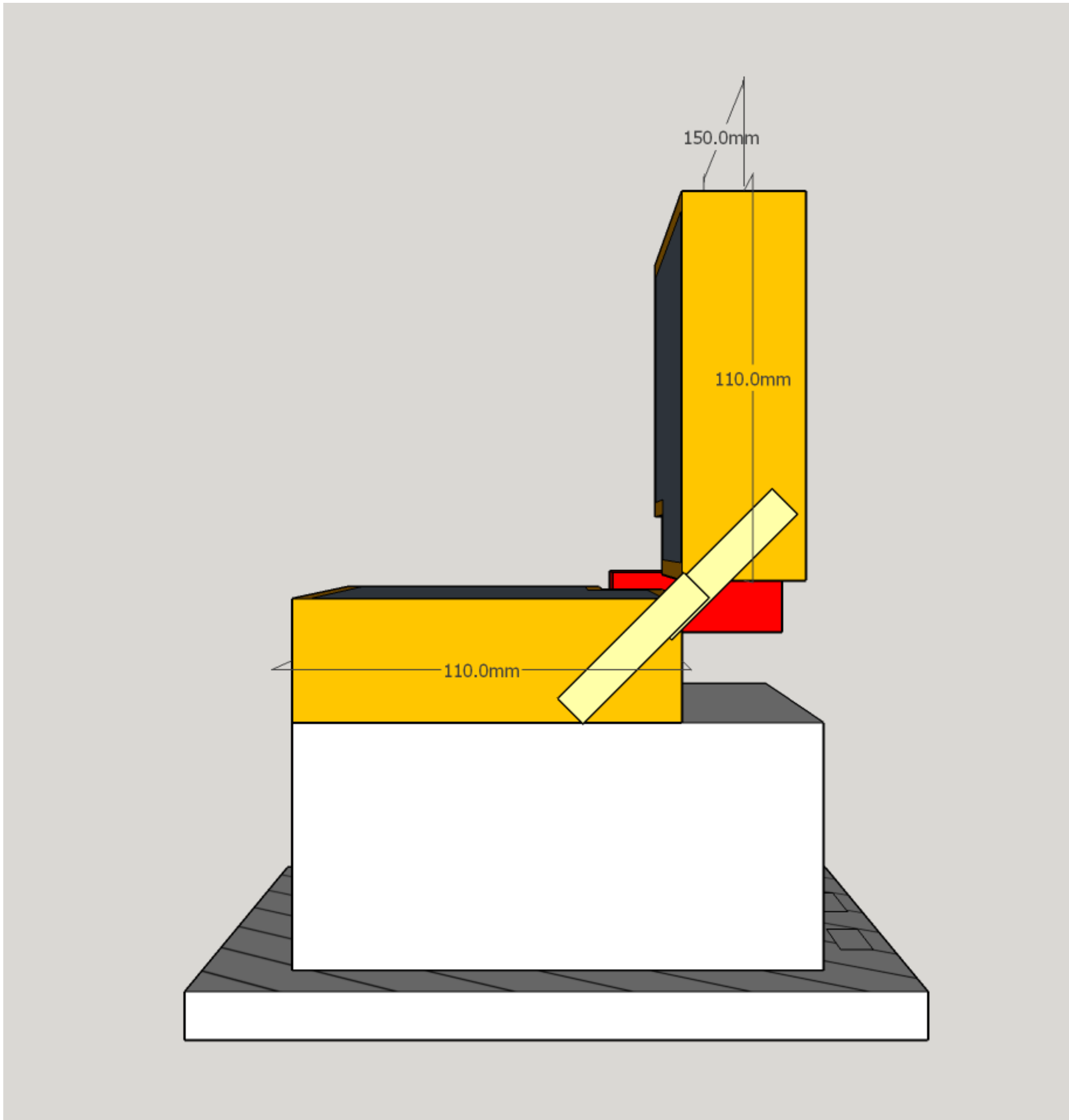


An angled view of the payload (opened)

