HASP Payload Specification and Integration Plan

Payload Title: CRESS: Cosmic Radiation Exposure System for Seeds

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

Payload ID: **2016 - 04**

Institution: **University of Florida**

Contact Name: **Robert Austin Schmitz**

Contact Phone: **(813) 480 7597**

Contact E-mail: **rschmitz@ufl.edu**

Submit Date: **06/24/2016**

I. Mechanical Specifications:

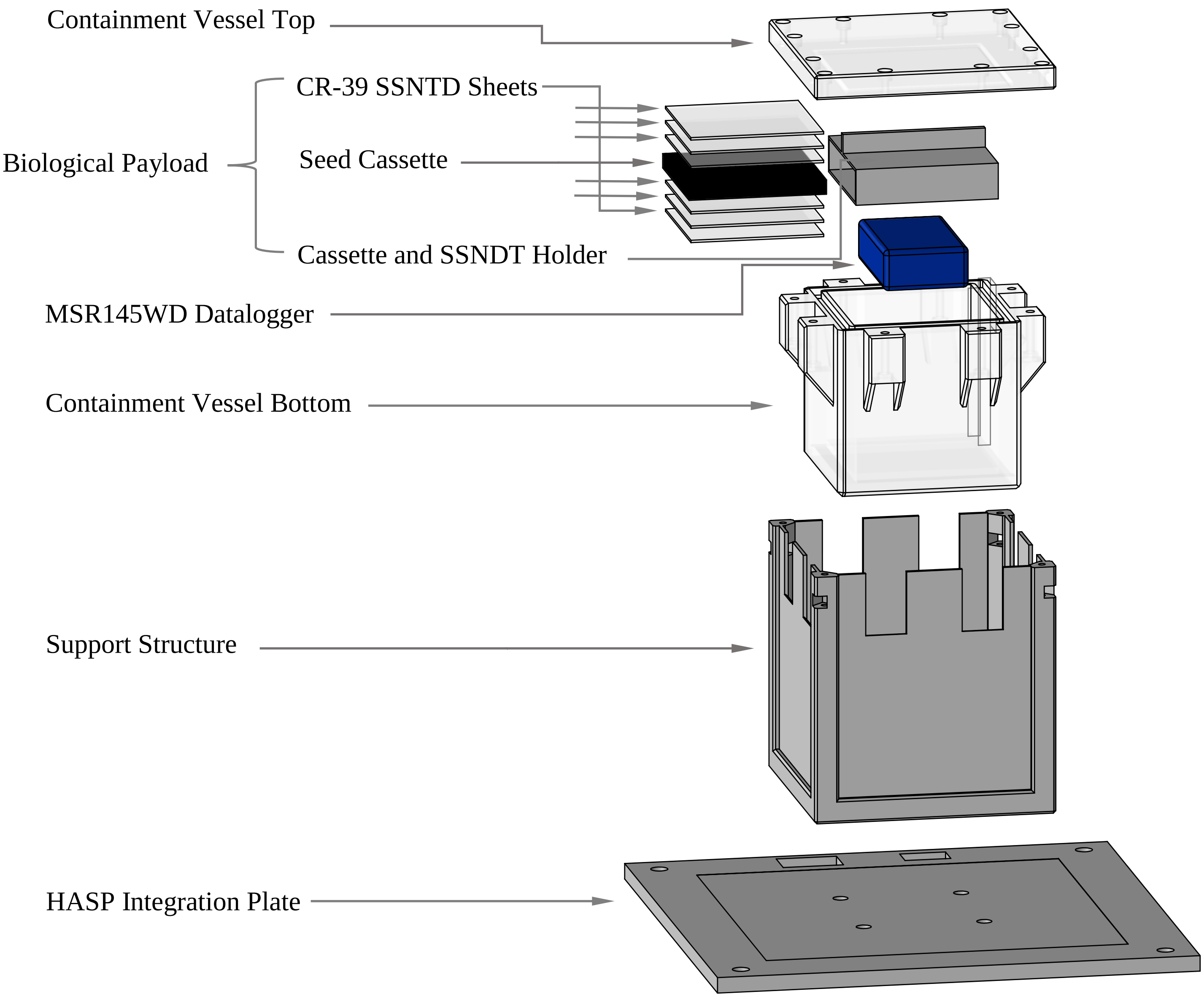
A. Measured weight of the payload (not including payload plate)

