HASP Payload Specification and Integration Plan

Payload Title: High Altitude Turbine Survey (HATS)

Payload Class: Small Large (circle one)

Payload ID: 09

Institution: Arizona State University

Contact Name: Patrick McGarey

Contact Phone: 602-300-5441

Contact E-mail: aeropat@gmail.com

Submit Date: 4/20/12

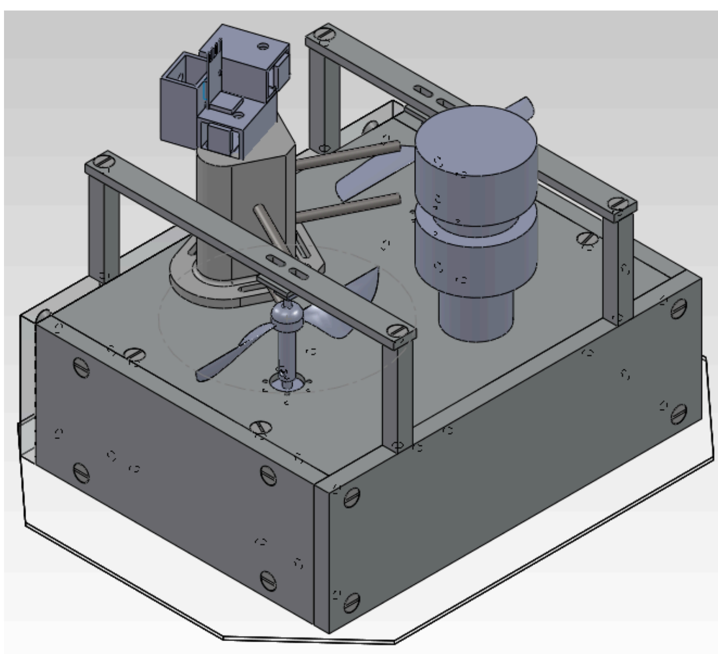
I. Mechanical Specifications:

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

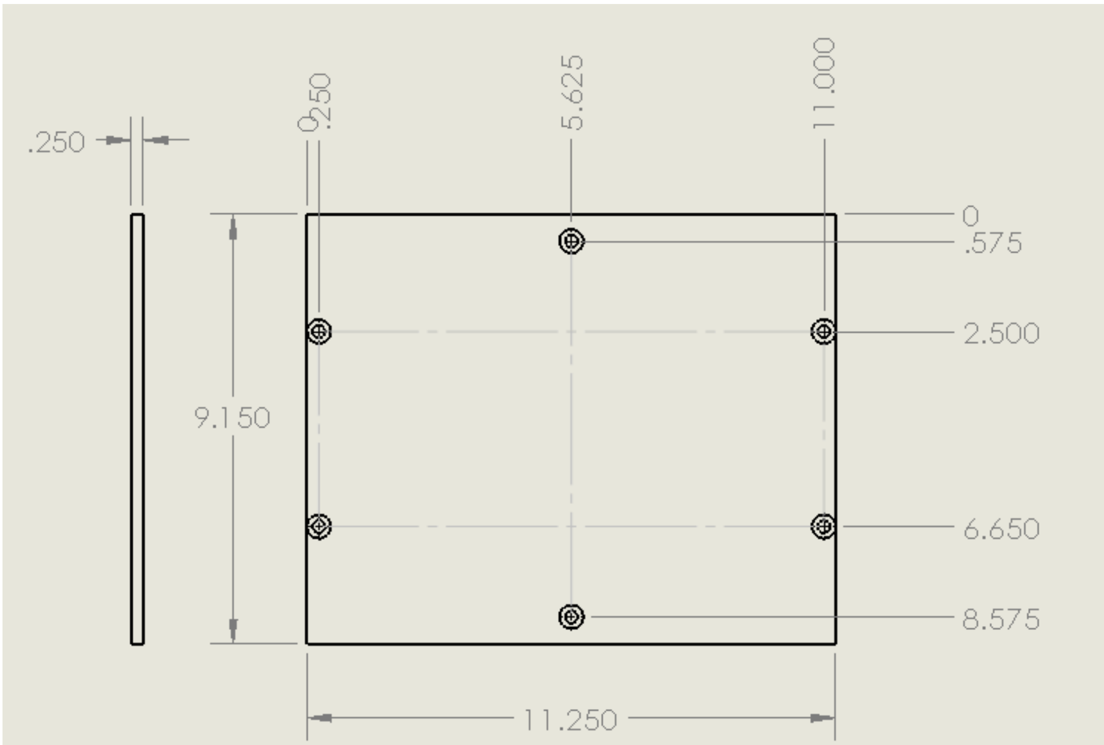
The measured weight of the payload is 8.7 kg.

