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SUMMARY

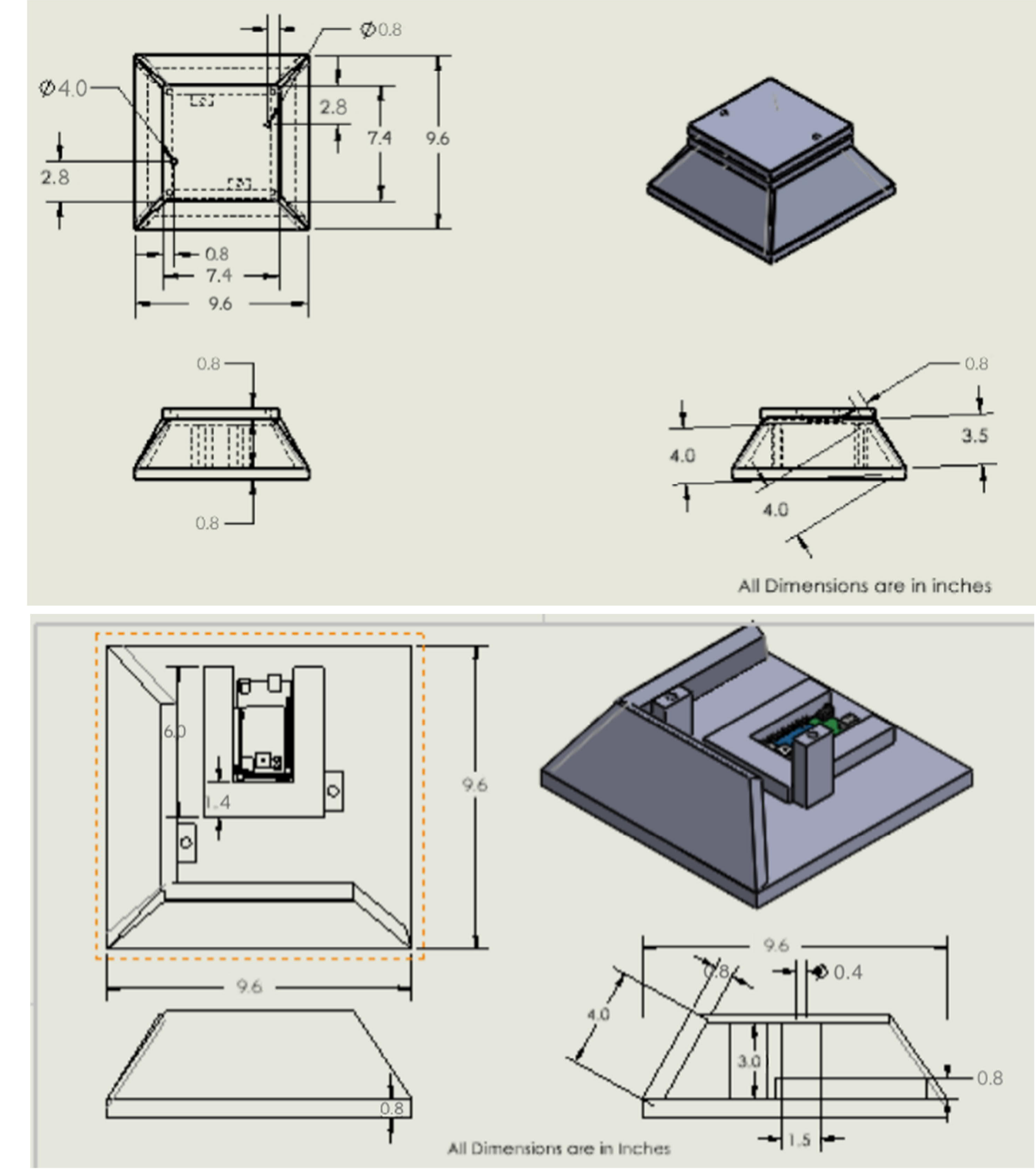
- Development of a helium balloon satellite
- Measure and collect weather conditions data
- Measure solar energy using photovoltaic detectors (solar panels)
- Test and verify payload under simulated flight conditions
- Launch satellite to 100,000 feet on a helium balloon
- Use data collected to develop a solar charger for future flights