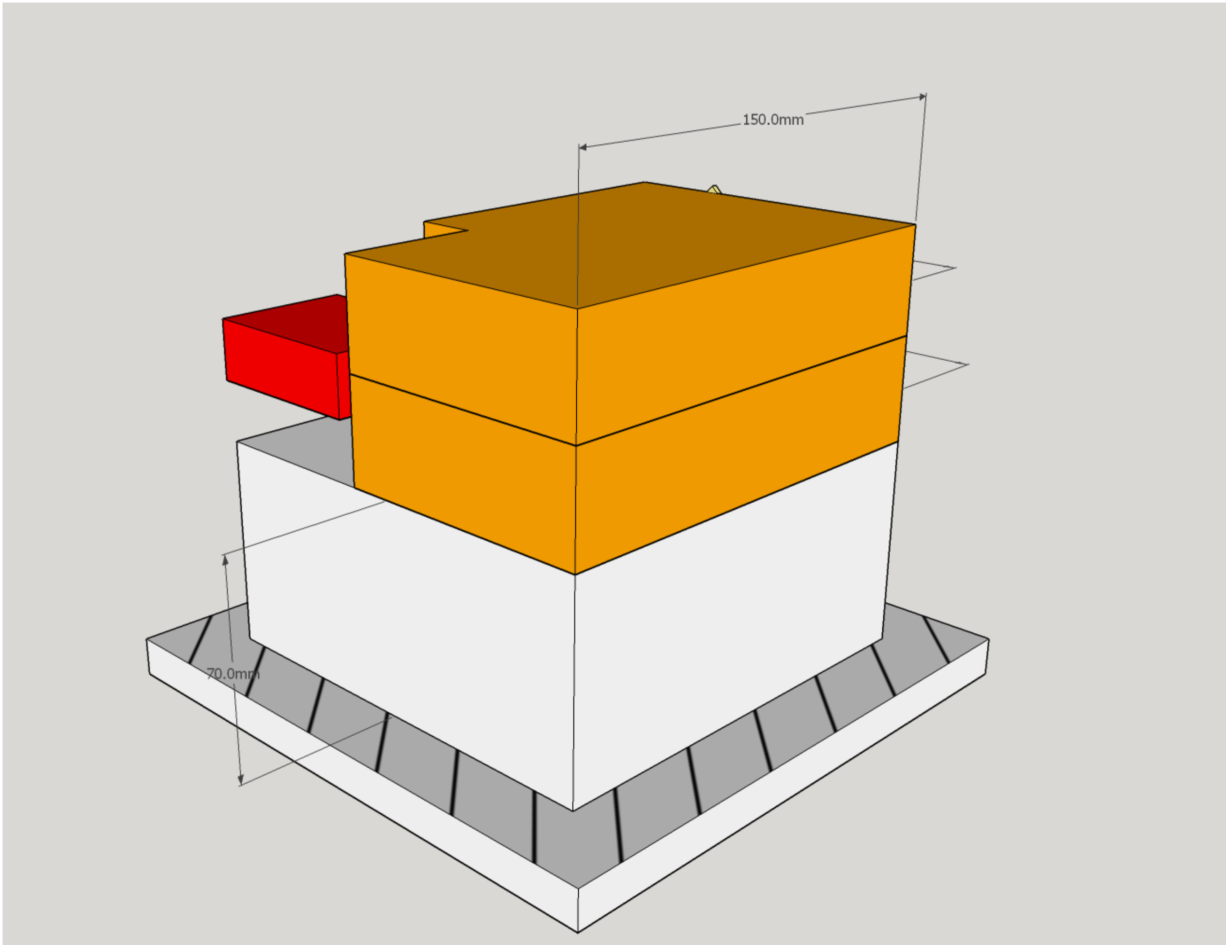
The gray area inside the box represents the Aerogel.



