MnSGC

Minnesota Space Grant Consortium | E-Vent

"Development of an Adaptable Vent for Latex Weather Ballooning"

Shea Larson · Jesse Cook · Seyon Wallo · Ethan Thompson-Jewell · Ashton Posey · Jacob Meyer · James Flaten

Attachment Point

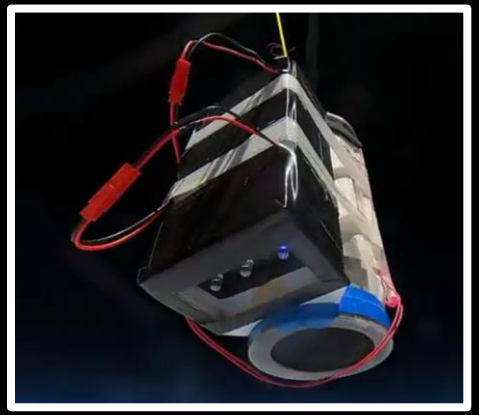
SECURED TO THE BALLOON NECK

Resistor Cutters

BURN TO RELEASE THE BALLOON

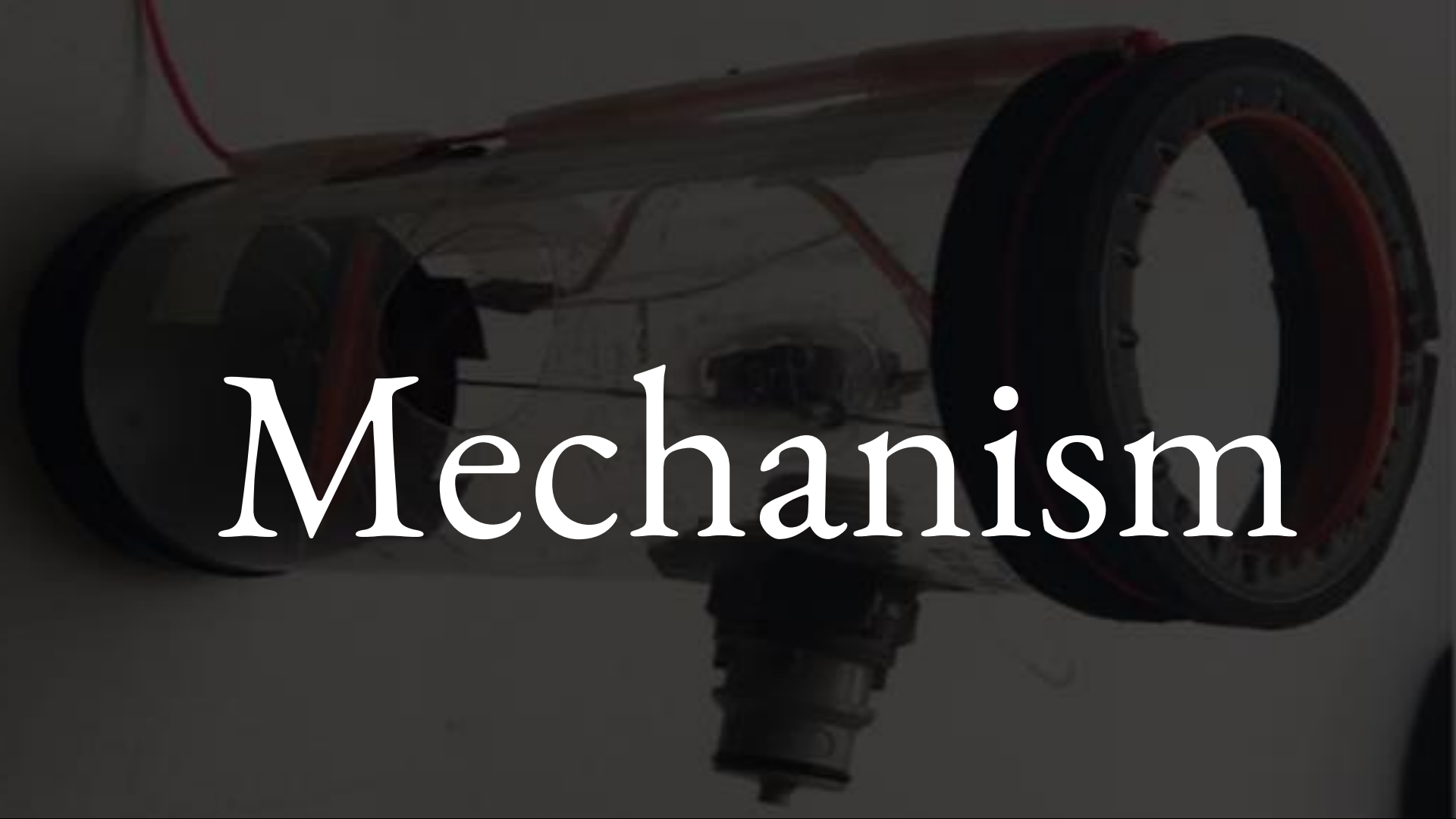
Servo Notch

AVIONICS ATTACHMENT



Vent Flapper

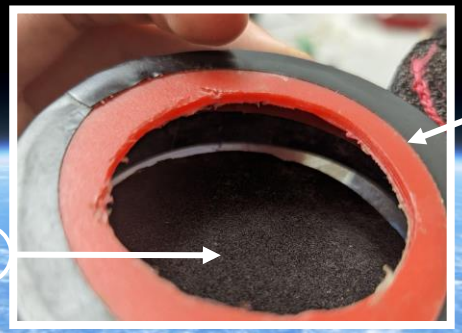
RELEASES LIFTING GAS



Mechanism

STRUCTURE

1. Thin tubing with rings cut out of caps for reinforcement
2. Inward-opening flap pressed against the bottom ring
3. EPDM foam seal attached to the opening flap
4. Access port and filling hatch
5. Foam rings sealing the balloon neck and rigging
6. “Service-able” design



