**Payload Title:** Sampling Microbes In The High atmosphere (SMITH)

**Payload Class:** Small Large (circle one)

**Payload ID:** P11

**Institution:** Louisiana State University A&M

**Contact Name:** Noelle Bryan

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**Submit Date:** April 29, 2011

1. **Mechanical Specifications:**
	1. Measured weight of the payload (not including payload plate)

The payload is estimated to be 30lbs (~13.6Kg) 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.

* 1. 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

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 itself as well as the component mounting plates will be made completely of aluminum. The electronics will be attached above the frame shown in Figure 3 and will be contained within their own housing. This housing will be aluminum that is insulated on the inside to maintain the temperature of the electronics while still providing protection. The entire footprint is 12 x 12 inches and will be less than 12 inches tall.



Figure

* 1. 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

* 1. Other relevant mechanical information

No other relevant mechanical information

1. **Power Specifications:**
	1. Calculated current draw by each component

|  |  |
| --- | --- |
| **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 : 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 | 12 | 4000 | 99.9 | 47.95 |
| DC Motor 2 | 12 | 4000 | .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  |

* 1. HASP is providing power to SMITH. Figure 1 provide a power system wiring diagram starting from pins on the payload interface plate EDAC 516 connector through your power conversion to the voltages required by the subsystems.



Figure : Power Subsystem

Table : EDAC Pin Assignment

|  |  |  |  |
| --- | --- | --- | --- |
| Function | EDAC Pins | Wire Color | Connector Pins |
| +30 VDC | 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 |

* 1. Other relevant power information

No other relevant information

1. **Downlink Telemetry Specifications:**

**I.       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 3: 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 intake sensor | 1 |
| Sample exhaust sensor | 1 |
| Sample RPM counter HIGH byte | 1 |
| Sample RPM counter LOW byte | 1 |
| Sample State:* Intake valve
* Exhaust valve
* pump
 | ½ byte |
| Control pump temp sensor | 1 |
| Control motor temp sensor | 1 |
| Control pressure sensor | 1 |
| Control intake sensor | 1 |
| Control exhaust sensor | 1 |
| Control RPM counter HIGH byte | 1 |
| Control RPM counter LOW byte | 1 |
| Control State:* Intake valve
* Exhaust valve
* pump
 | ½ byte |
| **Total:** | **20** |

Table 4: 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 |
| Environmental temp sensor | 1 |
| Environmental pressure sensor | 1 |
| Environmental humidity sensor | 1 |
| **Total:** | **8** |

D.    Number of analog channels being used:

None will be used.

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

None will be used.

F.      Number of discrete lines being used:

None will be used.

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

None will be used.

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

None will be used.

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 expected to be uplinked during the flight. However, we have the options to uplink more for manual controls.

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

Table 5: 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. Begin sampling
8. 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. Begin sampling
8. 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.

1. **Integration and Logistics**
	1. Date and Time of your arrival for integration:

The integration team will arrive on the afternoon of Sunday July 31, 2011.

* 1. Approximate amount of time required for integration:

To Be Decided

* 1. Name of the integration team leader:

Noelle Bryan

* 1. Email address of the integration team leader:

nbryan5@tigers.lsu.edu

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

Noelle Bryan

Allen Bordelon

* 1. 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 sending and receiving commands from the ground command.

Sample chamber is connected to the main payload and remains sealed until commanded to begin sampling.

* 1. 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