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

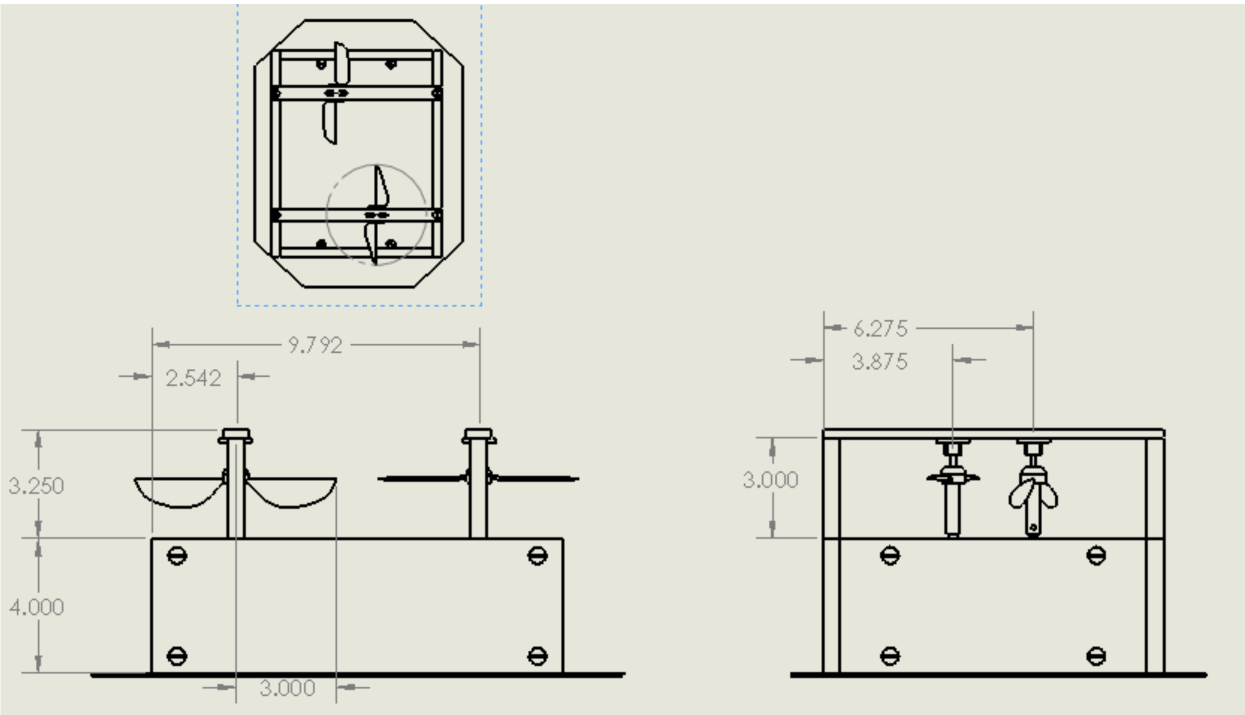
The current isometric view of the payload is as follows:



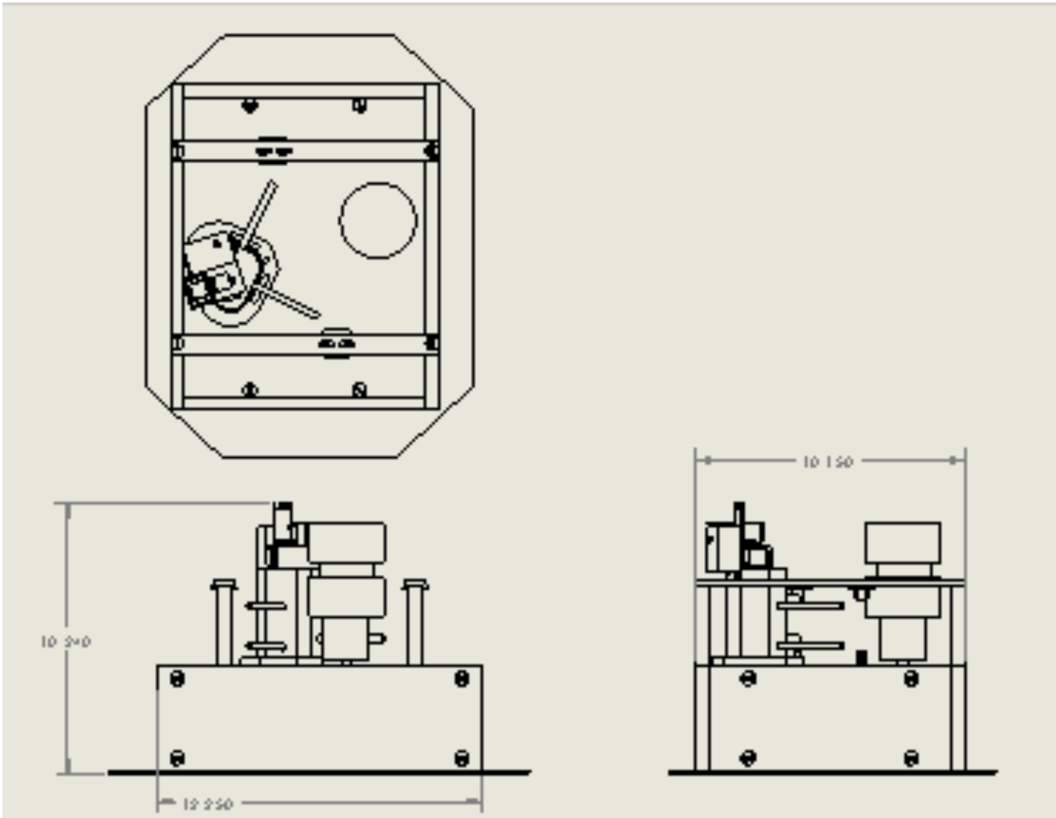
The base of the HATS system is a large aluminum box that contains all of the electronics. The bottom plate of the HATS system is made out of ¼"6061 aluminum. It will mount to the HASP integration plate via 6 1/4"-20 threaded screws as shown here:



HATS will house two propellers operating at 1140 rpm. The propeller mount is approximately 3.25" tall and mounts between the top plate and the upper bars. A strain gauge mount is also included between the upper bars and propellers to measure thrust.



The major external sensors are mounted on two elevated towers. These include the pressure sensors, wind sensors, and ultrasonic anemometer



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…)

   This payload will include two rotating propellers with blunt edges, which could pose a cutting hazard during their operation. The team will also use the TT300 Strain Gauge Adhesive by Omega. The MSDS for this high grade adhesive can be found here: http://www.omega.com/msds/msdspdf/MSDS0370.pdf

