HASP Payload Specification and Integration Plan

Payload Title: EagleSat

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

Payload ID: 2014-01

Institution: **Embry-Riddle Aeronautical University**

Contact Name: Zach Henney

Contact Phone: (707) 570-611

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

Submit Date: 25 April 2014

1) Mechanical Specifications:

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

	Component	Mass (g)	Margin (g)	Measured	Estimated
EagleSat	Payloads	79	50		yes
	Electrical Power System	60	30		yes
	Super Capacitors	174	50		yes
	Communications	136	20		yes
	On-Board Computer	98	10		yes
	Solar Panels	228	0	yes	
	Antennas	192	0	yes	
	Structure	200	0	yes	
Nest	GPS	27	0	yes	
	Thermal Management	50	0	yes	
	Arduino	35	0	yes	
	Electrical Management	50	15		yes
	Structure	290	0	yes	
	Total	1619	175		
	Total, with margin	1794			
	Mass allowance	3000			

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 attached appendix for mechanical drawings.

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 within our payload.

D. Other relevant mechanical information

No other information at this time.

2) Power Specifications:

A. Measured current draw at 30 VDC

	Compenent	Current (mA)
EagleSat		
	System	250
Nest		
	Arduino	120
	Total	370
	Allowable Current Draw	500

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 appendix for wiring diagram.

C. Other relevant power information

None at this time.

3) Downlink Telemetry Specifications:

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

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

Downlink is estimated to be around 1 bps.

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	Descirption
1	0-7	Last command received
2-5	0-31	Timestamp (seconds since January 1, 1970)
6	0-7	Length of reply string
7-8	0-15	Record Size
9	0-7	Checksum
10-n		Reply string

Data will be streaming out of EagleSat, and will be a record of the data being transmitted over the onboard radios. The reply string will contain operational data (Power consumption/generation, OBC status) and the length will vary over the time of the flight.

D. Number of analog channels being used:

No analog channels are in use at this time.

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

Not in use.

F. Number of discrete lines being used:

2.

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

Discrete 1 will be used to turn the transmitter off, and Discrete 2 will be used to turn the transmitter back on.

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

The communications system will be downlinking at 436.5 MHz at 500 mW of power.

I. Other relevant downlink telemetry information.

Information will be sent through HASP as well as through the on-board transmitter, allowing a duplicate copy of information to be created in case of corruption on either end.

4) 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, there will be a maximum of 2 commands per hour sent through HASP. Most commanding of the payload will take place through radio.

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

Based on the format in the HASP Interface Manual:

SOH	STX	BYTE 1	BYTE 2	ETX	CR	LF	Command
1	2	1	1	3	D	A	Ping
1	2	B	7	3	D	A	Transmitter on
1	2	C	F	3	D	A	Transmitter off
1	2	1	4	3	D	A	Status
1	2	1	5	3	D	A	Time
1	2	1	6	3	D	A	Report Status

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

The payload will be receiving on 436.5 MHz.

F. Other relevant uplink commanding information.

No other information.

5) Integration and Logistics

A. Date and Time of your arrival for integration:

It is anticipated that the team will arrive in Palestine in the afternoon on 28 July, 2014.

B. Approximate amount of time required for integration:

Integration is expected to take at most three hours, but could take longer if radio compatibility testing takes place in Palestine.

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:

Aaron Petrek (petreka@my.erau.edu)

Clayton Jacobs (jacobsc6@my.erau.edu)

Zach Henney (henneyz@my.erau.edu)

F. Define a successful integration of your payload:

Successful integration can be defined as:

- Powering on without any faults, including blown fuses on HASP, blown voltage regulators on EagleSat, or any short circuits.
- Successful telemetry with HASP – full serial communication, no swapped RX/TX lines, and no ungrounded serial lines.
- Passing radio compatibility checks.
- Successful operation during thermal vacuum tests, with no corrupted data or unplanned payload downtime.

