RockSat-X GSE Check-in Visual Verification
VRSE

Community Colleges of Colorado

6/3/21

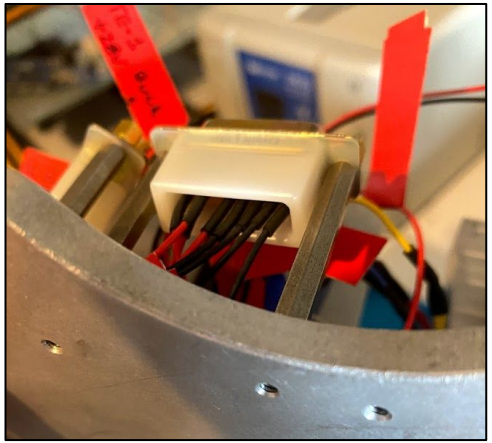
- Completion and approval of these slides are required prior to shipment of your experiment
- For each check-in step, provide as many pictures as needed to prove completion/compliance
  - All image slides must correspond to the check-in step on the previous slide
  - Remove the boxes and replace with the corresponding image
- ***All steps must include pictures or you will be required to recomplete the check-in procedure***

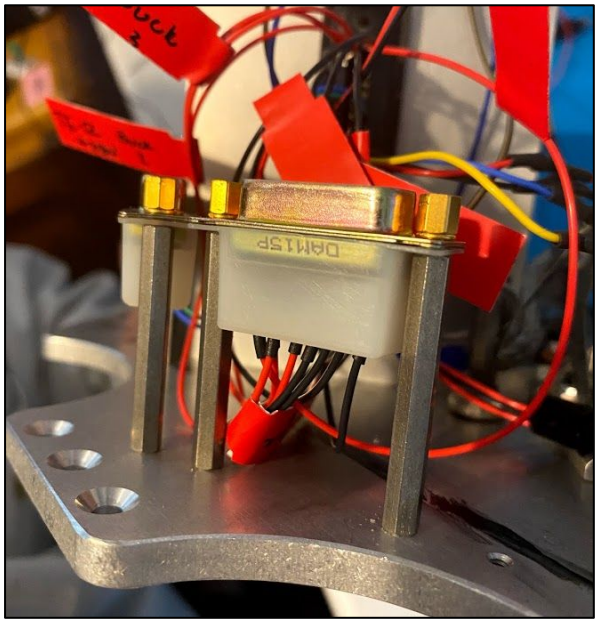
All payloads shall arrive with the power connector properly wired according to the **RS-X Power ICD.**

Power Connector: Electrical Integration

Interface Control Document	Community Colleges of Colorado
RockSat-X Power	
Revision: 07-28-2014	**Team Point of Contact (POC) Stacie Barbarick**
	POC Contact info 303.667.7294

Interface Type	Description	Specification
Mechanical	*Customers will be provided power and ground for flight operations through the RockSat-X Power*	
	Connector Type >	15 Pin Cannon (D-Sub)
	Gender >	Male (pins)
Constraints	*Wallops and COSGC maintain the right to remove payloads not meeting these specifications*	
	Current >	GSE and Timed Event lines are limited by WFF. Please see the diagram tab for clarification on
	Flight Power Off >	All decks will lose power at T+6 minutes (T+330 seconds)
	Capacity >	Each full payload space has been allotted their own 1 Ah battery
Electrical, Ground (GND)	*Wallops will supply a current return ground connection.*	
	Pins >	5 - 8 and 12 - 15 on RS-X Power Connector
	Max Current >	1 Amp max per line
Electrical, Ground Support Equipment (GSE)	*Wallops shall supply power lines capable of activation prior to launch*	*Wallops will activate the GSE lines during environmental and other testing on the rail prior to launch, which should be taken into consideration in electrical design.*
	Pins >	1 and 9 on RS-X Power Connector
	Voltage/Polarity >	28 +/- 6 V nominal per line
	Max Current >	See diagram on "Diagram" tab
	Speical Considerations for GSE lines >	All go active at T-3 and remain active for duration of flight. Also, see additional comment above.
	GSE 1 Activation Time Prior to Launch >	From T-10 to T-3 minutes (Customer Defined)
	GSE 2 Activation Time Prior to Launch >	From T-10 to T-3 minutes (Customer Defined)
Electrical, Timed, Non-redundant (TE)	*redundant lines capable of activation post launch*	
	Pins >	4, 10, and 11 on RS-X Power Connector
	Voltage/Polarity >	28 +/- 6 V nominal per line
	Max Current >	See diagram on "Diagram" tab
	TE-1 Activation Time Post Launch/dwell time >	From T+0.1 to T+6 minutes (Customer Defined) with Dwell Time from 1 second to flight
	TE-2 Activation Time Post Launch/dwell time >	From T+0.1 to T+6 minutes (Customer Defined) with Dwell Time from 1 second to flight
	TE-3 Activation Time Post Launch/dwell time >	From T+0.1 to T+6 minutes (Customer Defined) with Dwell Time from 1 second to flight
Electrical, Timed, Redundant (TE-R)	*redundant line capable of activation post launch*	
	Pins>	2 and 3 on RS-X Power Connector (Customers connect together)
	Voltage/Polarity >	28 +/- 6 V nominal per line
	Max Current >	See diagram on "Diagram" tab
	TE-RA/RB Activation Time Prior to Launch/Dwell Time >	From T+0.1 to T+6 minutes (Customer Defined) with Dwell Time from 1 second to flight

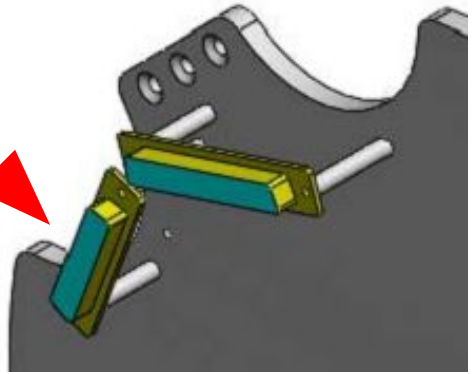




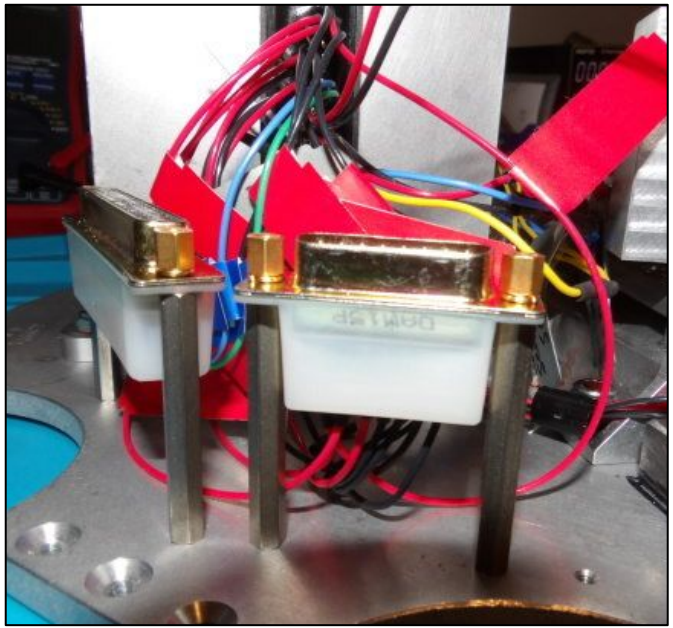
Power Connector: Mechanical Integration

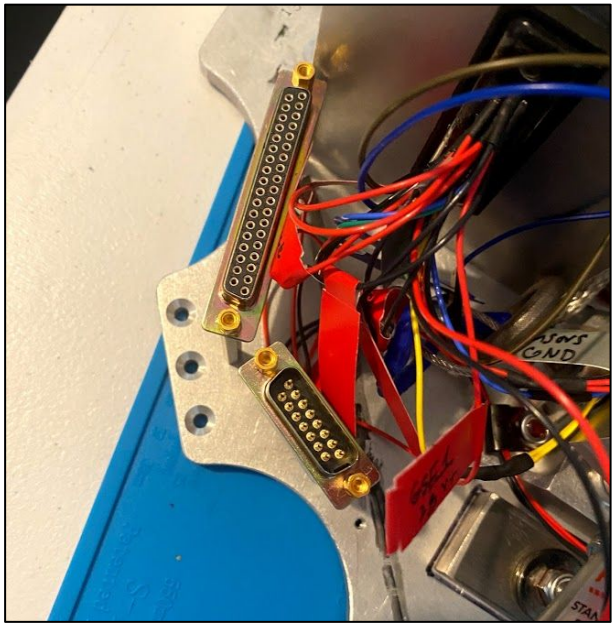
Payload shall arrive with the 15 pin (male D-Sub) power connector integrated on the left side of the plate as pictured below.

Power Connector

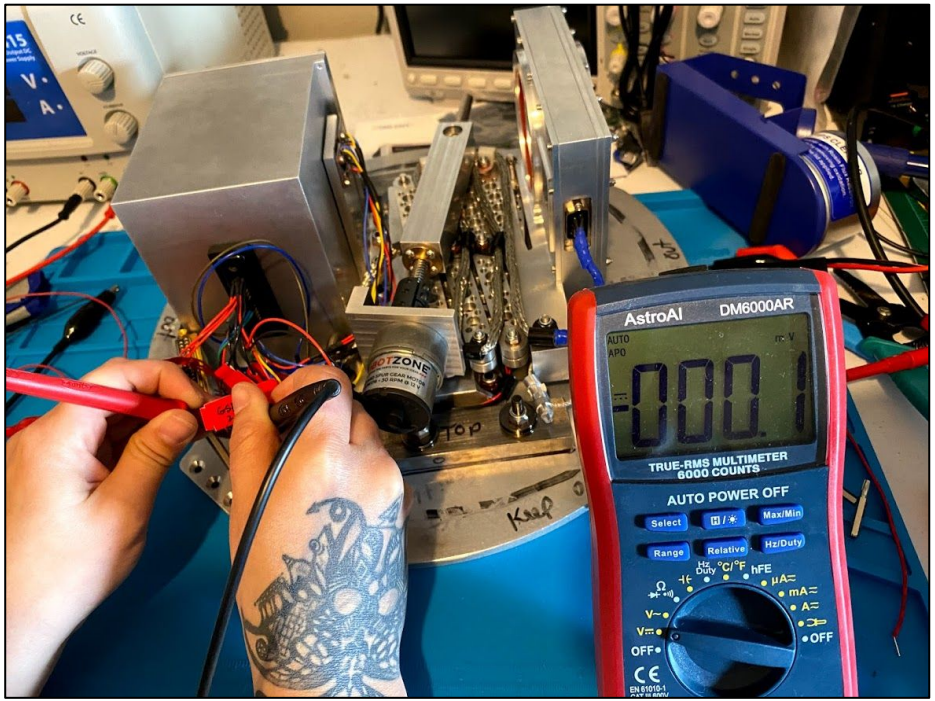


Power Connector: Mechanical Integration





All payloads shall have neutral power pins relative to GSE Ground.



Using multimeter probes and the corresponding power pinout, we verified that there was neutral voltage on all the power pins, including GSE.

Power Pins

Power Connector--Customer Side	
Pin	**Function**
1	+28 Volts (GSE-1)
2	Timer Event Redundant (TE-RA)
3	WV
4	Timer Event 1(TE-1)
5	GND
6	GND
7	GND
8	GND
9	WV
10	Timer Event 2 (TE-2)
11	WV
12	WV
13	WV
14	WV
15	WV

Timer Events Matrix

	School	Start (sec only)	Start (min, sec)	Dwell (sec)	End (sec only)	End (min, sec)	Comments
GSE-1	CCofCO	T-30s	T-0min, 30 s	Flight	Flight	Flight	Power to Pi and Pi cam power up and begin recording, power to sensors
GSE-2	WV	T-180s	T-3min	Flight	Flight	Flight	Power On
TE-R	CCofCO	T+85s	T+1min, 25s	245 s	330 s	5 min, 30 s	Power to motor hat, arm extension and primary camera turns on and begin recording
TE-1	CCofCO	T+261s	T+4min, 21s	69 s	330 s	5 min, 30 s	Arm Retraction, recording stopped
TE-2	CCofCO	T+330s	T+5min, 30s	5 s	335 s	5 min, 35 s	Lock Camera Power Off Data Loss Prevention
TE-3	WV	T+321s	T+5min, 21s	Flight	Flight	Flight	Latch of Internal Battery

The payload shall use no more than 1 Amp Hour (Ah) over the course of the flight. Shared decks shall use no more than 0.5 Ah.

