RockSat 2010
Payload Canister
User's Guide

The Next Step In Low Cost
Student Access To Space

Colorado Space Grant Consortium
Discovery Learning Center Room 270
520 UCB
Boulder, Colorado 80309-0520

Wallops Flight Facility
Wallop Island, Virginia

0.0 APPROVALS AND TRACKING

0.1. Signatures

Prepared by: _____ _____
Shawn Carroll, COSGC — Date
RockSat Student Project Manager

Reviewed by: _____ _____
Chris Koehler, COSGC — Date
COSGC Boulder Director

Concurrence: _____ _____
Phil Eberspeaker, Wallops Flight Facility — Date
Chief, Sounding Rockets Program Office

0.2. Revisions

Revision	Description	Date	Approval
- DRAFT	Initial release	7/31/2009	

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1.0 INTRODUCTION

1.1. Eligibility

Due to International Traffic in Arms Regulations (ITAR) restrictions, the RockSat payload canister is limited to U.S. educational institutions; only payloads from U.S. educational institutions are eligible to participate in the RockSat payload canister program.

For the purpose of the RockSat payload canister, 'educational institution' is defined broadly and includes, but is not limited to, the following: universities, colleges, technical schools, public and private high school, middle school and grade school, science museums, etc. Organizations which are not included in the above listing are encouraged to contact COSGC to clarify their eligibility in the program. In addition, U.S. entities (e.g. industry, research institutions, etc.) that fall outside of the eligibility conditions listed above, but who are interested in participating in the program, are encouraged to team with an eligible U.S. educational institution. Teaming between educational institutions and industry or other interests is allowed and in fact encouraged.

1.2. Purpose

The purpose of this document is to identify the interfaces, requirements and logistics pertaining to the University of Colorado-Boulder (CU-Boulder) Colorado Space Grant Consortium's (COSGC) RockSat payload canister. This document also establishes the guidelines and requirements for qualifying a payload for selection to be flown in June or possibly August of 2010, along with the review and integration schedule. Payloads shall be student based with faculty and/or industry involvement only. The RockSat payload canister is not available to payloads that are profit related endeavors and/or industry research and development. Students must be actively engaged and involved.

1.3. Getting Involved (Intent to Fly Form—IFF)

Interested institutions will need to submit an Intent to Fly Form no later than September 9, 2009 at 4:00 PM MDT. No later than October 19, 2009, ***each*** initially selected institution will make a $1,000 earnest deposit. This deposit is fully refundable until the customer has been down selected as a finalist in the month of January. Further details on the selection process can be found in Section 8.

1.4. Sharing

Customers that wish to share a RockSat Payload Canister shall indicate this on the submitted Intent to Fly Form (IFF). In the event that a sharing customer does not specify the fraction of the canister's volume and allowed mass required, COSGC will assume that the customer needs one-half of the usable space and one-half of the allowed mass. Customers may use as much as an entire can, half of a can, or as little as one quarter of a can.

Customers are encouraged to collaborate and pair prior to the submittal of the Intent to Fly Form (IFF). In the event that shared customers cannot fill a canister, COSGC will pair the remaining customers to fill each canister. Final customer pairings shall be released with initial selections. It is each customer's responsibility to review the list and request changes in paring assignments within two weeks of being initially selected if desired.

Two weeks after initial selections, all pairings, mass allotments, and volume allotments are final and cannot be changed without written consent of COSGC. In the event that a subset of customers would like to redistribute allotments, all customers of the subset must contact COSGC, and changes will only be made with written approval of all parties involved and COSGC. Cost sharing is covered in Section 1.4.

Customers that share a canister are responsible for interfacing to each other. It is required that all sharing customers assigned to a can collaborate and create specific interfacing slides for all design reviews. Interfacing across state lines can be extremely challenging but is a realistic challenge that many aerospace projects must overcome.

1.5. Cost

The cost of a flight is contingent upon the fraction of the canister being utilized. This cost covers the following expenses: launch costs, one (1) RockSat payload canister, mission management support, and other amenities provided during the week of launch.

During the week of launch, the cost will also provide the following amenities for four (4) team members: lunch on the first Friday integration, tentatively June 18th; lunch and breakfast on the following Monday through Wednesday (21st-23rd), a cold early breakfast and hot later breakfast the day of launch, tentatively June 24th, lunch on launch day, and a final celebration seafood feast on the evening of launch. Additionally, each of the four members will receive a RockSat t-shirt. The cost will NOT cover travel to and from Wallops Flight Facility, lodging, or other expenses incurred. In the event that a team would like

to bring more than four team members, additional meals and t-shirts can be purchased in advance. Please notify Shawn or Chris as soon as possible if this will be the case.

1.5.1. Dedicated Customers

A dedicated customer is an institution whose payload will occupy an entire canister. If a dedicated customer's payload is chosen to fly at final down select (January), he/she will then make two (2) additional equal payments of $5,500 on 01-22-2010 and 04-9-2010. ***After receipt of the first installment of $5,500, each customer will be sent one (1) RockSat payload canister contingent upon machining completion, and all deposits shall become non-refundable.*** All payments must be made in the form of a check made payable to: University of Colorado. Payments should be sent to:

Colorado Space Grant Consortium
Discovery Learning Center Room 270
520 UCB
Boulder, Colorado 80309-0520

1.5.2. Share Customers

A share customer is an institution whose payload will occupy only a fraction of a canister. Share customers have the option to occupy either one-half or one quarter of a canister; no other fractions will be allowed due to the added complexity of paring. The assigned fraction sets the maximum volume and mass that the shared customer can occupy from the available mass and volume. How each shared customer occupies his/her territory is the business of the sharing customers in the specific canister. Table 1 summarizes the total cost for shared customers. ***These costs include the earnest deposit of $1,000***.

Table 1: Shared Customer Costs

Shared Customer Costs	
Fraction	*Cost*
1/2	$7,000.00
1/4	$5,000.00

At the time that earnest deposits are due, all share customers shall still pay the earnest deposit of $1,000 made payable in the same method as described in Section 1.5.1. ***After receipt of the first installment all deposits shall become non-refundable.*** In the event that a subset of sharing customers is chosen at final

down select, the remaining cost to each customer in the can will be broken into two equal payments. These payments will be made on the dates indicated in the schedule (1/22/09 and 4/9/10) (see Section 9.0). The RockSat payload canister for a sharing subset will be given to the customers on the night of arrival in Virginia for fit checks.

1.6. Points of Contact

Program points of contact (POC's) are as follows:

Colorado Space Grant Director	Chris Koehler 303-492-4750 koehler@colorado.edu
Colorado Space Grant RockOn Student Program Manager	Shawn Carroll 720-234-4902 rocksatprogram@gmail.com

1.7. Applicable Documents and Links

- Colorado Space Grant Consortium RockOn website: http://spacegrant.colorado.edu/rockon
- NASA Wallops Flight Facility: http://www.nasa.gov/centers/wallops/home/index.html

2.0 ROCKSAT OVERVIEW

The RockSat payload canister is a modular system of cans designed for suborbital flights with Wallops Flight Facility's (WFF) Sub-SEM ring assembly (Figures 4 and 5). Images and solid models are also given below in Figures 1-3 and Appendix A. The objective of the RockSat payload canister is to give customers a design envelope to build around that will allow easy integration to any WFF rocket using the Sub-SEM ring assembly. This standardized approach provides customers low cost access to space. The RockSat payload canister was successfully tested in June of 2008 when 5 RockSat payload canisters carried payloads to an altitude of greater than 40 miles on WFF's improved Orion rocket.

