HASP Payload Specification and Integration Plan

Payload Title: *Hatchling II*

Payload Class: (Small) Large (circle one)

Payload ID: 01

Institution: **Embry-Riddle Aeronautical University**

Contact Name: Zach Henney

Contact Phone: (707) 570-6111

Contact E-mail: henneyz@my.erau.edu

Submit Date: 4/19/2013

I. Mechanical Specifications:

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

Component	Part Name	Mass (g)
Phoenix	Dust Sensor	30
	CO2 Sensor	15
	CO Sensor	13
	GPS Antenna	18
	GPS Logger	9
	Ext Temp/Hum	0.1
	Int. Temp	0.1
	Ext Pressure	0.09
	Structure	245
	Thermal Mgmt.	250
	Uncertainty	200
Phoenix Total		780.29
EagleSat	Comms	100
	Crystal Radio	95
	Solar	185
	Structure	250
	EPS	50
	Thermal	200
	Uncertainty	200
EagleSat Total		1080
Hatchling II	Total	1860

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

See the Appendix following this document for complete drawings of *Hatchling II*, as well as drawings of the *Phoenix* and *EagleSat* modules.

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…)

There will be no hazardous materials in the payload.

D. Other relevant mechanical information

No other information at this time.

II. Power Specifications:

A. Measured current draw at 30 VDC

Component	Part Name	Current Draw (mA)
Phoenix	Arduino	25
	Gas Sensors	20
	Optical Dust	11
	Humidity	1
	Pressure	1
	Temp	1
EagleSat	Comms	10
	EPS	50
	Integration Board	10
	Payload B	25
Total		154

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.

See the Appendix following this document for the *Hatching II* wiring diagram.

C. Other relevant power information

No other information at this time.

III. Downlink Telemetry Specifications:

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

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

0.133 bps, or 480 bits per hour. We do not expect to see large amounts of data downlinked.

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

Data will be downlinked in the following format:

Byte #	Bits	Description
1	0-7	Last command received
5-Feb	0-31	Timestamp (seconds since January 1, 1970)
6	0-7	length of reply string
7-n		Reply string

D. Number of analog channels being used:

None are planned to be used at this time.

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

Not in use at this time.

F. Number of discrete lines being used:

None in use at this time.

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

Not in use at this time.

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

The *EagleSat* communications system will be downlinking on 436.5 MHz with 500 mW of power.

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*)

During normal operations, we will be uplinking at most 2 commands per hour.

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

See the Appendix following this document.

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

The communications system will be receiving on 436.5 MHz, and the crystal radio will be receiving on 221.1 MHz.

F. Other relevant uplink commanding information.

V. Integration and Logistics

A. Date and Time of your arrival for integration:

It is anticipated that our team will arrive on the afternoon of July 28, 2013.

B. Approximate amount of time required for integration:

At most it is estimated that we will require three hours to complete integration. Realistically, we estimate it will take an hour to an hour and a half.

C. Name of the integration team leader:

Zach Henney

D. Email address of the integration team leader:

henneyz@my.erau.edu

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

Zach Henney henneyz@my.erau.edu

Jack Crabtree crabtrej@erau.edu

Kevin Jordan kevin.buffalo@gmail.com

F. Define a successful integration of your payload:

A successful integration would see the *Hatchling II* payload conform to all HASP requirements, operate exactly as designed, and successfully integrate with the HASP communications system.

G. List all expected integration steps:

1. Mount *Hatchling II* to HASP.
2. Connect to HASP power and data via the EDAC connector.
3. Check to ensure power system is working as designed, and providing proper power to each part of the payload.
4. Check to ensure proper communication between *Hatchling II* and HASP

5. Ensure that the *Hatchling II* communications system does not interfere with the CSBF radio communications system.
6. Begin a "day in the life" test – have *Phoenix* begin sampling the atmosphere as it would during flight operations, and have *EagleSat* verify the operations of its solar panels, EPS, crystal radio, and communications system.
7. If any errors occurred, address them and retest if necessary.

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

1. *Phoenix* data has been logged and appears to be within the normal range for the atmosphere being sampled.
2. *EagleSat* can communicate via HASP communications and its own internal communications system, while the EPS can properly integrate with HASP power.
3. *EagleSat*'s communications system does not interfere with CSBF's, and can allow us to uplink commands independent of those uplinked through HASP.