Power Budget						
Wallops Power Line	Subsystem	Voltage (V)	Max Current (A)	Time On (min)	Watts	Ah
GSE1/2	Raspberry Pi, Sensors	5.0	0.20	10	1.00	0.03
	DC Motor	12.0	0.50	2	6.00	0.02
TE1/2/3/R	Signal Arm Retraction	1.8	0.01	2	0.02	0.10
	Signal System Shutdown	1.8	0.01	0.083	0.02	0.12
TER	Signal Arm Extension	1.8	0.01	2	0.02	0.10
		GSE 1/2 Total	0.7			
		TE1 Total	.03			
		Total	0.73		7.05	.37
		Total Power Capacity	1.85			.5
		Over/Under	1.12			19.7

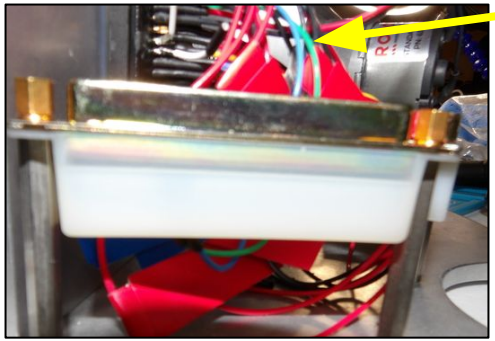
Telemetry Connector: Electrical Integration

All payloads shall arrive with the telemetry connector properly wired according to the specifications provided in the **RS-X Telemetry ICD.**

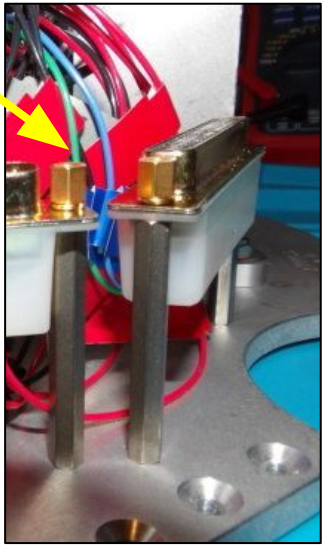
Telemetry Connector: Electrical Integration

Interface Control Document	Community Colleges of Colorado
RockSat-X Telemetry	
Revision: 07-28-2014	Team Point of Contact (POC) Stacie Barbarick
	POC Contact info 303.667.7294

Interface Type	Description	Specification
Mechanical	*Customers will be provided Analog/Digital (A/D), Asynchronous Serial, and*	
	Connector Type >	37 Pin Cannon (D-Sub)
	Gender >	Female (sockets)
Electrical, Ground	*Wallops will supply a current return ground connection*	
	Pins >	16, 19, 33*, 36 and 37 on RS-X Telemetry Connector
	Max Current >	1 Amp max per line *(Pin 33 is RS232 (asynch) ground)
Electrical, Not Connected (N/C)	*The said connector will have unuti*	
	Pins >	17, 34, and 35 on RS-X Telemetry Connector
	Voltage/Polarity >	Floating
	Max Current >	0 Amps
Electrical, Analog to Digital Converters	*Wallops shall supply two A/D lines to each full payload space*	
	Pins >	1 - 10 on RS-X Telemetry Connector
	Voltage/Polarity >	0 to 5 V
	Resolution/Sample Rate >	10 bits / 1 kHz
	Filtering >	None provided, highly encouraged
	High impedance input >	Yes
Electrical, Parallel Line	*Wallops shall supply a single, 16 bit parallel line to each full*	
	Pins >	11 - 16 and 20 - 29 and 30 on RS-X Telemetry Connector
	Sample Rate >	>=500 Hz
	Data Bits >	Pins 11* - 16 and 20 - 29** (bits 1 -16) *MSB **LSB
	Data Bits' Voltage/Polarity >	0 to 0.6 V digital "low", 2 - 5V digital "high"
	Parallel Read Strobe/Direction >	Pin 30 Parallel Read Strobe (See: Next Sheet/Output from WFF
	Parallel Read Strobe Voltage/Polarity >	0 to 5 V (nominal) "high", 0 - 0.6 V (nominal) "low"
Electrical, Asynchrounous Serial	*Wallops shall supply a single 8 bit asynchrous line to each full*	
	Pins >	32 and 33 on RS-X Telemetry Connector
	Protocol >	8-N-1 RS-232
	Logic 1 or "high" >	3 to 12 V relative to RS-232 GND
	Logic 0 or "low" >	-3 to -12 V relative to RS-232 GND
	Baud Rate >	19,200 kbs
	Data Pin/Voltage >	Pin 32 on RS-X Telemetry Connector / Logic 1 or Logic 0
	RS-232 GND Pin/Voltage	Pin 33 = 0 V (nominal)



The blue and green wires are our telemetry lines soldered to the 37 pin dsub provided by Wallops



Electrical, Asynchrounous Serial	*Wallops shall supply a single 8 bit asynchrous line to each full payload space*	
	Pins >	32 and 33 on RS-X Telemetry Connector
	Protocol >	8-N-1 RS-232
	Logic 1 or "high" >	3 to 12 V relative to RS-232 GND
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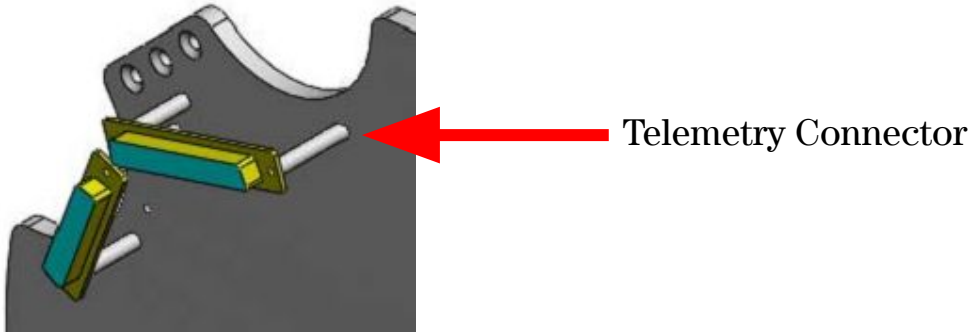
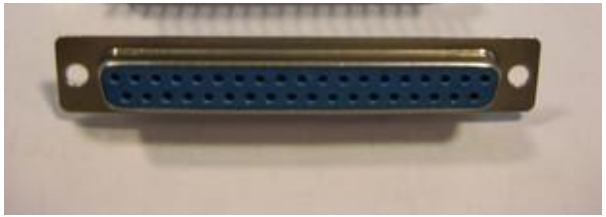
	Baud Rate >	19,200 kbs
	Data Pin/Voltage >	Pin 32 on RS-X Telemetry Connector / Logic 1 or Logic 0
	RS-232 GND Pin/Voltage	Pin 33 = 0 V (nominal)

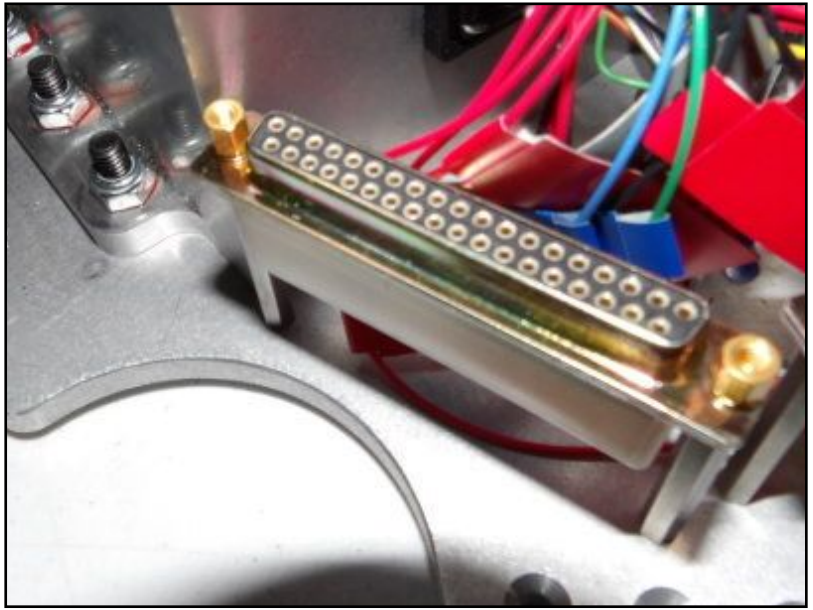
Telemetry Connector: Mechanical Integration

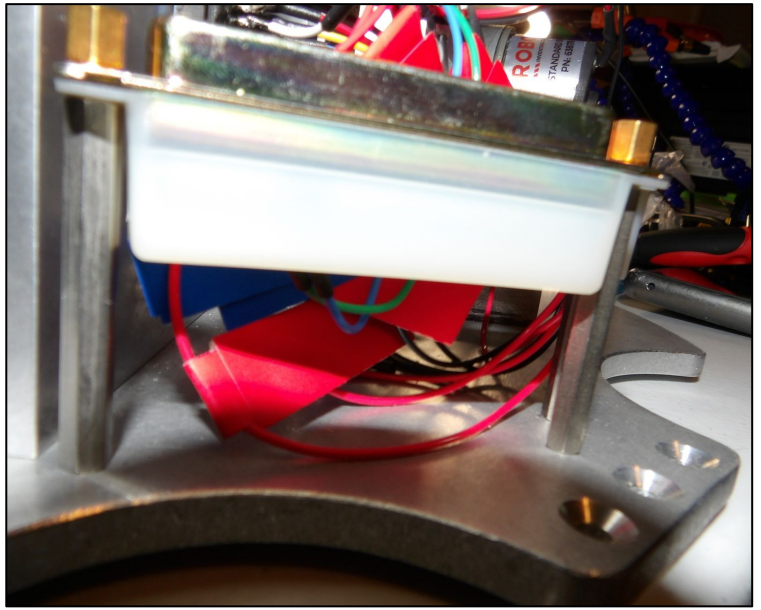
Payload shall arrive with the 37 pin (female D-Sub) telemetry connector integrated on the left side of the plate as pictured below.



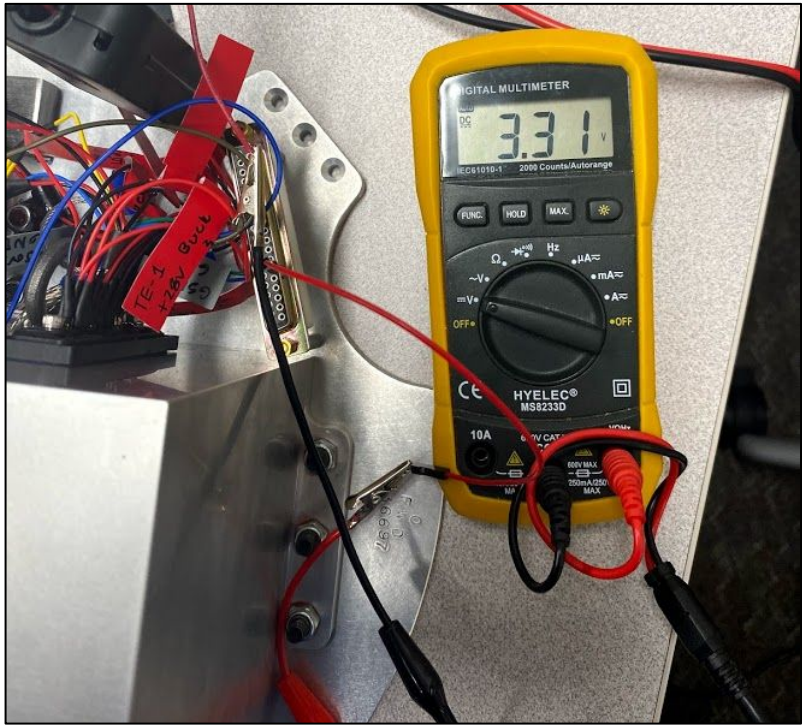


Telemetry Connector: Mechanical Integration





All payloads shall arrive with the correct voltages on each pin accordance with the **RS-X Telemetry ICD.**

