HASP Payload Specification and Integration Plan

Payload Title: Directional Cherenkov Detector

Payload Class: Small Large (circle one)

Payload ID: 04

Institution: Louisiana State University

Contact Name: Sean McNeil

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Submit Date: 6/01/2011

I. Mechanical Specifications:

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

Component	Measurement Method	Weight (g)
PMTs with coated bases	Measured	450 ± 0.1
Pulse Height Analyzer System	Measured	615 ± 0.1
Control System	Measured	35.2 ± 0.1
Power system and wiring	Measured	175 ± 0.1
Lucite radiator	Estimated	354 ± 1
Lead glass radiator	Estimated	872 ± 1
Mechanical structure	Estimated	317.75 ± 1
Total		2818.95 ± 3.4

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

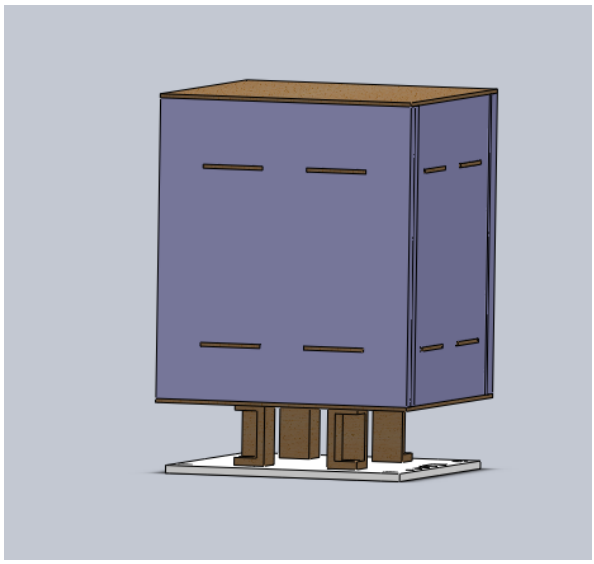

Figure 1: Overall Drawing

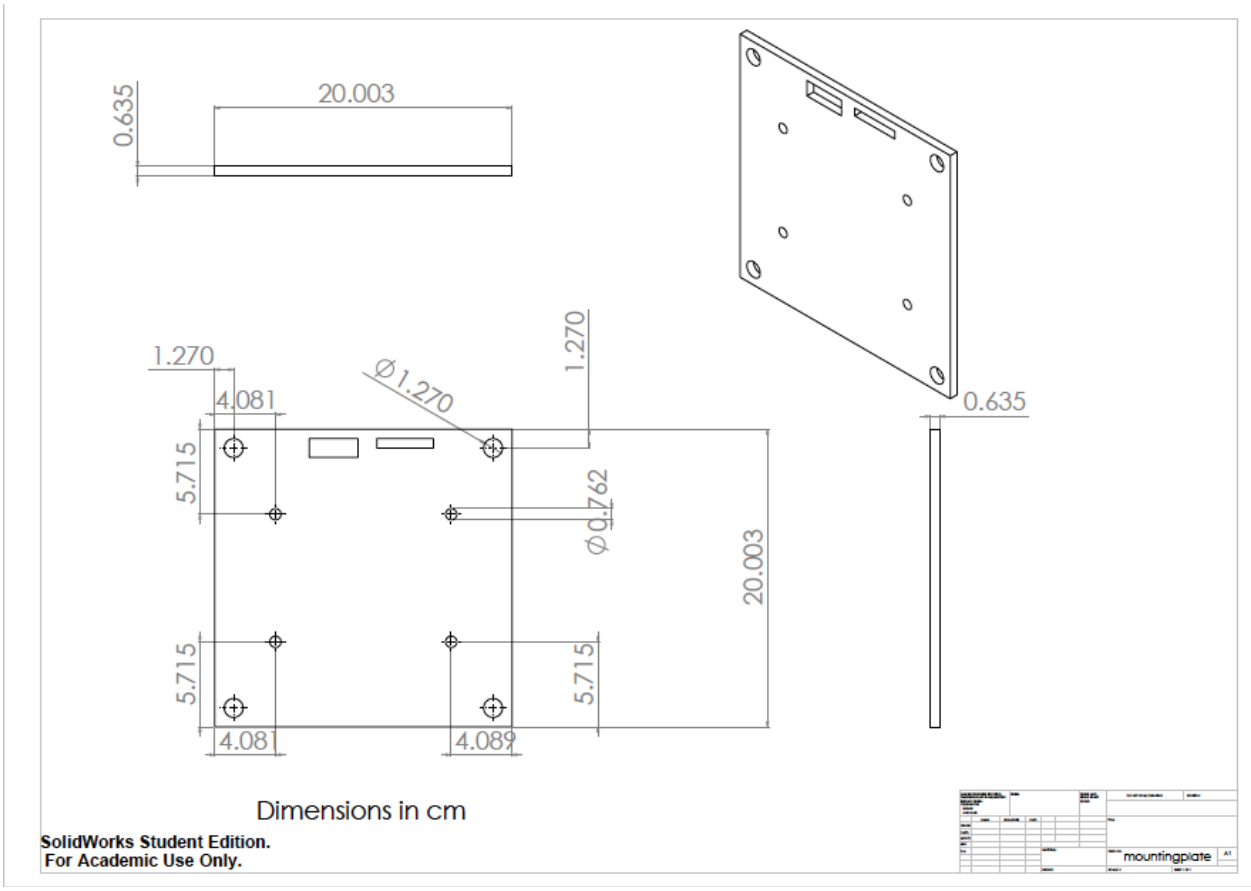

Figure 2:Mounting Plate

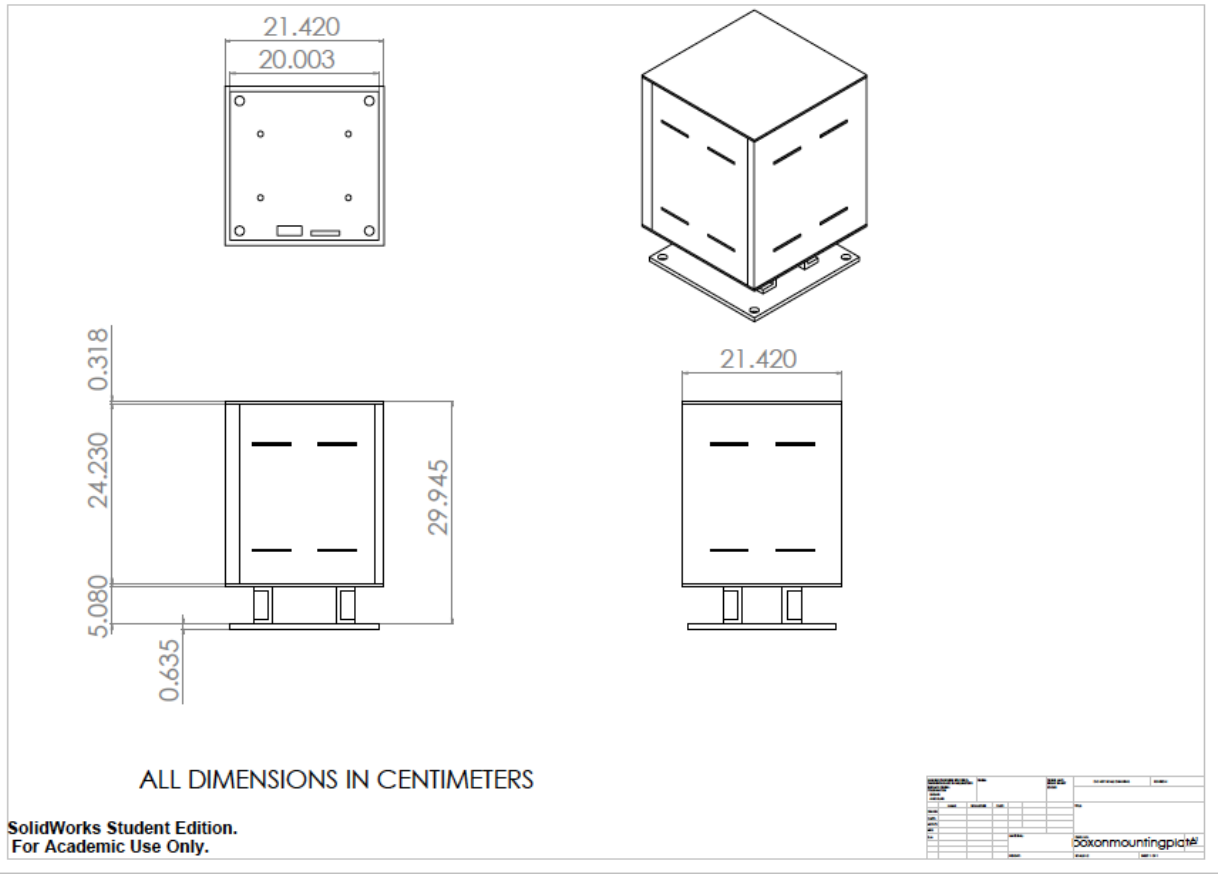

Figure 3: Payload Mounts