TABLE 1

Component Name	*Measured Mass*	*Uncertainty*
Containment vessel top + 8 M3 x 30mm hex bolts	**128.39g**	**±3.0g**
Biological payload (seed casette, holder, CR-39 sheets)	**32.9g**	**±3.0g**
MSR Data Logger	**27g**	**±0.05g**
Containment vessel bottom + 8 M3 locking nuts	**255.78g**	**±5.0g**
4 M3 x 30mm containment vessel-to-support structure bolts	**5.66g**	**±0.01g**
Support Structure	**138.20g**	**±6.0g**
6.5 ml Arabidopsis seeds	**4.46g**	**±0.40g**
Outreach addition	**30g**	**±10.0g**
Total Mass	**622.39g**	**27.46g**

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

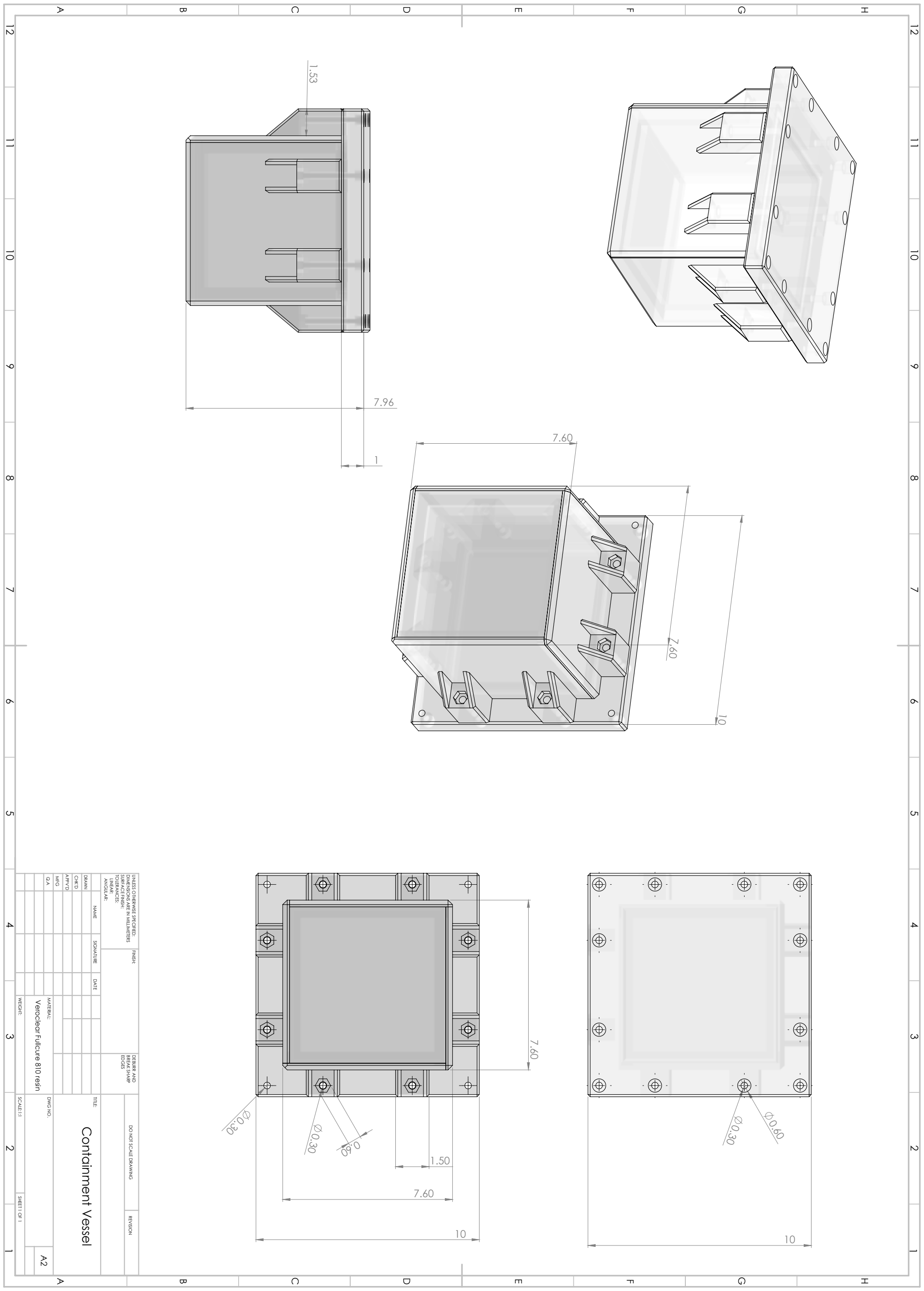
EXPLODED OVERVIEW



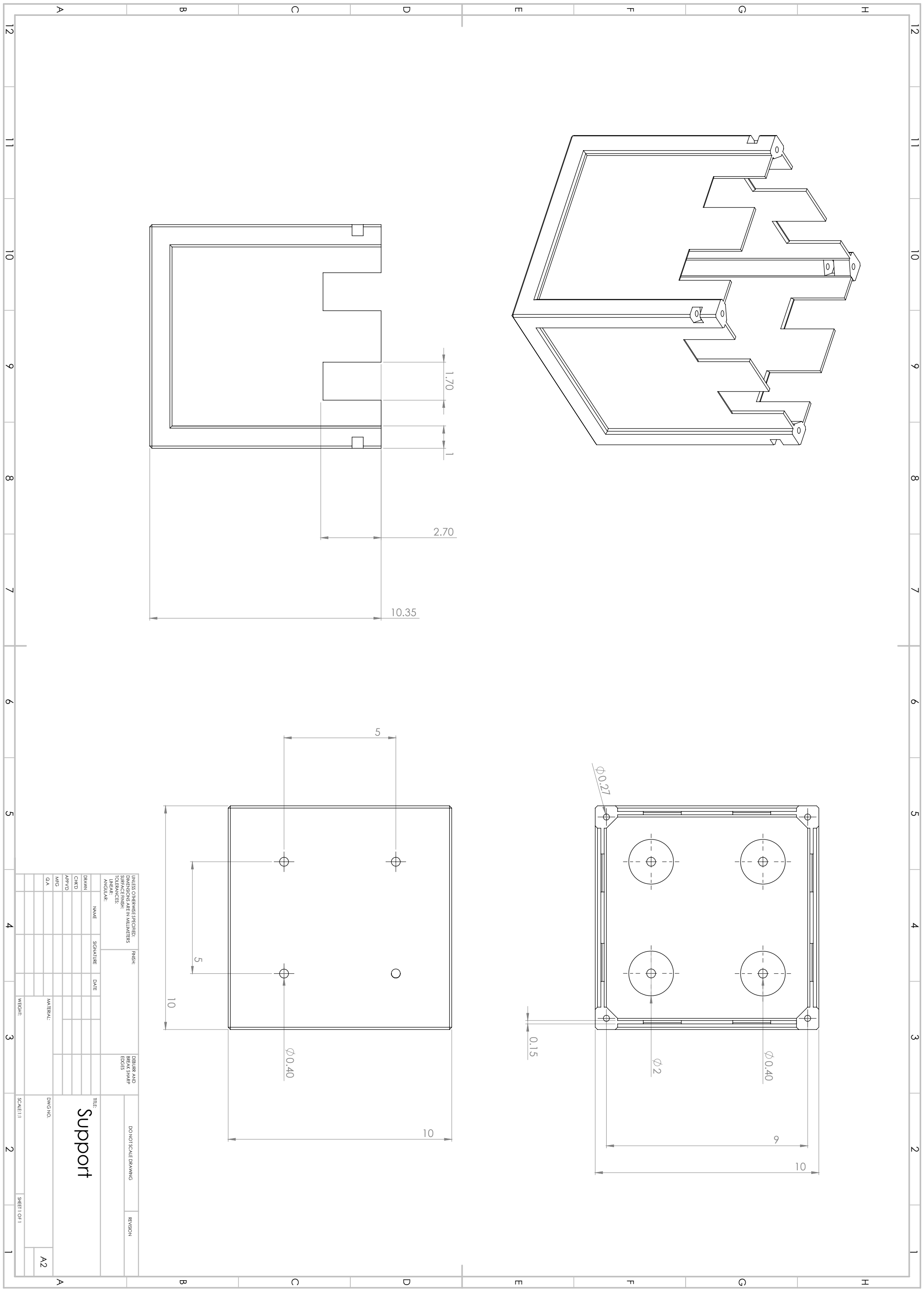
MECHANICAL DRAWINGS OF MAJOR COMPONENTS:

All dimensions are in centimeters

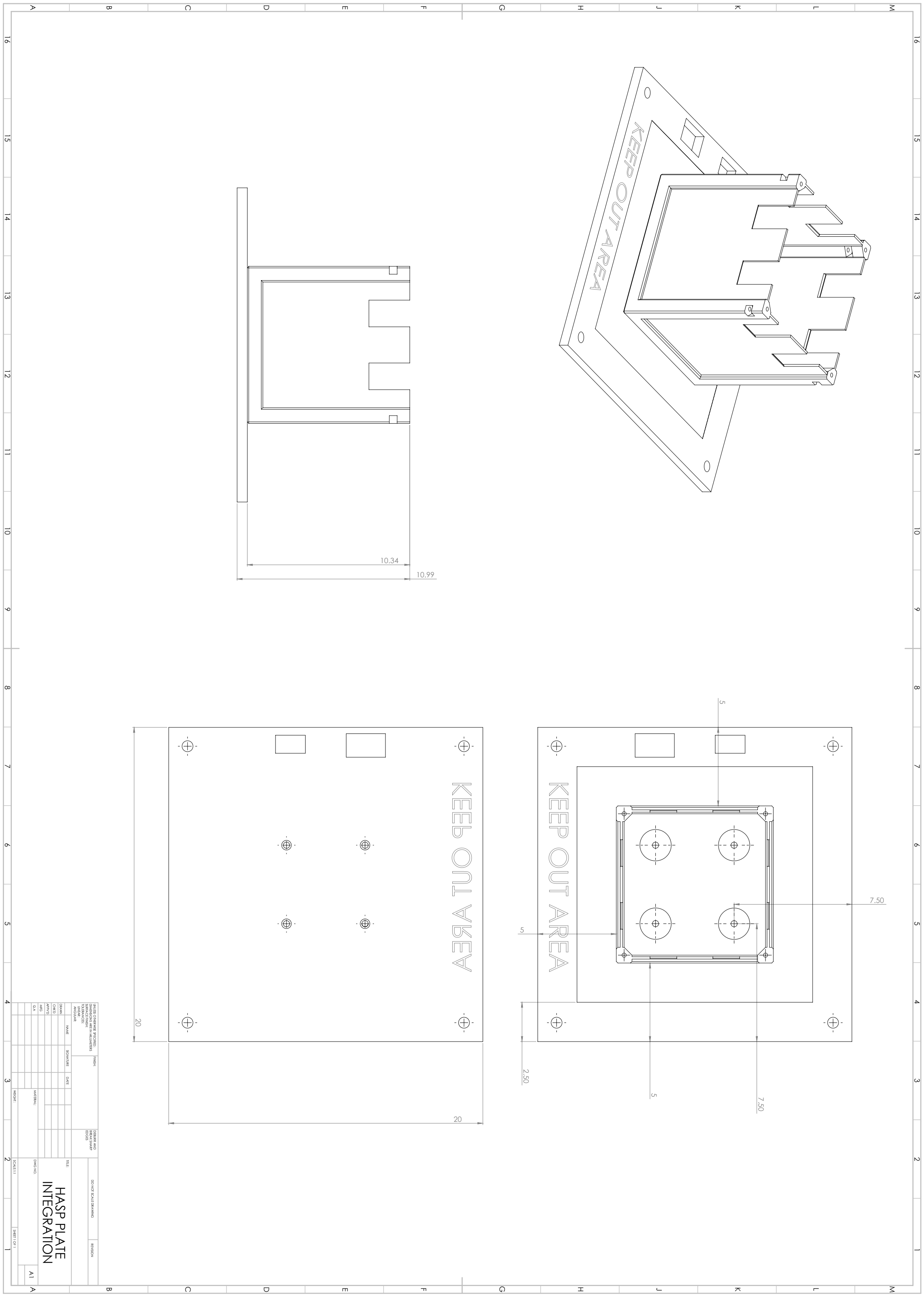
Containment Vessel (Top and Bottom)