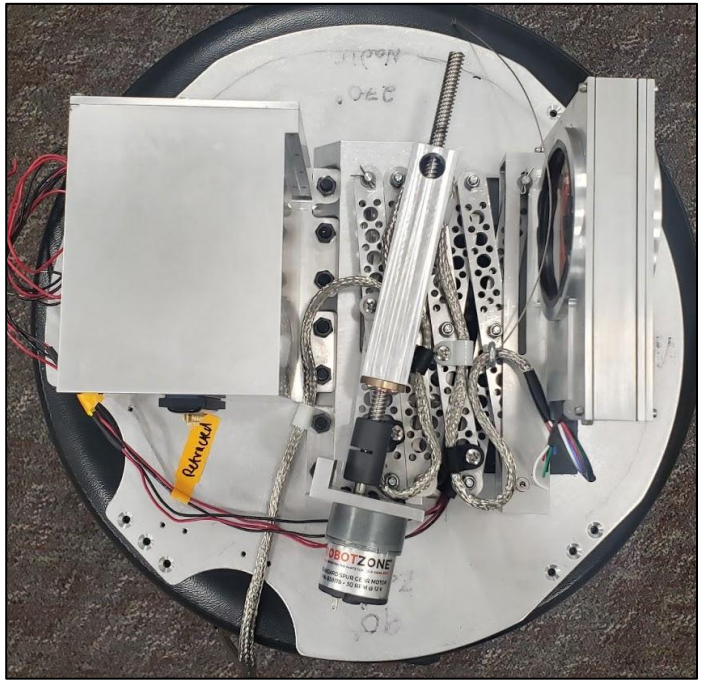


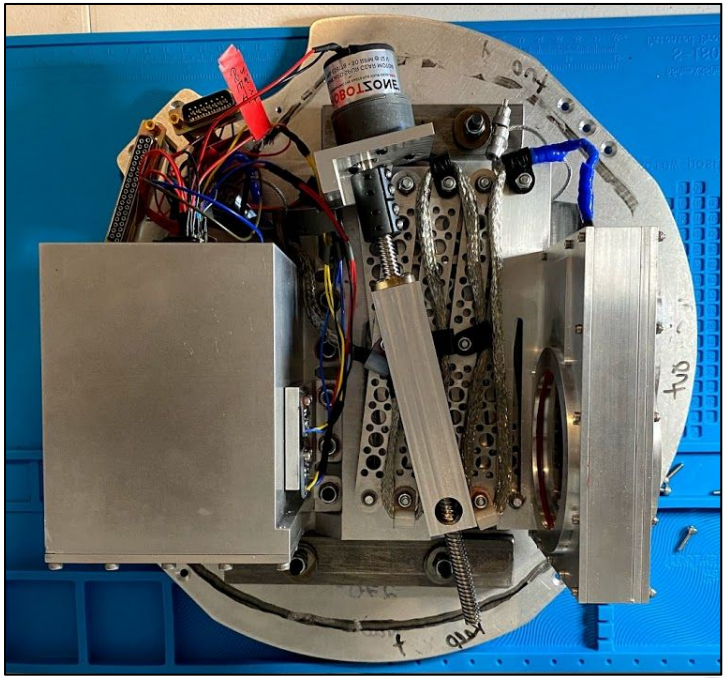
We inserted multimeter probes between our telemetry lines and Ground and ran our code, verifying the voltages of each line.

Pin Number	Recorded Voltage	Consistent with Telemetry ICD (Y/N)?
28		
29		
30		
31		
32	3.31 V	Yes
33	-3.31 V	Yes
34		
35		
36		
37		

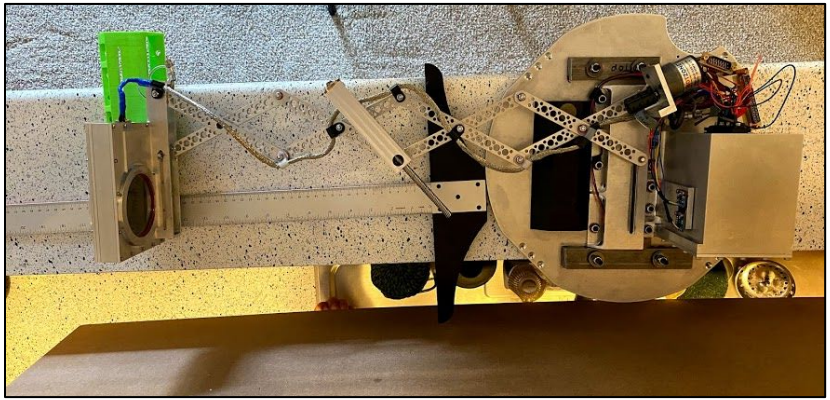
All payloads shall be built as presented in FMSR presentation.

Design Verification: Top View, Retracted

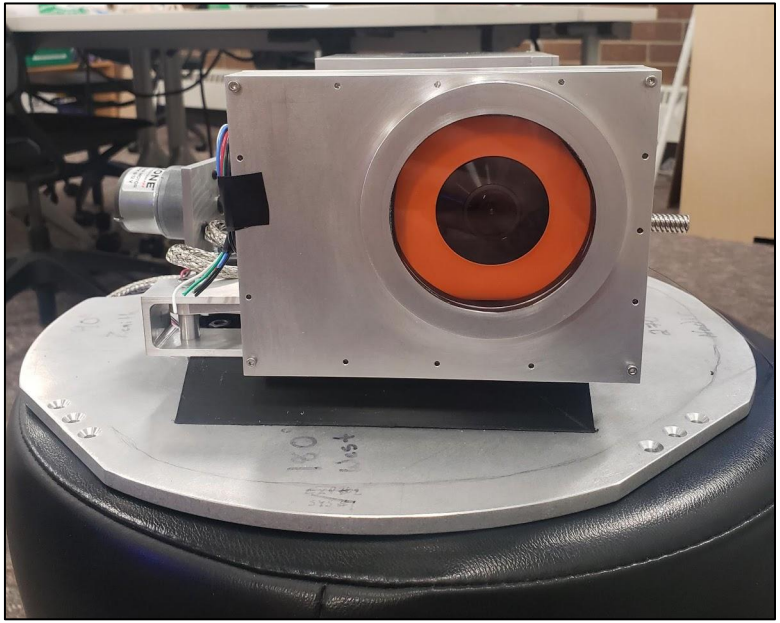


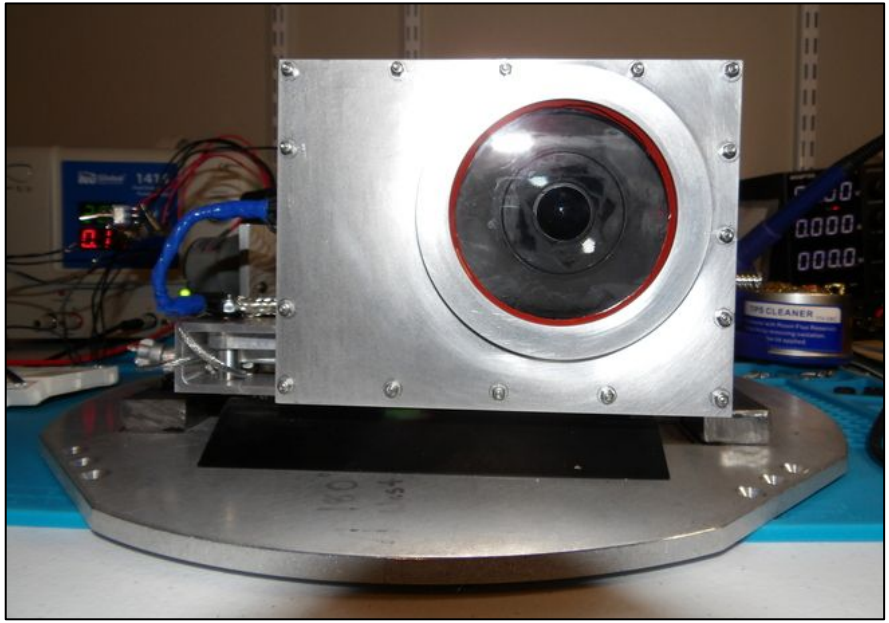


Design Verification: Top View, Extended

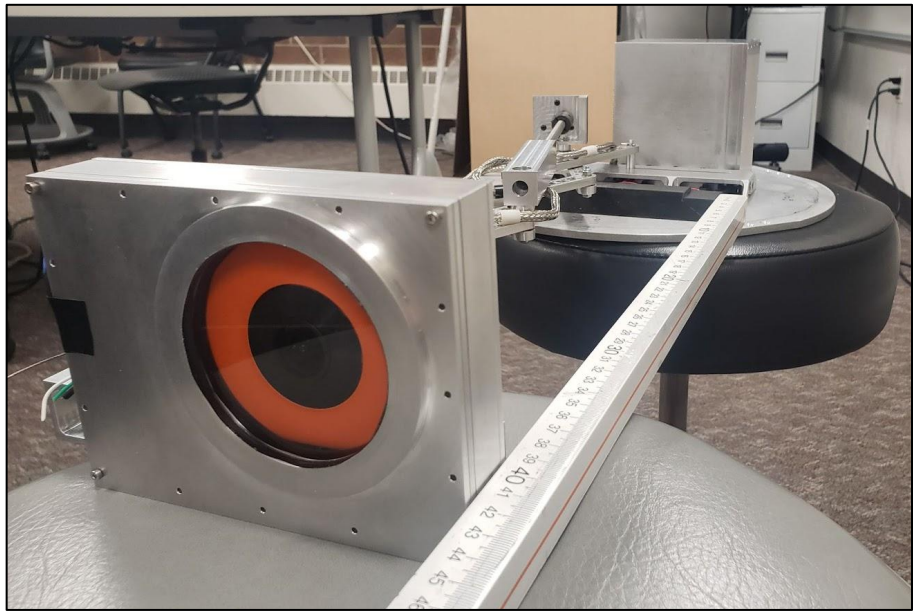


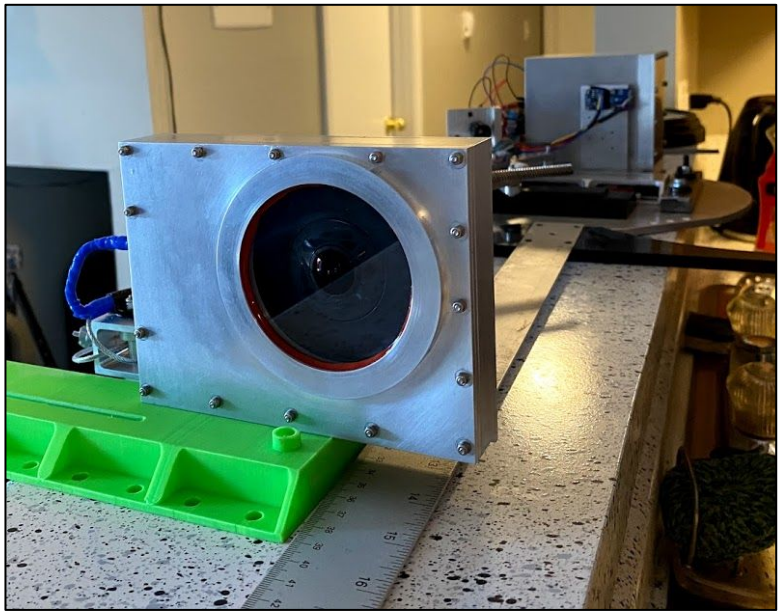
Design Verification: Front View, Retracted