D. Other relevant mechanical information

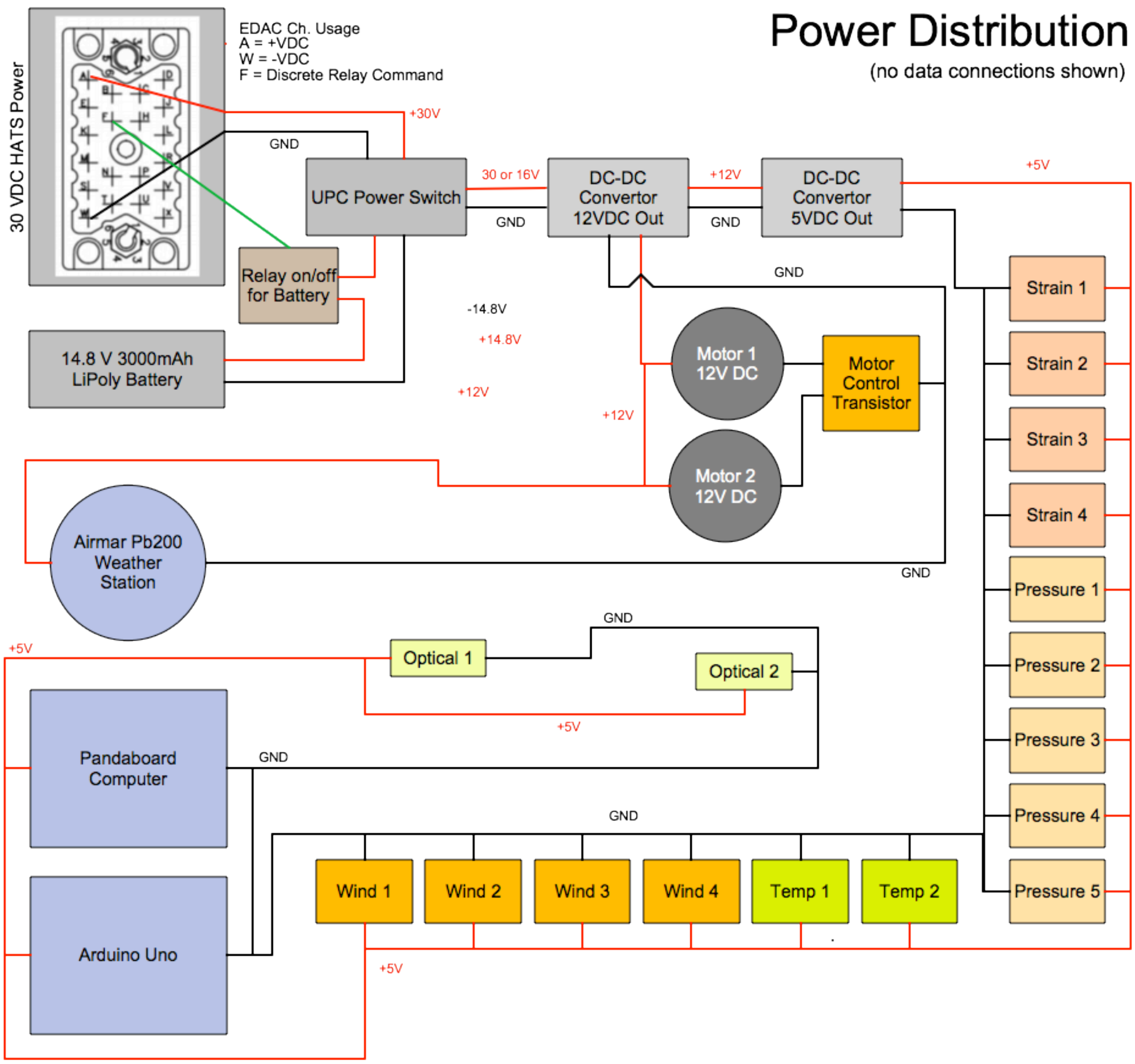
   N/A

II. Power Specifications:

A. Measured current draw at 30 VDC

The measured current draw at 30 VDC is 0.7 to 1.0 A

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.



C. Other relevant power information

N/A

III. Downlink Telemetry Specifications:

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

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

To be determined. HATS will export a text based data file.

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

Prepackaged text based file, length to be determined.