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…):

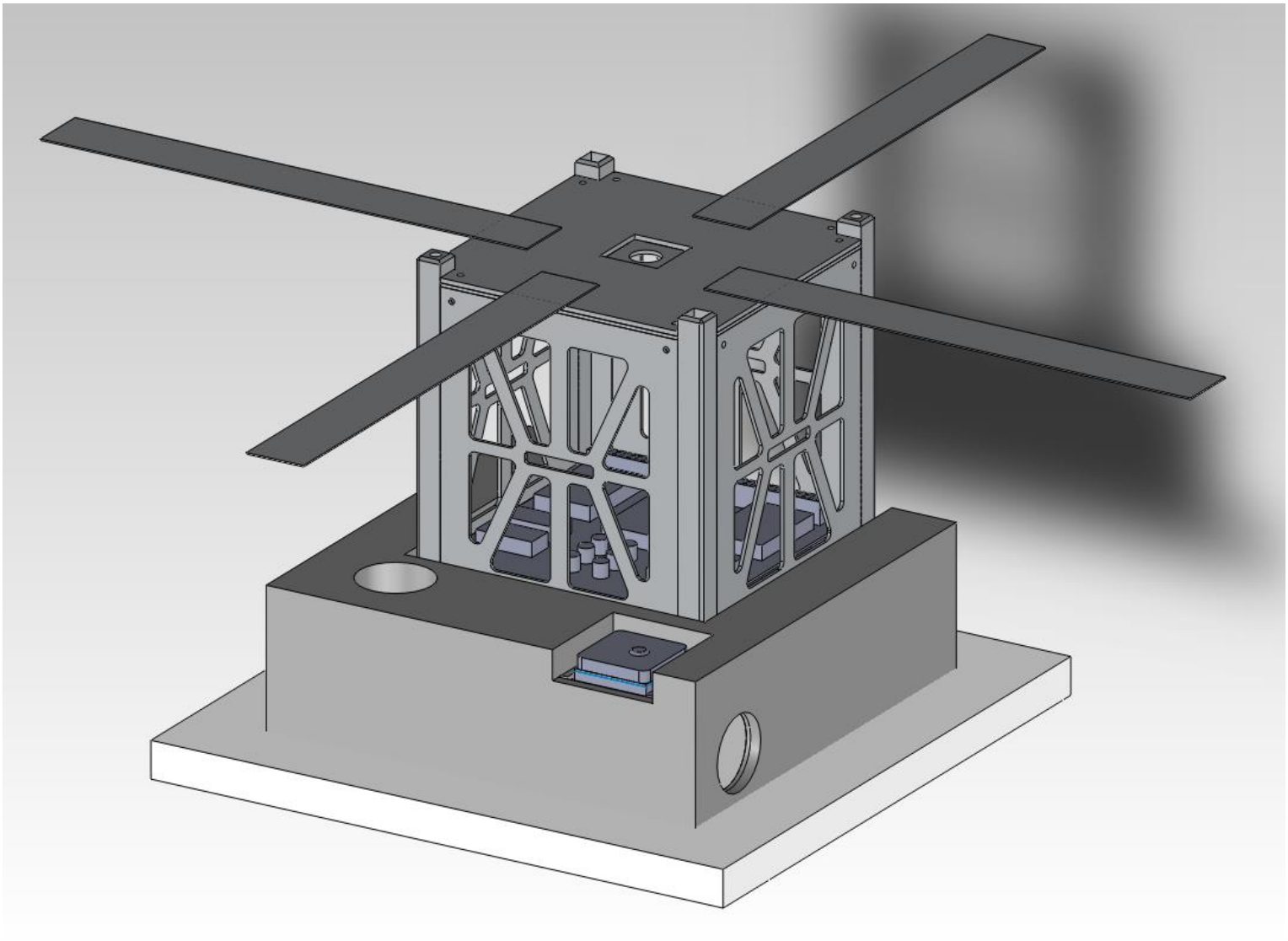
None at this time.

