HASP Payload Specification and Integration Plan

Payload Title: D.I.E. H.A.R.D. (Demonstrating Intensity of Electromagnetic High Altitude Radiation Determination)

Payload Class: Large

Payload ID: 11

Institution: **University of Colorado**

Contact Name: Grant Fritz

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Contact E-mail: grant.fritz@colorado.edu

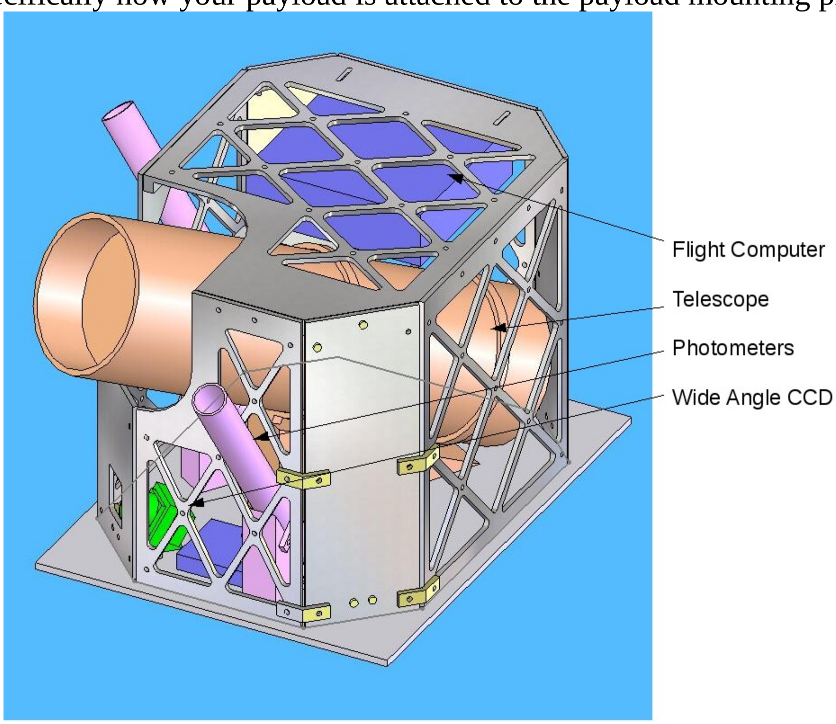
Submit Date: 06/1/08

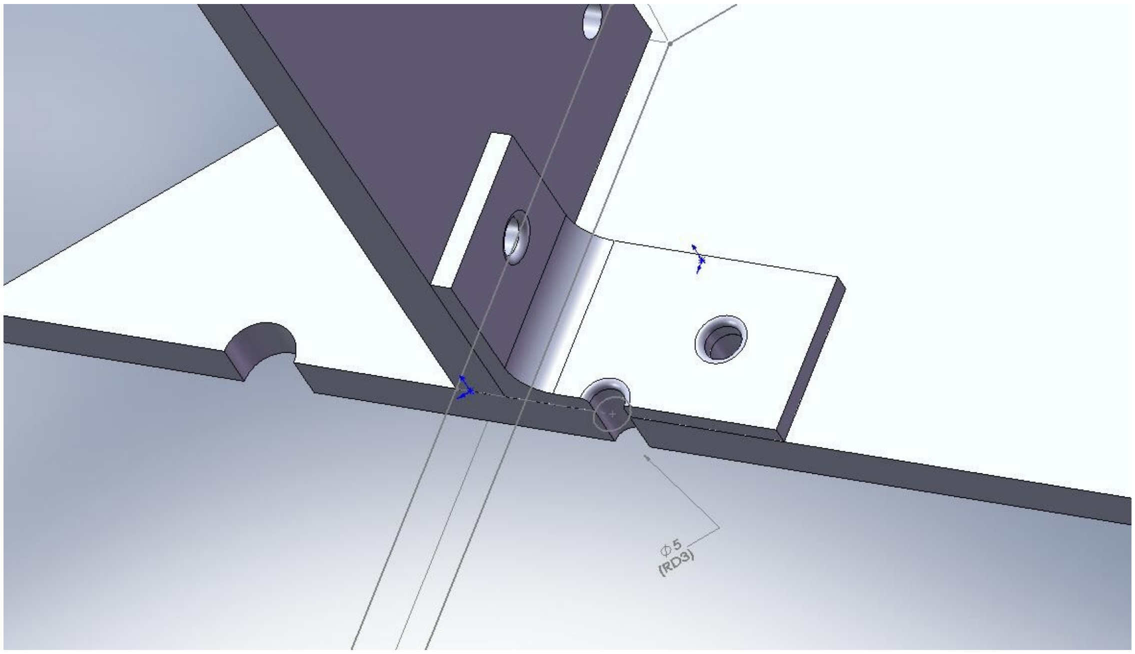
I. Mechanical Specifications:

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

This weight estimate of 10 kg is through massing every component individually as well as analyzing the weight of the structure through Solid Works. Plus we added a margin for any cords, brackets, and other unforeseen connection/mounting components.