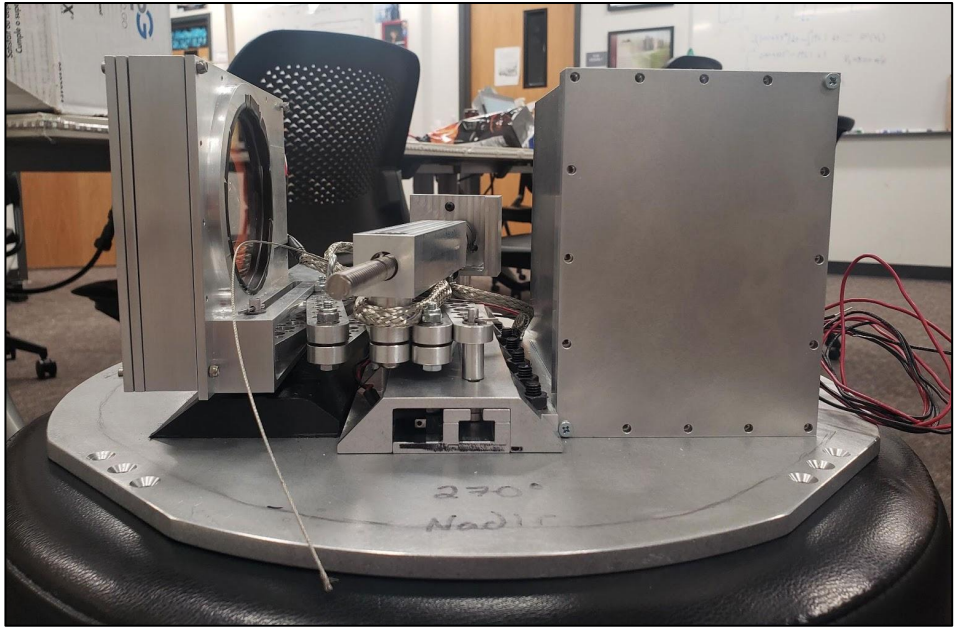


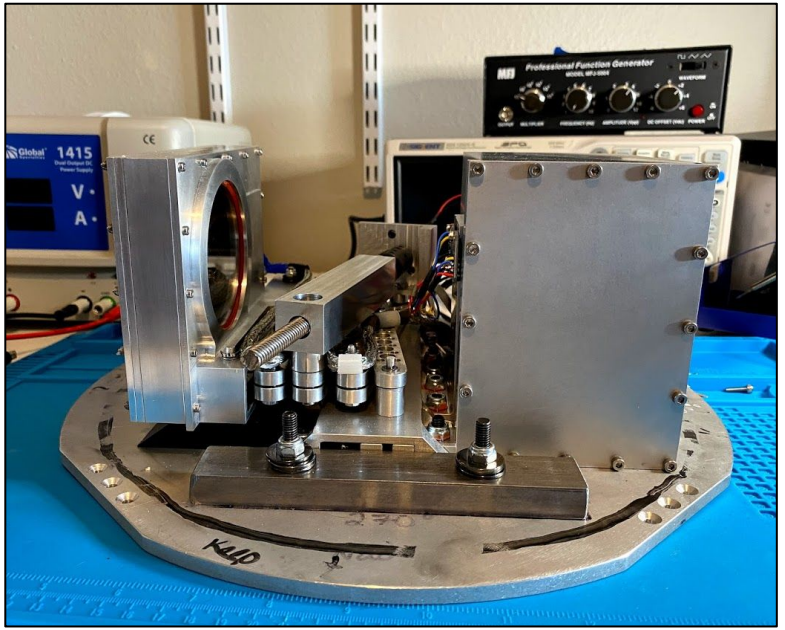
Design Verification: Front View, Extended



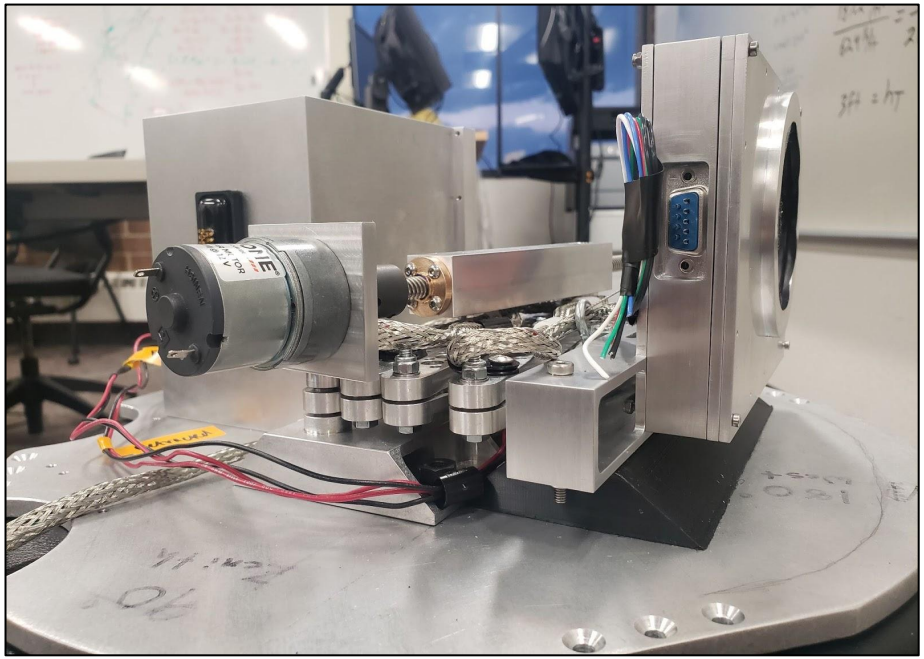


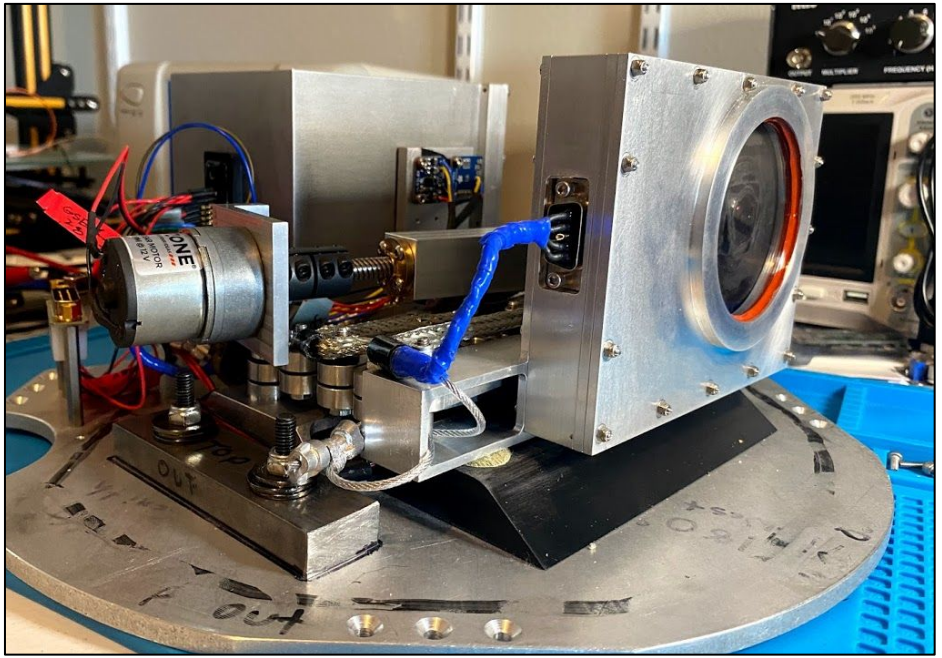
Design Verification: Left View, Retracted





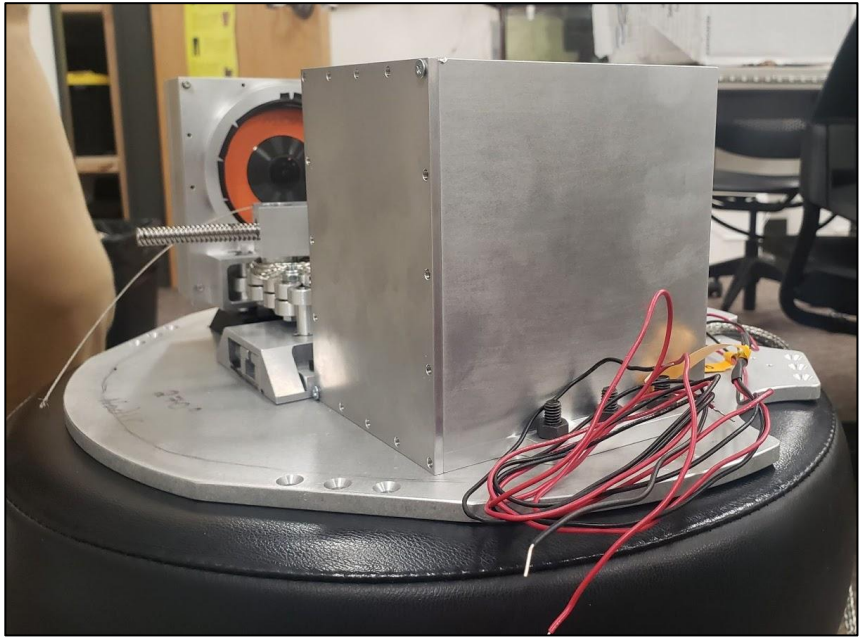
Design Verification: Front/Right, Retracted

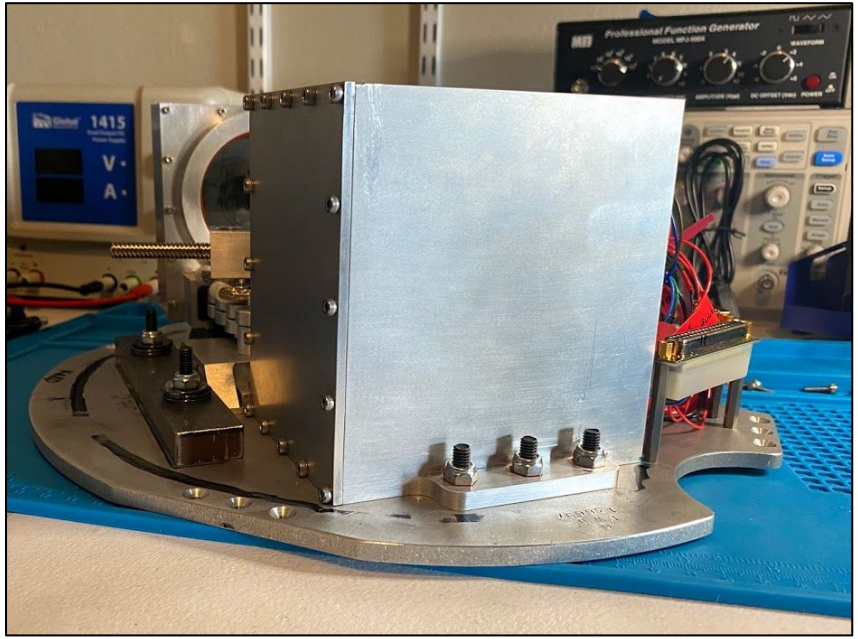




Design Verification: Right View, Extended

Design Verification: Back, Left, Retracted



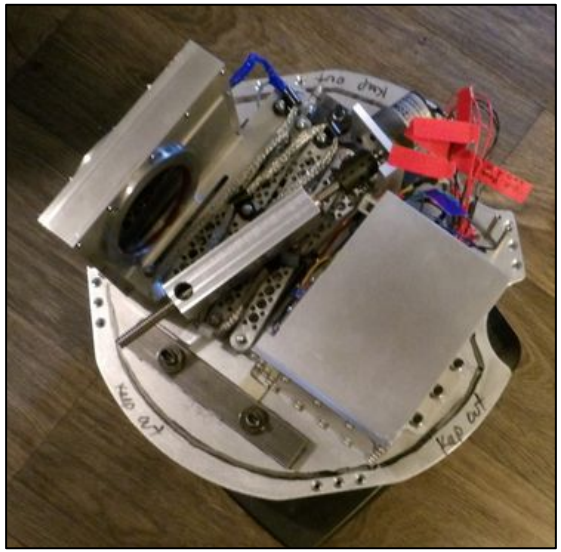


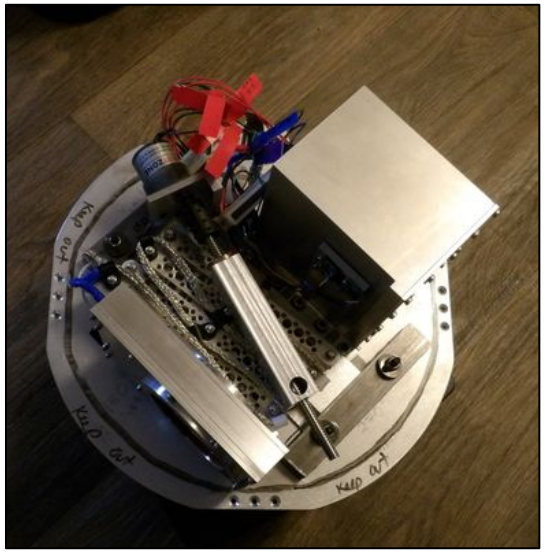
All payloads shall weigh 30+/- 1 lbf. Shared decks shall weight 15 +/- 0.5 lbf.

We added three jars so we could see the scales window; Scale was zeroed after jars were added so weight shown is only the payload

Weight of payload looks to be almost exactly 15 lbs.

The experiment shall be completely contained within the keep out zone of the RS-X payload deck.





Here are views showing payload within limitations.