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

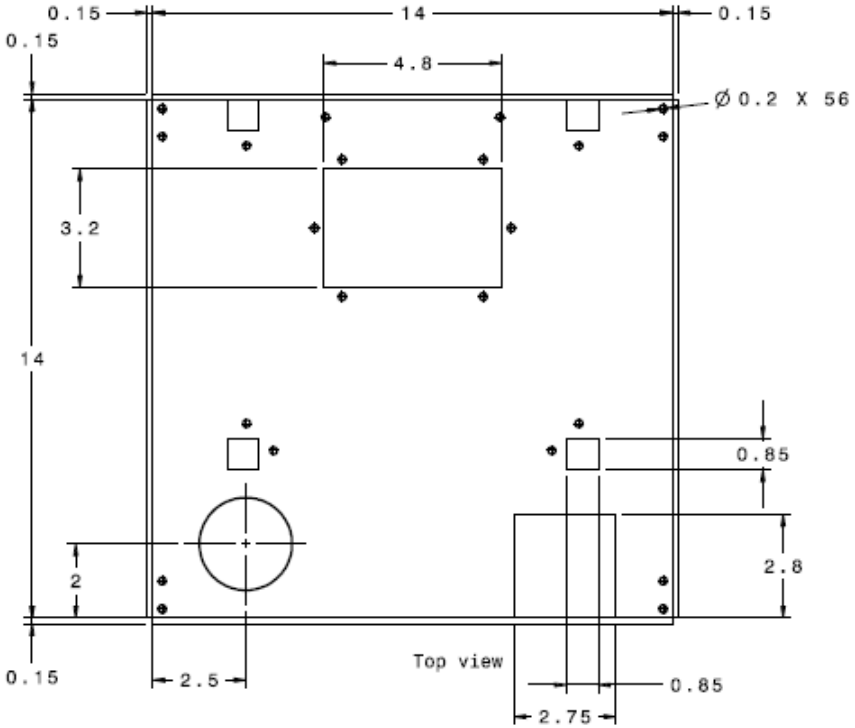
It may be necessary to use LSU supplied oscilloscopes and soldering equipment if problems arise during integration.