The second iteration of the RockOn workshop took place from June 21-26, 2009. The first iteration of RockSat flew on June 26, 2009 when 4 customer cans carrying 10 experiments soared to an altitude of greater than 117 km (72.7 mi) on Wallops Flight Facility Terrier Improved-Orion rocket. In the event that a selected RockSat payload canister cannot fly on launch day, there shall be back up canisters present and ready to fill

the vacant spot. In addition to the June flight, there is a possibility of a second flight in August of 2010. Details on this second flight are TBD.

2.1. RockSat Payload Canister Images

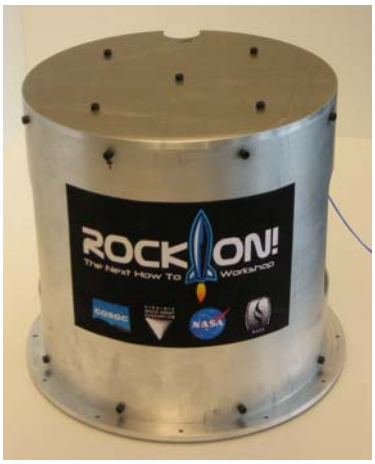

Figure 1: RockSat Payload Canister

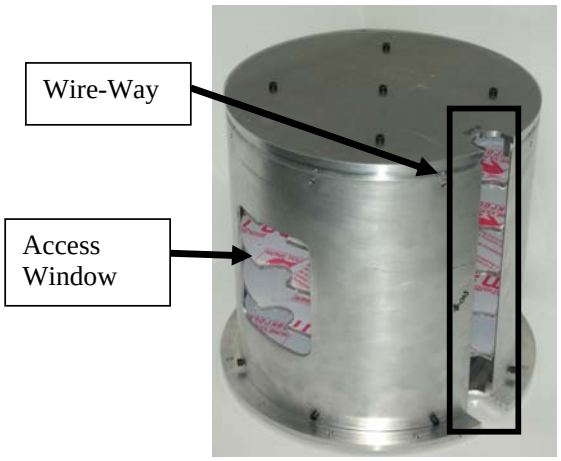

Figure 2: RockSat Payload Canister

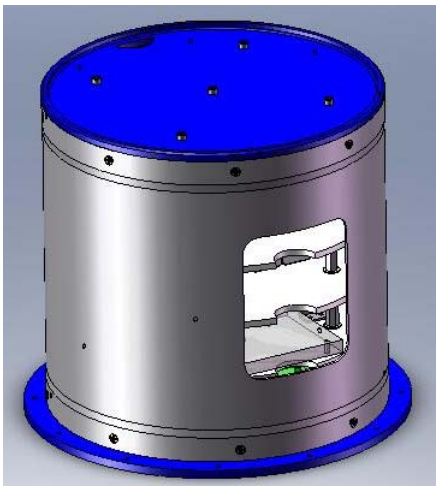

Figure 3: RockSat Payload Canister

** Makrolon plates visible in the picture and SolidWorks model are part of the RockOn workshop and are not required or included.

3.0 ROCKET DESCRIPTION AND CAPABILITIES

This section covers key interfacing and launch vehicle capabilities that customers should be aware of for the design of his/her payload.

3.1. RockSat Payload Canister Interface General Description

Each RockSat payload canister will be attached to the Sub-SEM ring assembly in a stacked configuration (Figure 4). The Sub-SEM rings are further attached to longerons that span the entire length of the experiment section (Figures 4 and 5). With 9 RockSat cans flying (4 RockOn, 5 RockSat customers), the Terrier-Orion is estimated to reach an altitude of approximately 100-130 km.

The selected RockSat payload canisters will be flying with four (4) other RockSat payload canisters that will contain payloads of RockOn 2010 workshop participants. The RockSat payload canisters shall use the five (5) top bulkhead bolts and five (5) bottom bulkhead bolts to secure the payload to the canister. Further details on these bolts and dimensions are discussed in Section 5.2.

In addition to meeting the bolt interface requirements, each payload shall have a Remove Before Flight pin (RBF) activation system. This system shall be constructed such that no current passes though to the Terrier-Orion shorting plug at the time of Wallops activation. A detailed description of constraints and construction of the activation system can be found in Section 5.2.2. A compliance test shall be performed before integration. ***Payloads that do not meet this requirement shall be removed from the flight.*** The RBF system shall be designed such that only two (2) wires pass through the designated wire-way. Further details on the dimensions and location of the wire-way can be viewed in section and Section 5.1.5 and Appendix A.

Comment: Under review and will be updated when more details are available from Wallops.

The RockSat payload canister is cylindrical in shape with a useable payload space having a diameter of approximately 9.3 inches and an approximate height of 9.5 inches, see Figure 6 and mechanical drawings in Appendix A for exact dimensions. Each RockSat payload canister weighs approximately 6.9 pounds without the caphead screws. The total weight of the integrated RockSat payload canister, complete with customer hardware, shall be 20±0.2 lbf. No modifications shall be made to the RockSat payload canister. ***Violation of this rule will result in the customer being removed from the flight***.

3.1.1. Modular Structure, Sub-SEM, and Payload Space Images

Figure 4: Modular Stacked Assembly

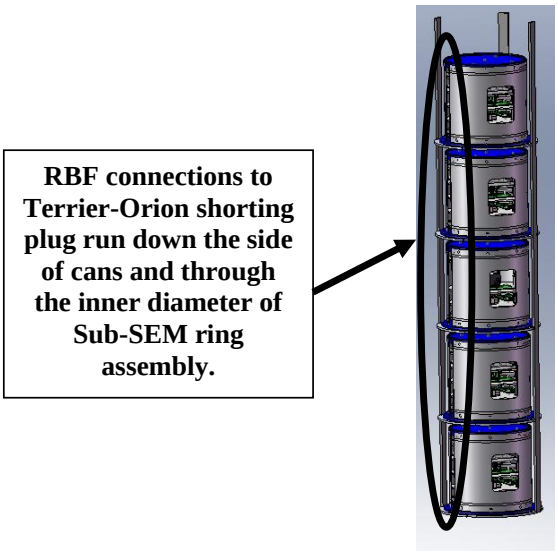

Figure 5: Longerons and Sub-SEM Ring

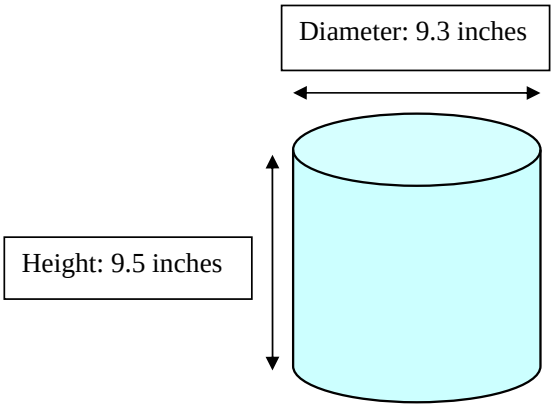

Figure 6: RockSat Payload Canister Volume Constraints

3.2. Rocket Key Performance Parameters

Table 2: Key Performance Parameters

Key Performance Parameter	Value	Note
Altitude (km)	≈115 km	1,2
Spin Rate (Hz)	≈1.3 Hz at Terrier burn out; ≈4.8 at Orion burn out	1,2
Maximum Ascent G-Load	25 G	1,2
Rocket Sequence (Burn Timing)	5.2 s Terrier burn—9.8 s coast—25.4 s Orion burn	1,2
Chute Deploy (seconds)	489.2 s	1,2
Splash Down (seconds)	933 s	1,2

Notes:

1. All parameters are subject to change, but all customers will be notified of any changes.
2. Data from 2009 Terrier Improved Orion launch.