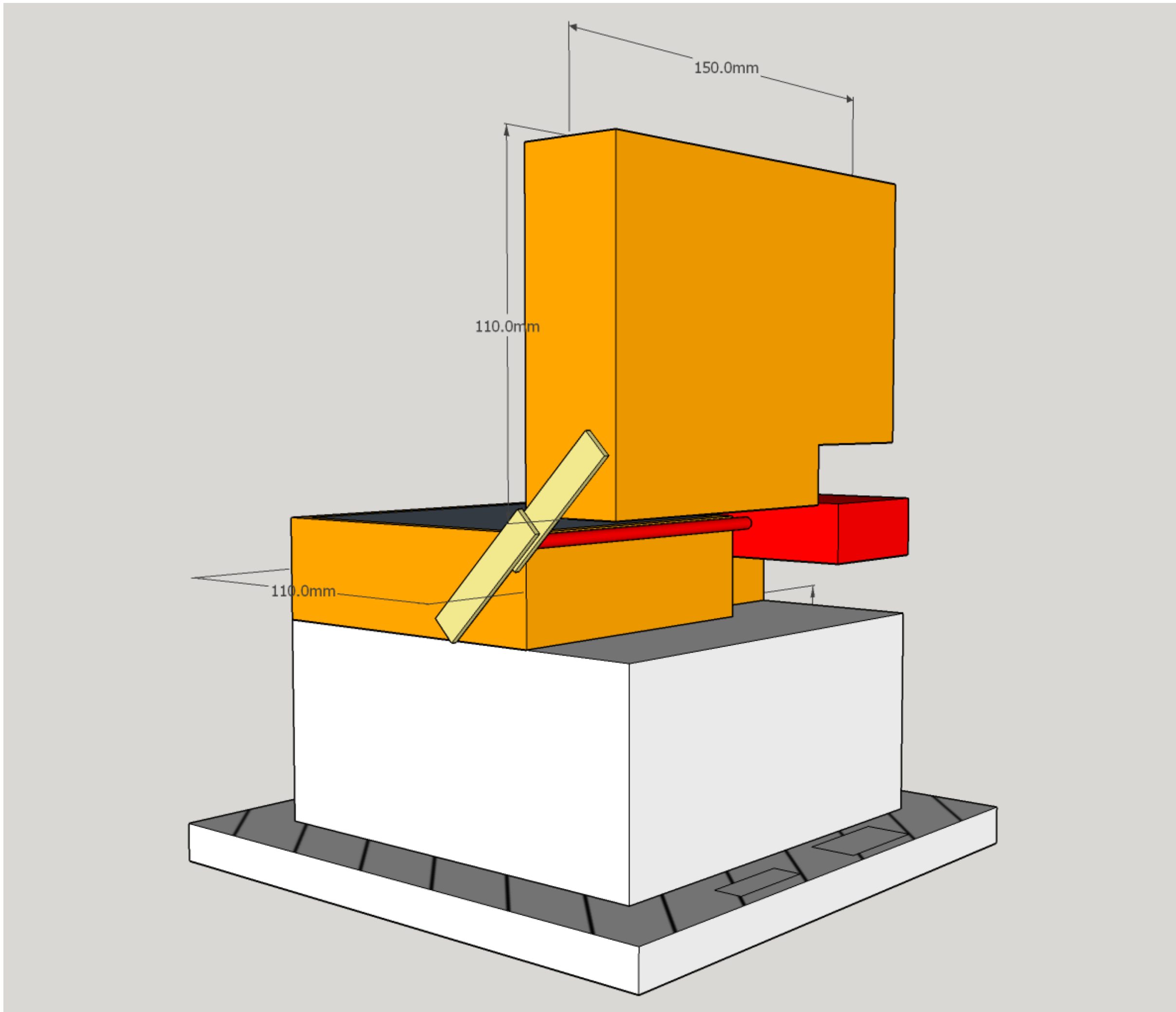
A frontal view of the payload (opened)



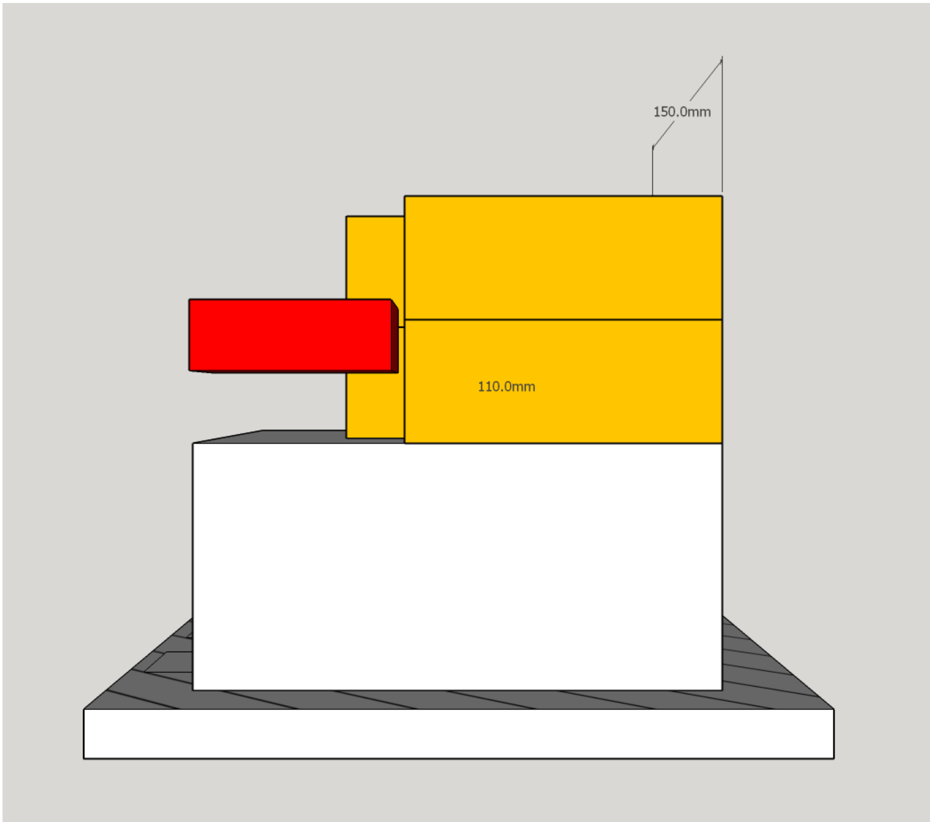
A side view of the payload (opened)