Support Structure



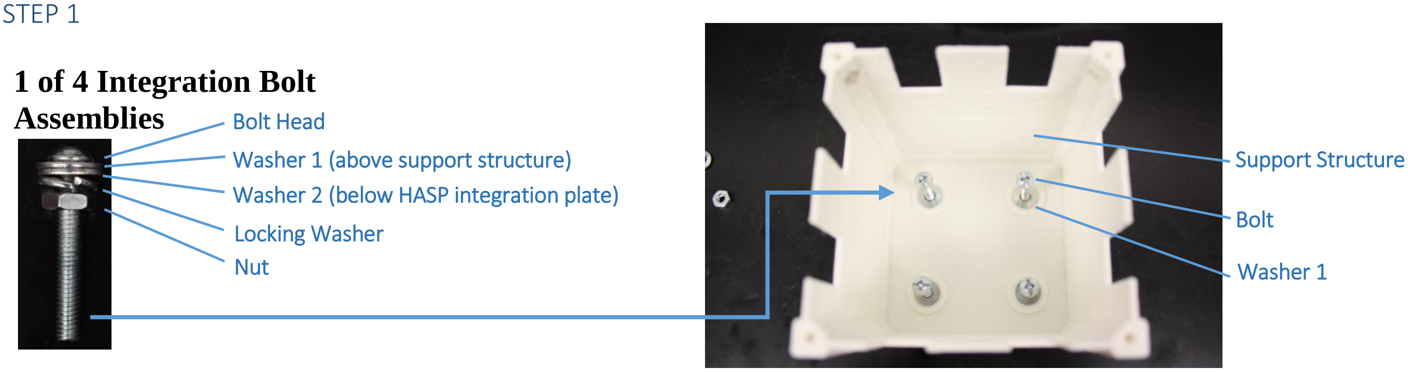
Support Structure and HASP Integration Plate



INTEGRATION:

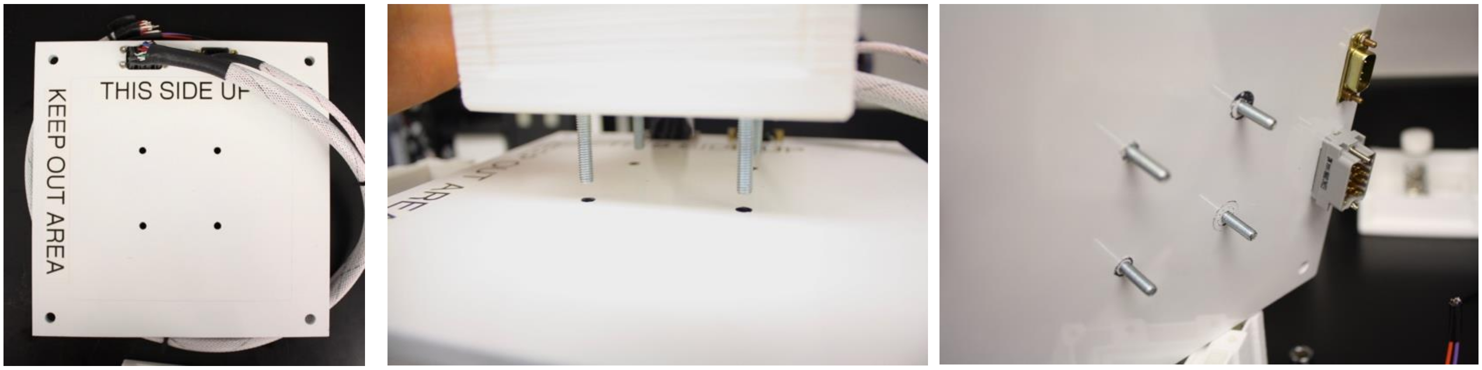
STEP 1

1 of 4 Integration Bolt Assemblies



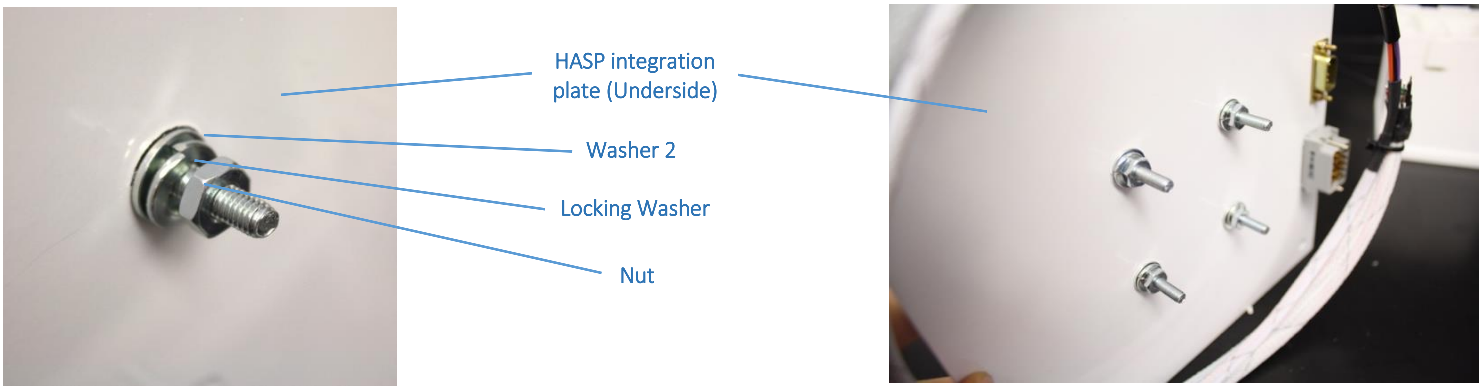
STEP 1: Place Washer 1 over the integration holes in the Support structure. Insert the bolt through washer 1 and through the support structure integration holes as pictures to the right.

STEP 2



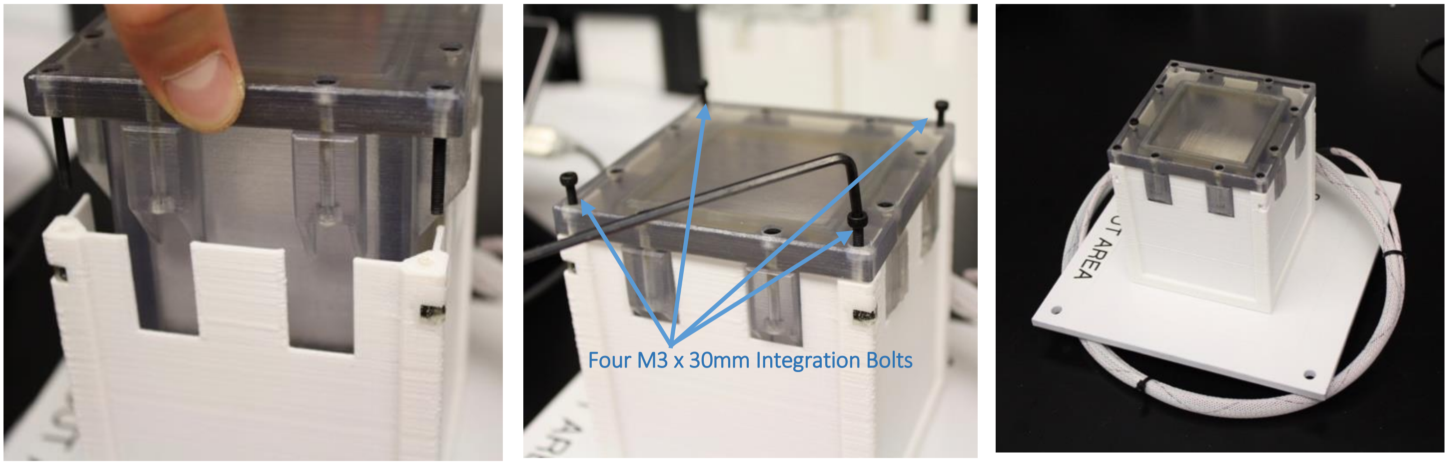
STEP 2: Position the support structure and bolt assembly over the HASP integration plate and insert the four bolts through the corresponding holes.