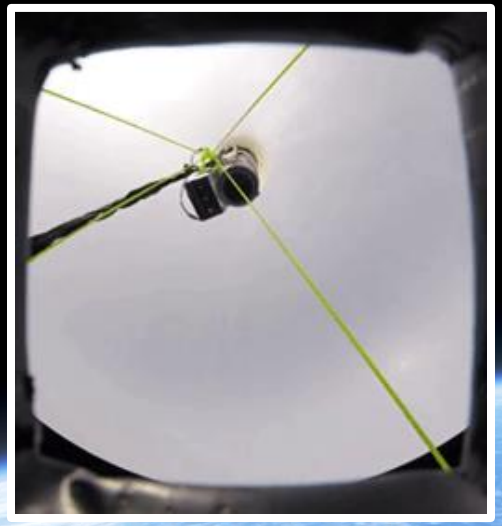
VENTING ACTION

VENT DOOR OPENS INWARD

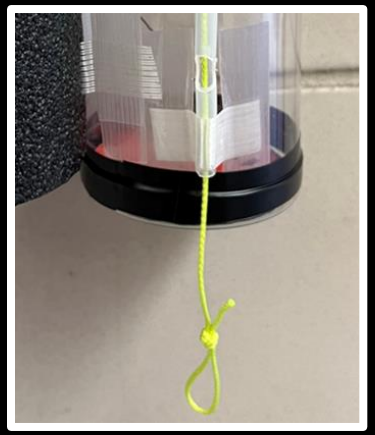
SERVO AND ROD ATTACHMENT

ADJUSTABLE LENGTH

FOAM SEAL



THE ATTACHED SERVO CONTROLS THE “FLAPPER”, THEREBY RELEASING LIFTING GAS UPON COMMAND



VENT RIGGING

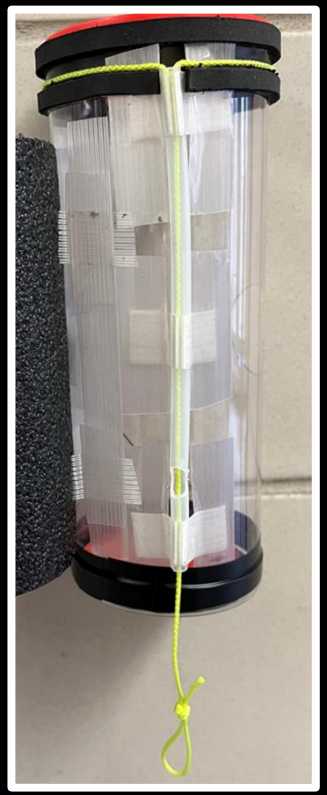
TOP RIGGING STARTS AT THE “LASSO” AND RUNS THROUGH A POLYETHYLENE TUBE

NOTCH FOR RESISTOR BURNER

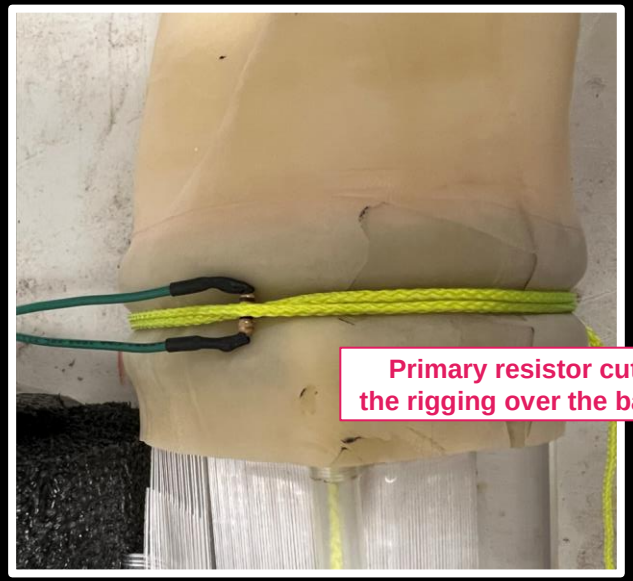
THE LINE ENDS IN A LOOP AT THE BOTTOM