G. List all expected integration steps:

1. Connect the payload plate to HASP, connect power and data through the EDAC connector.
2. Power on the payload.
3. Send startup data through the serial line to verify connection.
4. If data does not automatically send, ping the payload with a serial command to receive data.
5. (If available during integration) Verify that the transmitters on-board EagleSat do not interfere with CSBF radios.
6. Power down and disconnect payload, and report to thermal vacuum chamber.
7. Attach payload to HASP for thermal vacuum test.
8. Repeat steps (2), (3), and (4) to ensure proper operations prior to test.
9. Perform the thermal vacuum test with the payload running normal operations.
10. Remove payload from thermal vacuum chamber, power down, and remove from HASP.

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

1. Data has been logged through both HASP and radio telemetry, and appears to be normal and consistent with test environment.
2. Power use remains in normal, HASP-allowable region, and does not go over 500 mA at any point in time.
3. EagleSat can communicate through on-board radios as well as through HASP serial.
4. EagleSat does not interfere with CSBF radios.

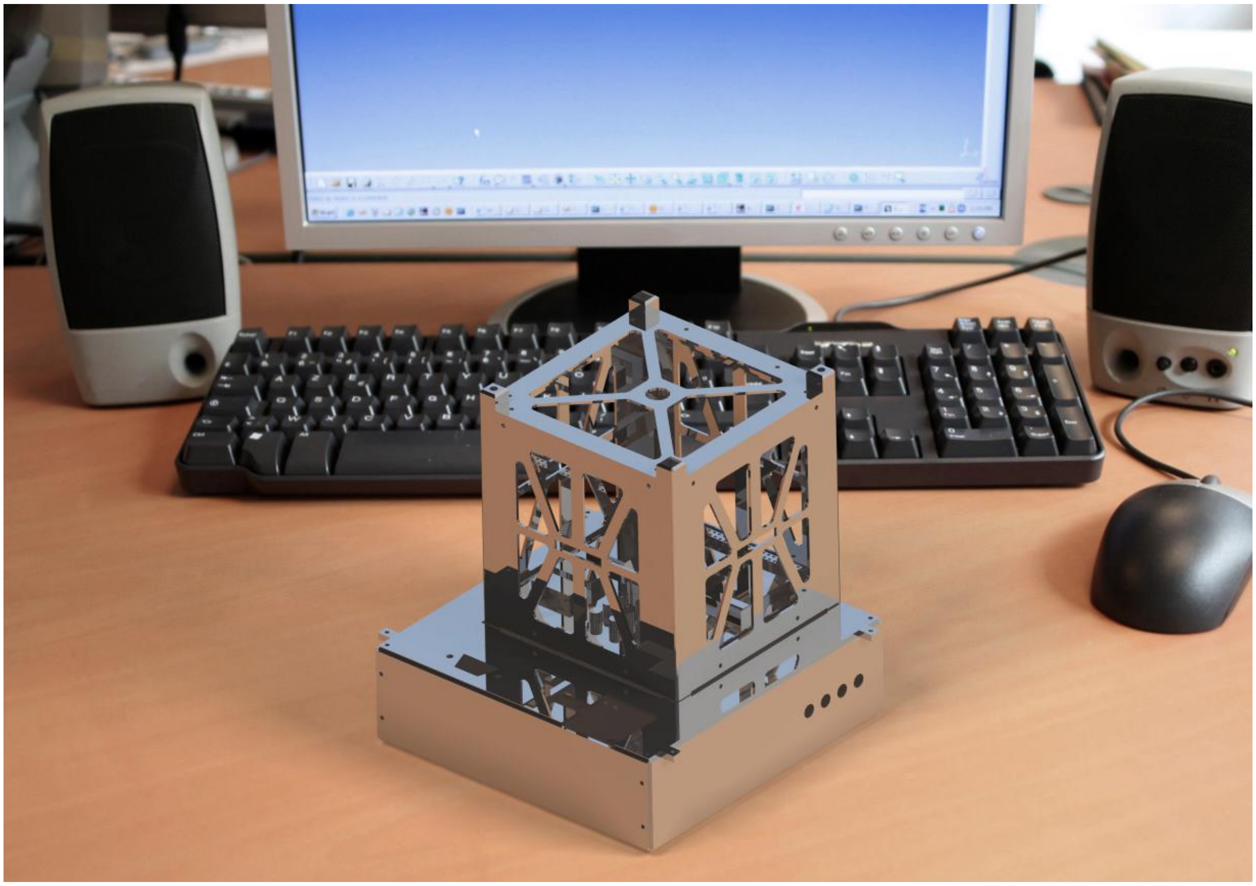
I. List any additional LSU personnel support needed for a successful integration other than directly related to the HASP integration (i.e. lifting, moving equipment, hotel information/arrangements, any special delivery needs…):

