HASP Preliminary Payload Specification and Integration Plan

Payload Title: HELIOS

Payload Class: Small (Large) (circle one)

Payload ID: 10

Institution: University of Colorado at Boulder

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Submit Date: 04/20/2012

I. Mechanical Specifications:

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

Current Weight: 10.8 kg

Weight will be continually reassessed as payload is assembled to ensure total weight is under 20 kg.

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

Payload shall be mounted to the payload plate using angle iron and bolt-nut combination as detailed in integration plan.

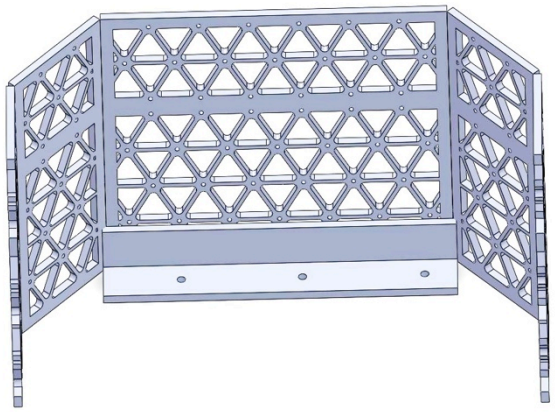


Figure 1. Angle Irons Connects Payload to Mounting Plate

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…)

N/A

D. Other relevant mechanical information

We request a 15 cm height extension to accommodate telescope height, extended field of view, and range of motion.

II. Power Specifications:

A. Measured current draw at 30 VDC

1.8A - 2.0A

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 pg. 6)

C. Other relevant power information

N/A

III. Downlink Telemetry Specifications:

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

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

9600 bps

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

Byte	Bits	Description
1	0-8	Record identification/type
2-5	0-31	Timestamp
6-7	0-15	Record size
8	0-7	Least significant 8 bits of the record checksum
9-18	0-1023	Readings of the 5 temperature sensors on the motors, CPU, cameras
19-22	0-31	Photodiode readings
23-24	0-15	Computer processes statuses
25-26	0-15	Yaw and pitch information (relative to platform)
27-28	0-15	Yaw and pitch information (absolute)
29	0-7	Last major system event (entered sleep mode, system restart, etc.)
30	0-7	Error codes present
31-32	0-15	Last command uplinked

D. Number of analog channels being used:

0

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

N/A

F. Number of discrete lines being used:

4

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

On/Off of power converters.

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.

N/A

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*)

6

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

Command	**Objective**
1	Reset Microcontroller 1
2	Reset Microcontroller 2
3	Disable watchdog
4	Initiate searching algorithm
5	"Sleep Mode" command
6	“Awake from Sleep Mode” command
7	Switch ADCS method (photodiode to image processing)
8	Uplink ADCS yaw and pitch position, if automated sun-searching fails
9	Power on/off

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

No

F. Other relevant uplink commanding information.

N/A

V. Integration and Logistics

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

B. Approximate amount of time required for integration:

90 min (preliminary estimate, may be adjusted post-testing in Boulder)

C. Name of the integration team leader:

Gabrielle Massone

D. Email address of the integration team leader:

Gabrielle.Massone@colorado.edu

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

Participant:	**Email Address:**
Gabrielle Massone	Gabrielle.Massone@colorado.edu
Glenda Alvarenga	Alvarenga.glenda19@gmail.com
Jacob Broadway	Jacob.Broadway@colorado.edu
Greg McQuie	gmcuie@gmail.com
Vincent Staverosky	Vincent.staverosky@colorado.edu
James Busse	James.busse@colorado.edu

F. Define a successful integration of your payload:

A successful integration of the HELIOS Payload involves the following:

- *The payload receives uplinked commands via the CSBF frame*
- *All components power on and remain operational following an uplinked power-on command*
- *Following power-on, ADCS and SHAIRC systems initialize and the Sun searching process begins*
- *System downlinks all health and status reports*
- *System receives all uplinked commands*
- *System enters sleep mode upon up-linked command*
- *Upon power-on and initialization, SHAIRC records images*
- *The payload remains firmly attached to the mounting plate and CSBF frame*