STEP 3



STEP 3: Add washer 2, the locking washer, and nut over the four protruding bolts. Hand screw the nuts until tight. Tighten further using a wrench and screwdriver only until the locking washers lie flat, no more.

STEP 4



STEP 4: Place containment vessel assembly over the support structure and insert four M3 x 30mm integration bolts in to the support structure holes. Tighten down four M3 x 30mm integration bolts using an M3 hex wrench until assembly is secure, no more. Fully Integrated payload pictured right.

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…)

   i. N/A

D. Other relevant mechanical information

II. Power Specifications:

A. Measured current draw at 30 VDC: **N/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. **N/A**

C. Other relevant power information: **N/A**

III. Downlink Telemetry Specifications:

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

B. Approximate serial downlink rate (in bits per second): **N/A**

C. Specify your serial data record including record length and information contained in each record byte. **N/A**

D. Number of analog channels being used: **N/A**

E. If analog channels are being used, what are they being used for? **N/A**

F. Number of discrete lines being used: **N/A**

G. If discrete lines are being used what are they being used for? **N/A**

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

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) **N/A**

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*) **N/A**

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

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

F. Other relevant uplink commanding information. **N/A**

V. Integration and Logistics

A. Date and Time of your arrival for integration: **August 1, 2016 2:00pm**

B. Approximate amount of time required for integration: **Two Hours**

C. Name of the integration team leader: **Austin Schmitz**

D. Email address of the integration team leader: **rschmitz@ufl.edu**

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

  i. **Austin Schmitz – rschmitz@ufl.edu**
  ii. **Robert Ferl – robferl@ufl.edu**

F. Define a successful integration of your payload:

  i. **Containment vessel is sealed and mounted onto the payload support. MSR Datalogger blinking blue LED indicating data acquisition.**

G. List all expected integration steps:

  i. **Biology and MSR data-logger are placed within the Containment Vessel**
    1. **Initiate data acquisition.**
    2. **Check for blinking blue LED.**
  ii. **Containment vessel top is bolted to containment vessel bottom and torques to specifications. Check seal visually.**
  iii. **Containment Vessel Support is bolted on to the HASP integration plate.**

   iv. **Assembled containment vessel/integration plate is bolted on to support structure.**
   v. **Check for loose bolts and ensure structural integrity.**

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

   i. **All bolts are secure.**

   ii. **MSR Datalogger is showing a blue blinking LED indicating data acquisition.**

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…): **N/A note: our payload will be hand carried to the integration site.**

J. List any LSU supplied equipment that may be needed for a successful integration: **N/A note: tools for integration of the plate to the gondola are assumed to be LSU-supplied.**

RESPONSES TO HASP PRE-PSIP COMMENTS:

Please provide a completed weight table that includes the weights of all major components in your payload.

Please see Table 1 on page one.

Part of the successful integration is the completion of a thermal vacuum test. Integration will not be considered a success if the containment vessel does not survive the test.

Detailed results of thermal and vacuum testing are included in the month's (June) monthly status report. We have demonstrated that the containment vessel is capable maintaining pressure while in a low pressure environment.

How do you test for exposure? Is this factored into a successful integration? You do not mention it in your integration procedure and checkout.

Structurally, the payload has been tested at extreme temperatures that are expected to happen during flight. It has also been thoroughly tested in vacuum chambers. This should not affect integration on the HASP platform.

Scientifically, the desired exposure to increased cosmic rays is detected post

flight by developing the exposure films integrated into the containment vessel along with the seeds, as well as by germinating the seeds.

How is this data logger controlled? How long does it run?

The MSR145WD datalogger is controlled either manually (push button) or via Bluetooth using the proprietary MSR controller application available for apple devices.

Once set and activated, no further control is required.

Note: The MSR has a memory capacity of 1,000,000 measurements and a battery capacity of 260mAh. Memory capacity is the limiting factor for data acquisition time. Record time varies depending on record rate for Temperature (T), Pressure (P), and 3-axis acceleration (A). For example, when the rate is set to 1 recording for each T, P, and A every 5 seconds, memory capacity is about 20 days. This drops to 15 days for 1 recording every 3s. We are confident that neither battery capacity nor memory capacity will limit our ability to record flight environmental conditions relevant to the payload.