None at this time.

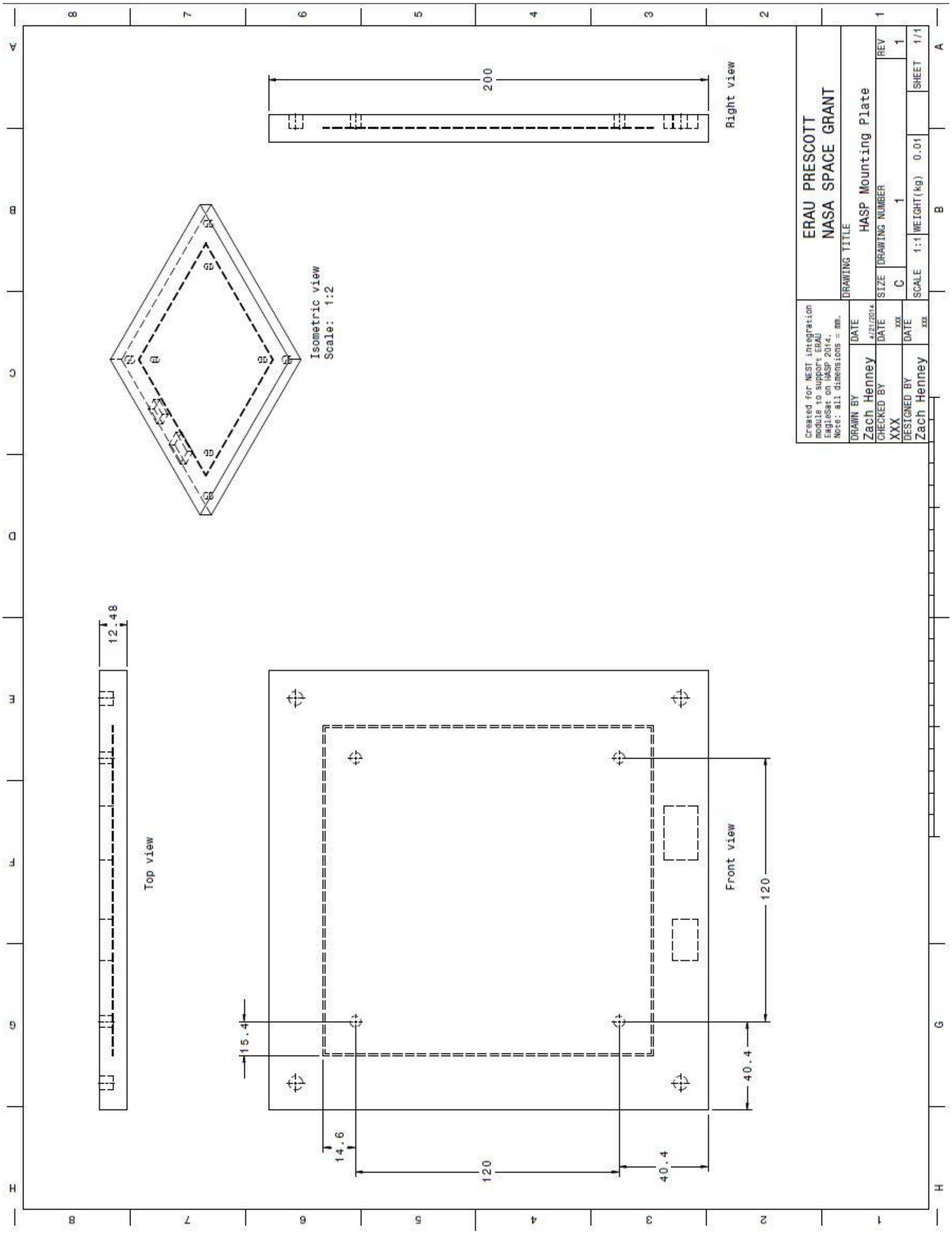
J. List any LSU supplied equipment that may be needed for a successful integration:

If problems arise during integration, access to oscilloscopes and soldering equipment may be necessary.

APPENDIX



Render of the EagleSat structure mounted to the Nest integration module, without mounting plate.


Right view
200
Isometric view
Scale: 1:2
Top view
12.48
Front view
120
15.4
40.4
14.6
120
40.4
ERAU PRESCOTT
NASA SPACE GRANT
Created for NEST integration module to support ERAU EagleSat on HASP 2014.
Note: all dimensions = mm.
DRAWING TITLE
HASP Mounting Plate
DRAWN BY
Zach Henney
DATE
4/21/2014
CHECKED BY
XXX
DATE
XXX
DESIGNED BY
Zach Henney
DATE
XXX
SIZE
C
DRAWING NUMBER
1
REV
1
SCALE
1:1
WEIGHT(kg)
0.01
SHEET
1/1
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B
C
D
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G
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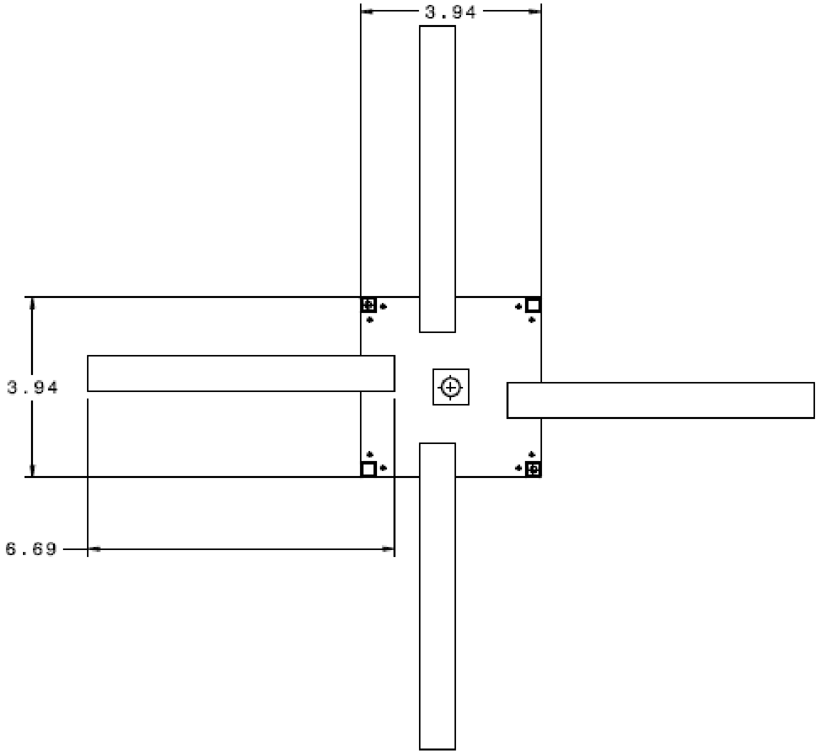
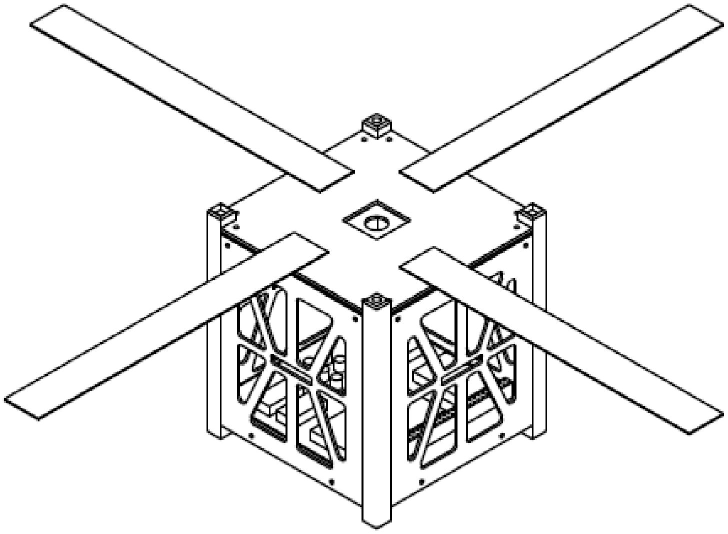
3
4
5
6
7
8