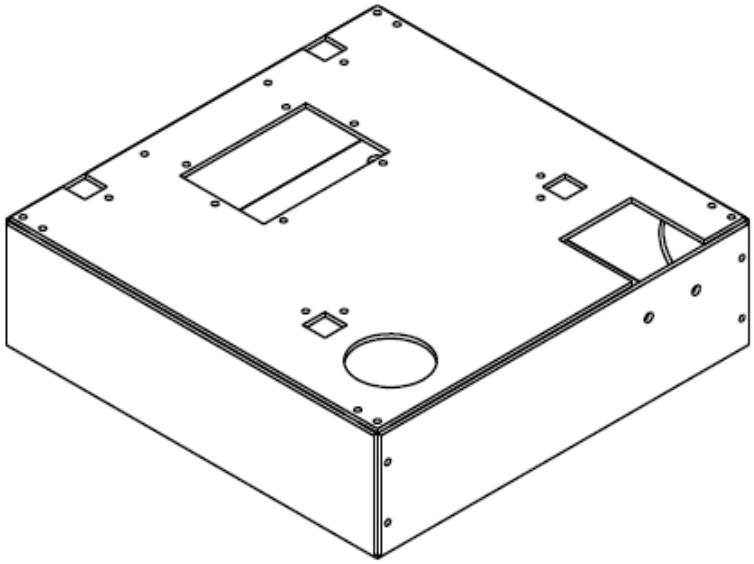
APPENDIX

PAYLOAD DESIGN DRAWINGS

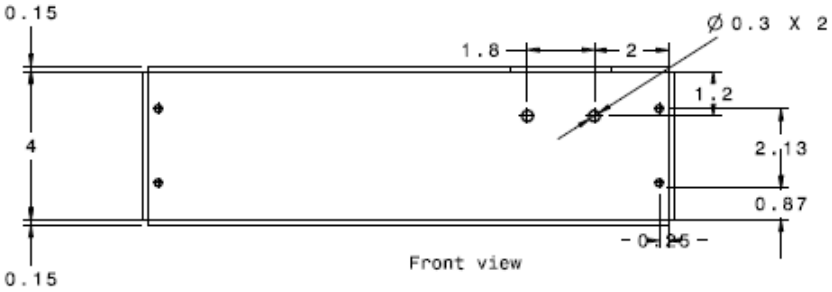


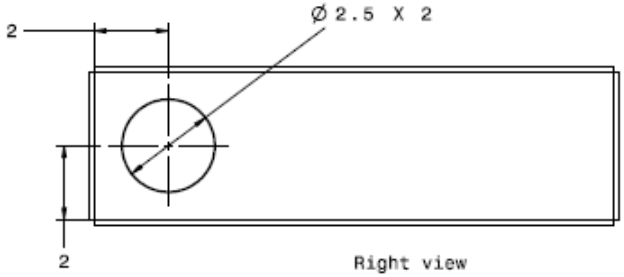
Hatchling II – Phoenix, with thermal shroud, with barebones *EagleSat* structure mounted on top.