3.3. Flight Environment Conditions

The biggest environmental factor to consider for WFF flights will be G-loading. During the 2008 RockOn workshop, participants recorded sustained G-loads of approximately 25 Gs during ascent on the improved Orion rocket. Payloads shall be designed to withstand 25 Gs of quasi-static loading in all three axes with possible impulses of approximately 50 Gs in the Z (longitudinal) axis. Three axes vibration testing will be conducted by WFF before flight. ***Payloads that do not pass WFF's vibration test will be removed from the flight***.

Temperatures in the experiment section began at ambient (72° F for RockOn 2008), and climbed to a maximum of 90° F during the ascent of the improved Orion.

In most orbital and suborbital flights, outgassing is an important consideration. Wallops Flight Facility pressurizes its experiment sections with nitrogen, so this should not be an issue. In the event that the seal is lost, it is best to use low outgassing materials in payload design. Outgassing properties for most materials can be found at: http://outgassing.nasa.gov/.

3.4. Disclaimer

Recovery of payloads is not guaranteed. As with any flight, there are possible anomalies that can occur during the flight or recovery that can severely damage or destroy flight hardware. All selected teams should consider this and understand that space flight involves risks that neither COSGC nor WFF can plan for. Selected payloads assume all risks, and neither of the said institutions shall be held responsible in event of an anomaly and/or unrecoverable payload.

4.0 ORGANIZATIONAL RESPONSIBILITIES

4.1. Hardware and Interface Responsibilities

Component and functional design responsibilities are listed below.

RockSat Payload Customer

- Payload experiment and support system.
  - Support system includes:
    - Power to operate payload
    - Data storage
    - Thermal system (if desired)
    - Internal structure to RockSat payload canister
    - All environmental sensors (if desired)
    - Activation system at launch (in accordance with Section 5.2.2.)
- Mechanical interface to the ten (10) bulk head screw outlined in Section 5.2.1.
- Safety features for experiment-related hazards
- Two (2) drop down RBF activation wires
- All required ground side data analysis equipment (computers not provided)
- Required interfacing between sharing customers

COSGC and WFF

- Terrier-Orion rocket, range safety, launch support, recovery and tracking
- One (1) RockSat payload canister
- Ten (10) 8-32 Black Oxide Alloy Steel Socket Head Cap Screws [To bulk heads]
- Pressure testing and integration onto full rocket

4.2. Ground Control

After the RockSat payload canisters have been integrated onto the sub-SEM ring assembly two days prior to launch, the customer will have very limited access to

the payload. WFF will handle all activities pertaining to payload preparation, launch, and recovery until the RockSat payload canister has been recovered and the payload skin section is deintegrated

5.0 PAYLOAD DESIGN REQUIREMENTS

5.1. Payload Physical Envelope, Mass, and Center of Gravity Requirements

The following subsections outline the physical requirements and constraints of the RockSat payload canister.

5.1.1. Constraints on Payload Types

The purpose or mission of a payload is open to the customer. The customer shall design a payload that by all standards (engineering and laymen) would be considered safe and practical. Experiments shall not put other payloads, WFF employees, COSGC employees, or the launch vehicle at risk. All payloads shall be formally selected before the customer can become a contender for flight (IFF). This approval will come with signatures on the Intent to Fly Form (IFF) that will be submitted no later than September 9, 2009 at 4:00 PM MDT. The RockSat payload canister can be sub-divided between other customers to share space and costs. If two or more customers choose to share payload space, this should be documented on the IFF.

5.1.2. Physical Envelope

All payloads must be contained within the RockSat payload canister. The can is cylindrical in shape with a diameter of 9.3 inches and a height of 9.5 inches. The payload may occupy as much or as little of this space is required. Mechanical drawings of the RockSat payload canister are contained in Appendix A.

5.1.3. Mass Properties

The entire RockSat payload canister and payload shall weigh 20±0.2 lbf (9.07 kg). RockSat payload canister will be weighed prior to integration. ***Cans not conforming to the weight constraints will be removed from the flight***.

5.1.4. Center of Gravity

All payloads shall be designed to have a center of gravity (CG) that lies within a 1x1x1 inch envelope of the geometric centroid of the integrated RockSat payload canister. To ensure stable flight, WFF may require a moment of inertia (MOI) test prior launch. This test will confirm that the CG of the payload and RockSat payload canister lie within the one inch cube envelope discussed above. ***Payloads that do not meet WFF's CG requirements will be removed from the flight.***

5.1.5. Payload Access Windows and Wire-Way

The RockSat payload canister has two (2) payload access windows that are separated by 180 degrees. These windows have approximate dimensions of 3.5 inches wide by 4.5 inches tall. The wire-way is offset 90 degrees from these windows. The wire-way consists of a notch on the bottom and top bulkheads that allow RBF and other necessary wires to pass down the payload section. In addition to the notches, the RockSat payload canister skin has a cut-away for running wires. Mechanical drawings of the locations and dimensions of the windows and wire-way can be found in Appendix A.

COSGC and WFF require that each RockSat payload canister pass down one (1) set of two (2) wires that WFF personnel will connect to the launch vehicle shorting plug. Each experiment shall have one (1) set of RBF wires of no shorter than 4 feet. These wires will be trimmed and will have Winchester connectors added at WFF. Once again, there shall be no current passing through these wires until the payload is activated at launch. If other wires need to be passed to other payloads or to WFF, a formal variance request should be submitted to Chris Koehler and Shawn Carroll.

5.1.6. Optical and Atmospheric Ports

Unless indicated otherwise on the IFF, all payloads are assumed to be contained within the experiment section and will not have access to an optical or atmospheric access port. If a port is desired, this needs to be explicitly stated on the IFF. Not every payload can be granted access to these ports due to limitations of the rocket skin and the cost of the ports themselves.

For the June launch, the customer payload section will have access to three (3) static pressure ports, one (1) dynamic pressure port, and four (4) optical ports. As previously stated, not all payloads can be granted access to these ports, and any desired ports shall be indicated in the IFF. When choosing sharing partners, it should be noted that each of the four (4) available canisters will be granted one

(1) optical port. Pertinent dimensions for the optical ports can be found in Appendix C.

Comment: When further drawings are acquired from Wallops, they will be added as Appendix C to this document.

If a customer is granted access to an atmospheric port, he/she must provide the drop down tubing to interface to Wallops. The customer end shall terminate with a male ¼" NPT connector. Tube lengths will be determined once placement in the payload section has been established. ***In addition to providing the drop down tubing, customers using an atmospheric port shall also design in a redundant valve to close prior to splash down to ensure that no water will enter the payload section in the event of a Wallops shut off valve failure.*** Wallops valves are designed to open at 5,000 feet on ascent and close at 5,000 feet during ascent.

Port options for the possible August launch are TBD at this time.