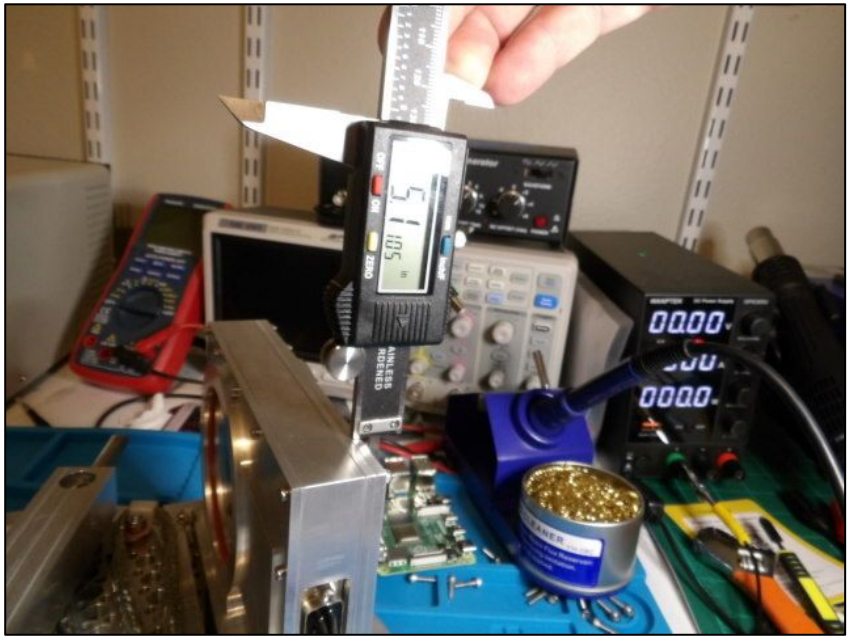
RF Frequency shall be consistent with the value submitted and approved on the Wallops FUR Form (if applicable).

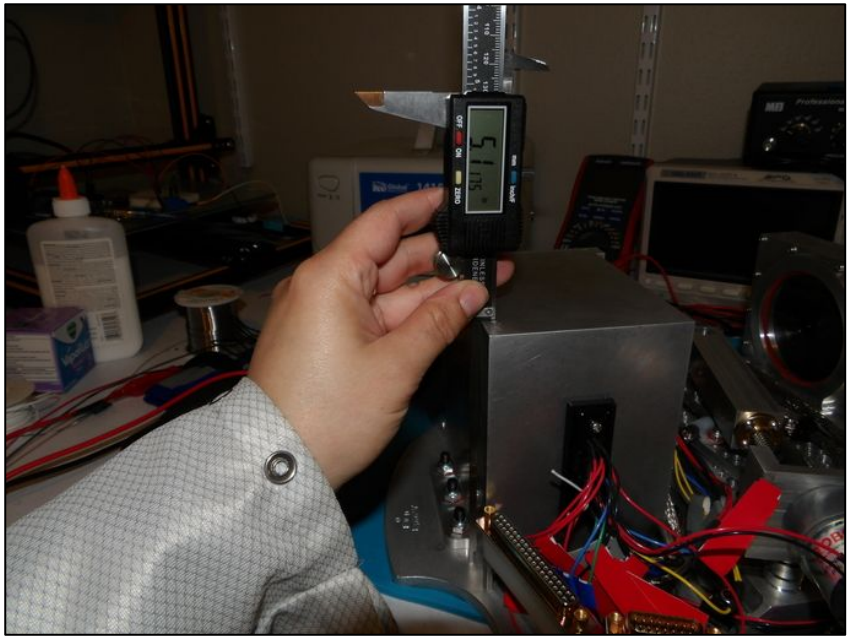
Insert a screenshot of your FUR form

N/A

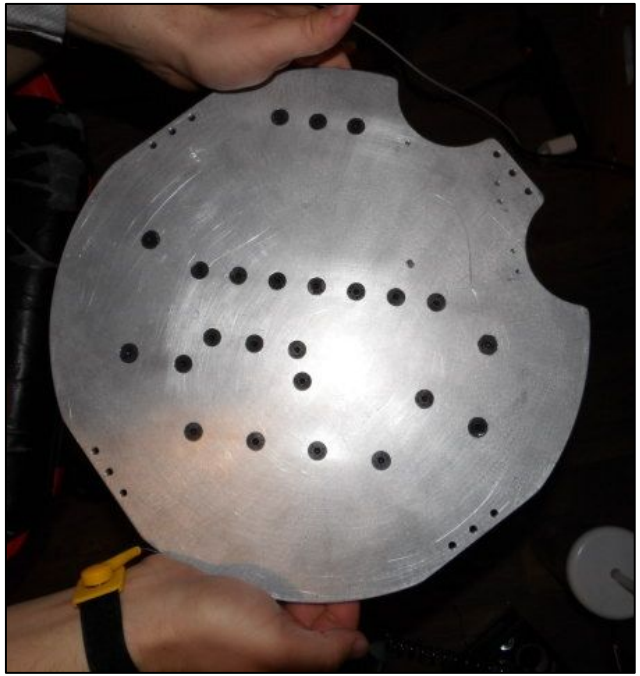
Measure payload height from top of deck to highest point (Not to exceed 10.75 inches for full payload and 5.13 inches for half payload)

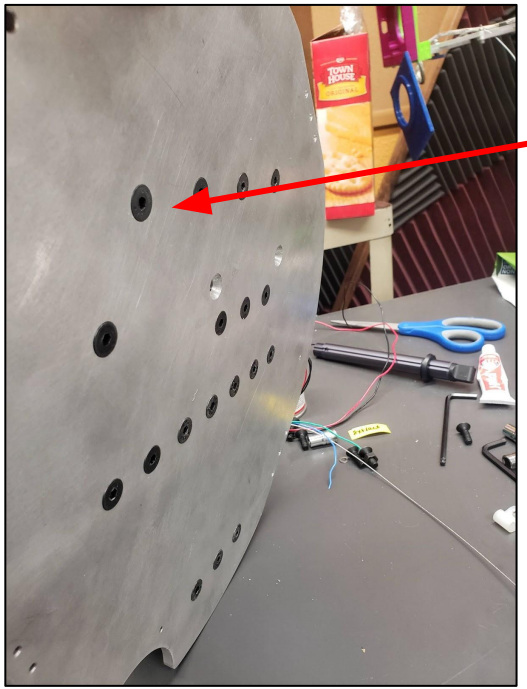
Payload Height





Bottom of deck has flush mounted bolts/screws/nuts.





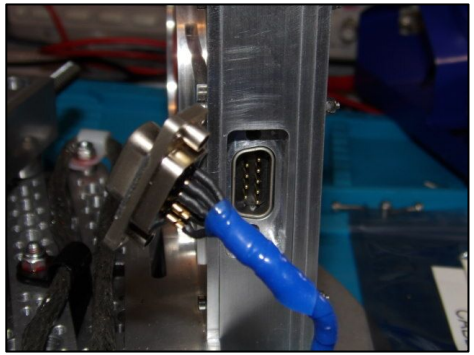
All plate holes countersunk so hardware is flush

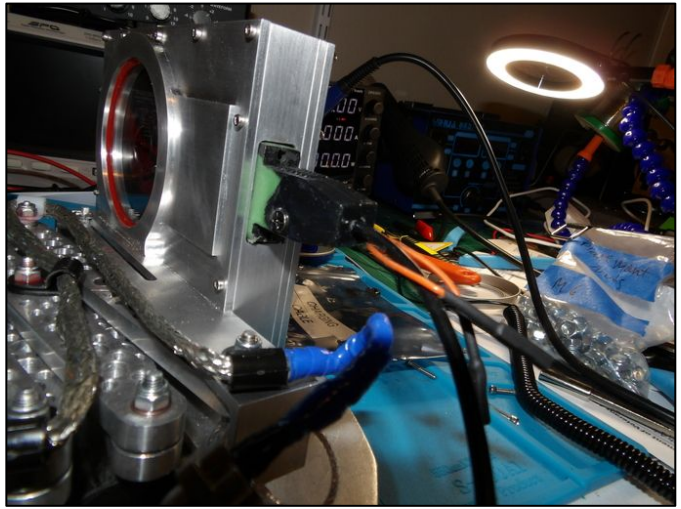
Extensions and retractions should not exceed a speed of 1in/sec (if applicable)

Scissor Arm Testing

Extension						Retraction					
	Date	Trial	Distance (d) in	Time (t) s	Velocity (v) in/s		Date	Trial	Distance (d) in	Time (t) s	Velocity (v) in/s
	3/30/2021	1	21.01	34.58	0.607576634		3/30/2021	1	20.07	35.53	0.564874754
	3/30/2021	2	21	34.8	0.603448276		3/30/2021	2	20.06	36.11	0.555524785
	4/1/2021	3	21.25	34.32	0.619172494		4/1/2021	3	20.04	36.6	0.547540984
	4/6/2021	4	21	34.87	0.60223688		4/6/2021	4	20.04	37.26	0.53784219
	4/6/2021	5	21.38	34.64	0.617205543		4/6/2021	5	19.85	36.8	0.539402174
	4/6/2021	6	21.37	34.86	0.613023523		4/6/2021	6	20.12	36.84	0.546145494
	4/6/2021	7	21.5	34.34	0.626092021		4/6/2021	7	20.63	36.51	0.565050671
	4/6/2021	8	21.5	34.25	0.627737226		4/6/2021	8	20.5	36.19	0.566454822
	4/6/2021	9	20.875	34.24	0.609667056		4/6/2021	9	19.75	36.16	0.546183628
	4/6/2021	10	21.5	34.24	0.627920561		4/6/2021	10	20.1	36.36	0.552805281
	4/6/2021	11	20.9	34.17	0.611647644		4/6/2021	11	20	36.33	0.550509221
	4/6/2021	12	20.8	34.17	0.6087211		4/6/2021	12	20.2	36.37	0.555402805
			Extension Average v (in/s) =		0.614537413				Retraction Average v (in/s)		0.552311401
			Average Distance from mount plate (in) =		21.17375				Average Length of Retraction (in) =		20.11333333

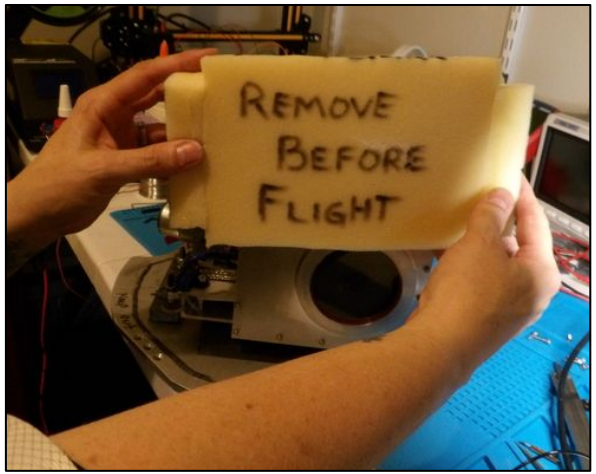
Indicate all remove before flight items that must be completed before rocket skin installation. Include all procedures, inhibits, and activities that need to be completed and their purpose. More detail on the procedure should be included on the RPB procedures slide.

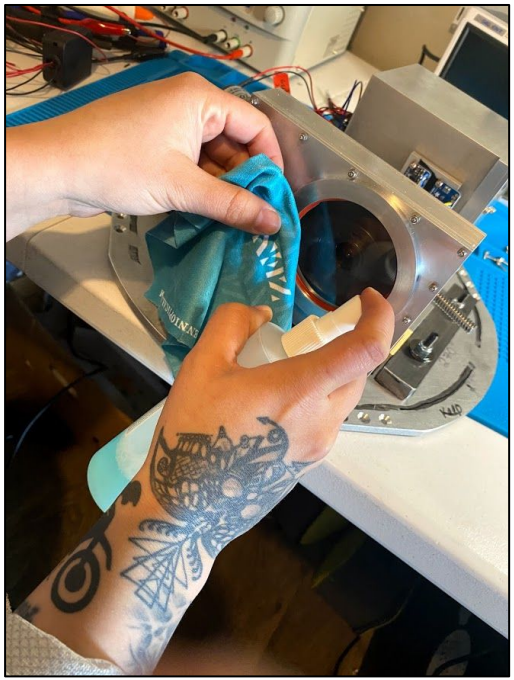




Unplug camera dsub, plug in charging cable to camera case dsub and an external power source and charge the camera for four hours. Replace payload camera dsub when finished. (Step-by-step instructions below; also reference our “Flight Procedures”, step 1)

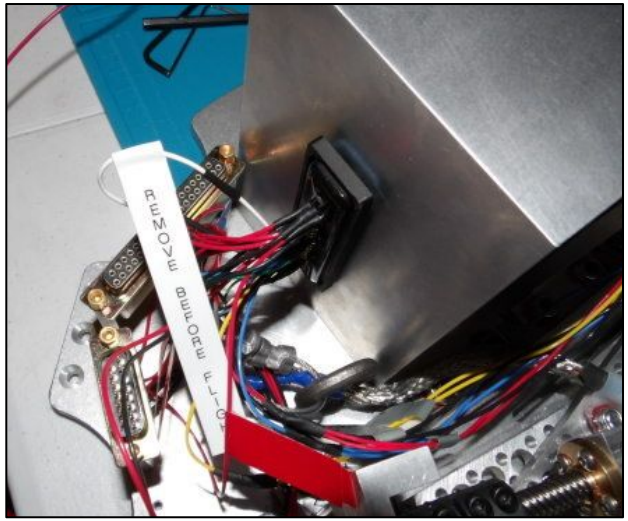
Remove Before Flight Procedures: Protective camera foam must be removed. (Clearly marked.)