PAYLOAD STACKS CAN BE CLIPPED TO IT

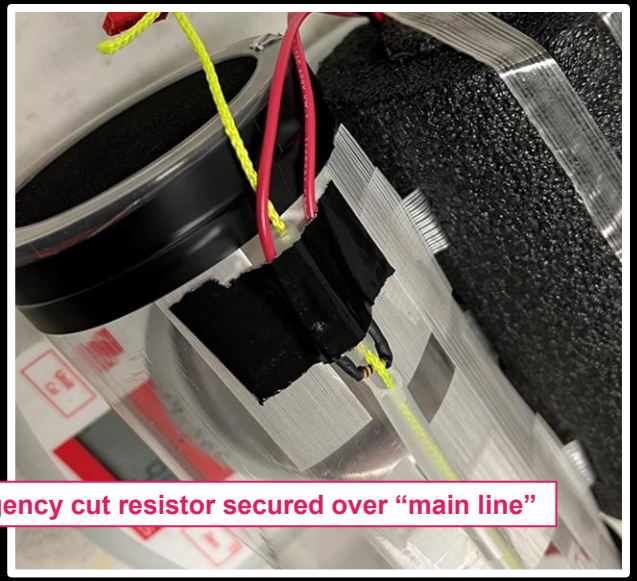
THE RIGGING SECURES THE BALLOON NECK TO THE VENT IN A CIRCULAR NOTCH



CUT DOWN/DESCENT



Primary resistor cutter tied with the rigging over the balloon neck

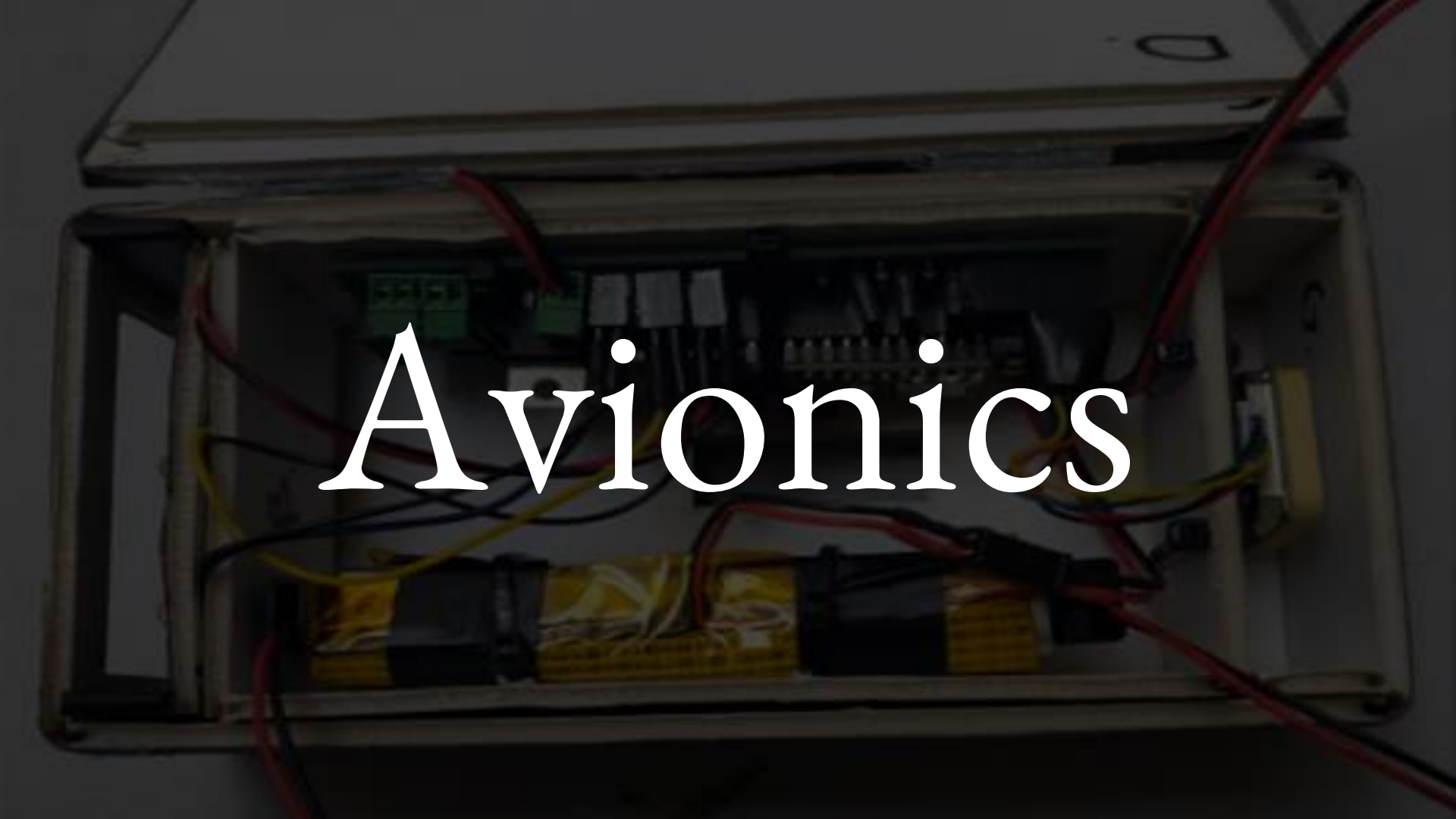


Emergency cut resistor secured over “main line”

The primary resistor performs a controlled, pinpoint burn on the “waist line” rigging securing the balloon neck.