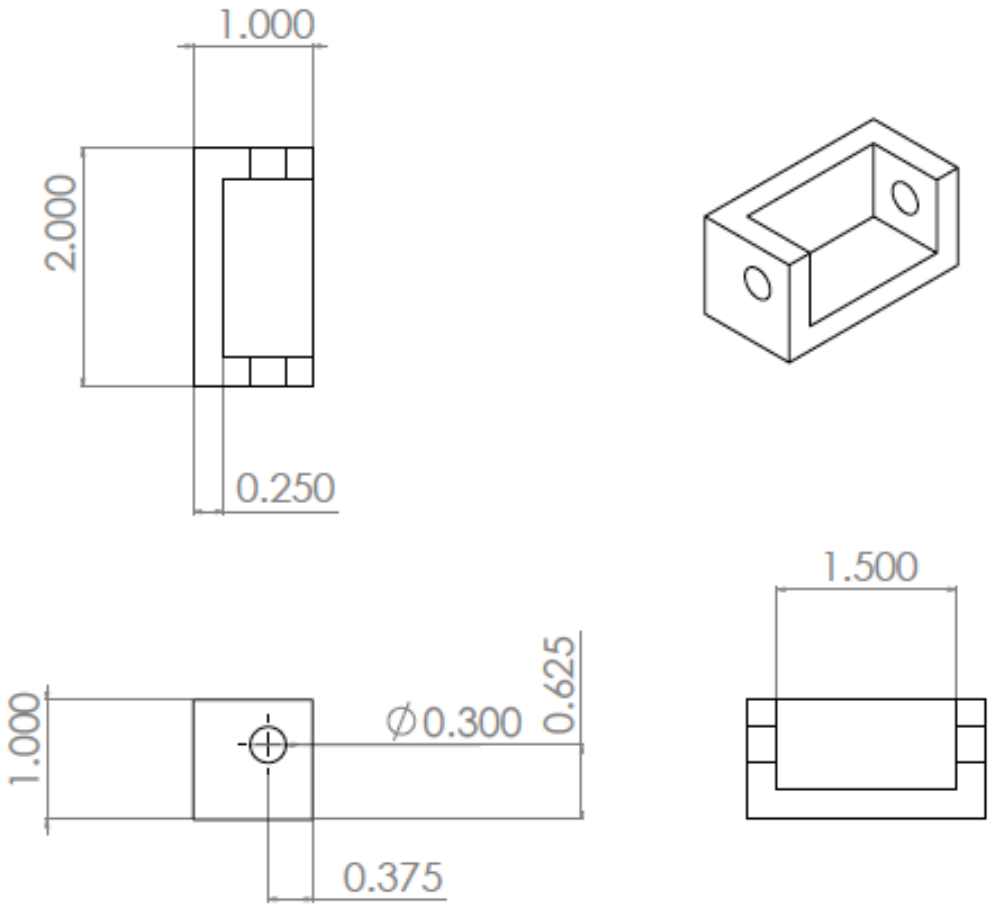

Figure 4: Standoffs

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

D. Other relevant mechanical information

Device MUST be oriented up with top facing the sky.

II. Power Specifications:

A. Measured current draw at 30 VDC is

Component	Power (W)
Photomultiplier Tube System	2.5
Pulse Height Analyzer System	8.8
Control System	1.1
Total	12.4

Estimated current draw is 12.4 W divided by 30 V which comes to 0.413 A.

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.

