HASP Payload Specification and Integration Plan

Payload Title: Measurement of the ozone profile in the stratosphere using nanocrystalline and nanocomposite sensor arrays on a high altitude balloon platform.

Payload Class: Small

Payload ID: 7

Institution: University of North Dakota and University of North Florida

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Submit Date: June 22, 2012

I. Mechanical Specifications:

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

#	Item	Mass (Grams)	Uncertainty (Grams)	Dimension (mm)	Uncertainty (mm)
1	Metal Box for sensors	112.0	2.0	127.0x56.0x 56.0	0.1x0.1x0.1
2	Sensor Circuit board	15.0	0.2	130.0x 42.0x2.00	
3	24 Sensors array	5.0	0.2	75 x 25 x1	
4	6 binder clips	8.4	0.5		
5	Fan with wires	12.0	1.0		
6	25 pin cable	35.0	2.0		
7	heater with wire	1.6	0.1		
8	Temperature sensor	3.0	0.1		
11	Screws and nuts	10.0	1.0		
12	LEDs	5.0	0.1		
13	extra washers and Hot glue	10.0	1.0		
Total mass of sensors box(#1 to13)		215.0	7.9		
Payload Body		1595.0	10.0	296x 141x141	2x1x1
Thermal blanket		18.0	1.0		
Base Mounting Plate & Cables		560.0	1.0		
Circuit board with components		185.0	5.0	146.1x101.6x15.0	
Total mass of the payload including mounting plate		2790.0	25.0		

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

The 2008 payload body was built using foam. There was an issue to open the payload for testing once it was closed. The 2009 and 2010 payload bodies were built using PVC sheet and aluminum frame (Fig.1). It was easy for us to open and close the payload during testing and integration of payload. The 2009 and 2010 payload bodies were mechanically stable and thermally insulated compared to the 2008 payload. The 2012 payload body is similar to the 2010 payload body.

Fig 1.

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…)