An angled view of the payload (closed)

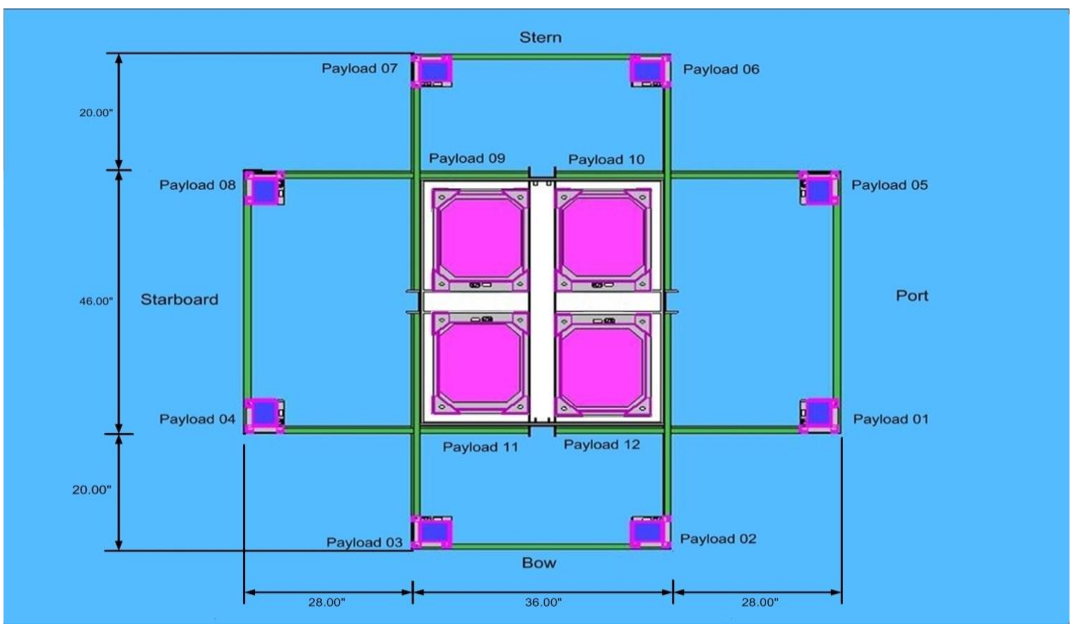


An angled back view of the payload (opened)



Side view of the payload (closed)

Payload Configuration (Payload 8)



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…)