5.1.7. Summary of Key Constraints

Table 3: Summary of Key Constraints

Type	Quantitative Constraint
Physical Envelope	Cylindrical: Diameter: 9.3 inches Height: 9.5 inches
Mass	Canister + Payload = 20±0.2 lbf
Center of Gravity	Lies within a 1x1x1 inch envelope of the RockSat payload canister's geometric centroid.
Ports	Customer shall provide drop down tubing for atmospheric plumbing. Plumbing must terminate with a male ¼" NPT connector. Additionally, the customer shall design in a redundant valve to protect the payload at splash down.

5.2. Payload Interfaces

5.2.1. Mechanical Interfaces

The payload shall be contained within the RockSat payload canister. The restrictions on volume, mass, and CG can be found above in Section 5.1. In addition to the above restrictions, each payload shall be designed such that its internal structure mounts to the ***top and bottom*** bulkheads of the RockSat payload canister. The top and bottom bulk heads each have holes for five (5) 8-32 black

oxide alloy steel socket head cap screws. This means that the customer's payload must mount to ten (10) of the said bolts. This requirement will ensure that the top and bottom bulk heads are secured to the payload. These bolts can be ordered in various lengths and shall be provided by COSGC and WFF. This interface must be addressed in all design reviews.

No payload may alter or modify the RockSat payload canister in any way. The RockSat payload canister shall remain in the same state that it was issued in, and no part of the internal payload shall be mounted to any other part of the RockSat payload canister but the bulkheads as described above.

5.2.2. Electrical Interfaces

Comment: As stated in the IFF, this section MUST be reviewed once the interface has been fully defined and formalized.

THIS INTERFACE IS UNDER REVIEW WITH WALLOPS. THIS INTERFACE IS ONE OF THE MOST CRITICAL AND ***MUST*** BE REVIEWED ONCE IT HAS BEEN FORMALIZED.

Each payload shall be electrically self-contained. No power will be provided by WFF or the launch vehicle. It is highly recommended that all payloads use rechargeable batteries, but ***the use of rechargeable lithium ions is strictly prohibited***. Non rechargeable lithium ions are allowed, however. Wallops Flight Facility will activate the RBF wires though a shorting plug, but this is the extent of electrical interface to the rocket. ***RBF activation system shall be constructed such that no current flows through the payload or RBF wires prior to G-switch activation to ensure the safety of Wallops Flight Facility personnel***.

The customer is responsible for payload activation at launch. Wallops Flight Facility cannot activate payloads at launch. It is required that the customer use a mechanical G-Switch to activate his/her payload.

The Remove Before Flight (RBF) system shall consist of two wires that will be passed down the wire-way to the WFF shorting plug. The system shall be constructed such that there are two "opens" in the activation system before the RBF wires are shorted. Once WFF adds the shorting plug, this will leave only one open in the system, the mechanically activated G-switch. No current shall flow through any portion of the payload until both opens have been closed at launch.

Wallops will perform a no-volts check between the RBF wires. Diagrams of an acceptable RBF activation system and the three key states are shown below.

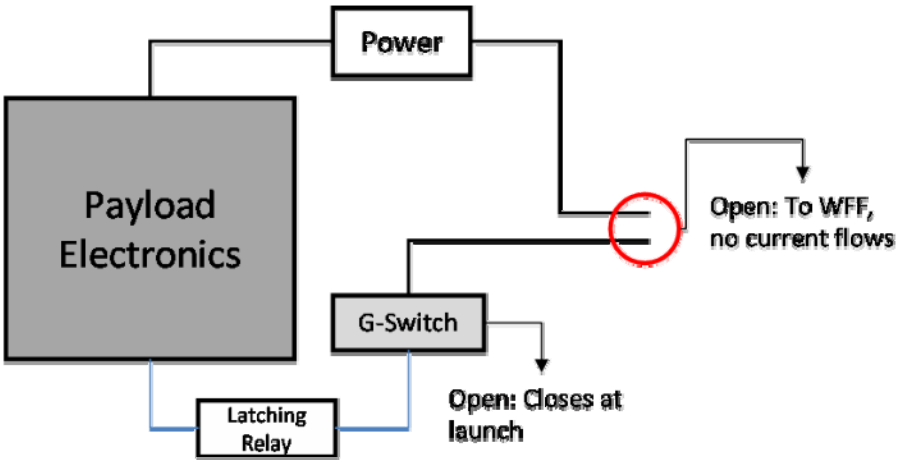

Figure 7: Initial State of RBF System (Safe)

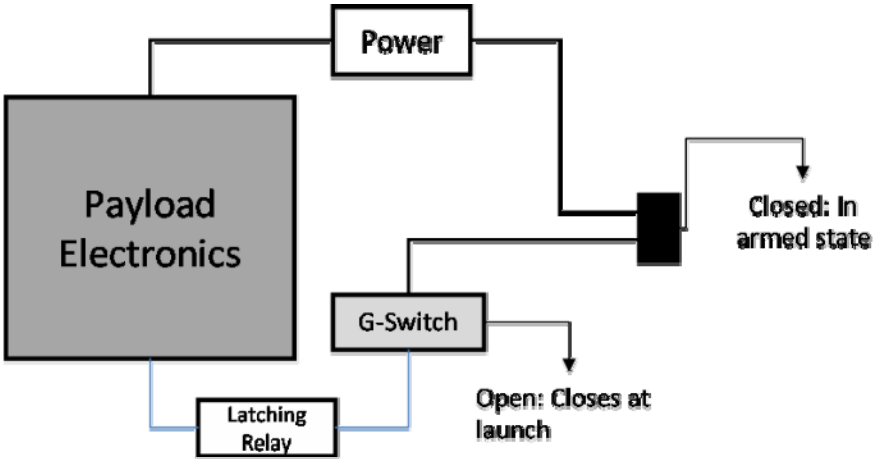

Figure 8: RBF System After WFF Shorting Plug Added (Armed)

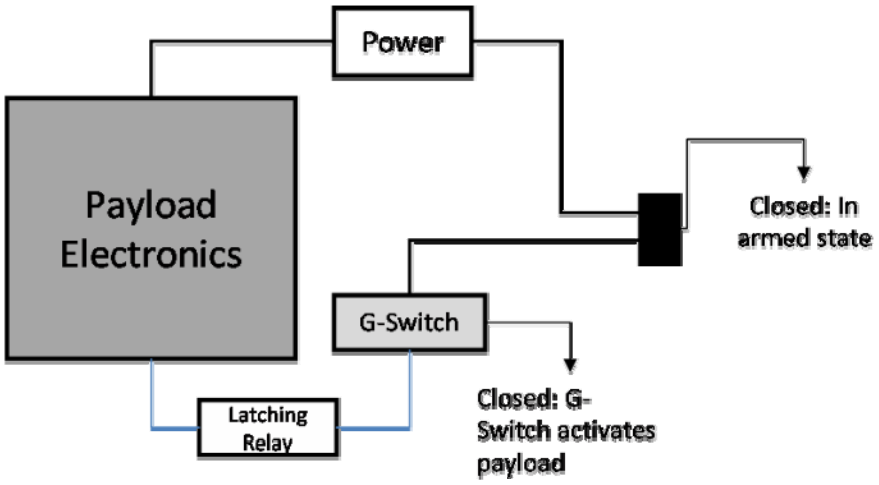

Figure 9: RBF System After Launch (Activated)

WFF pressurizes its experiment sections, but in the event that the seal is broken, the payloads will experience near vacuum conditions at apogee. To mitigate risk, no high voltage experiments will be allowed without a formal variance request. This variance will be in written form and must be approved by Chris Koehler and Shawn Carroll.