G. List all expected integration steps:

Payload integration steps of the HELIOS payload are expected to change slightly as the payload is assembled and needs are assessed. Expected steps of integration at this time are:

1. *Mount payload to CSBF Frame*
2. *Connect payload to HASP power and communication lines*
3. *Uplink power-on command to payload. Check that command is received and that all systems power-on.*
4. *Check that ADCS begins Sun-searching and tracking.*
5. *Uplink manual ADCS position and ascertain the system moves into correct orientation*
6. *Check that SHAIRC collects and stores images to the on-board solid-state drive.*
7. *Check that ADCS attitude adjustments are recorded.*
8. *Uplink Sleep Mode command, and ascertain payload enters sleep mode.*
9. *Uplink Awake command and ascertain payload awakens*
10. *Uplink all other commands listed in table above and ascertain system responds as expected.*
11. *Receive downlinked health and status reports from payload.*
12. *Uplink power-down command, and ascertain all systems shut down properly.*

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

Aspect	**Specification**	
Mechanical	Weight must remain below 20kg	
	Payload securely mounts to CSBF frame	
	Structure experiences no shifting or displacement during mountain	
Power	Payload is drawing 28 VDC at 1.8 – 2.0 A	
	Payload is correctly wired to HASP power lines	
Thermal	Thermal and vacuum test must simulate anticipated environment	
	No components experience temperatures beyond operating temperature ranges as defined by the respective data sheets.	
Science	SHAIRC collects and records images	
ADCS	Begins Sun tracking upon power-on	
	Remains within required accuracy and delay margins	
Communication	Serial data downlink is packetized format	
	Test serial downlink rate to be functional	
	Validate proper use of analog channels	
	Validate proper use of discrete channels	

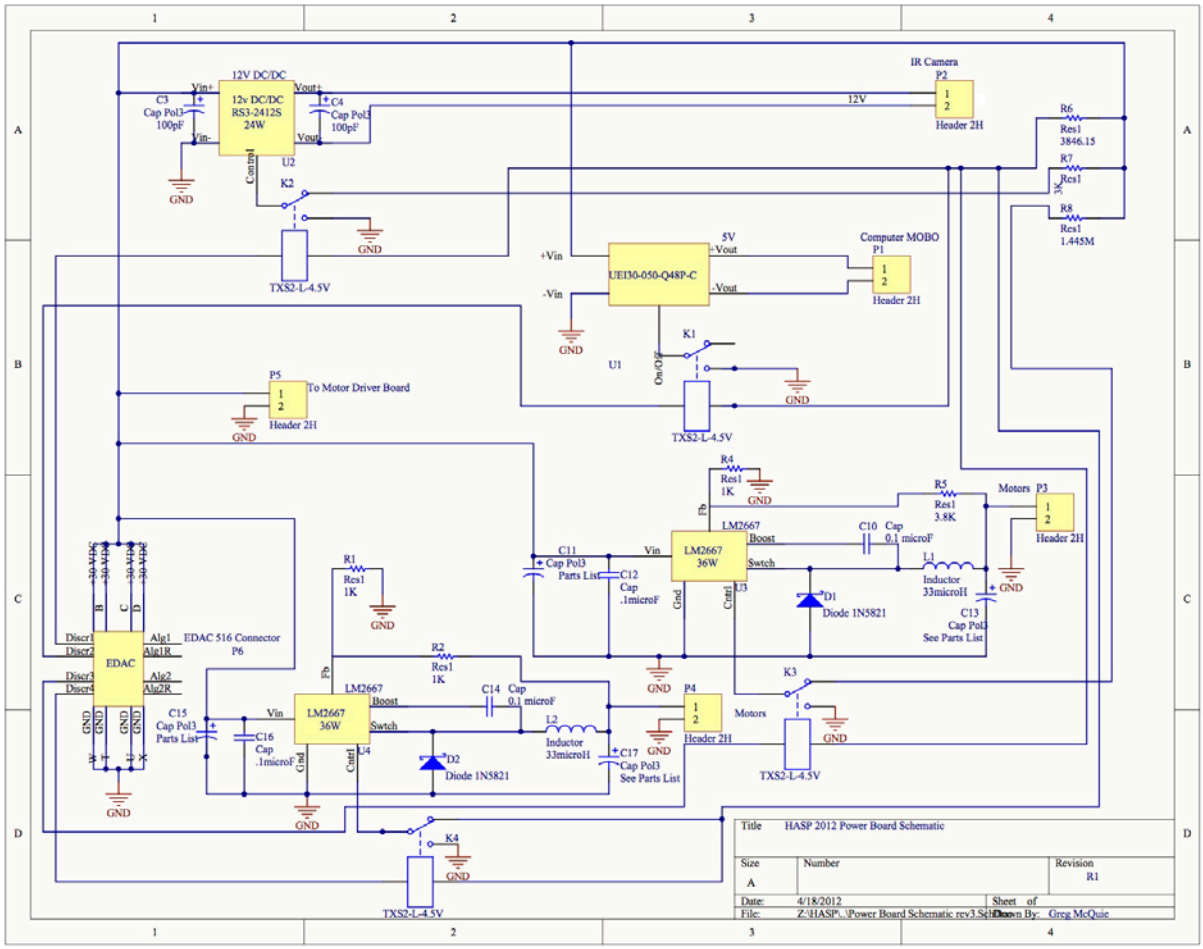
	Validate proper functionality of uplink commands	
	Test and record transmitter frequency (MHz) to be appropriate	
	Test and record transmitter power (W) to be appropriate	
	Test and record receiver frequency (MHz) and functionality to be appropriate	