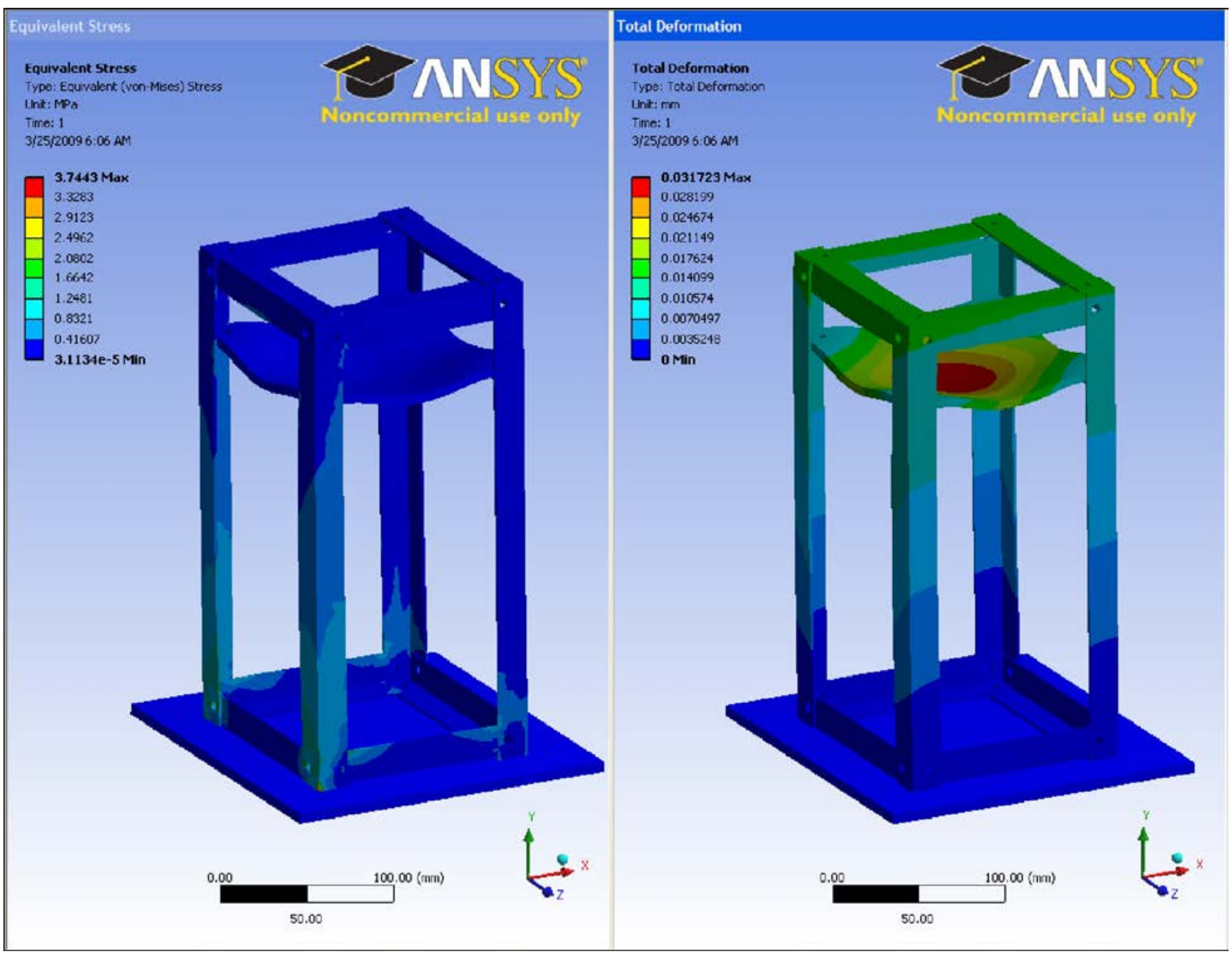
   NA

D. Other relevant mechanical information

   The payload structure comprises of Al 6061 angel frames and PVC walls 1/8” thick. The PVC plates are attached to the Al 6061 framework by M6 bolt, washer and nut assemblies. The footprint of the payload is limited to less than 30 cm in height (~29cm), and is ~15cm x 15cm. The complete payload assembly will be mounted on the HASP mounting plate with 4 M6 bolt, washer, and nut assemblies.

   The complete payload assembly will be wrapped up with multiple layers of Mylar (space) blanket for insulation. The insulation will have reflective silver surface facing inside to assure maximum thermal insulation.

   Please refer the attached stress analysis images of deformation and stress gradient satisfying 10 g vertical and 5 g horizontal accelerations.



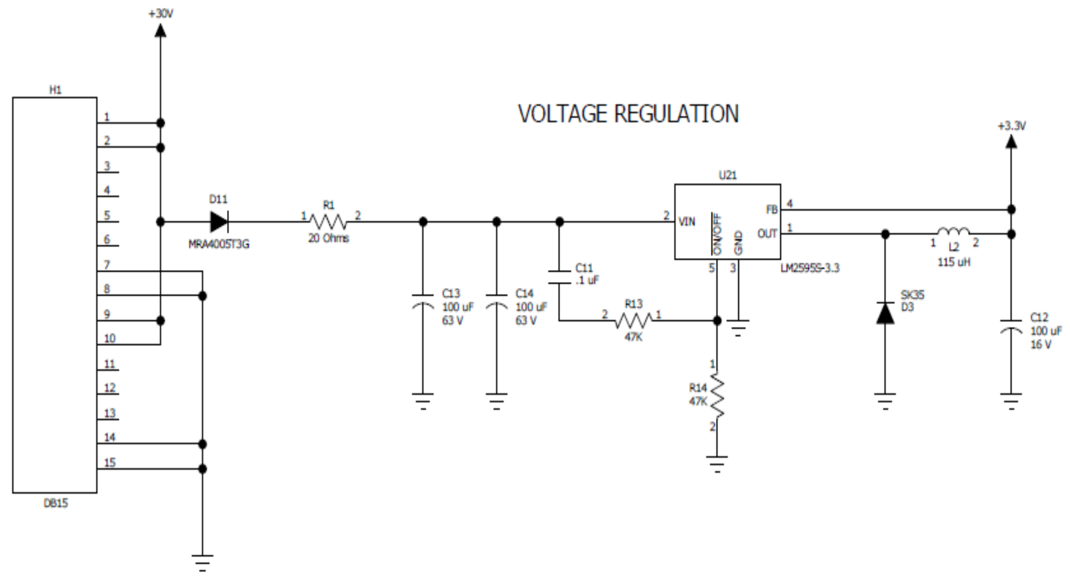
II. Power Specifications:

A. Measured current draw at 30 VDC

0.5 A (measured system max)

0.1 A (heater off, and other systems functioning)

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

None

III. Downlink Telemetry Specifications:

A. Serial data downlink format:

Packetized

B. Approximate serial downlink rate

120 bps

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

9 bytes for data packet synchronization
4 bytes for UTC time (unsigned long integer format, fraction seconds truncated)
4 bytes for MLS altitude (unsigned long integer format, meters)
24x2 bytes for filtered ozone date (unsigned integer format indicating ozone ppm)

2 bytes for atmospheric pressure in milli-bar
4 bytes for system temperatures in degrees C
1 byte for system status
1 byte for system current draw

D. Number of analog channels being used:

0

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

NA

F. Number of discrete lines being used:

0

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

NA

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.

NA

IV. Uplink Commanding Specifications:

A. Command uplink capability required:

Yes

B. If so, will commands be uplinked in regular intervals:

No

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*)

1-2 commands per hour maximum

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

Byte	Hex Value	Description
1	0x01	SOH
2	0x02	STX
3	0x71	Checksum for 0x31
	0x72	Checksum for 0x32
	0x73	Checksum for 0x33
	0x74	Checksum for 0x34

	0x75	Checksum for 0x35
	0x76	Checksum for 0x36
	0x77	Checksum for 0x37
4	0x31	System Reset
	0x32	Erase Flash
	0x33	Upload Data
	0x34	Stream Sensor Readings
	0x35	Heater on
	0x36	Heater off
	0x37	Logging on
	0x38	Logging off
	0x39	Stream UBLOX
	0x3A	Stream HASP GPS
5	0x03	ETX
6	0x0D	CR
7	0x0A	LF

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

NO

F. Other relevant uplink commanding information.

None

G. Request: Team is requesting the HASP to provide the GPS strings from eh gondola every 1 second

V. Integration and Logistics

A. Date and Time of your arrival for integration:

July 30, 2012, 10:00 am

B. Approximate amount of time required for integration:

6 Hours

C. Name of the integration team leader:

Marissa Saad

D. Email address of the integration team leader:

mrzhasaad@gmail.com

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

Marissa Saad - mrzhasaad@gmail.com

Jonathan Snarr – jonathan.snarr@und.edu

Nirmalkumar Patel – npatel@unf.edu

F. Define a successful integration of your payload:

Payload successfully mounts to platform, both mechanically and electronically. Payload successfully performs a sensor/communication check, and systems health checks to ensure proper data/headers formatting. After an initial test sequences a steady 1 Hz flashing STATUS LED indicates a sound system. After initial system testing is complete the system will successfully packet and send data to HASP computer and ground station computer will decipher and provides data plots of ozone concentration in real-time during final preflight testing (thermal vacuum testing).

G. List all expected integration steps:

1. Successfully interface the payload to platform.
   a. Mount to platform
   b. Interface with power system and communication bus

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

a) Perform communication and data checks.

b) Successfully execute command set.

c) Monitor system to ensure proper operation via real time data stream of sensor readings, pressure, and ambient temperature.

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…):

NA

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

Team will carry all required equipment and tools. We may need standard set of wrenches, soldering station, oscilloscope, and heat gun.