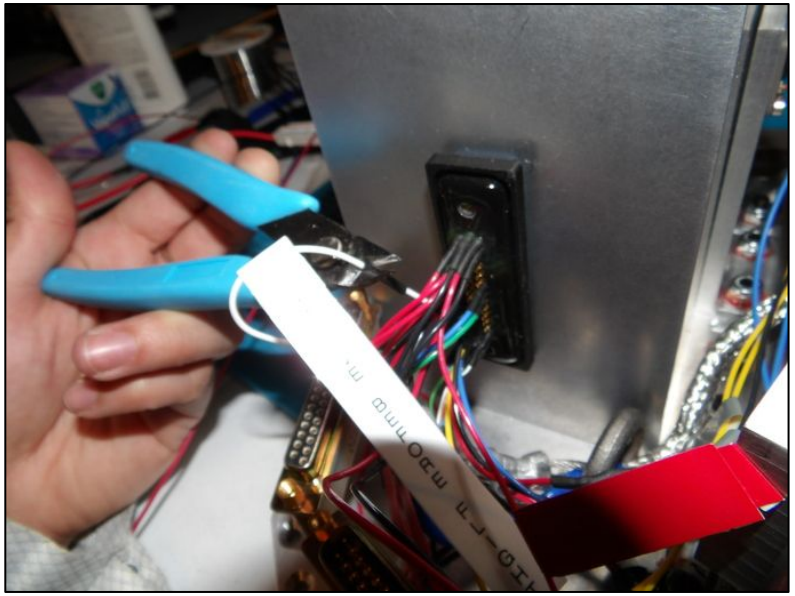




Remove clearly labeled foam camera protector and wipe front and back site glass with cleaner and cloth. (From our "Flight Procedures", step 2)

Remove Before Flight Procedures: Inhibit wires are clearly marked and need to be cut before flight.





Inhibit (clearly labeled on the Electronics Box d-sub) wire should be cut right before flight. (From our “Flight Procedures”, step 3.)

Remove Before Flight Procedures

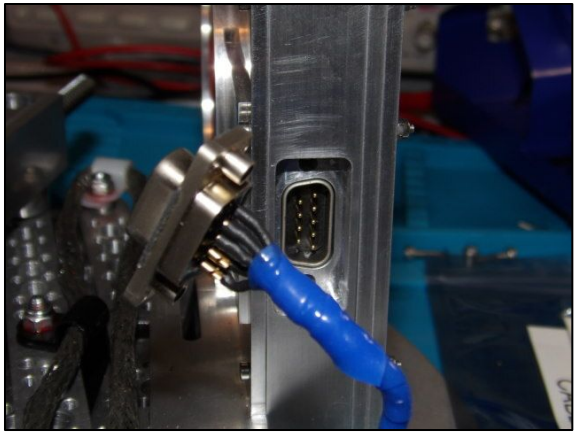
These can be found in detail in our “Flight Procedures”, Steps 2-3.

Inhibit	Inhibit Type	Purpose	Type of Procedure
Wire Inhibit	Electrical	Prevents power from reaching Raspberry Pi	Wire Cut
Foam Camera Case	Glass Protection	Protects glass on camera case	Remove foam

If there are any procedures you would like us to follow to prep you experiment for flight, include them on the following slides with images of your team following each step of the procedure. Please make sure the images are clear, as we will reference these slides when completing your procedures. The slides should be consistent with your procedure document.

Summary of Flight Procedures (Detailed explanation can be found in our “Flight Procedures”.)

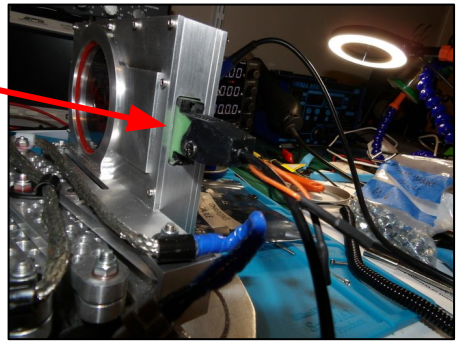
1. Charge Camera: **Note that this process is mission critical**
2. Remove foam case and clean the sight glass on front and back of the camera case
3. Remove Wire Inhibit
4. After payload retrieval: PLEASE REMOVE CAMERA AND RASPBERRY PI SD CARDS AND PLACE IN DESSICANT!!!



Step 1

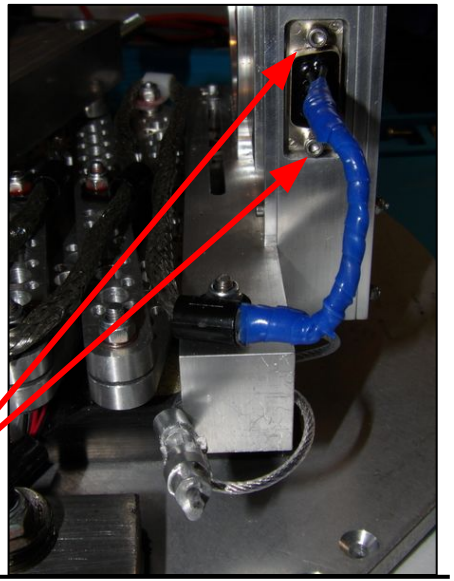
- Charge Camera: **Note that this process is mission critical**
  - A d-sub connector has been provided that interfaces with the camera case in order to charge the Mad V camera
  - The exterior dsub on the camera case will need to be removed. This dsub's wires are wrapped in blue.
    - A small screwdriver with the appropriate hex head attachment has been provided in order to remove and replace this dsub.
  - Remove Charging Cable from included care package

Connected Charging Cable



Step 1

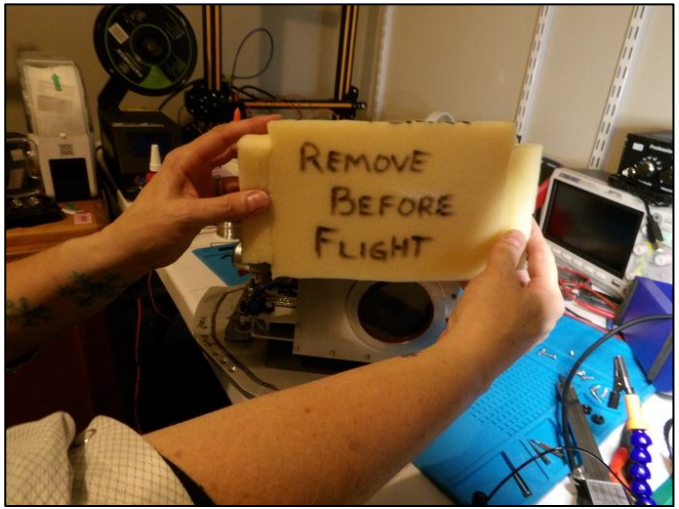
- Charge Camera: **Note that this process is mission critical**
  - Plug in charging Cable connected to a power source and allow to charge for
  - Once the camera has been charged properly, disconnect the charging cable, re-plug-in the flight d-sub (wrapped in blue tape) and retighten the dsub screws with the included screwdriver with hex head.
  - Make sure the bolts are very tight in order to retain proper signal connection and water-tightness on the camera case



Bolts to be tightened after reconnecting flight dsub.

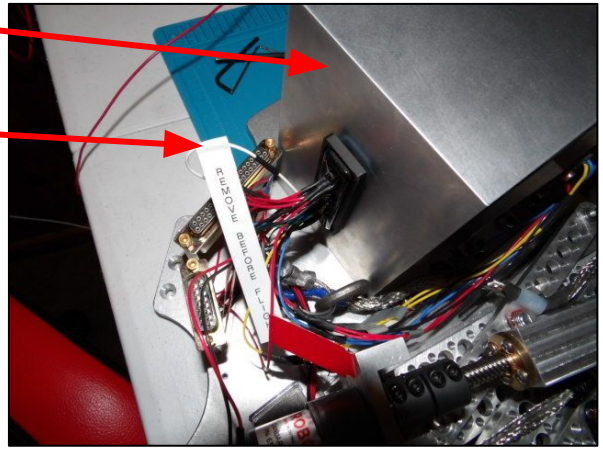
Step 2

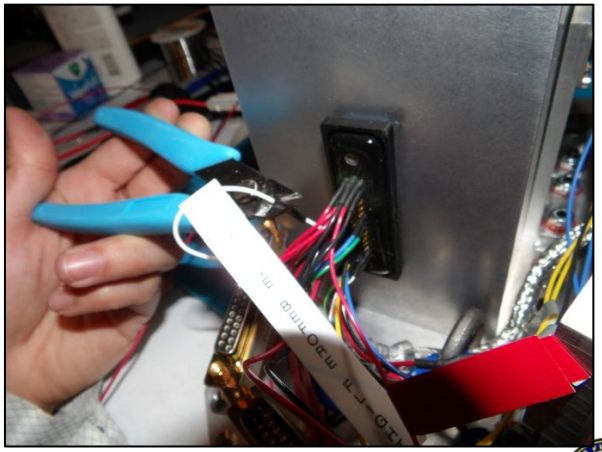
- Remove foam case and clean the sight glass on front and back of the camera case
  - A cloth and spray is provided for cleaning the site glass on the front and the back of the camera case
  - Spray glass and wipe with cloth until no streaks remain. Just the exterior, no need to open the cam case



Electrical Box

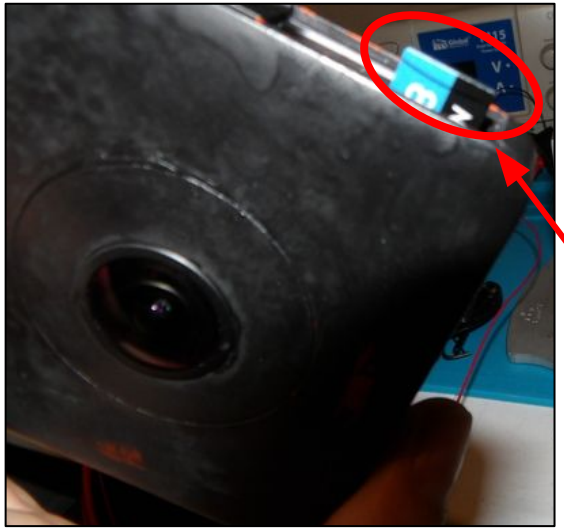
White electrical inhibit wires



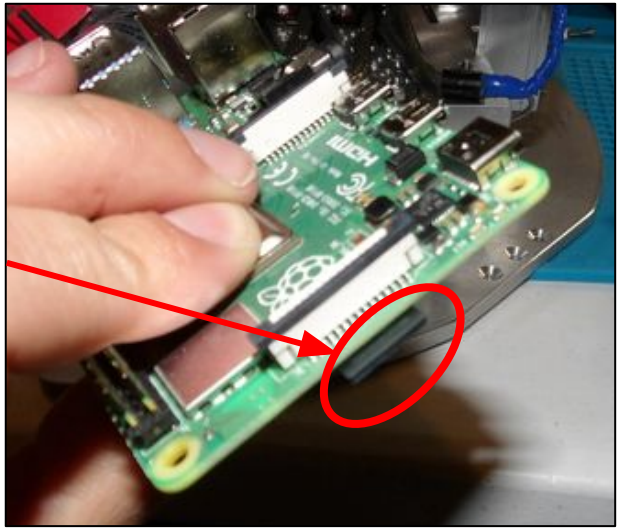


Step 3

- Remove Inhibit
  - The white inhibit wire is clearly labeled
  - Inhibit wire should be cut before flight in order to uninhibit the extension and retraction of the arm.
  - With wire cutters provided, cut the labeled inhibit wire at each end, close to the d-sub so that the two severed ends cannot touch each other during flight. (any contact could prevent arm from extending)



SD Cards



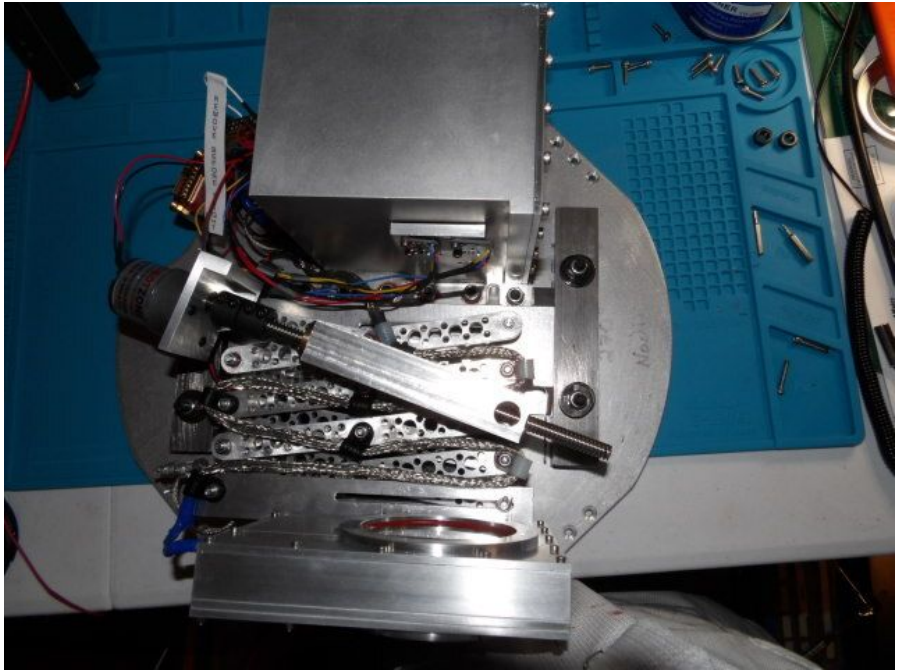
Step 4

- After payload retrieval: PLEASE OPEN CAMERA CASE AND ELECTRONICS BOX. REMOVE CAMERA AND RASPBERRY PI SD CARDS AND PLACE IN DESSICANT!!!