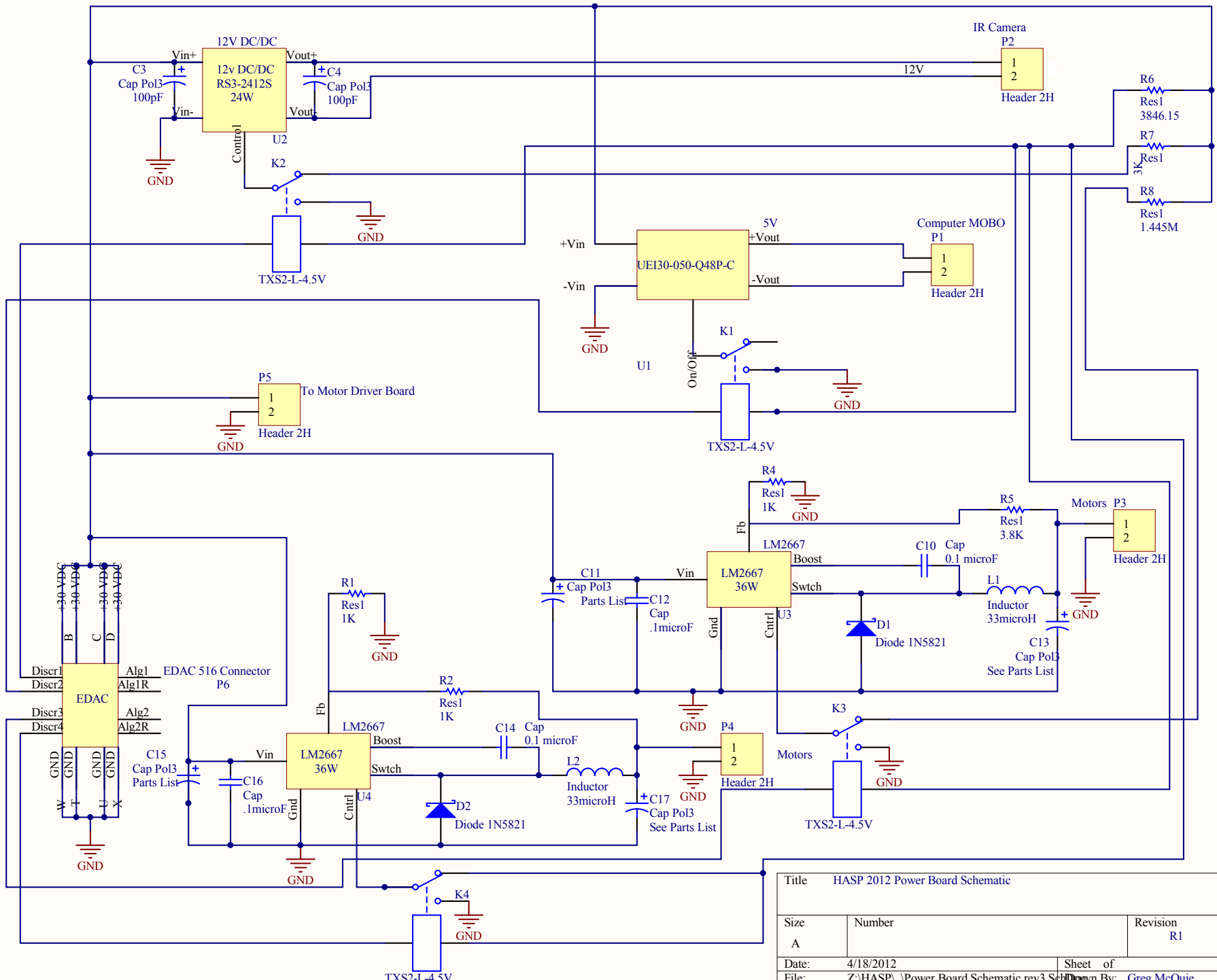
I. List any additional LSU personnel support needed for a successful integration other than directly related to the HASP integration (i.e. lifting, moving equipment, hotel information/arrangements, any special delivery needs…):
None currently necessary. Will reassess for Final PSIP plan.

