HASP Payload Specification and Integration Plan

Payload Title: Second Look Intelligent Calibration Camera System (SLICC)

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

Payload ID: 12

Institution: Texas A&M University

Contact Name: Ron Denton or Dr. Thomas J. Talley, P.E.

Contact Phone: (979) 845-8768

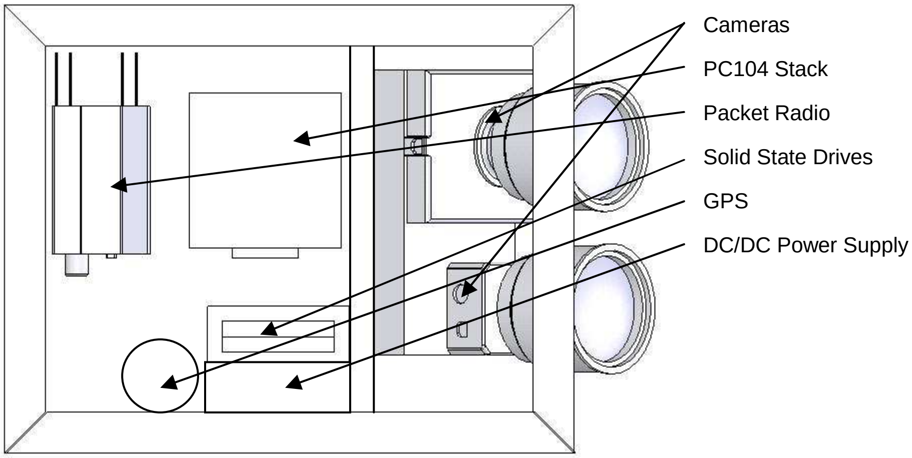
Contact E-mail: denton@cs.tamu.edu or talley@tamu.edu

Submit Date: June 01, 2009

I. Mechanical Specifications:

A. Measured weight of the payload (not including payload plate)
6.8 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



The PC104 stack contains a single board computer, a power supply, a SATA controller, and a thermocouple interface board. The payload will be fastened to the mounting plate with 4 thermally isolated carriage bolts or screws located in each corner of the payload.

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…)
Not Applicable.

D. Other relevant mechanical information
Our payload will include a dipole antenna for our on-board packet radio that will need to hang below the gondola.

II. Power Specifications:

A. Measured current draw at 30 VDC
Estimated: 2.3 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.
See attached diagram.

C. Other relevant power information
Not Applicable.

III. Downlink Telemetry Specifications:

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

B. Approximate serial downlink rate (in bits per second)
4,800 bps

C. Specify your serial data record including record length and information contained in each record byte.
Serial packets will vary in length, but in all cases will be less than 50 bytes long. Each packet will contain the following fields:

- **Packet Type (1 byte)**
- **Payload Length (1 byte)**
- **Packet CRC (2 bytes)**
- **Payload (up to 46 bytes)**

Payload will vary based on packet type. Below we provide a list of payload data items in no particular order or grouping:

1. **System Time (6 bytes)**
2. **System Date (6 bytes)**
3. **System Status Code (4 bytes)**
4. **System Error Code (4 bytes)**
5. **Location (from on-board GPS)**
    - **Latitude (10 bytes)**
    - **Longitude (11 bytes)**
    - **Altitude (7 bytes)**
    - **Speed (4 bytes)**
    - **Course (3 bytes)**

6. **Velocity (from on-board GPS)**
   - **East (6 bytes)**
   - **North (6 bytes)**
   - **Up (6 bytes)**
7. **Payload Temperatures (6 bytes each)**
   - **PC104 CPU**
   - **PC104 Power Supply**
   - **Camera Sensor (CCD & CMOS)**
   - **Camera External (CCD & CMOS)**
   - **DC/DC Converter**
   - **Packet Radio**
8. **Image Capture Information**
   - **Image count CCD & CMOS (6 bytes each)**
   - **Image SNR CCD & CMOS (8 bytes each)**
   - **Image Exemplar Star (variable - may require multiple packets)**

D. Number of analog channels being used:
None.

E. If analog channels are being used, what are they being used for?
Not Applicable.

F. Number of discrete lines being used: **2**

G. If discrete lines are being used what are they being used for?
1. **HASP master power control On/Off**
2. **On Board Transmitter On/Off**

H. Are there any on-board transmitters? If so, list the frequencies being used and the transmitted power.
One Kantronics Talon UDC UHF packer radio. Adjustable frequency from 450-470 MHz. Maximum transmit power: 6 Watts. We will adjust our frequencies to avoid interference with HASP control frequencies.

