HASP Payload Specification and Integration Plan

Payload Title: SMITH LSU

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

Payload ID: 11

Institution: Louisiana State University

Contact Name: Noelle Bryan

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Contact E-mail: nbryan5@lsu.edu

Submit Date: 4/20/12

I. Mechanical Specifications:

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

The payload is estimated to be 35lbs (~15.87kg) based on the component weights and estimated housing weight. Its center of mass will be near the center of the interface plate and the height will be below 6 inches of the plate itself. These are all estimates based on mechanical drawings and will be defined further as the payload is developed.

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 payload will be mounted to the interface plate with 4 ¼" screws. Their positions are shown in Figure 1 below. The overall outline of the payload is shown as well and is completely contained in within the keep out line.

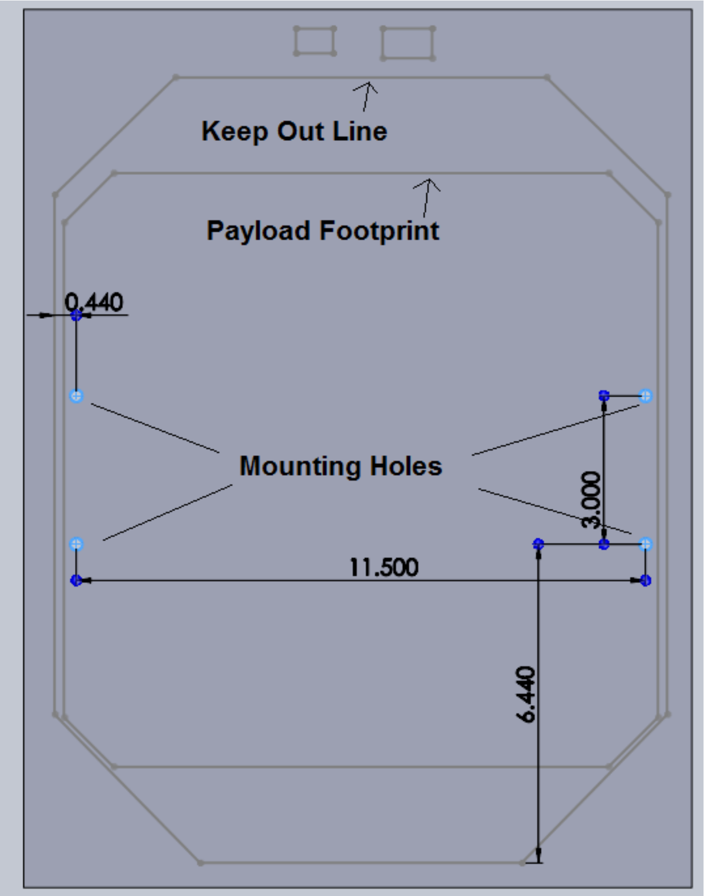

Figure 1

The payload will consist of 2 DC motors, 2 model airplane engines, 4 solenoid valves, 2 filters, and the electronics. Everything except the electronics will be mounted on the lower half of the payload and is shown in Figure 2. The side panels will detach from the frame to allow easy access to the inside when assembling and bolting to the interface plate. They are then reattached and the whole system will be fully assembled before the interface plate is attached to HASP. The frame as well as the component mounting plates will be made completely of aluminum. The electronics will be attached above the frame and contained within its own housing. This housing will be insulated aluminum to maintain the temperature of the electronics while still providing protection. The entire footprint is 12 x 12 inches and will be less than 36 inches tall.