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





This is a cross sectional example of how we're going to be mounting our primary structure to the mounting plate. The way we're going to attach the structure is by using an L bracket that attaches to the walls and the primary mounting plate along the bottom of all the exterior walls. This bracket will bolt through both the walls and the mounting plate itself with washers on the under side of the mounting plate to distribute the force from the structure.

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…)

   No hazardous materials are on board the DIE HARD payload.

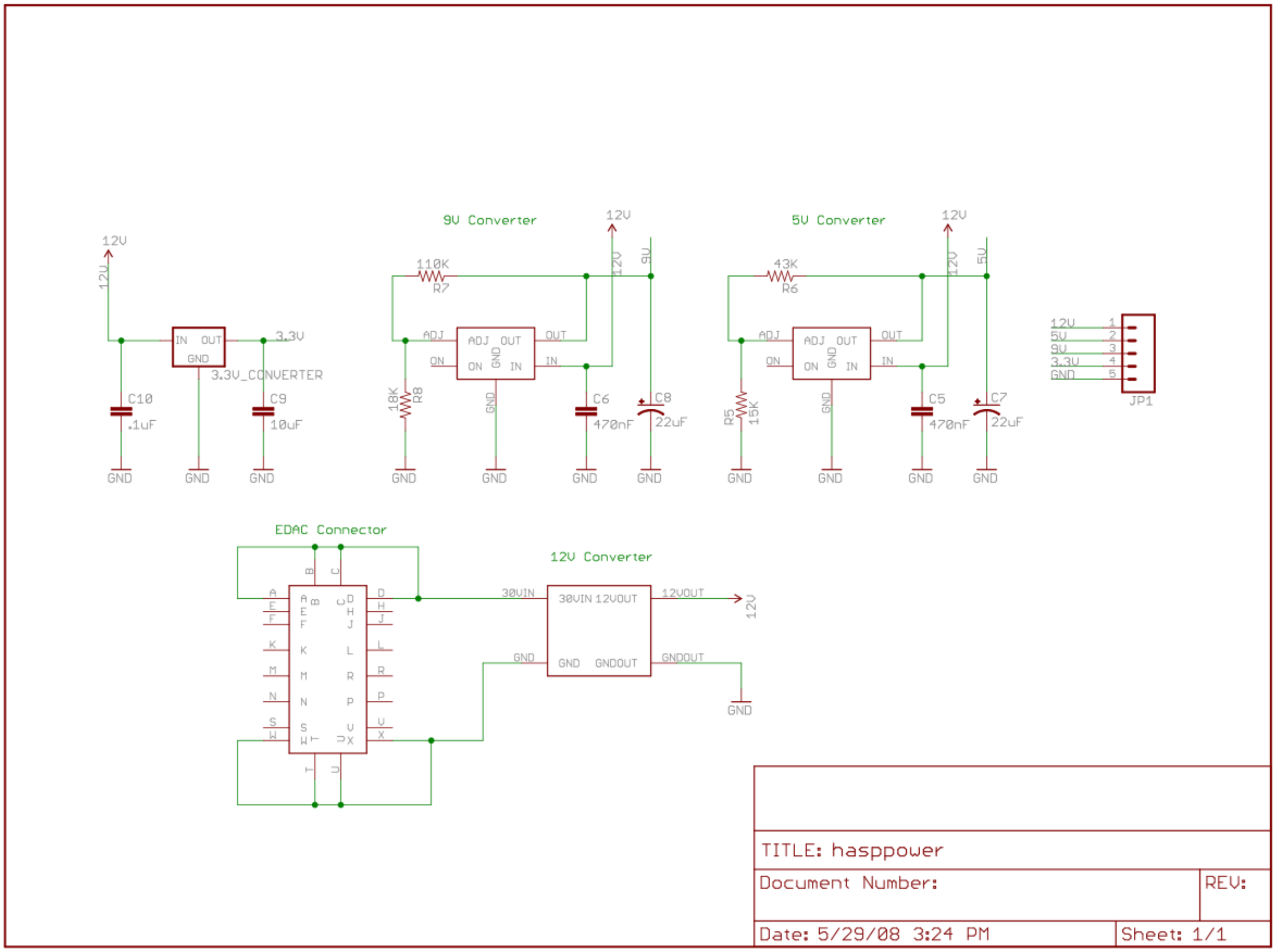
D. Other relevant mechanical information

II. Power Specifications:

A. Measured current draw at 30 VDC:

   The most recent current measurement was from a system test at peak draw with a margin added for components that were not incorporated into the system test. The current draw was1.8 Amps.

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

III. Downlink Telemetry Specifications:

A. Serial data downlink format: Packetized

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

At our current estimates we expect to send on average about 4000 bits per second.