I. Other relevant downlink telemetry information.
Our group has a mobile nationwide FCC license. Our license call sign is WE2XVH. Our license allows for up to 6 Watts and a frequency between 456-470 MHz. A copy of our license is available on request.

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*)

Not Applicable.

D. Provide a table of all of the commands that you will be uplinking to your payload
Not Applicable.

E. Are there any on-board receivers? If so, list the frequencies being used.
Same as transmitter in III-H.

F. Other relevant uplink commanding information.
None.

V. Integration and Logistics

A. Date and Time of your arrival for integration:
Our team will arrive in Palestine, Texas on Sunday, August 2. We will arrive at the Columbia Scientific Balloon Facility at 8:00 AM on Monday, August 3 to start integration.

B. Approximate amount of time required for integration:
4 Hours.

C. Name of the integration team leader:
Ron Denton

D. Email address of the integration team leader:
denton@cs.tamu.edu

E. List **ALL** integration participants (first and last names) who will be present for integration with their email addresses:
Dr. Thomas J. Talley, talley@tamu.edu
Adam Watkins, adamwatkins@neo.tamu.edu

F. Define a successful integration of your payload:

i. **The system is placed on the payload carrier in a secure method so that the imager windows have an unobstructed view of the sky.**
ii. **System turns on and off when the appropriate telemetry command is sent**
iii. **Images are taken and the image counts increment appropriately**
iv. **Status is received**
v. **Modifiable status can be set to appropriate states**
vi. **System turns off when power is removed by telemetry**
vii. **System restarts without problems when power is reapplied by telemetry**

viii. **On Board Transmitter turns On/Off when commanded by telemetry**

ix. **On Board Transmitter turns On/Off when commanded internally by on board computer**

G. List all expected integration steps:

i. **Place Package on platform**

ii. **Connect power**

iii. **Connect serial communication cable**

iv. **Verify the that the system is securely mounted**

v. **Verify that lens covers with "Remove Before Flight" Streamers attached are in place**

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

i. **Remove the Lens Covers**

ii. **Activate telemetry through HASP control to provide power to package**

iii. **Observe image counts increasing on each camera**

iv. **Observe status messages**

v. **Command the on-board Radio on/off for two cycles and have the radio respond appropriately.**

vi. **Command Heaters on/off and have them respond appropriately**

  1. **Note the temperature changes in the status messages**

vii. **Turn on-board Radio Off**

viii. **Turn heaters off**

ix. **Activate telemetry through HASP control to remove power from the package**

x. **Take dark images at programmed integration time while package is at appropriate sample temperatures.**

xi. **Repeat steps i-viii**

xii. **Replace the Lens Covers with the "Remove Before Flight" Streamers attached.**

xiii. **Report system ready for flight**

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…):