Top view
Scale: 1:2



Isometric view
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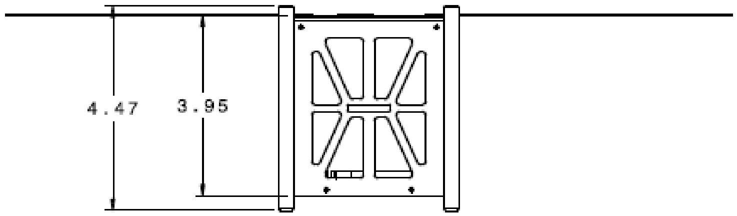
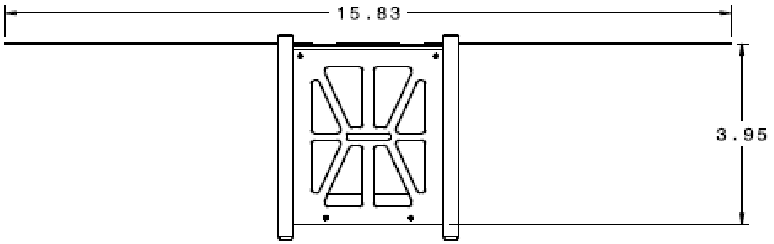


Front view
Scale: 1:2



Right view
Scale: 1:2

All units in centimeters

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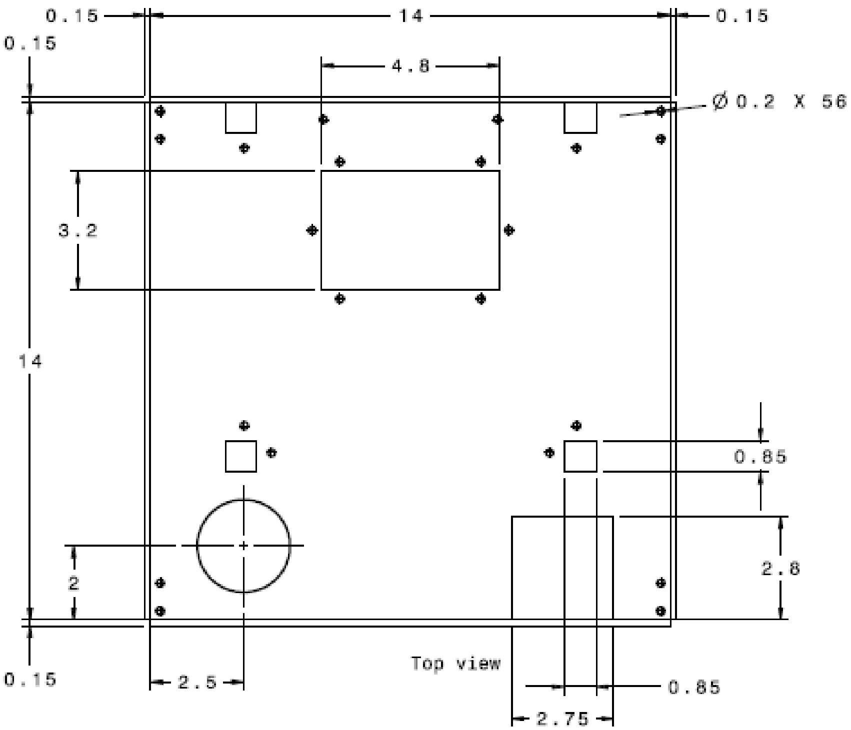