The rigging is cut loose, the balloon neck itself slips off of the vent, and the payload begins its free-fall.

Should this burn fail, the emergency cut resistor activates, and the vent assembly is lost.

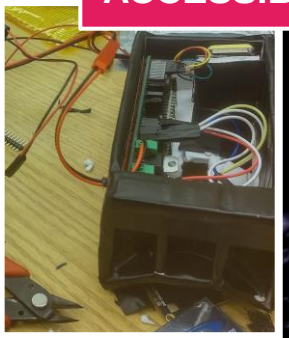

Avionics

FUNCTIONALITY

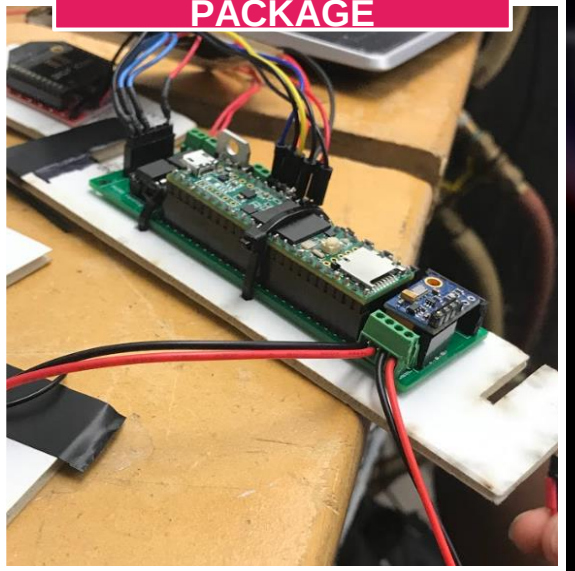
```
}
burnResistor();
Serial.println("Burning waistline resistor");
if (currTimeS - burnTime1StartS > 7.9)
{
  stopBurn();
  Serial.println("Waistline resistor burning stopped");
  Res1Burned = true;
}

lse if (!Res1Burned2)

if (!Res1on)
```