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

None currently necessary. Will reassess for Final PSIP plan.

Power Board Schematic: For more detailed view, please see attached document.




12V DC/DC
12v DC/DC
RS3-2412S
24W
Vin+
Vin-
Vout+
Vout-
Control
U2
C3
Cap Pol3
100pF
C4
Cap Pol3
100pF
GND
K2
TXS2-L-4.5V
IR Camera
P2
12V
Header 2H
R6
Res1
3846.15
R7
Res1
3K
R8
Res1
1.445M
+Vin
-Vin
UEI30-050-Q48P-C
5V
+Vout
-Vout
U1
On/Off
K1
Computer MOBO
P1
Header 2H
P5
To Motor Driver Board
Header 2H
R4
Res1
1K
R5
Res1
3.8K
Motors
P3
Header 2H
LM2667
36W
Fb
Boost
Swtch
Gnd
Cntrl
U3
C10
Cap
0.1 microF
L1
Inductor
33microH
D1
Diode 1N5821
C11
Cap Pol3
Parts List
C12
Cap
.1microF
C13
Cap Pol3
See Parts List
Vin
R1
Res1
1K
R2
Res1
1K
EDAC
EDAC 516 Connector
P6
Discr1
Discr2
Discr3
Discr4
Alg1
Alg1R
Alg2
Alg2R
+30 VDC
B
C
D
GND
W
T
U
X
C15
Cap Pol3
Parts List
C16
Cap
.1microF
LM2667
36W
U4
C14
Cap
0.1 microF
L2
Inductor
33microH
D2
Diode 1N5821
C17
Cap Pol3
See Parts List
P4
Header 2H
Motors
K3
TXS2-L-4.5V
K4
TXS2-L-4.5V
Title
HASP 2012 Power Board Schematic
Size
A
Number
Revision
R1
Date:
4/18/2012
Sheet of
File:
Z:\HASP\..\Power Board Schematic rev3.SchDoc
Drawn By:
Greg McQuie