5.2.3. Telemetry Tracking and Control

Wallops Flight Facility will not provide real-time telemetry. No payload shall transmit data of any kind. Communication systems are strictly prohibited; there will be no exceptions.

All data should be stored on on-board memory. Using on-board memory alleviates the complexity of a communication system, and has been proven to be extremely effective for the RockOn workshop and other COSGC rocket payloads.

Post flight radar tracking might be available. In the event that radar skin tracking data is provided from Wallops Flight Facility, COSGC will provide the data to teams that request a copy.

5.3. Structural Design Requirements

Each payload will experience extreme and varying G-loads during the course of flight. Workshop participants from RockOn 2008 experienced up to 25 Gs in the positive Z (longitudinal) direction during ascent and experienced about +/- 10 Gs in the X and Y (lateral) axes. In the event of a parachute failure, there would be more extreme loading in all three axes.

5.3.1. Material Selection

When designing the structure for the payload, materials with high resistance to stress corrosion cracking (SCC) are recommended. Materials that have worked well in the past have been aluminum (6061), steel, and Makrolon. Plastics or other petroleum based materials shall be used sparingly. In the event of a pressure loss, outgassing could fog optics or sensors on other RockSat payloads.

5.4. Thermal Design Requirements

The customer is responsible for thermal control of his/her payload. Due to the short duration of the flight and the closed experiment section, thermal systems may not be required. The RockOn workshop of 2008 saw an increase in temperature of 18 degrees Fahrenheit during the flight. RockOn workshop payloads do not use thermal control, but the choice to use a thermal control system will be left to the customer.

5.5. Electrical Design Requirements

Payload electronics shall be designed to be safe and practical. Each payload is required to have a RBF activation system that carries no current (Section 5.2.2.) It is highly recommended that a latching relay system be used where the RBF connection allows a mechanical G-switch to complete the circuit and activate the payload upon ascent.

Any payload that uses alternating current or circuitry with substantial switching (relays) shall notify COSGC as soon as possible during the design phase. Fast switching can induce magnetic interference that must be approved by WFF.

5.6. Electrical Harnessing and Staking

All payloads shall harness wires with a nylon lacing tape or the equivalent. Wire harnesses that are excessively long should be staked to the structure to mitigate the risk of disconnects during flight. It is also highly recommended that all connectors and IC sockets be tied and staked in place using aerospace grade RTV. An example of a well harnessed and staked payload can be seen below.

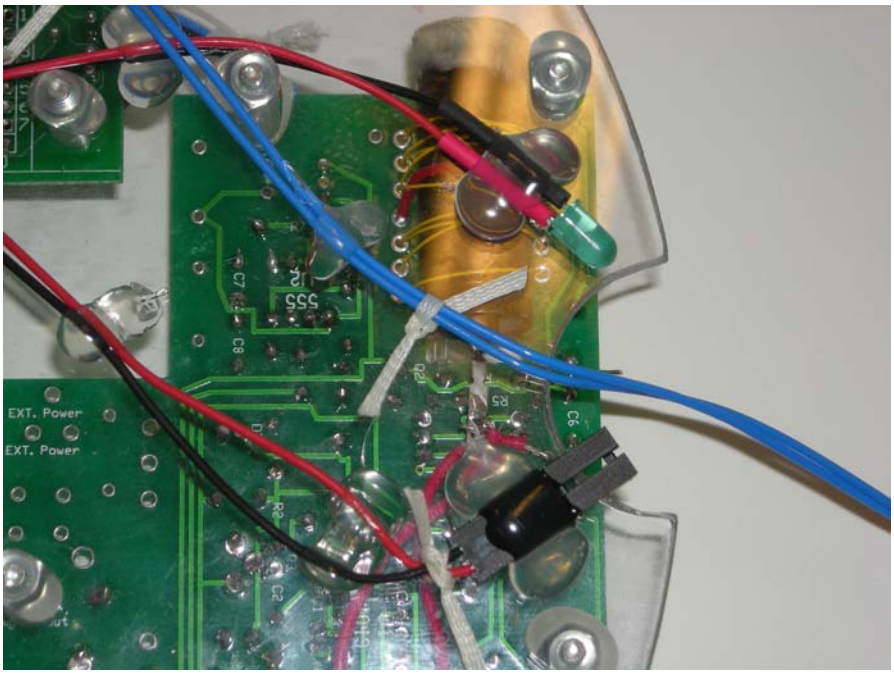

Figure 10: Staking and Harnessing

6.0 PAYLOAD HARDWARE INTEGRATION

The customer shall furnish a complete, functional, and fully integrated payload to COSGC and WFF on the night of visual inspections, tentatively June 17th, that meets all of the requirements of this document. The customer's payload shall pass pre-flight inspections by members of COSGC and WFF to ensure compliance with the requirements of this document. A launch readiness review (LRR) will be held two (2) weeks before launch via teleconference. Integrated payloads shall be delivered to WFF no later than seven (7) days before launch (Thursday, June 17th). Wallops Flight Facility

may require MOI and/or vibration testing prior to integration to the sub-SEM ring assembly. Integration of the customer's RockSat payload canister to the sub-SEM ring assembly will occur 2 days prior to launch. After the customer's RockSat payload canister has been integrated to the sub-SEM ring assembly, there will be limited access to the payload.

7.0 PAYLOAD TEST REQUIREMENTS

Testing of the payload shall be performed by the customer to ensure payload functionality and survivability. All tests shall be documented and/or recorded for the testing reviews whose dates have been established in Section 9.

7.1. Structural Testing

The customer shall perform any testing that he/she sees fit to ensure that his/her payload will survive the launch environment. In addition to the testing completed by the customer, WFF will perform a three axes vibration test the week before launch.

7.2. Environmental Testing

It is not required but highly recommended that the customer run a full mission simulation in a vacuum chamber.

7.3. Day in the Life Testing (DITL)

The customer is required to run two (2) full mission simulations to demonstrate functionality of the payload. This test should consist of the payload being operated on the bench as an integrated payload for the entire mission life (less than 30 minutes). The results of these tests will be presented at the weekly teleconferences as indicated on the schedule.

8.0 SELECTION PROCESS

Any educational institution wanting to fly shall submit the IFF either via email or by fax no later than September 9, 2009 at 4:00 PM MDT. The IFF will be emailed along with this document upon its release.

The Intent to Fly Forms will be reviewed, and initial selections will be made by September 18, 2009. Initially selected candidates will be chosen based on responses to the questions on the IFF. Institutions that submit an IFF will be expected to pay a refundable earnest deposit of $1,000 no later than October 19, 2009. All payments must be in the form of a check made payable to the University of Colorado (Section 1.5.1). At this point in the selection process, there will be more candidates than available positions. Over the next three months, candidates will refine their mission and complete three (3) design reviews. The first review is the Conceptual Design Review (CoDR), which will mature to a Preliminary Design Review (PDR), which will ultimately end with a Critical Design Review (CDR). In addition to these reviews, candidates will submit monthly, online progress reports. Each of these presentations and online progress reports will be reviewed and used to determine the flight worthiness of all initially selected candidates.

No later than January 8, 2010, COSGC and WFF will award flight opportunities to the four to five RockSat payload canisters that are the most mature and ready to continue in the engineering process. Up to two canisters of customers may be kept as reserve payloads, and will continue in the design process.