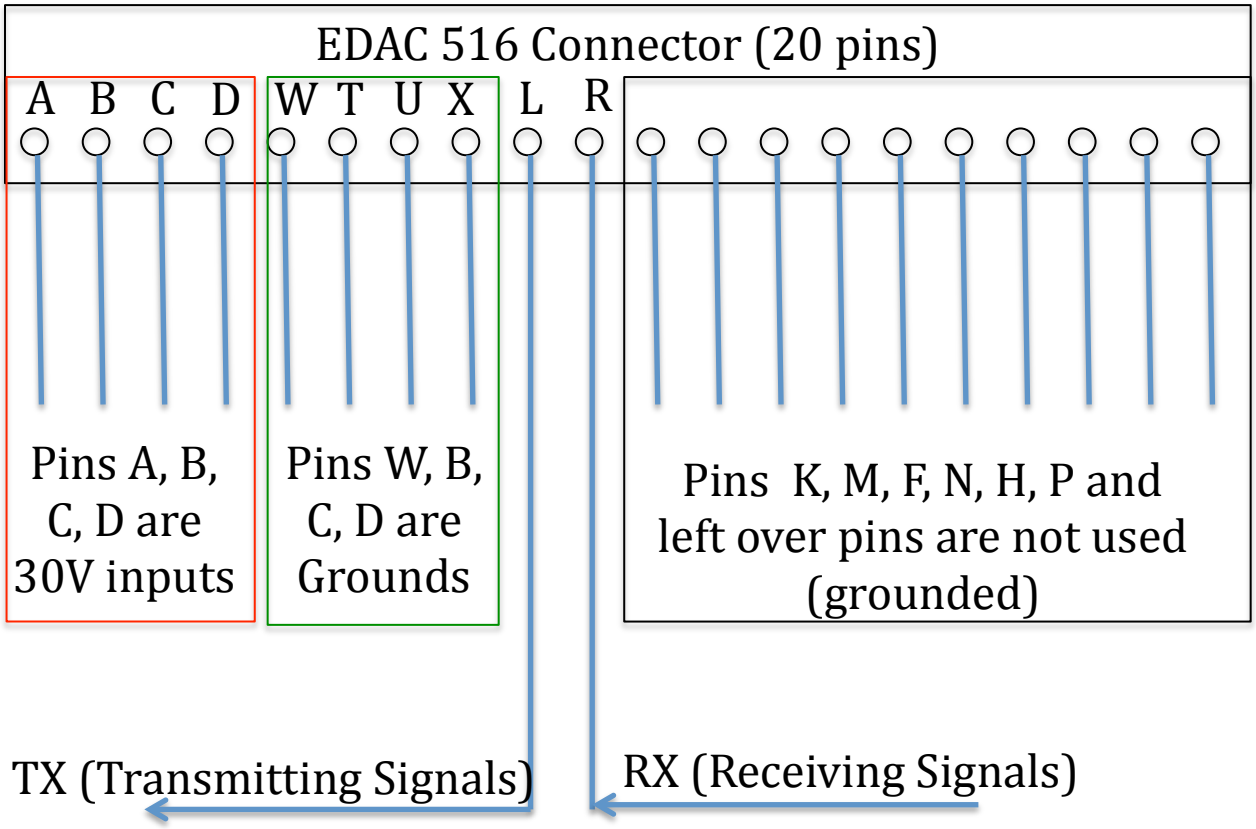

Figure 5: EDAC Diagram

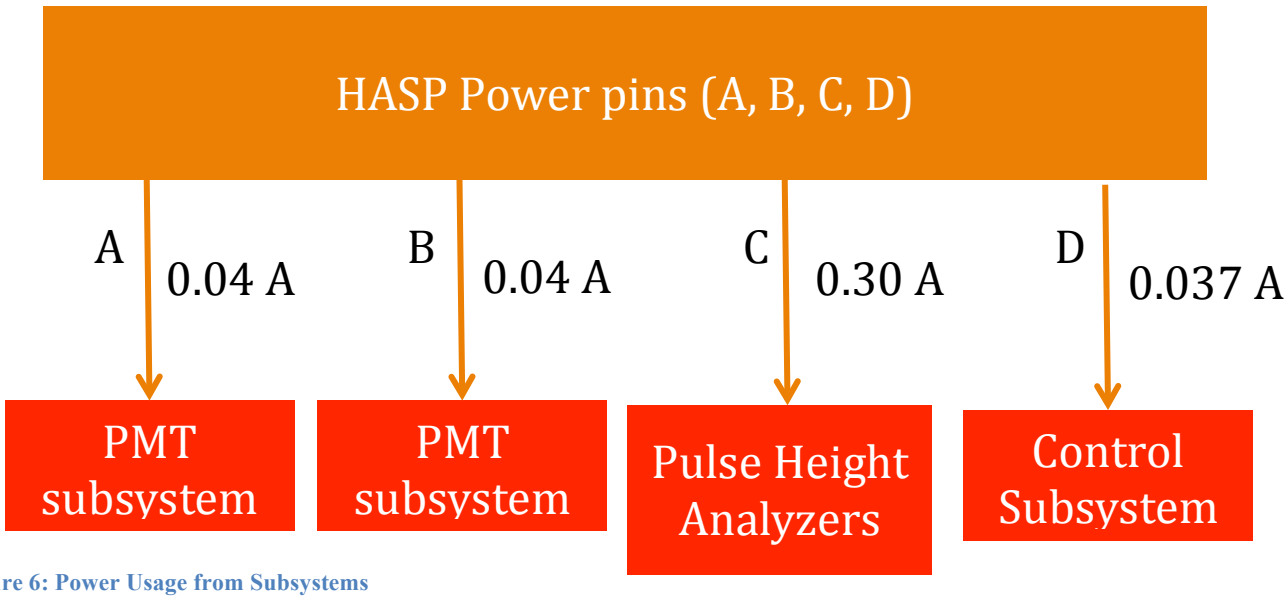

Figure 6: Power Usage from Subsystems

III. Downlink Telemetry Specifications:

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

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

403 bits/s

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

Bytes	Bits	Description
1	0-7	Type
2-5	0-31	Timestamp (UNIX time)
6	0-7	Least significant 8 bits of checksum
7-26	0-159	Pulse height PMTs 1-10

Bytes	Bits	Description
1	0-7	Type
2-5	0-31	Timestamp (UNIX time)
6	0-7	Least significant 8 bits of checksum
7-8	0-15	Status for PMTs 1-10
8-10	0-23	Coincidence tally

D. Number of analog channels being used:

ZERO

E. Number of discrete lines being used:

ZERO

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

NO

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*)

Less than 1 command per hour depending on need to suspend system operations incase of emergency.

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

Command description	Byte	Bits	Description(hex val)
Turn off onboard Relays	1	0-3	Checksum(TBD)
	1	4-7	Payload ID(4)
	2	0-7	Command(A0)
Turn on onboard Relays	1	0-3	Checksum(TBD)
	1	4-7	Payload ID(4)
	2	0-7	Command(A1)
Force send system status	1	0-3	Checksum(TBD)
	1	4-7	Payload ID(4)
	2	0-7	Command(A2)

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

NO

V. Integration and Logistics

A. Date and Time of your arrival for integration:

August 1, 2011

B. Approximate amount of time required for integration:

1-2 days

C. Name of the integration team leader:

Jace Boudreaux

D. Email address of the integration team leader:

jboud52@lsu.edu

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

Sean McNeil smcnei2@lsu.edu

Jace Boudreaux jboud52@lsu.edu

F. Define a successful integration of your payload:

When the system is attached and mounted on HASP and switched on, LED indicator lights will start to blink. A serial connection establishing communication provides downlinked data and allows for uplinked commands. Voltage sensors will confirm power is being provided to systems. Data from cosmic ray muons will trigger the sensors producing data shortly after integration.