None

D. Other relevant mechanical information

None

II. Power Specifications:

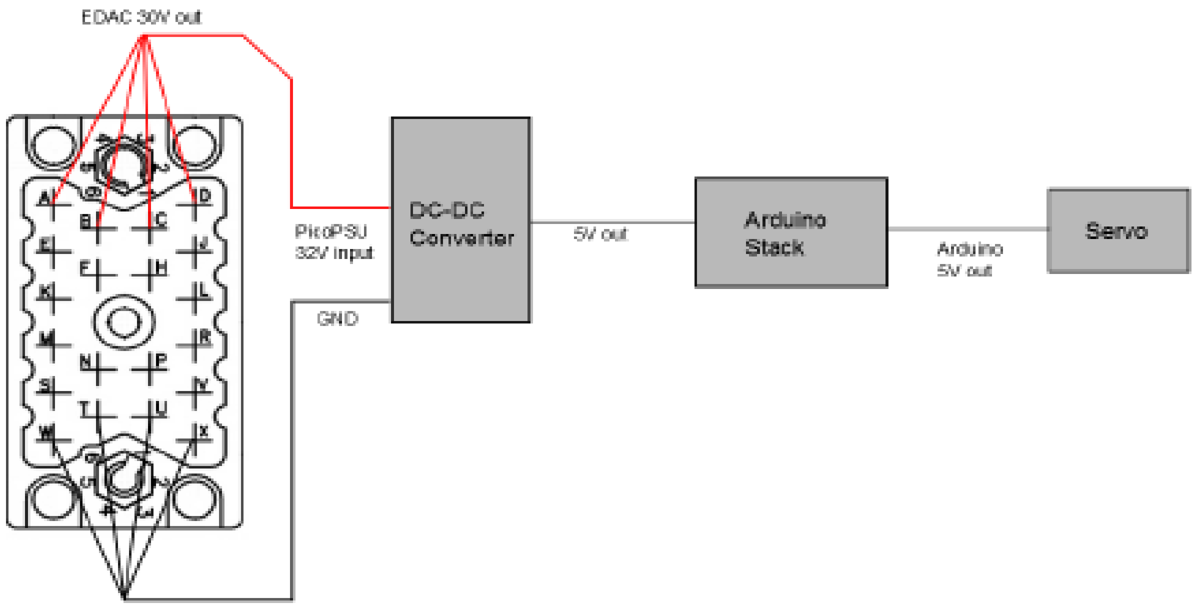
A. Measured current draw at 30 VDC

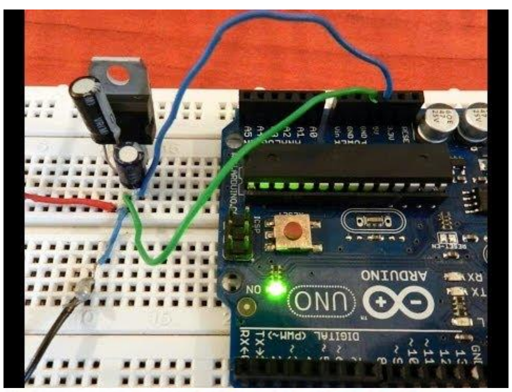
System Component	Current	
Arduino Uno	150 mA	
GPS	20 mA	
Servo	150 mA	
Temp Sensor	2.5 mA	
Data Logger	20 mA	
GPS Antenna	12.6 mA	
	355.1 mA	0.355 Amps

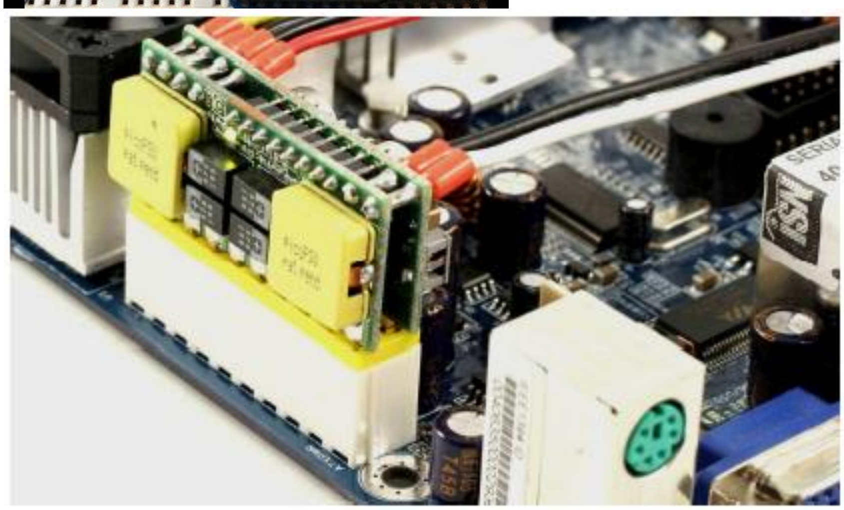
(The values in the above table are estimated via testing)

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.

MADAC Power Plan / EDAC interface


EDAC 30V out
PicoPSU
32V input
DC-DC
Converter
GND
5V out
Arduino
Stack
Arduino
5V out
Servo





The figure above shows and example of the connection providing power

PicoPSU-80-WI-32 (12-32V input DC-DC ATX power supply unit (PSU)) is used, provides 120 Watts peak of power using a single 12-32V power source.