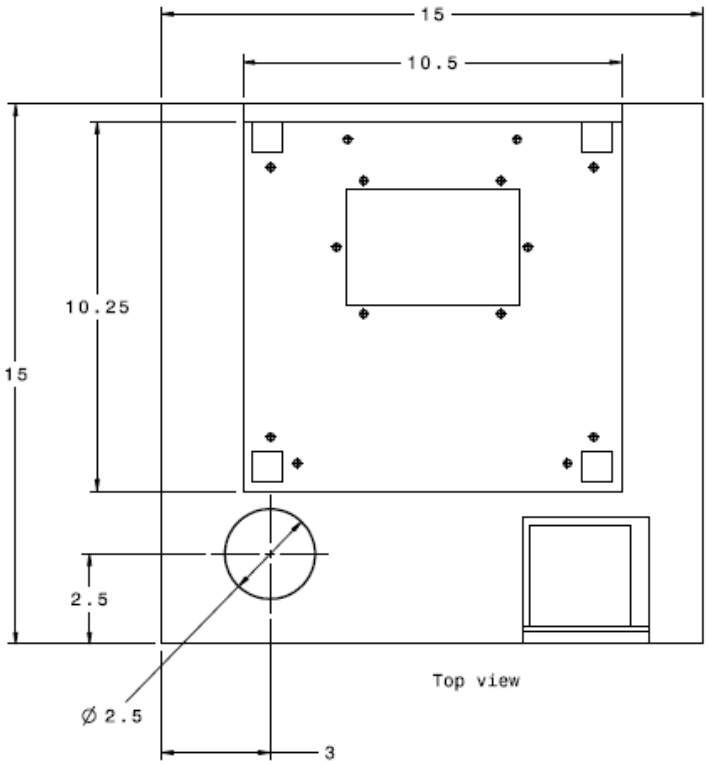
Isometric view
Scale: 1:1



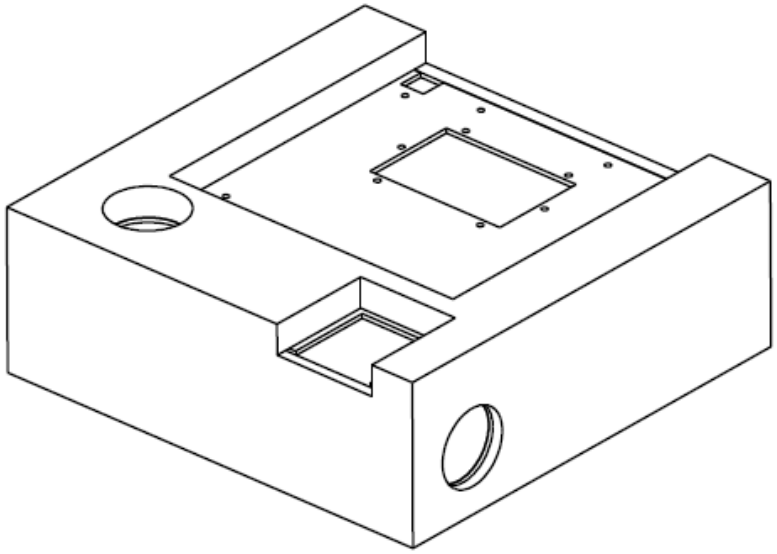


All units in centimeters

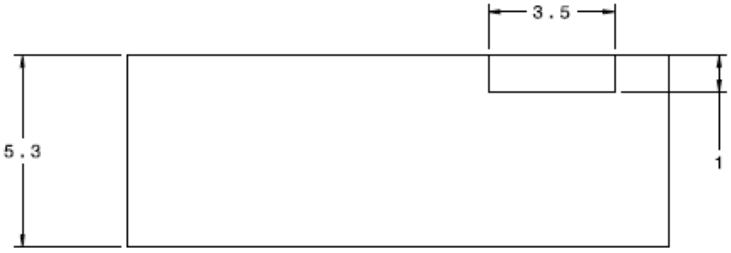
This drawing is our property. It can't be reproduced or communicated without our written agreement.		ERAU NASA SPACE GRANT	
DRAWN BY: Mo Sabliny	DATE: 5/21/2013	DRAWING TITLE: Phoenix	
CHECKED BY: Zach Henney	DATE: 5/21/2013	SIZE: C	DRAWING NUMBER: 004 / REV: B
DESIGNED BY: Zach Henney	DATE: 5/21/2013	SCALE: 1:1	WEIGHT(kg): XXX / SHEET: 1/1