SPECIFICATIONS

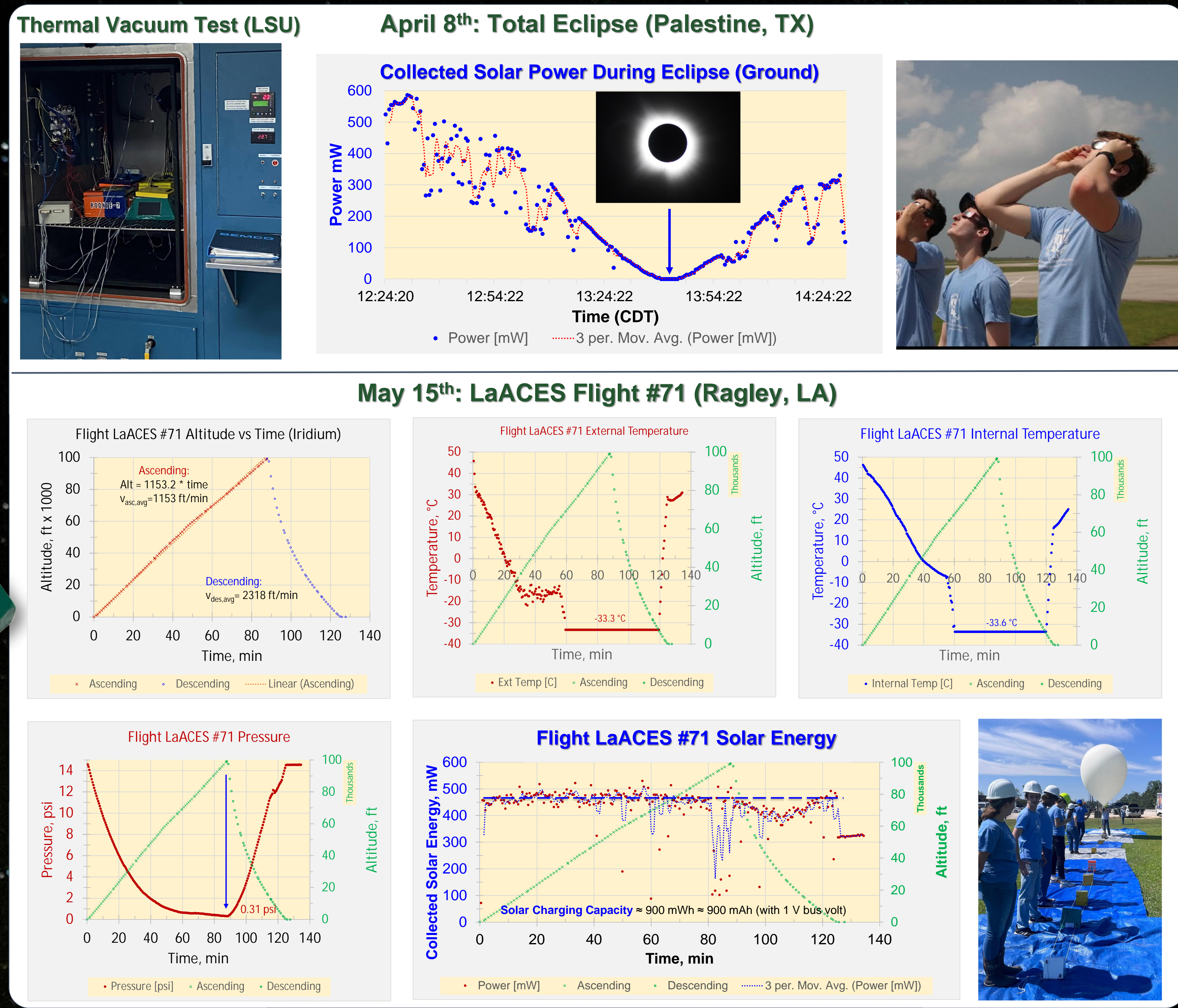
- Mechanical:**
- 9.6 in x 4 in x 0.75 in Trapezoidal Walls
 - 454 g Total Weight
 - ¾" Polystyrene Foam
 - Vehicle Interface System
- Electrical:**
- 9V DC Battery
 - 4 (1.2 W) Panel Solar Array
 - Arduino Mega 2560 Controller
 - MegaSat Custom Sensor Board
 - Adafruit GPS Shield with SD card