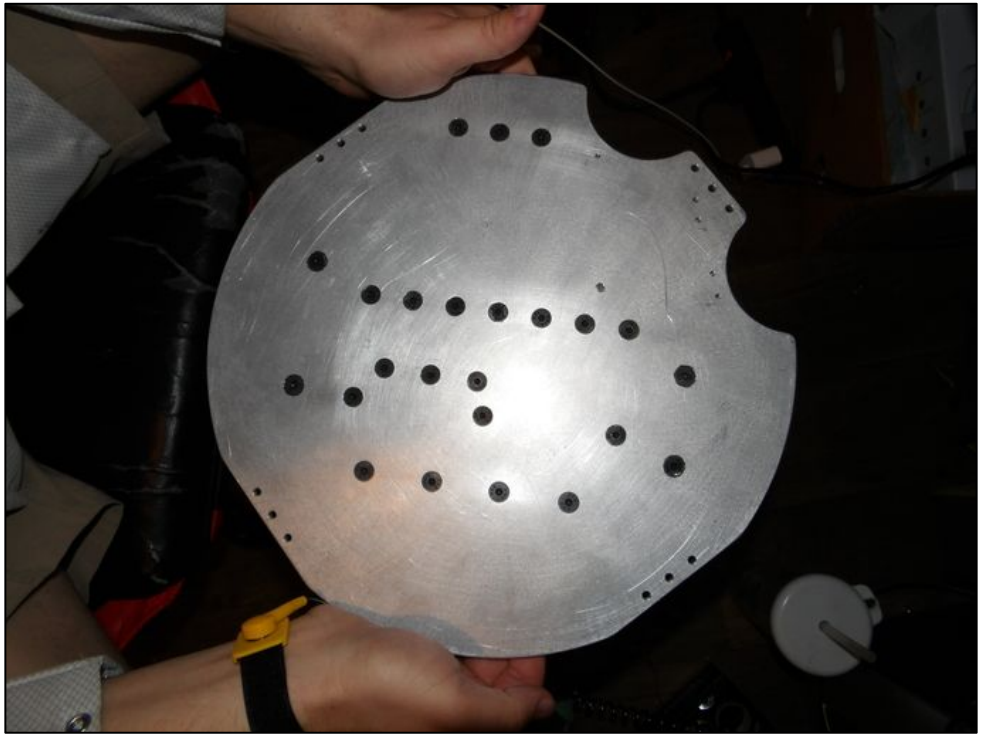
Payload Interface Verification and Inspection

Insert an image of the specified payload orientation on the following six slides.

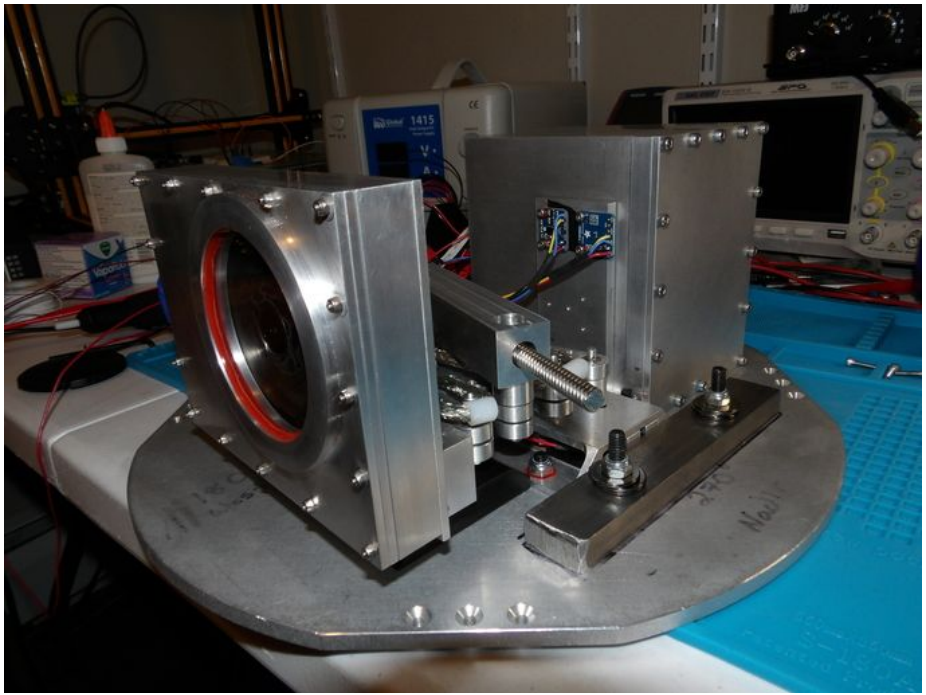
Payload Top View



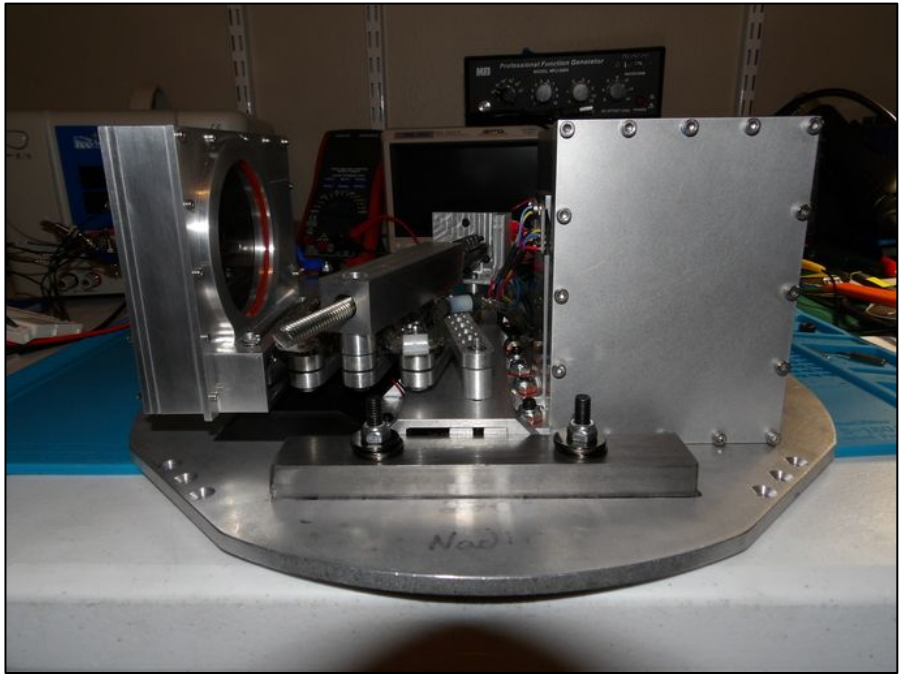
Payload Bottom View



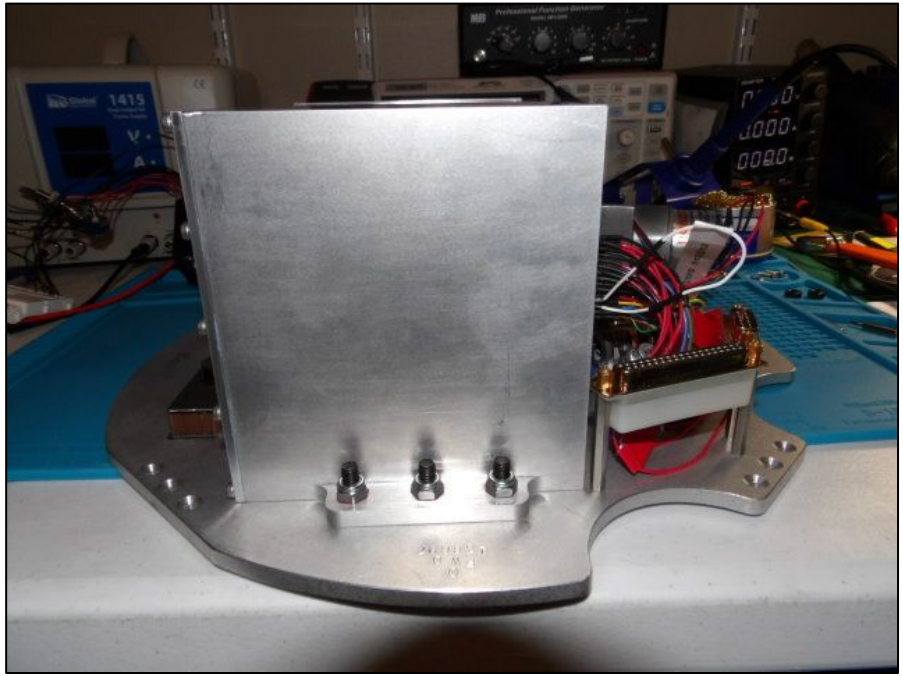
Payload Side View (0 degrees)



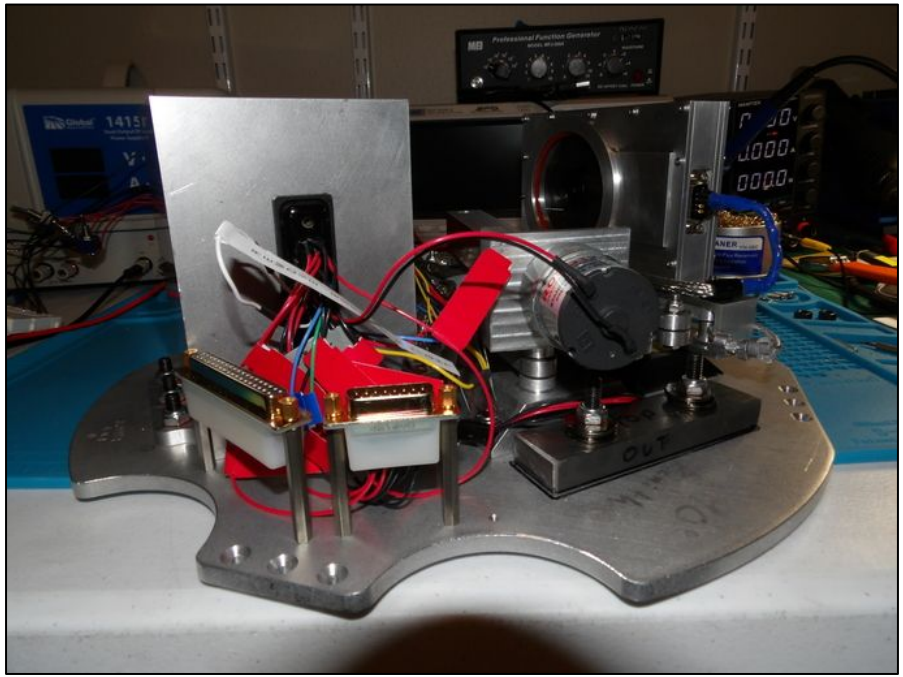
Payload Side View (90 degrees)