i. **One table on which the team can locate two laptop computers**

ii. **Power cord access to work table**

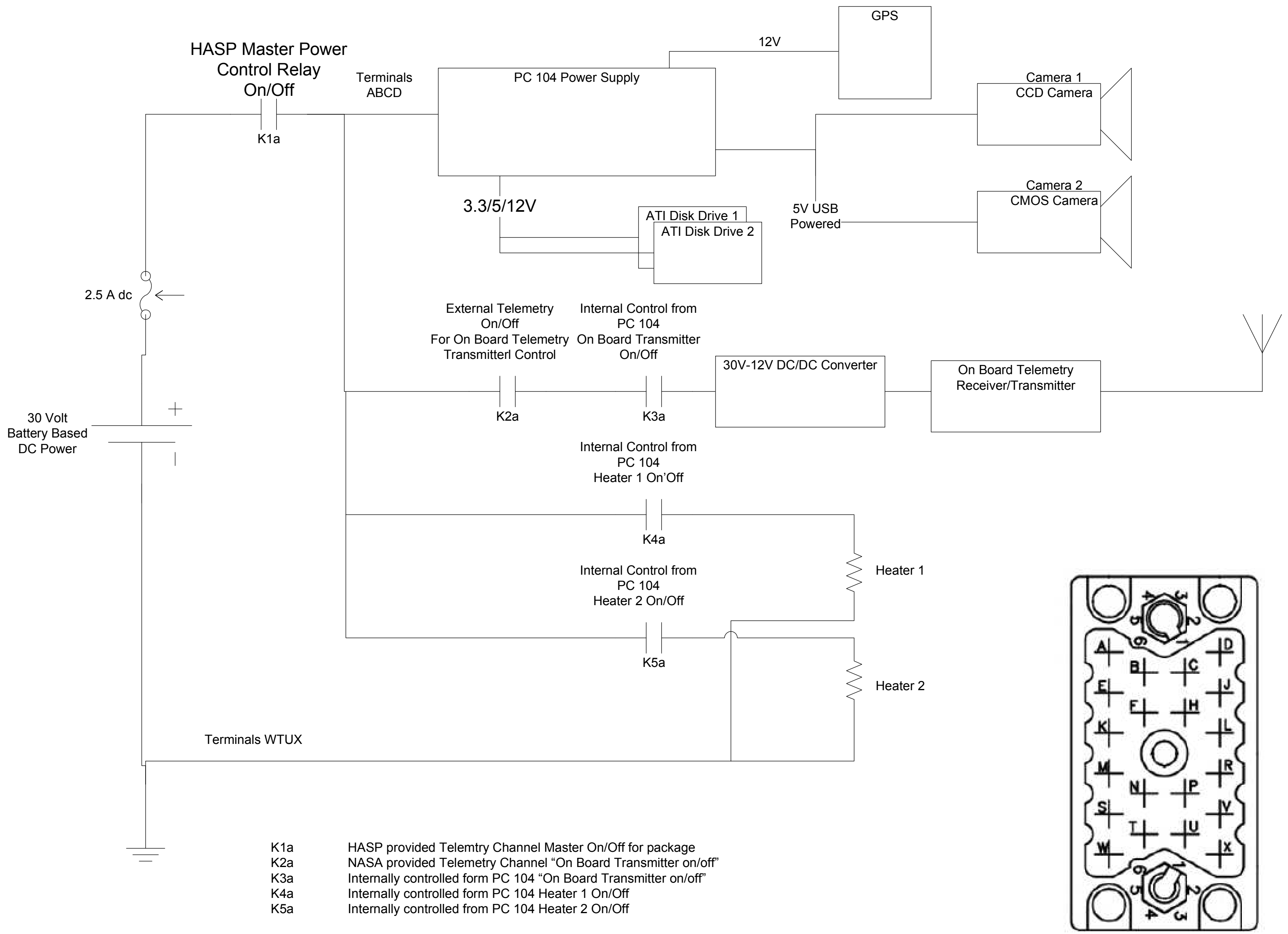
iii. **During flight, we will need a method of running a data wire (RS-232) from the table with our control computer to a location outside where the ground station**

packet radio can be placed.

J. List any LSU supplied equipment that may be needed for a successful integration:
None.

SLICC Electrical System One Line Diagram

Monday, June 01, 2009



K1a	HASP provided Telemtry Channel Master On/Off for package
K2a	NASA provided Telemetry Channel “On Board Transmitter on/off”
K3a	Internally controlled form PC 104 “On Board Transmitter on/off”
K4a	Internally controlled form PC 104 Heater 1 On/Off
K5a	Internally controlled from PC 104 Heater 2 On/Off

Figure 5: The EDAC 516-020 receptacle pin layout.