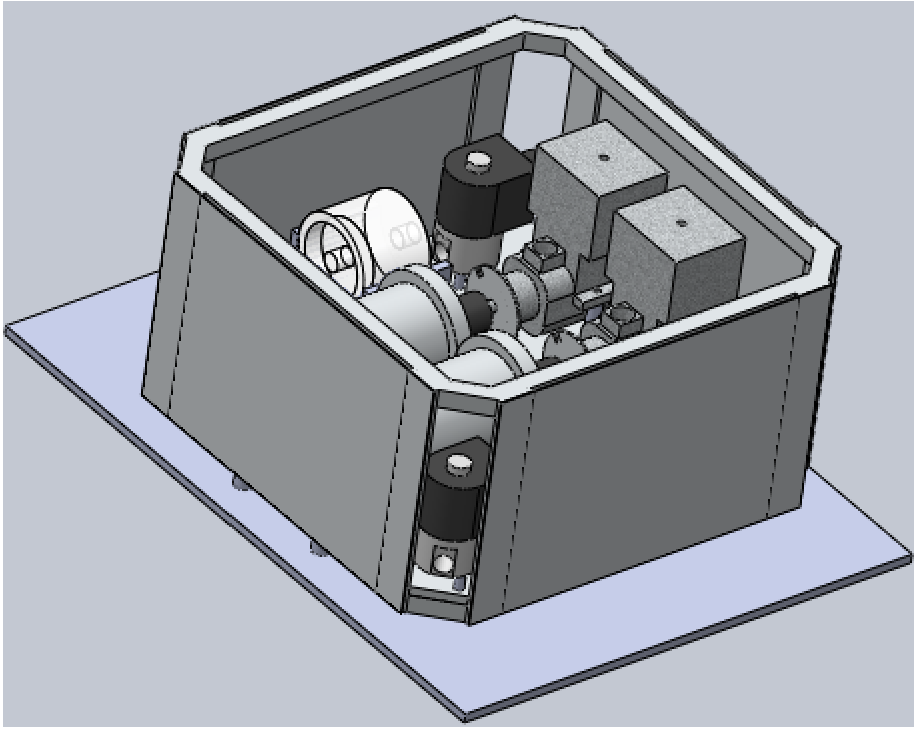

Figure 2

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…)

No Hazardous Material

D. Other relevant mechanical information

No other relevant mechanical information

II. Power Specifications:

A. Measured current draw at 30 VDC

Type of DC/DC Converter	Efficiency (%)
30 V-12 V (Converters 1)	94
30 V-12 V (Converters 2)	85
30 V-3.3V	83

Table 1: Preliminary current drawn by each component

Part Number	Voltage	Current (mA)	Duty Cycle (%)	Power (W)
30-12 V DC/DC Converter 1	30	188	100	5.64
30-12 V DC/DC Converter 2	30	1882.35	100	8.47
30-3.3 V DC/DC Converter	3.3	0.396	100	0.0048
MAX 3107 Chip 1	3.3	1.3	100	0.00429
MAX 3107 Chip 2	3.3	1.3	100	0.00429
MAX 3232	3.3	1	100	0.0033
PCA9514A	5	6	100	0.03
PCF8583	5	50	100	0.25
HOA088X	5	80	100	0.4
BalloonSat	12	55	100	0.66
DC Motor 1 OR Heater	12	4000 – max	99.9	47.95
DC Motor 2 OR Heater	12	4000 – max	.1	0.048
Intake Valve 1	12	190	100	2.5
Intake Valve 2	12	190	100	2.5
Outtake Valve 1	12	190	0.1	0.00228
Outtake Valve 2	12	190	0.1	0.00228
Temperature Sensor 1	12	1	100	0.012
Temperature Sensor 2	12	1	100	0.012
Temperature Sensor 3	12	1	100	0.012
Temperature Sensor 4	12	1	100	0.012
Pressure Sensor 1	12	1.5	100	0.018
Pressure Sensor 2	12	1.5	100	0.018
Total				**68.55**

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.