Payload Side View (180 degrees)

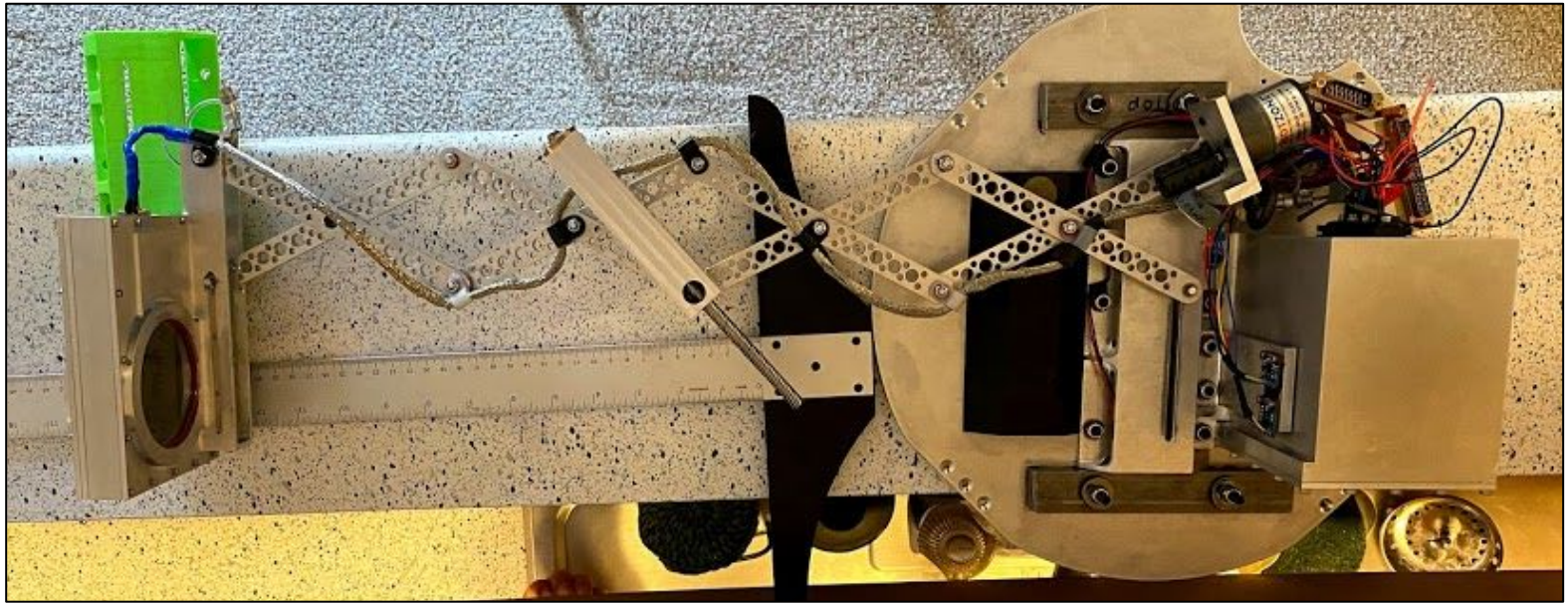


Payload Side View (270 degrees)

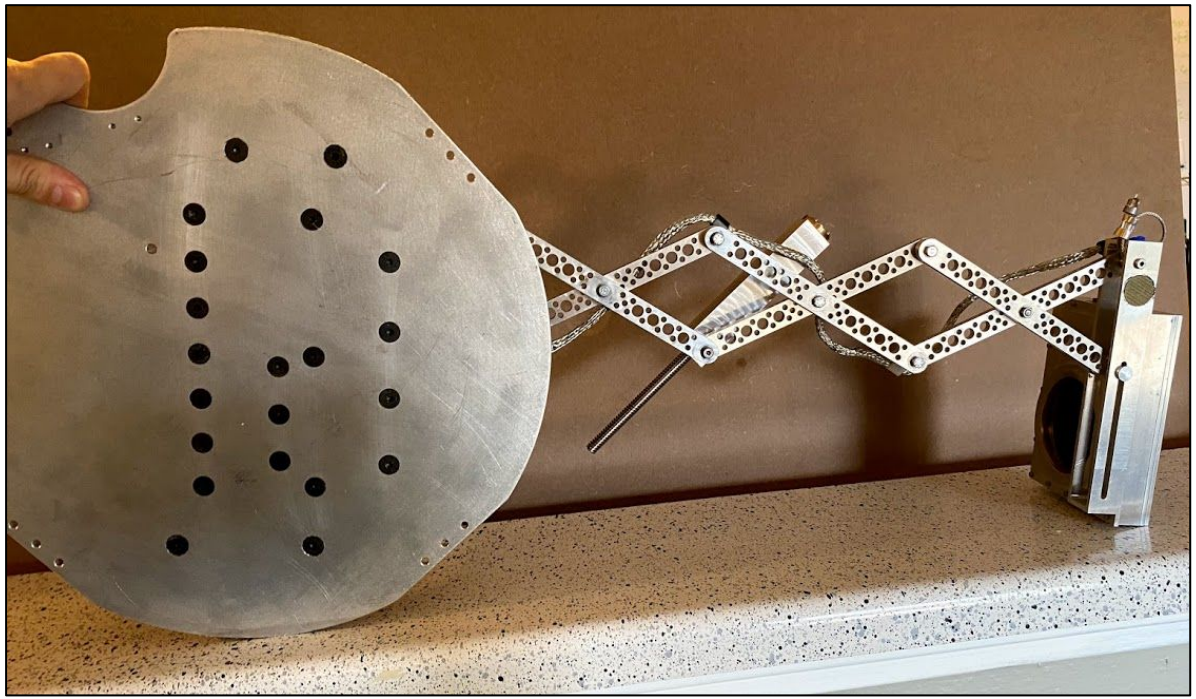


If your experiment includes a deployment of any kind, include an image of each view of the fully deployed experiment on the following six slides. If you are not deploying anything, disregard the following slides.

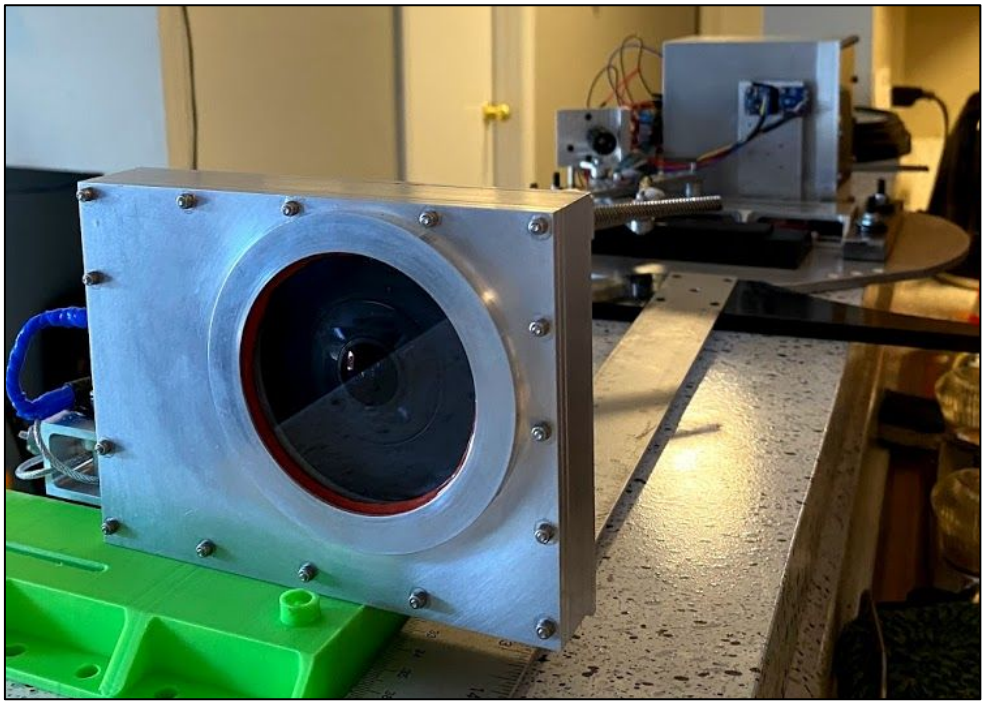
Deployment Top View



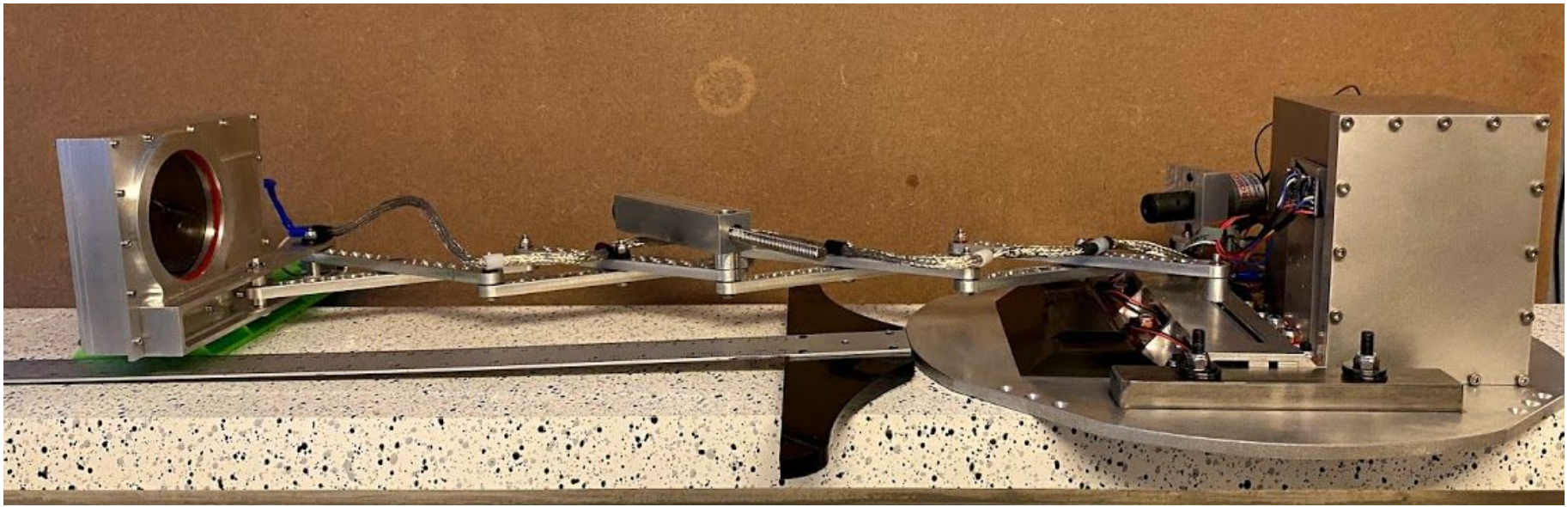
Deployment Bottom View



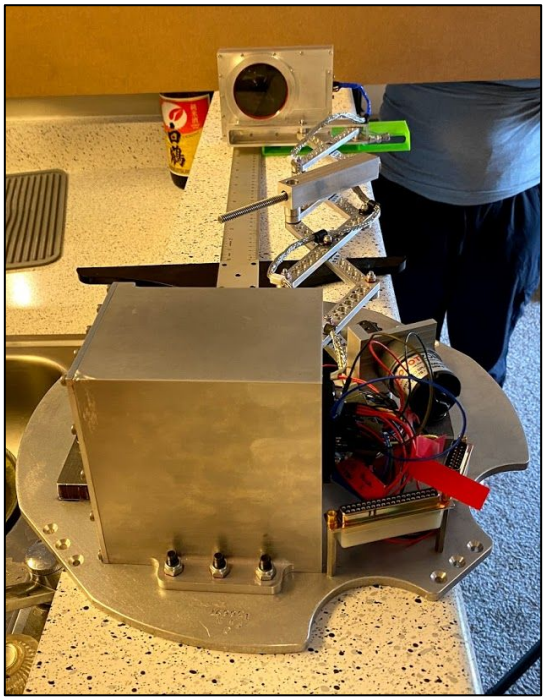
Deployment Side View (0 degrees)



Deployment Side View (90 degrees)



Deployment Side View (180 degrees)



Deployment Side View (270 degrees)

Once you have completed all the slides, upload them to the **“Remote Check-In” folder** in your team’s google drive folder. Before submitting, review all the slides and confirm that all required information and pictures are included. If your images are blurry or unclear, you will be asked to retake them.

Upload your slides and payload procedures to the google drive folder **at least 24 hours before your scheduled GSE Visual Verification Date.**