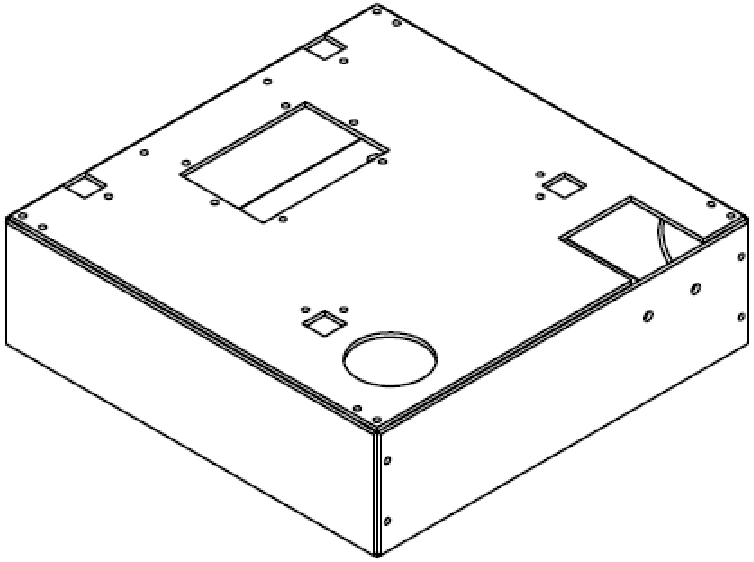
DRAWN BY Mo Sabliny
DATE 5/21/2013
CHECKED BY Zach Henney
DATE 5/21/2013
DESIGNED BY
DATE

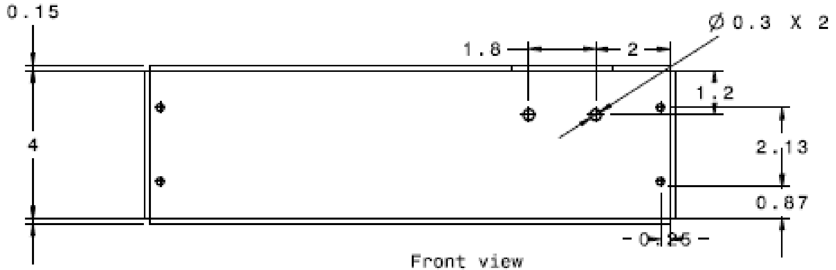
DRAWING TITLE EagleSat
SIZE C
DRAWING NUMBER 002
REV B
SCALE 1:2
WEIGHT(kg) XXX
SHEET