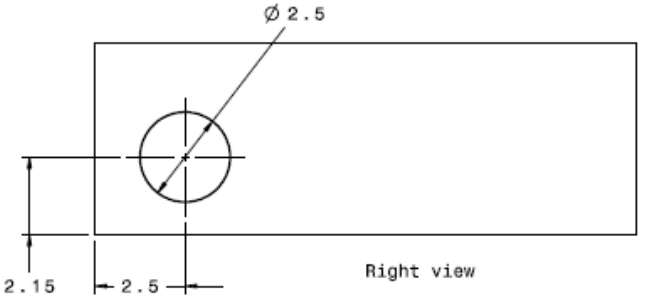
Top view



Isometric view
Scale: 1:1



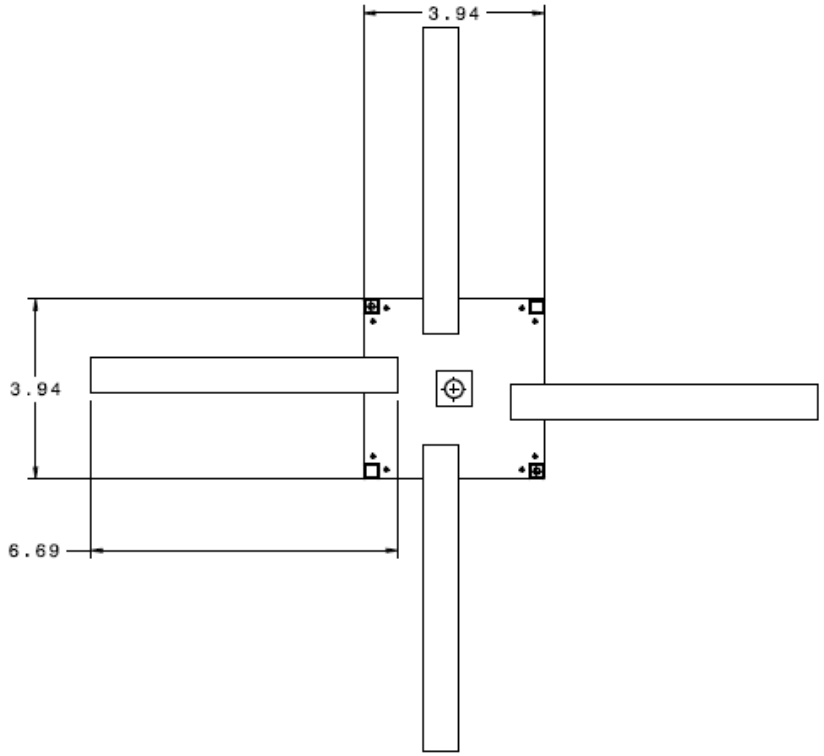
Front view



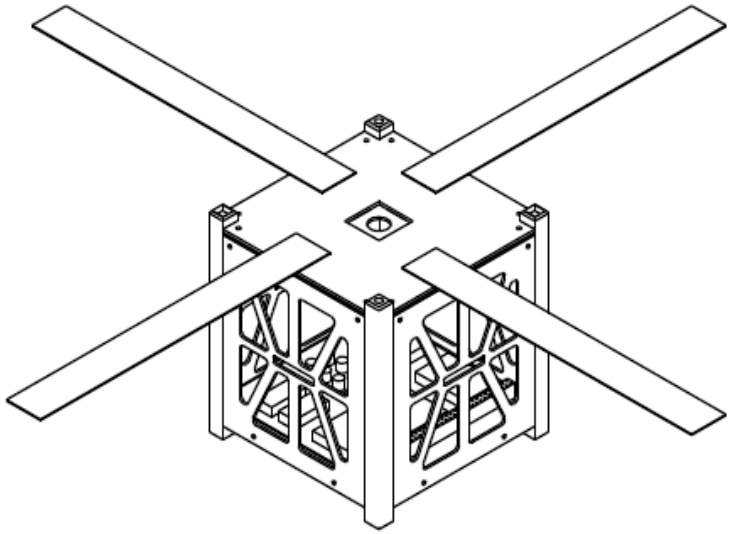
Right view

All units in centimeters

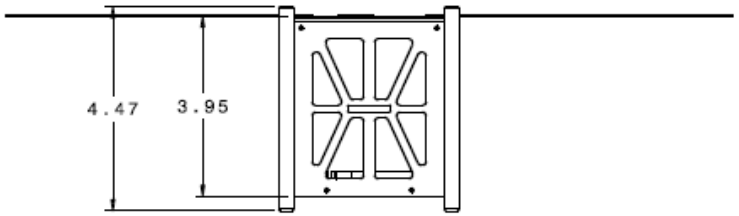
DRAWN BY: Mo Sabliny	DATE: 5/21/2013	ERAU NASA SPACE GRANT	
CHECKED BY: Zach Henney	DATE: 5/21/2013	DRAWING TITLE: Phoenix & Thermal	
DESIGNED BY: Zach Henney	DATE: 5/21/2013	SIZE: C	DRAWING NUMBER: 003 / REV: X
		SCALE: 1:1	WEIGHT(kg): XXX / SHEET: 1/1