Unnecessary wires have been removed by plugging in the picoPSU directly into the motherboard connector.

Specifications, picoPSU-80-WI-32, DC-DC ATX PSU

Power Ratings (max load, peak load)

Volts (V)	Max Load (A)	Peak Load (A)	Regulation %
5V	6A	7A	+/- 1.5%
5VSB	1.5A	2A	+/- 1.5%
3.3V	6A	7A	+/- 1.5%
-12V	0.1A	0.1A	+/- 5%
12V	4A	6A	+/- 3%
At max load, forced air ventilation is required. For fanless operation and/or V(In)>=24V de-rate the combined output of the 3.3, 5V and 12V rails by ~20-40% in order to prevent excessive temperatures. Peak load should not exceed 60 seconds. Combined output power should not exceed 80watts.			

The Arduino Uno uses the atMEGA328 microcontroller, which has an absolute maximum rating of 40 mA source or sink per GPIO.

For getting a stable 5 volts of current is in the form of regulator.

C. Other relevant power information

None

III. Downlink Telemetry Specifications:

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

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

224 bits per second (28 bytes per second)

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

7 sets of data will be downlinked during flight:

- GPS: four data sets
- Monitor the current of payload, so we can look for a peak in the current data to make sure our servomotor has opened and closed.
- The total data sets we need are temperature, humidity, current, and GPS (altitude, time, longitude, latitude).
- All of these data sets will use 4 bytes each. This adds up to a total of 28 bytes per second out of the 120 bytes per second that we are allotted.

Downlinking Table		
Serial Data	**Data Details**	**bytes/sec**
GPS-Time	will relay time from GPS	4
GPS-Altitude	will relay altitude from GPS	4
GPS- Latitude	will relay latitude from GPS	4
GPS- Longitude	will relay longitude from GPS	4
Temperature	will relay temp from DHT22 sensor	4
Humidity	will relay humdidity from DHT22 sensor	4
Current	will relay current from arduino	4
	Total bytes/sec	28

D. Number of analog channels being used:

0

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

Not being used

F. Number of discrete lines being used:

2

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

Open/Close only (in case of opening/closing of Aerogel compartment malfunction)

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

No

I. Other relevant downlink telemetry information.

None

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*)

We do not plan on uplinking any data during the flight. The reason for this is that the Arduino will be programed in advance to signal the system when the servomotor needs to be opened and closed. The downlink data will be monitored during the flight should the need for emergency uplink command is required. If a part of the payload (which we can tell) fails during the flight, an uplink command shall be send; Open (1) or Close (0). Each of these commands will take up one byte of the two bytes that are allowed.

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

In the event of an emergency, we will send the uplink command: Open (1) or Close (0).

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

No

F. Other relevant uplink commanding information.

None

V. Integration and Logistics

A. Date and Time of your arrival for integration:

July 27th 2014, Time is to be determined – arrival in Palestine TX

July 28th 2014, (morning) arrival at testing facility

B. Approximate amount of time required for integration:

Integration will take approximately one hour to complete

C. Name of the integration team leader:

Marieta S. Nedyalkova

D. Email address of the integration team leader:

etinedyalkova@gmail.com

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

Marieta S. Nedyalkova	etinedyalkova@gmail.com

F. Define a successful integration of your payload:

1.) The MADAC payload and capsule is in closed position on the HASP mounting plate and it is secured on the gondola.

2.) Once configured with HASP power all payload mechanics operate properly

a. The aerogel compartment is sealed and ready for flight

b. The servo is performing the opening and closing command for the capsule and is flight ready

c. All electronics are secured inside the foam core housing compartment and flight ready

3.) GPS, Temp/Hum sensors are providing accurate data once configured with HASP

G. List all expected integration steps:

1.) Electronics, housing and aerogel compartment are secured on HASP and flight ready

2.) Power, telemetry and all sensors (GPS, Temp/Hum) are connected and responding

3.) Aerogel compartment is checked and sealed, secured on top of electronics and flight ready

4.) The payload is fastened to the HASP mounting plate, secured and flight ready

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

1.) MADAC payload is functional (as tested) and flight ready

2.) Payload is fastened and secured onto HASP gondola

3.) Aerogel compartment is sealed, secured on payload and flight ready

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…):

None

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

None