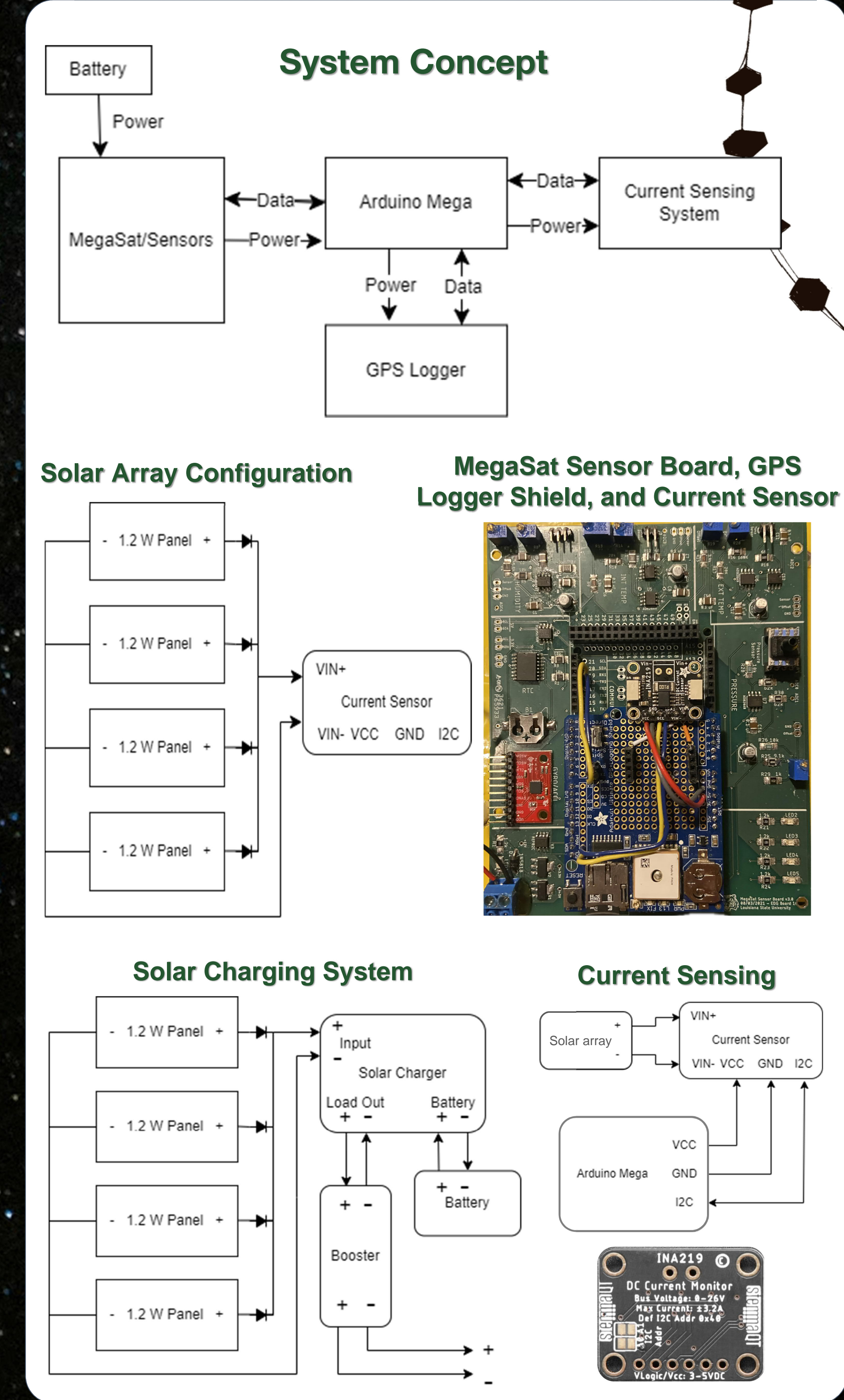
HOUSING DESIGN



TESTING AND RESULTS



ELECTRICAL SYSTEM



SOFTWARE AND OUTPUT

Header Files and Definitions for MegaSat Interfacing

```

Initialize current sensor
Begin serial connection and BALLOON MODE
Define NMEA sentence and interrupt
Define SD card, megaSatFile, solarFile, counters, and headers
Timer function
Interrupt Service Routine
    
```

Void setup

```

initialize current sensor, GPS, and SD card
SD card initialized
Open megaSatFile, name, and print headers
Open solarFile, name, and print headers
    
```

Void loop

```

New NMEA -> Parse Sentence
New MegaSat Data -> Max writes -> Write data -> Increment counter
New Solar Data -> Max writes -> Write data -> Increment counter
Exit
    
```

Calibration Equations Applied to Program

```

float PSI = 0.0161 * pressureSensor - 0.822;
float highGainPSI = 0.000241 * highGainPressureSensor - 0.0666;
float internalCelcius = -0.197 * internalTemperatureSensor + 169;
float externalCelcius = -0.185 * externalTemperatureSensor + 157;
float relativeHumidity = 0.0978 * humiditySensor;
    
```

Solar Array Data (0 – 3.5 min)

Time [CDT]	Altitude [m]	Shunt Voltage [mV]	Current [mA]	Bus Voltage [V]	Power [mW]
10:58:15	20.6	7.24	72.4	1	72
10:58:45	64.7	46.34	463.5	0.98	458
10:59:15	156	46.55	465.7	0.98	456
10:59:45	270.4	42.77	427.7	0.98	420
11:00:15	387.8	45.29	452.9	0.98	446
11:00:45	481.5	45.44	454.4	0.98	446
11:01:15	571.1	44.66	447.3	0.98	440
11:01:45	734.3	45.04	450.2	0.98	442

MegaSat Sensor Data (0 – 3.5 min)

Time [CDT]	Altitude [m]	Pressure NA [psi]	Pressure HG [psi]	Temp EXT [C]	Temp INT [C]	Humidity [%]
10:58:15	20.60	14.57	0.18	45.82	46.20	25.33
10:58:45	64.70	14.36	0.18	39.81	45.60	25.53
10:59:15	156.00	14.07	0.18	33.60	45.00	33.25
10:59:45	270.40	13.76	0.18	31.16	44.20	23.86
11:00:15	387.80	13.49	0.18	31.72	43.60	26.5
11:00:45	481.50	13.19	0.18	29.84	43.20	27.29
11:01:15	571.10	12.91	0.18	28.90	42.00	18.09
11:01:45	734.30	12.65	0.18	30.41	41.80	24.35

ACKNOWLEDGEMENTS



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