AUTONOMOUS CONTROL

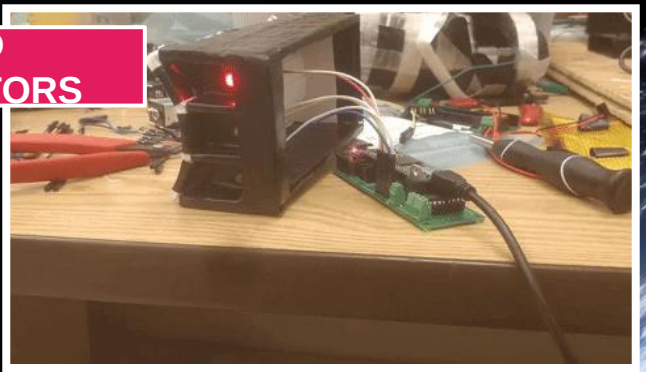
ACCESSIBLE CASING



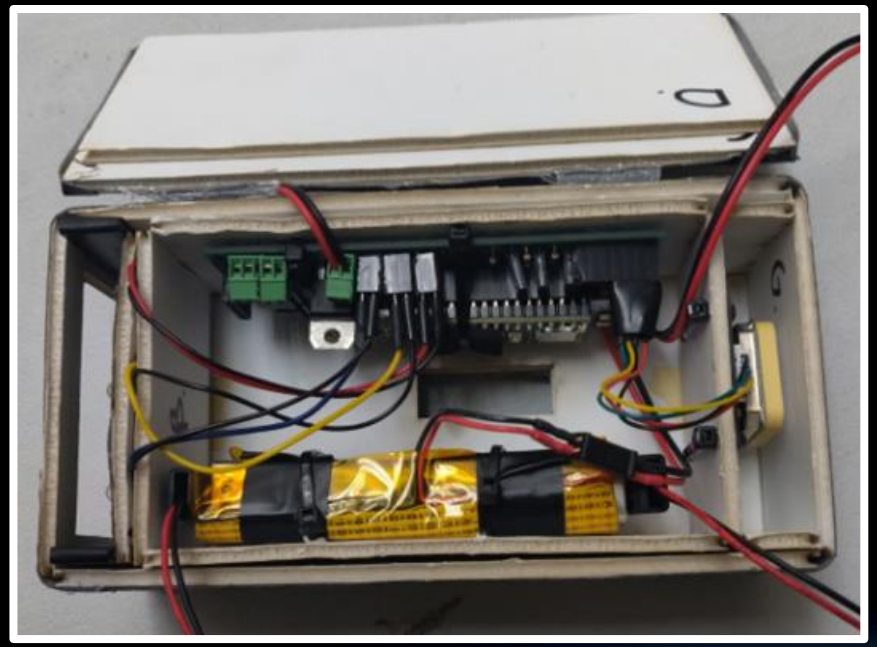
HARDWARE PACKAGE

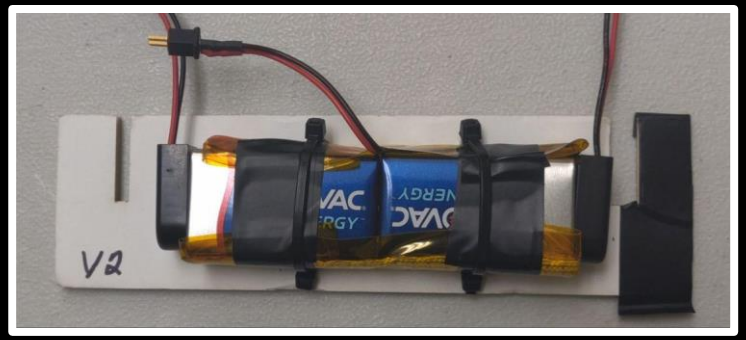


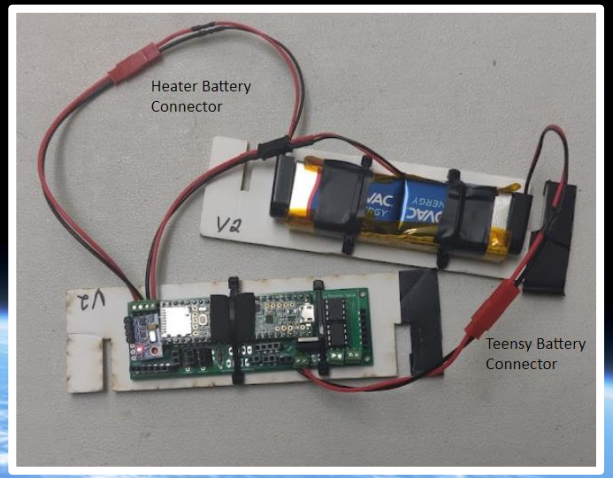
LED INDICATORS



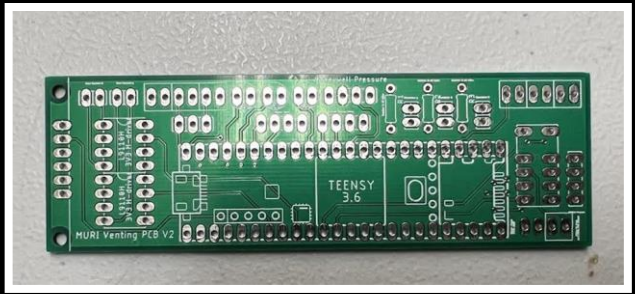
MODULAR DESIGN

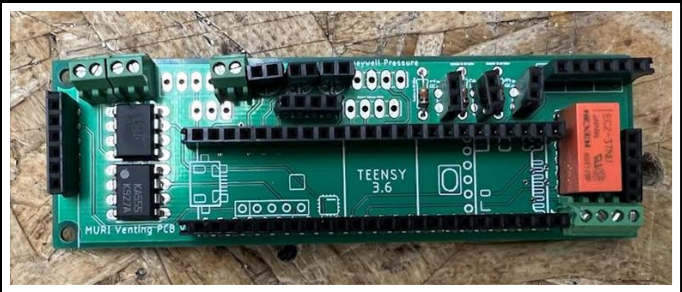