If an institution is NOT selected at final down select, their earnest deposit will be refunded in full. Those institutions that are awarded flights will continue to the next step of the engineering process. The four to five selected canisters and the reserve customer(s) will make the first non-refundable installment on January 22, 2009. ***Once the initial payment is received, the customer's space has been reserved and no refunds will be issued for any reason; this includes but is not limited to failing to complete the payload before launch or being removed from flight by either Wallops Flight Facility or COSGC.*** The final non-refundable installment will be due April 9, 2009. For further details concerning the engineering/design process after final down select, please see the schedule in Section 9.

In the event that a customer cannot complete his/her payload or does not follow requirements set forth in this document, a reserve customer will become a primary customer, and the primary customer will ***not*** be refunded or compensated in any way. In the event that the four to five finalists all launch, the reserve customer(s) will be refunded the cost of flight, but will NOT be compensated for any hardware, travel, or miscellaneous expenses incurred in the engineering process.

9.0 SCHEDULE

The following are key deadlines and reviews that the customer should be aware of.

7/31/2009	RockSat Payload User's Guide Released
9/9/2009	Submit Intent to Fly Form
9/18/2009	Initial Down Selections Made
10/14/2009	Conceptual Design Review (CoDR) Due
10/16/2009	Conceptual Design Review (CoDR) Teleconference
10/19/2009	Earnest Deposit of $1,000 Due
10/30/2009	Online Progress Report 1 Due
11/4/2009	Preliminary Design Review (PDR) Due
11/6/2009	Preliminary Design Review (PDR) Teleconference
11/25/2009	Critical Design Review (CDR) Due
11/27/2009	Online Progress Report 2 Due
11/27/2009	Critical Design Review (CDR) Teleconference
1/8/2010	Final Down Select—Flights Awarded
1/22/2010	First Installment Due
1/29/2010	Online Progress Report 3 Due
1/30/2010	RockSat Payload Canisters Sent to Dedicated Customers
2/17/2010	Individual Subsystem Testing Reports Due
2/19/2010	Individual Subsystem Testing Reports Teleconference
2/26/2010	Online Progress Report 4 Due
3/24/2010	Payload Subsystem Integration and Testing Report Due
3/26/2010	Payload Subsystem Integration and Testing Report Teleconference
4/9/2010	Final Installment Due
4/9/2010	Weekly Teleconference 1
4/14/2010	First Full Mission Simulation Test Report Due
4/16/2010	Weekly Teleconference 2 (FMSTR)
4/23/2010	Weekly Teleconference 3
4/30/2010	Weekly Teleconference 4
5/7/2010	Weekly Teleconference 5
5/14/2010	Weekly Teleconference 6
5/19/2010	Second Full Mission Simulation Test Report Due
5/21/2010	Weekly Teleconference 7 (FMSTR 2)
5/28/2010	Weekly Teleconference 7
6/2/2010	Launch Readiness Review (LRR) Teleconference
6/4/2010	Weekly Teleconference 8 (LRR)
6/11/2010	Weekly Teleconference 9
6/17/2010	Visual Inspections at Refuge Inn
06-(18-21)-2010	Integration/Vibration at Wallops
6/23/2010	Presenatations to Next Years RockSat
6/24/2010	Launch Day