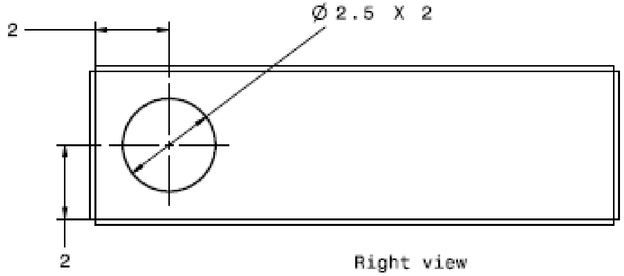
Top view



Isometric view
Scale: 1:1



Front view



Right view

All units in centimeters

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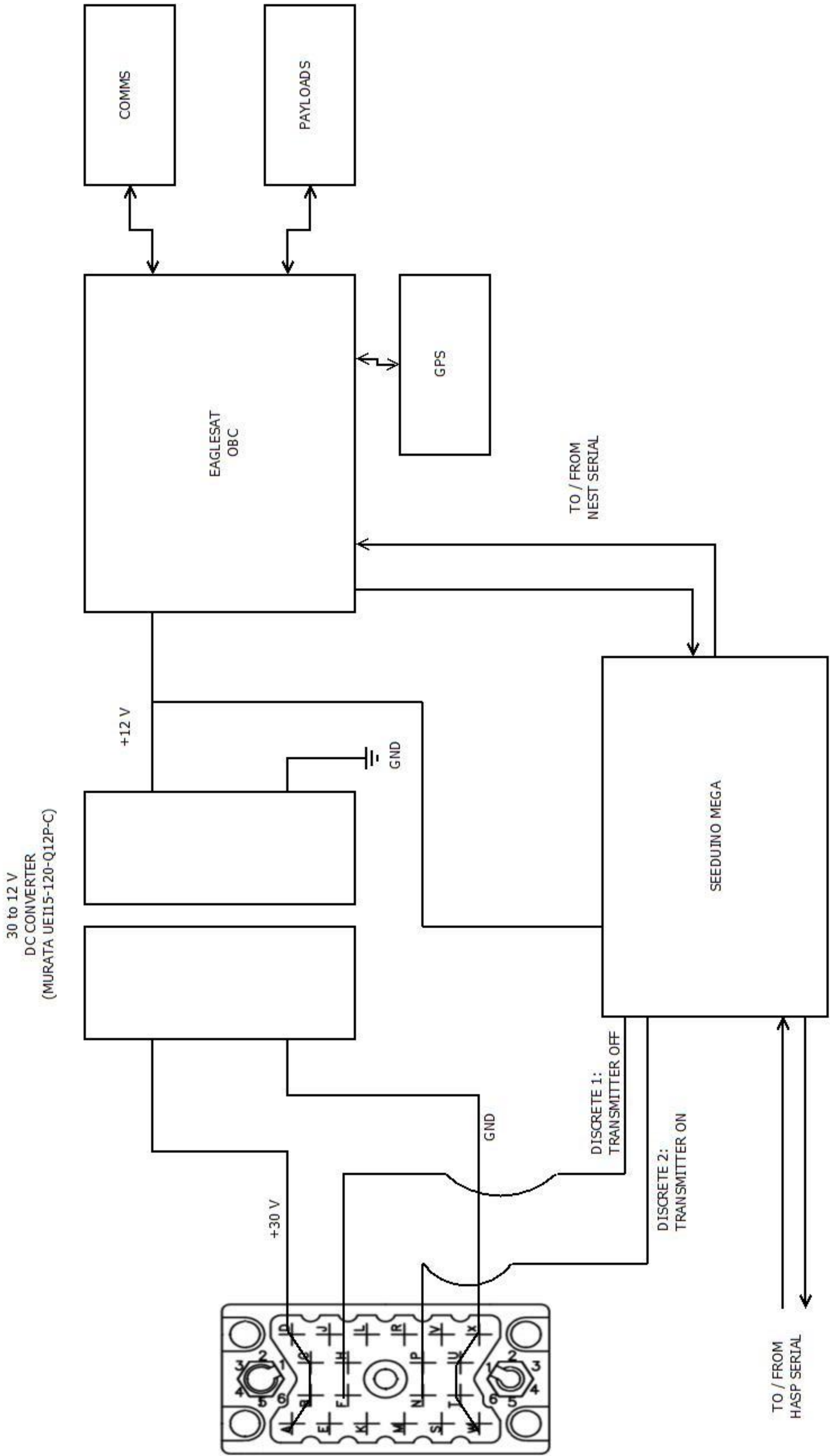
DRAWN BY Mo Sabliny DATE 5/21/2013
CHECKED BY Zach Henney DATE 5/21/2013
DESIGNED BY Zach Henney DATE 5/21/2013

DRAWING TITLE Phoenix
SIZE C
DRAWING NUMBER 004
REV B
SCALE 1:1
WEIGHT(kg) XXX
SHEET 1/1



EagleSat Wiring Diagram