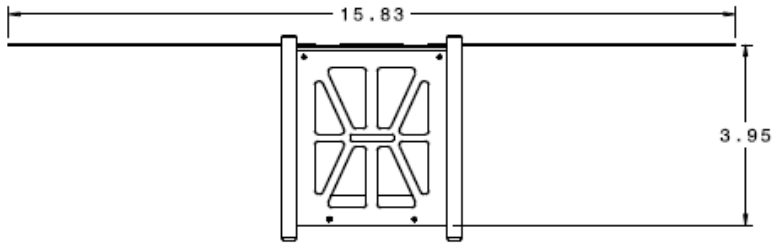
Top view
Scale: 1:2



Isometric view
Scale: 2:3



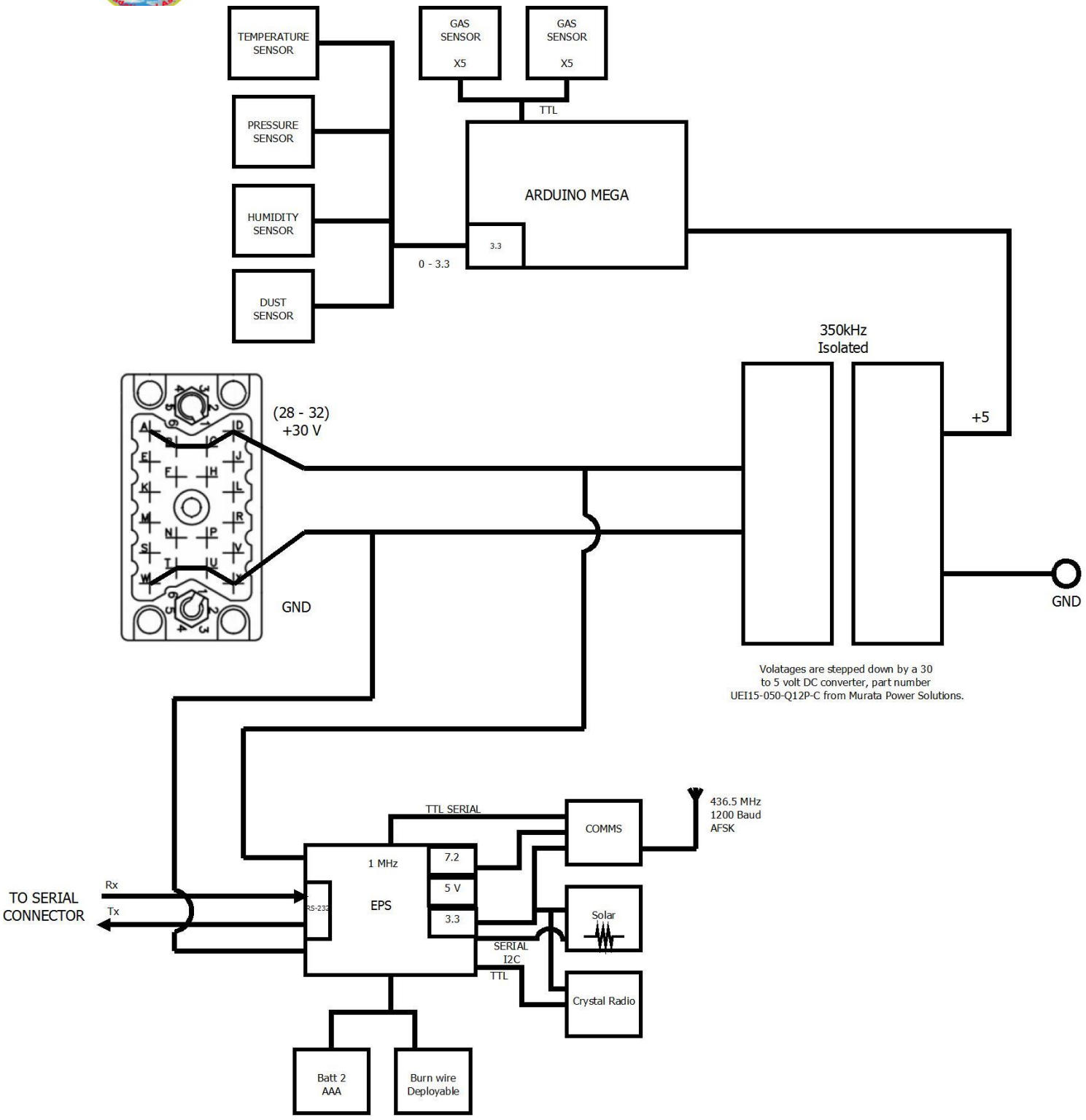
Front view
Scale: 1:2



Right view
Scale: 1:2

All units in centimeters

DRAWN BY: Mo Sabliny	DATE: 5/21/2013	ERAU NASA SPACE GRANT	
CHECKED BY: Zach Henney	DATE: 5/21/2013	DRAWING TITLE: EagleSat	
DESIGNED BY	DATE	SIZE: C	DRAWING NUMBER: 002 / REV: B
		SCALE: 1:2	WEIGHT(kg): XXX / SHEET



Hatchling II Power Diagram

CMD #	command	Command's function	Listening for additional data after command?
1.	BCON	Sends comms into beacon mode	no
2.	BOFF	Turns beacon mode off	no
3.	PING	Asks to respond	no
4.	TRCQ	Transmits callsing, CQ, and satallite identifyer	no
5.	SWTH	Switches antennas	no
6.	FILE	Asks to transmit file	yes, the file name
7.	TIME	Asks to transmit current time	no
8.	SLEP	Puts comms into sleep until WAKE command is sent	no
9.	WAKE	Wakes up comms, returns to normal behaviour	no
10.	SLPT	Tells comms to sleep for a specified time, or until wake command comes	yes, interger number of seconds to sleep
11.	BURN	Send the command to the EPS to burn the burn wires (to deploy solar panels)	no
12.	DUMP	Dumps all stored data that EPS has	no
13.	STOR	Asks to store data file	yes, data file to be stored
14.	RPRT	Reports data about specific instrument (i.e. temperature, frequency, accelerometer, gyroscope, magnetometer, EPS, etc)	yes, instrument that data is being requested from
15.	STAT	Reports status about instrument (this includes comms)	yes, instrument that status is being requested of

EagleSat Commands List