G. List all expected integration steps:

i. The system is placed in its appropriate position and oriented upright so that the top is facing up.
ii. A discrete command turning the payload on is sent to the relay controlling the payload power.
    1. LED indicator lights should light up if power is successfully enabled.
iii. A serial command uplink is sent which switches the internal relays on.
iv. Status of the payload will be downlinked and verified.
    1. The sensors monitoring temperature and voltages throughout the system should read nominally
    2. Data should be outputted from the detector due to cosmic ray muons

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

i. Are the LED indicator lights on?
    1. "Yes" indicates power is being provided to the system
    2. "No" indicates power connection is faulty
ii. Is any data being downlinked from HASP?
    1. "Yes" indicates system data is transmitting
    2. "No" indicates serial port is not enabled or connected correctly
iii. Is data from the temperature sensors nominal (about room temperature)?
    1. "Yes" indicates the analog inputs connections are functioning nominally.
    2. "No" indicates that control system is not functioning properly or connections have been severed.
iv. Is data from the voltage sensors nominal for each subsystem?
    1. "Yes" indicates that power is being provided to each subsystem
    2. "No" indicates that internal relays were not enabled or connections were severed
v. Is data from the detector being outputted?
    1. "Yes" indicates that detector is functioning properly and detecting cosmic rays on the ground

2. "No" indicates that detector system is faulty or connections were severed

vi. Test uplink connection

1. Successful uplink of relay shutoff command should be indicated by voltage sensors
2. Successful uplink of send status command should be indicated by downlink of status data
3. Unsuccessful test indicates software malfunction

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

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

NONE