ONBOARD SENSOR SUITE



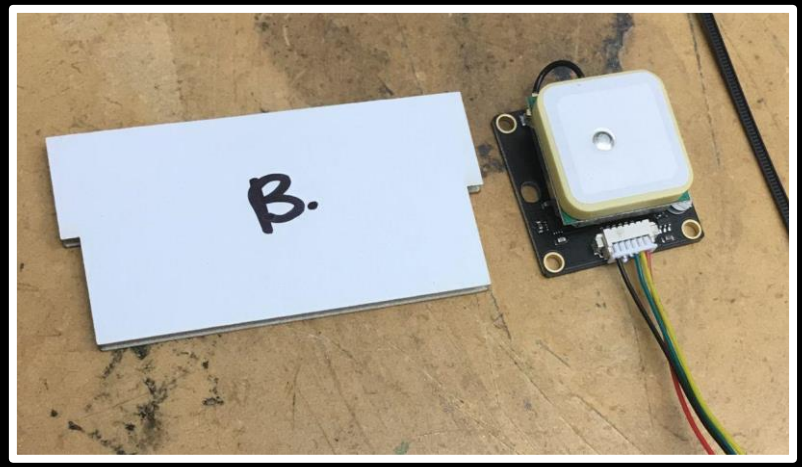


80 Female Headers | **8** Terminals | **2** H-Drivers | **1** H-Driver Socket

2 Resistor Cutters | **1** Thermistor | **1** Heater Relay | **1** Pressure Sensor

2 9V Battery Connectors | **1** 5V Regulator | **1** UBlox GPS | **1** Teensy 3.5