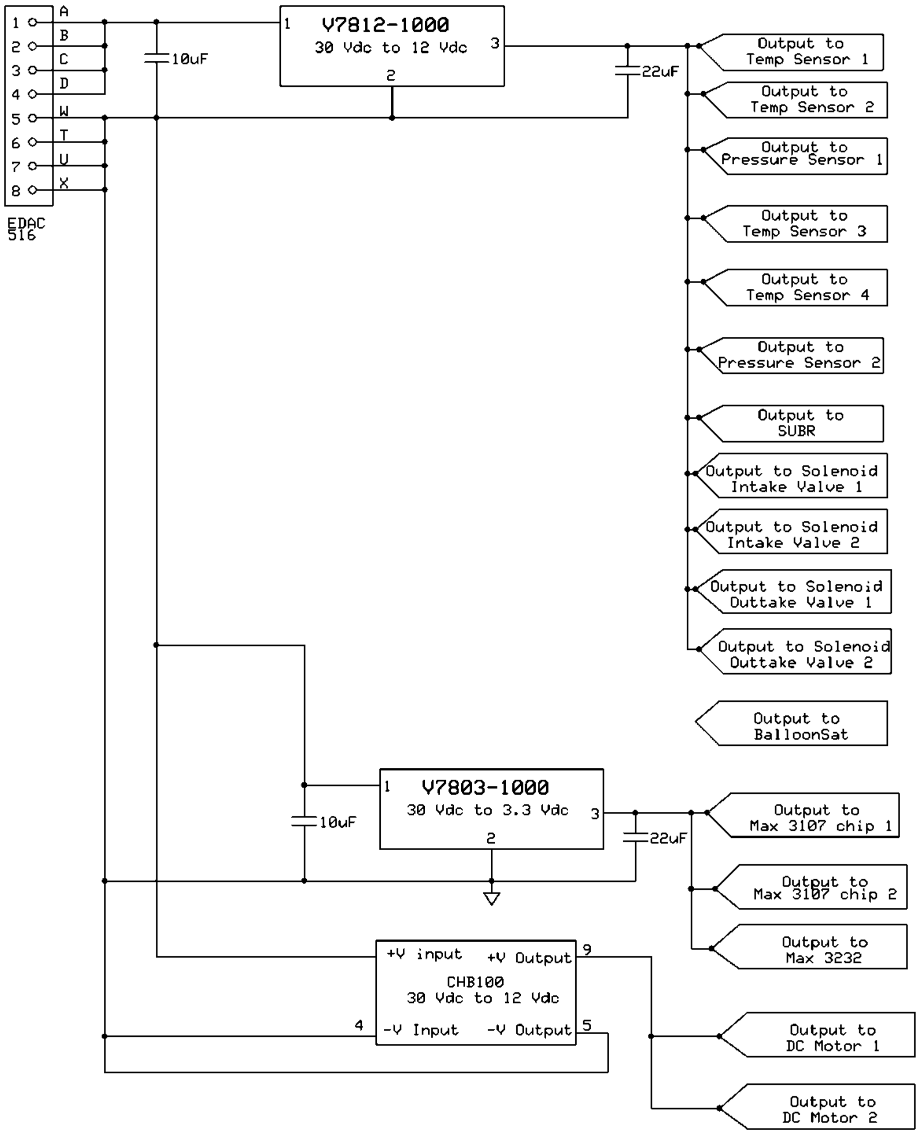

Figure 3

Function	EDAC Pins	Wire Color	Connector Pins
+30 V_{DC}	A, B, C, D	White with Red Stripe	1, 2, 3, 4
Power Ground	W, T, U, X	White with Black Stripe	5, 6, 7, 8

C. Other relevant power information

No other relevant power information

III. Downlink Telemetry Specifications:

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

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

20 bps

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

Table 2: Record Format for Every 10 seconds

Record Format	**Size (Bytes)**
Label	1
Real Time Clock – Day	1
Real Time Clock – hour	1
Real Time Clock – Minute	1
Real Time Clock – Second	1
Sample pump temp sensor	1
Sample motor temp sensor	1
Sample pressure sensor	1
Sample flow sensor	1
Sample RPM counter HIGH byte	1
Sample RPM counter LOW byte	1
Sample State: • Flow • Pump	½ byte
Control pump temp sensor	1
Control motor temp sensor	1
Control pressure sensor	1
Control flow sensor	1
Control RPM counter HIGH byte	1
Control RPM counter LOW byte	1
Control State: • Flow • Pump	½ byte
Total:	**18**

Table 3: Record Format for every 1 minute

Record Format	**Size (Bytes)**
Label	1
Real Time Clock – Day	1
Real Time Clock – hour	1
Real Time Clock – Minute	1
Real Time Clock – Second	1
UV Sensor 1	1
UV Sensor 2	1
UV Sensor 3	1
Ambient Temperature	1
Ambient Pressure	1
Ambient Humidity	1
Total:	**11**

D. Number of analog channels being used: none

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

F. Number of discrete lines being used: 4

G. If discrete lines are being used what are they being used for? Turning on/off heating system for sampling pump, turning on/off DC motors

H. Are there any on-board transmitters? If so, list the frequencies being used and the transmitted power. none

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*)

Two commands are required to be uplinked during flight, but heaters may be required to turn on (only when DC motor is off for power purposes) as well as commands to change the voltage provided to the DC motor. These are expected at a rate of roughly 1 command per hour.

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

Table 4: Up-link Commands

List of commands for sampling chamber:
1. Open Intake Valve 2. Close Intake Valve 3. Open Exhaust Valve 4. Close Exhaust Valve 5. Turn on pump 6. Turn off pump 7. Turn on heaters 8. Turn off heaters 9. Begin sampling 10. Stop sampling
List of commands for control chamber:
1. Open Intake Valve 2. Close Intake Valve 3. Open Exhaust Valve 4. Close Exhaust Valve 5. Turn on pump 6. Turn off pump 7. Turn on heaters 8. Turn off heaters 9. Begin sampling 10. Stop sampling

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

None will be used.

F. Other relevant uplink commanding information.

V. Integration and Logistics

A. Date and Time of your arrival for integration: TBD

B. Approximate amount of time required for integration: TBD

C. Name of the integration team leader: N. Bryan

D. Email address of the integration team leader: nbryan5@lsu.edu

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

Noelle Bryan, nbryan5@lsu.edu

Scott Burke, scottgnd@gmail.com

F. Define a successful integration of your payload:

Payload is bolted down on the HASP plate

Payload is receiving power from HASP EDAC connecter

Payload is receiving commands from team member

Payload is streaming data to team member

G. List all expected integration steps:

1. Attach sample chamber to main payload
2. Power verification
3. Communication verification
4. Begin sampling procedures
5. Turn on pump
6. Verify pump functioning at various pressures and temperatures
7. Turn off pump
8. Close valves in proper order
9. Remove sample chamber
10. Verify sample chamber remains sealed
11. Power down

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

Payload is bolted down on the HASP plate

Payload is receiving power from HASP EDAC connecter

Payload is receiving commands from team member

Payload is streaming data to team member

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…):

Holiday Inn Express Palestine, TX

2 rooms

J. List any LSU supplied equipment that may be needed for a successful integration: none