10.0 Appendix A: Structural Drawings

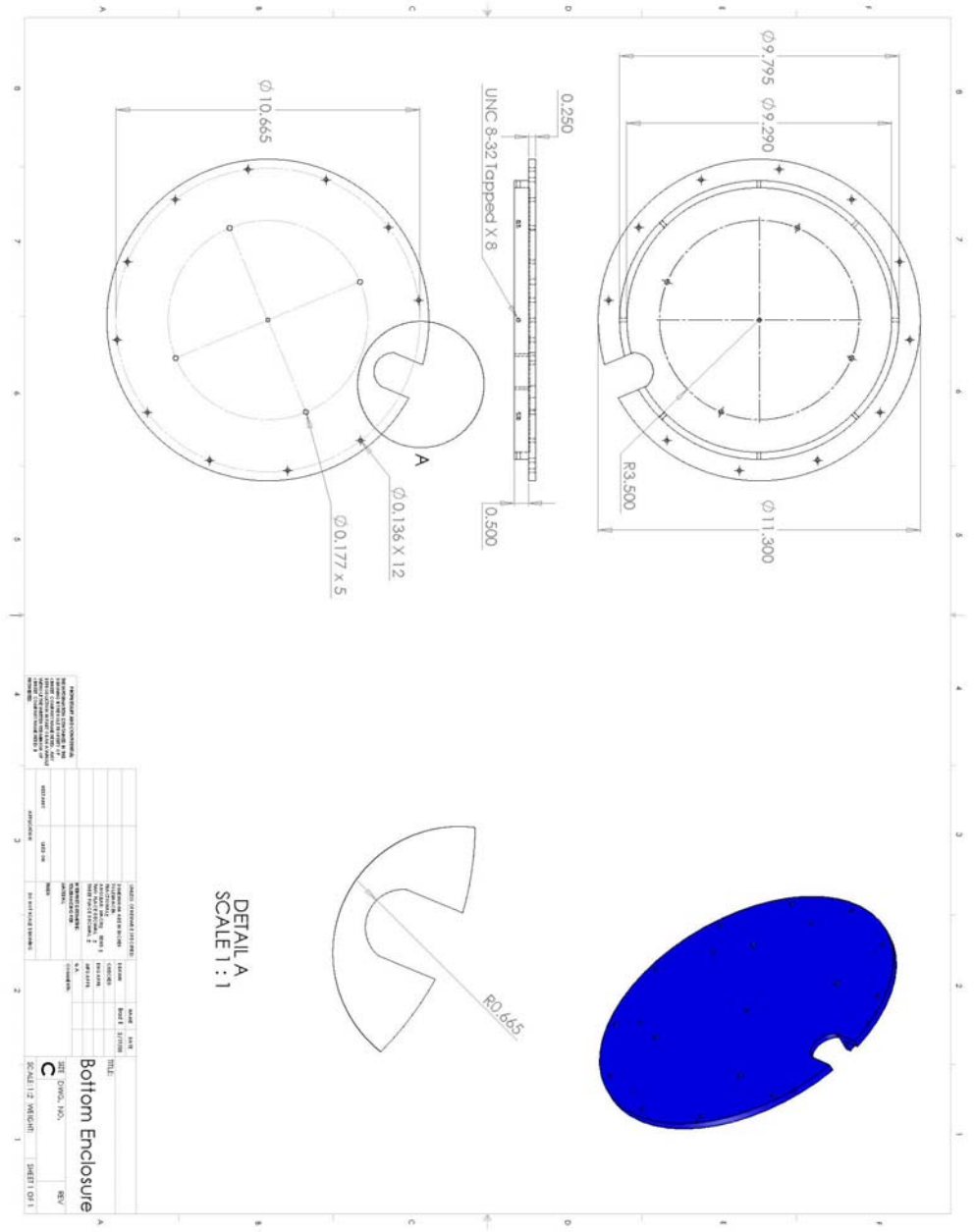

Figure 11: Bottom Bulk Head Mechanical Drawing

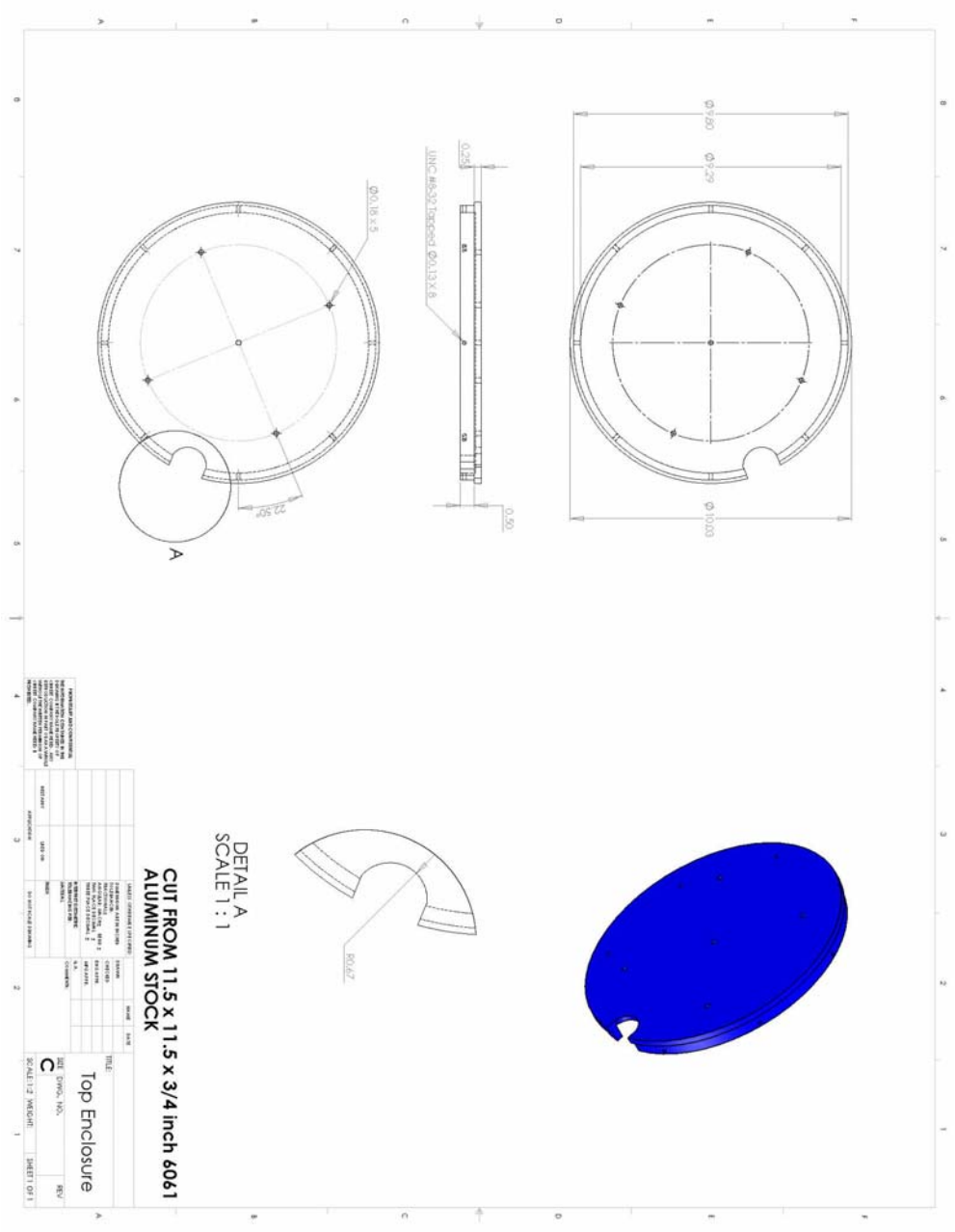

Figure 12: Top Bulk Head Mechanical Drawing

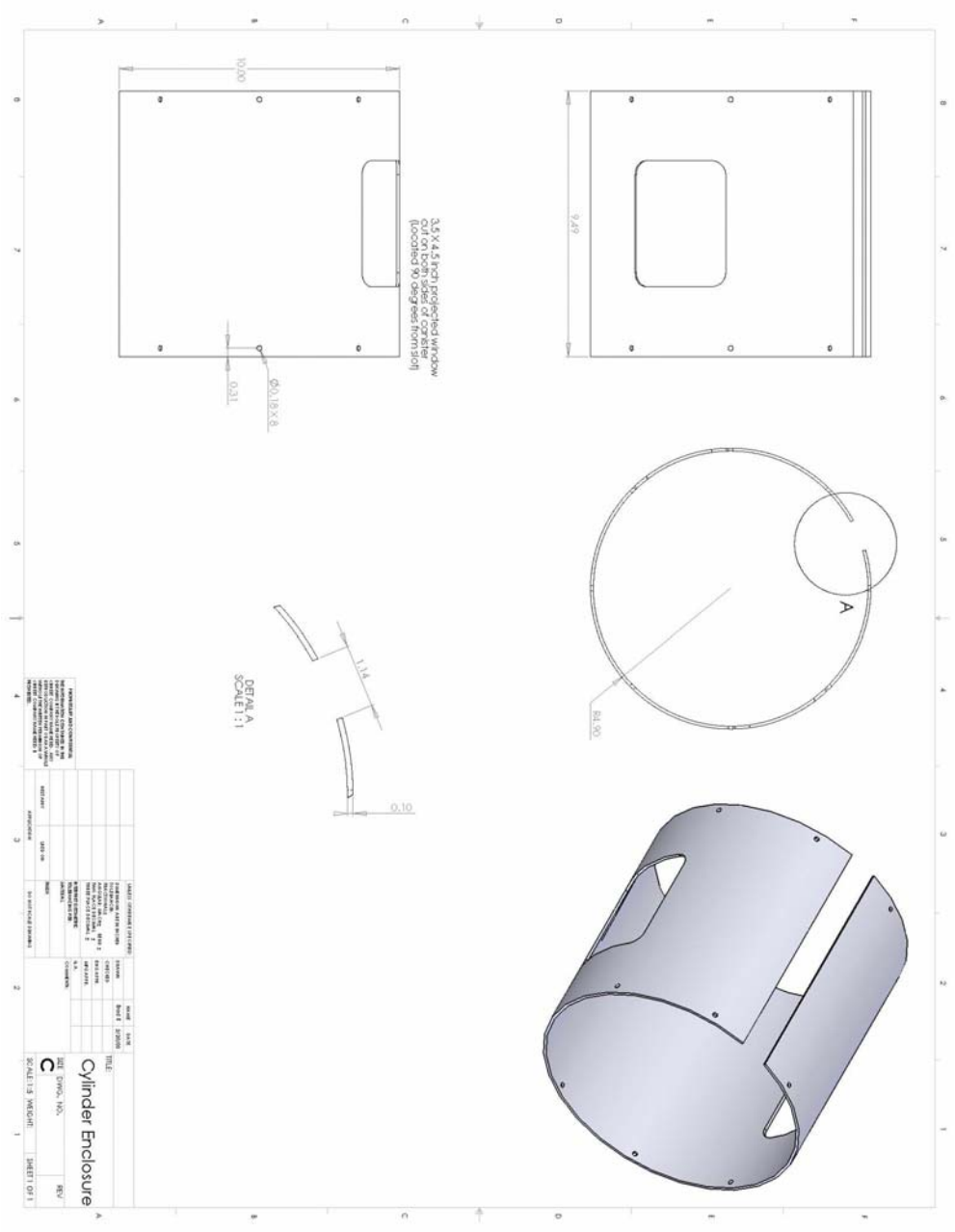

Figure 13: RockSat Skin Mechanical Drawing

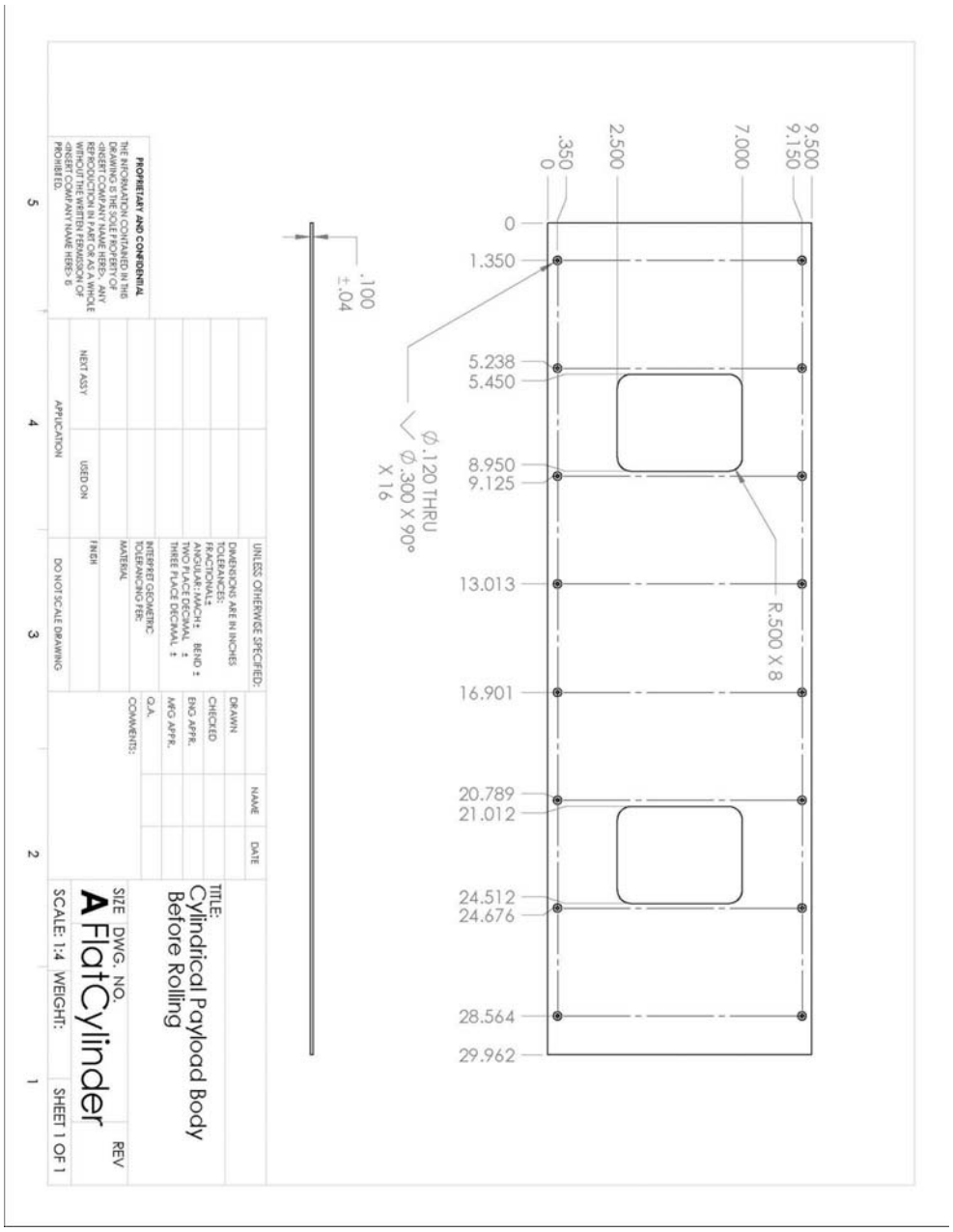

Figure 14: RockSat Skin Mechanical Drawing

11.0 Appendix B: Launch Week/Integration Agenda

Comment: Tentative schedule that is subject to change.

Day 1, Thrusday (June 17, 2010)

		Teams arrive morning and afternoon	
9:00 P	(90)	Chris and Shawn visually inspect payloads	Refuge Inn

Day 2, Friday (June 18, 2010)

7:30 A	(15)	Arrive and get through security	
7:45	(30)	Safety briefing	
8:15	(45)	Walk to F-10 and setup payloads	Building F10
9:00	(60)	Wallops visual inspections and weight check	Building F10
10:00	(120)	Stack integration/vibration/spin testing	Building F10
12:00 P	(60)	Lunch	Williamsburg Room
1:00	(60)	Testing continues	Building F10
2:00	(150)	Stack disassembly and payload inspections	Building F10
4:30	(30)	Action items assigned to teams that didn't pass testing	Building F10
5:00		Day ends	

Day 3, Saturday (June 19, 2010)

10:00 A	Refuge conference room open and available for action items	Refuge Inn
10:00 P	Refuge conference room closed for the evening	Refuge Inn

Day 4, Sunday (June 20, 2010)

10:00 A	Refuge conference room open and available for action items	(RockSat)
10:00 P	Refuge conference room closed for the evening	(RockSat)

Day 5, Monday (June 21, 2010)

8:00 A	(15)	Arrive and get through security	