UBlox NEO M8N/M9N



GPS/ALTIMETER

−40°C

MINIMUM OPERATING TEMPERATURE

85°C

MAXIMUM OPERATING TEMPERATURE

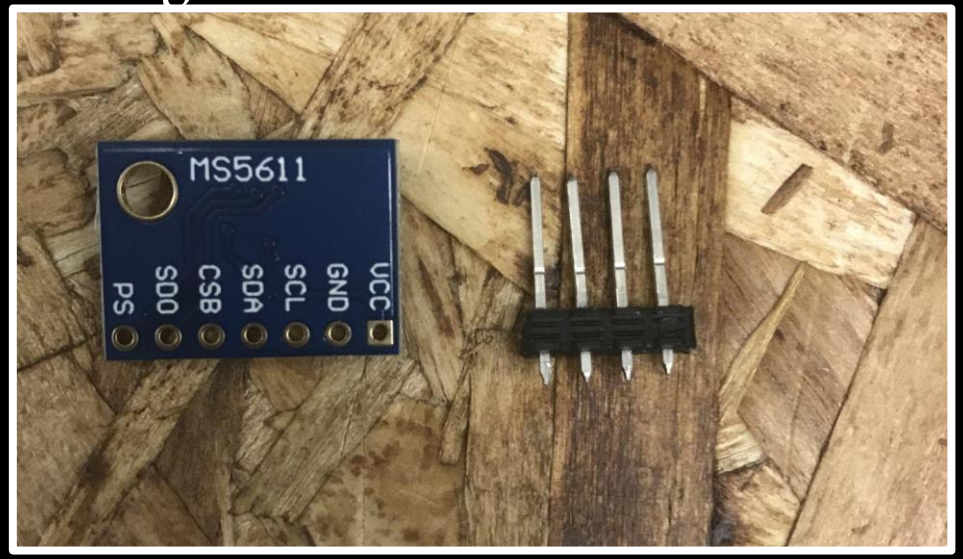
3.5V

EXPECTED VOLTAGE

PRIMARILY USED FOR VENTING DECISIONS

Enables location and altitude specific data

HiLetgo MS5611



PRESSURE SENSOR

−40°C
MINIMUM OPERATING TEMPERATURE