D. Number of analog channels being used:

None

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

N/A

F. Number of discrete lines being used:

1

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

HATS will require 1 discrete command in addition to the power on/off that HATS provides. This discrete command will be used to pull up/down a relay, which activates the connection of a lithium polymer battery to the power switch for operation during the descent phase when HASP power has been turned off.

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

N/A

I. Other relevant downlink telemetry information.

N/A

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*)

Motor Control – 2 commands – speed change
Battery Initiation – 2 commands – on/off
Temp Control – varies – will not be used unless internal temperature drops below -20 C
Total 4+ commands at irregular intervals

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

Command Type	System	Command
Discrete	Battery Power Relay	On/Off with pull up
Serial	Motor	Change speed function
Serial	Temp Control Heater	On/Off function

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

N/A

F. Other relevant uplink commanding information.
N/A

Integration and Logistics

G. Date and Time of your arrival for integration:

It is expected that the team will arrive at least two nights before the launch of the HASP system.

H. Approximate amount of time required for integration:

The team approximates needing three to five hours to complete full integration.

I. Name of the integration team leader:

Patrick McGarey

J. Email address of the integration team leader:

aeropat@gmail.com

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

Patrick McGarey	aeropat@gmail.com
Srikanth Saripalli	Srikanth.Saripalli@asu.edu
Scott Munchuk	scott.minchuk@asu.edu
Mike Joslin	Mike.Joslin@asu.edu
Benjamin Brugman	bbrugman@asu.edu
Stevie Dunn	Stevie.Dunn@asu.edu

L. Define a successful integration of your payload:

- HATS system is mounted to the payload plate such that it is structurally sound
- Payload plate is mounted to the HASP structure in a structurally stable manner
- Sensors and propellers are properly mounted to the HATS structure
- On-board computers are powered
- Arduino is capable of connecting with each of the sensors
- Data is being collected
- On-board computers are able to fully communicate with HASP
- Propellers are able to be operated free of obstructions
- Current draw from the motors is within maximum current limits

M. List all expected integration steps:

Step 1: Ensure proper physical mounting of sensors to HATS

Step 2: Mount HATS to HASP Plate

Step 3 Cross reference all electrical connections with the electrical schematic.

Step 4: Connect 12 V power supply to system and observe effects

Step 5: Use a DMM to measure voltage and current at each sensor

Step 6: Connect HATS to HASP Power

Step 7: Test voltage and current through system

Step 8: Confirm communication link between HATS and HASP

Step 9: Ensure data is being written properly and packetized to HASP

Step 10: Test current draw from motors

Step 11: Test charge in battery

Step 12: Test battery switch over command

Step 13: Confirm all mechanical connections

Step 14: Seal box and monitor temperature rise

Step 15: Power down and await launch

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

- All bolts and nuts are tightened as far as possible.
- The current and voltages through the system shall be nominally:

Subsystem	Current (mA)	Voltage (V)	Quantity	Power (W)
Optical Encoders	57 (nom.)	5	2	0.57
Strain Gauges	15 (nom.)	5	4	0.30
Pressure Sensors	0.006 (nom.)	5	5	0.15
Temperature Sensors	1.5 (max)	5	2	0.015
Wind Sensor	200 (max)	12	1	2.4
Chip Wind Sensor	40 (max)	5	4	0.8
Motors	800 (nom.)	12	2	19.2
**Motors at stall*	*3170 (max)*	*12*	*2*	*76.08*
Arduino(s)	25 (nom.)	7	2	0.35
Data Collection	50	3.3	2	0.33

- Successful demonstration of a command through HASP to stop a motor
- Successful demonstration of data received from HATS through HASP
- Monitoring of temperature inside closed box for 5 minute minimum
- Battery is at a charge >80%.
- Demonstration of continued operation for at least 10 minutes after HASP disconnect
- No anomalous data for the 10 minute test of structure

O. 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…):

No specific moving or lifting equipment is needed for this project. Information about hotels and accommodations in the area will be greatly appreciated.

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

No additional LSU equipment will be needed for this project at this time.