8:15	(45)	Final Wallops inspections	Building F10
9:00	(180)	Re-vibes (if necessary) / integration begins	Building F10
12:00 P	(60)	Lunch	Williamsburg Room
1:00	(240)	Re-vibes (if necessary) / integration continues	Building F10
5:00		End of the day	

Day 6, Tuesday (June 22, 2010)

8:00 A	(15)	Arrive and get through security	
8:15	(225)	Integration wrap up	Building F10
12:00 P	(30)	Lunch	Williamsburg Room
12:30 P	(120)	Workshop canister integration/Backup RockSat integration	Building F10
3:00	(60)	Skin integration	Building F10
4:00	(120+)	Pressure test begins	Building F10

Day 7, Wednesday (June 23, 2010)

10:30 A	(90)	RockSat presentations to RockOn 2010 participants	Building F3
12:00 P	(30)	Lunch	Williamsburg Room
12:30 P	(120+)	Tours and picture with rocket (??)	

Day 8, Thursday (June 24, 2010)

4:00 A	(30)	Cold Breakfast in Refuge Inn Conference Room	Refuge Inn
4:30	(30)	Travel to launch viewing site (own vehicles)	Wallops Island
5:00	(60)	Wait for launch	Wallops Island
6:00	(60)	Launch!	Wallops Island

7:00	(300)	Recovery Operations - May return to hotel Hot Breakfast AvailableWilliamsburg Room	
12:00	(30)	Lunch (Provided)	Williamsburg Room
12:30	(60)	Can / Rocket De-integration	Building F10
1:30	(60)	Can De-integration	Building F10
5:00	(120)	Seafood Celebration Dinner, Party, Awards, and Thanks - Teams Discuss Unique Results from Data and the Workshop (learned, liked, disliked, etc)	Building F3
7:00	(30)	Pack up and clean up and head home	Building F3

12.0 Appendix C: Wallops Interfacing Documents

Comment: As documents become available, they will be added here.