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

I can not give an exact record length and what every single byte is in the entire stream because we have not finished the serial programming. However I can outline it to demonstrate what we're sending and give an estimate of the size of the different components. The downlink will consist of a health and status package initially which has data from, 5-6 internal temperature sensors, 1 accelerometer, 1 magnetic compass, 3 astrophotometer readings, 1 pressure sensor reading and 1-2 black and white 640x480 snapshot of our recorded video. A set of data will be sent every 10 minutes – 15 minutes in accordance with the payloads video recording and sensor sampling. We'll have a better layout of the downlink once the serial communication programming is complete and we've run simulated HASP communication tests. As far as it stands right now, the bits should go as follows (this is not finalized).

Bit	# of Bits	Description
1-48	48	6 Temperature Sensors
49-73	24	1 accelerometer
74-90	16	1 magnetic Compass
91-115	24	3 photometers
116-132	16	1 pressure sensor
133-2457733	2457600	1 BW 640x480 snapshots

D. Number of analog channels being used:

We're using both analog down link channels.

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

The two analog channels will be used for two temperature sensors which will be used to monitor key points of our system and give us some of an idea if anything major happens to our payload. Basically designed as a final most basic check of our system.

F. Number of discrete lines being used:

We're using three discrete command lines in our payload.

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

The three discrete command lines will be used for cycling the computers power button, computer reset button, and microcontroller reset button. The reset lines will be used to reset the computer or microcontroller if either or both of them lock up on a coding error.

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

There are no transmitters in our payload, all data is stored on our internal solid state hard drive and a small amount of data is packaged and sent down through the HASP serial connection.

I. Other relevant downlink telemetry information.

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*)

We expect to use a minimum of one command at the end of the flight to finish all recording however if a problem occurs mid-flight then we have troubleshooting commands which we would like to send up. Our total expected commands either way should not exceed 10 commands.

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

The primary goal of our programming is to make the payload as self reliant as possible, however if an error occurs we want to have as much control of the payload as possible. Therefore we're going to have a pretty detailed set of uplink commands, however since we have not finished the flight computers programming the current uplink commands are subject to change as well as the addition of more commands. All commands will be outlined in a document prior to integration.

Hex	Description
01	Initiate override and start recording as if at float
02	Disable stepper motor at blank filter
03	Stop recording and shutdown for flight termination
04	Close sunshade permanently
05	Open sunshade permanently

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

We have no receivers in our payload.

F. Other relevant uplink commanding information.

V. Integration and Logistics

A. Date and Time of your arrival for integration:

Currently we are planning on arriving for integration sunday 8/3/08 but we have not figured out a precise time yet because we still are unsure of whether we are going to fly down to texas or drive down.

B. Approximate amount of time required for integration:

It'll approximately take about five to six hours to fully integrate and test the DIE HARD payload and transfer the recorded data off of the flight computer.

C. Name of the integration team leader:

Grant Fritz

D. Email address of the integration team leader:

grant.fritz@colorado.edu

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

Grant	Fritz	grant.fritz@colorado.edu
Kyle	Kemble	kyle.kemble@colorado.edu
Ahna	Isaak	Ahna.isaak@colorado.edu
Brandon	Benjamin	brandon.benjamin@colorado.edu
Viliam	Klein	viliam.klein@colorado.edu

F. Define a successful integration of your payload:

Full payload functionality, equivilent to flight, with power and communications through HASP. Response to discrete command channels and through serial communication commands, a hardware checkout via the computer systems programming and viable recorded data relative to previous set standards.

G. List all expected integration steps:

1. Double check the power and ground pins on the EDAC connector with a multimeter to make sure no damage to either HASP or our payload.
2. Double check the serial connector pins.
3. Mount the payload onto the HASP structure and connect the EDAC and Serial cables.
4. Supply power to the DIE HARD payload and measure voltages out of the power subsystem.

5. Verify the functionality of the discrete commands by cycling the power and reset lines for the computer and the reset line for the microcontroller.
6. Check the status of the computer through a monitor connected to the computer system.
7. Verify the functionality of the serial communications between HASP and DIE HARD by checking the serial transmissions from DIE HARD and by sending a checkout command to the DIE HARD payload.
8. Finally verify the full payload functionality by transferring and analyzing the recorded instrument data during the payloads initialization.

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

-Check the EDAC connector pins

-Check the serial connector pins

-Check discrete commands

-Check power subsystem voltage levels

-Check serial communications

-Check overall payload functionality

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…):

The only additional information that would help would be hotel information, namely what hotels are recommended and which are close to the integrations site.

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

The only equipment we will need for a successful integration is a keyboard, monitor and mouse to monitor and access the flight computer in DIE HARD, and a HASP operator to aid in the transmission and receiving of data from the DIE HARD payload through HASP.