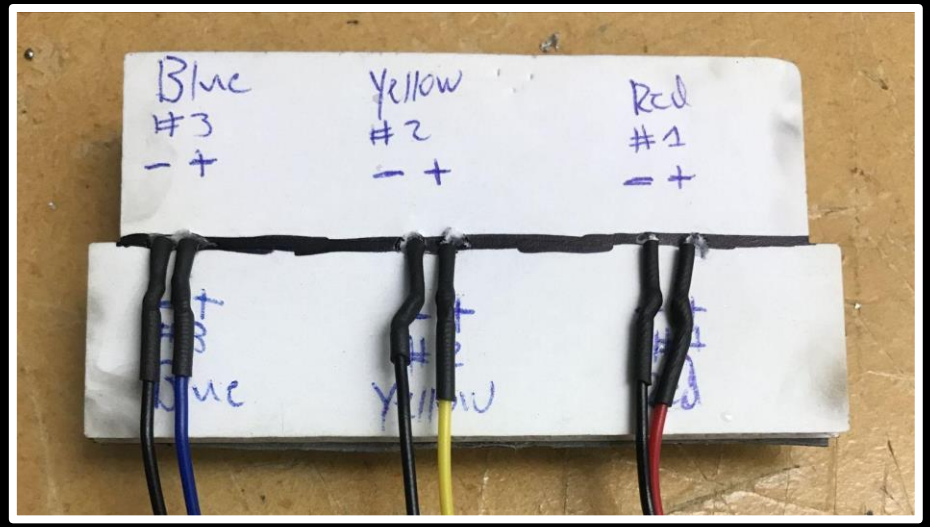
85°C
MAXIMUM OPERATING TEMPERATURE

3.5V
EXPECTED VOLTAGE

Backup for GPS Venting Decisions

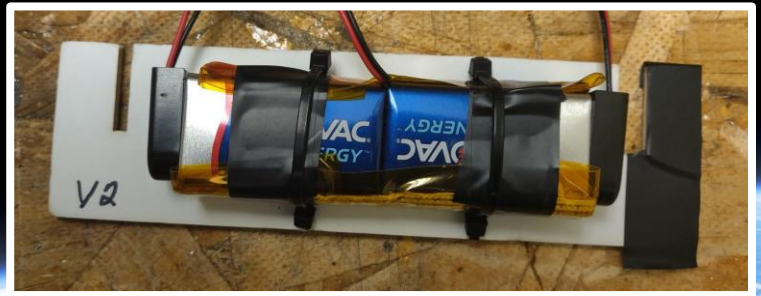
Calculates altitude from pressure data

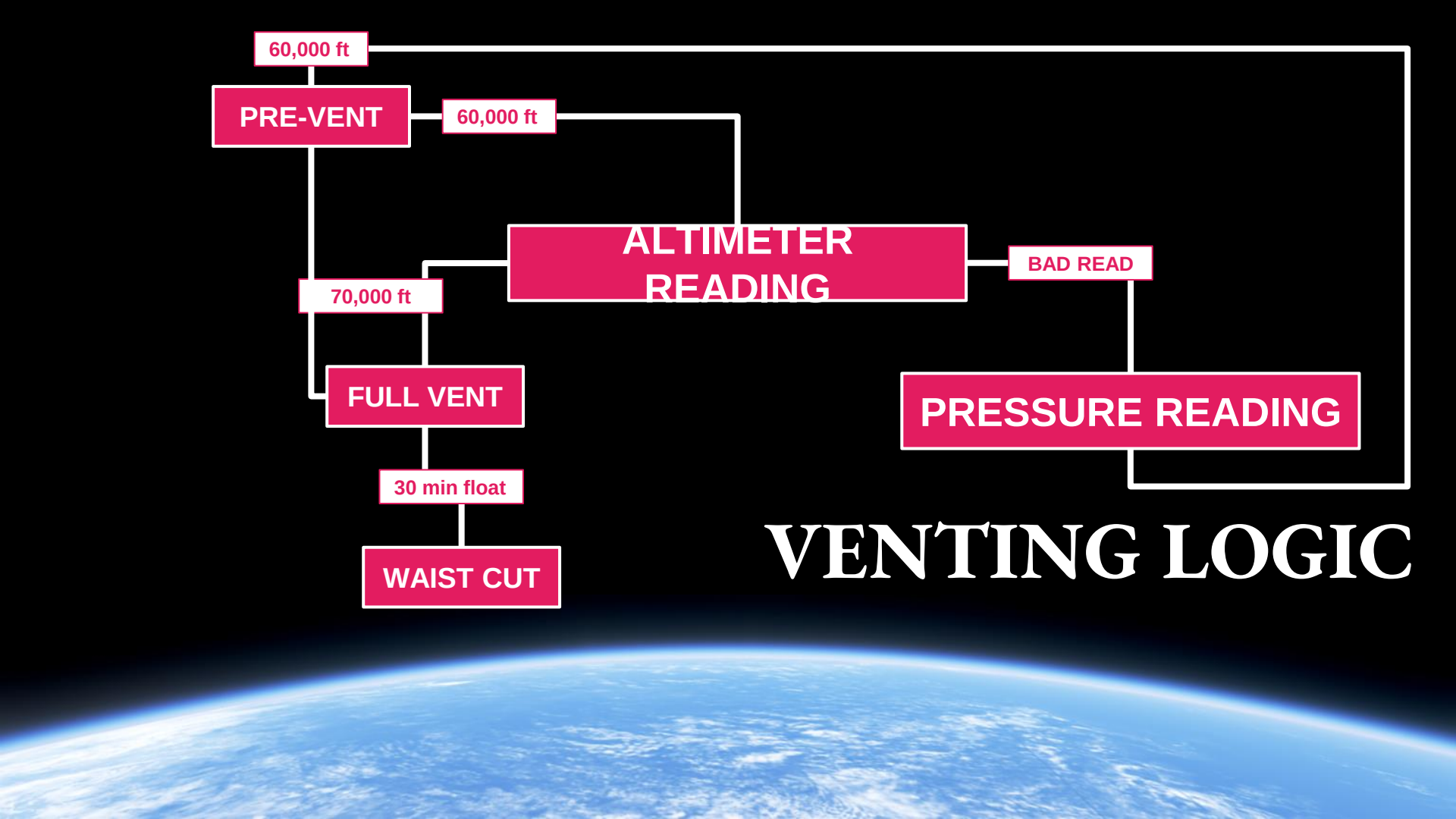
INDICATOR LEDS



THERMISTOR

BATTERY HEATING





VENTING LOGIC

FINAL REMARKS