AVA Team's DEMOSAT project - A satellite that was sent to the atmosphere to receive data for commercial planes

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Abstract

For the DEMOsat project the AVA team assembled a satellite to be able to try to find the best altitude for commercial airplanes to fly in. Yes, 30,000 ft through 40,000 ft is the best altitude for commercial planes to be flying in but the AVA's test project is trying to find the exact altitude that is best for these type of planes. Finding the best altitude that the commercial planes should fly in will benefit the aircraft. The humidity, pressure, and altitude is what the AVA teams project will be receiving data on. Although we will not have all the sensors that affect planes, we will still try to find the best and safest altitude for commercial planes. The goal of the project is to receive useful and accurate data to be able to try to find the best altitude level that will benefit commercial planes.

- ***Here are some of the main ways humidity can affect aircraft:(Lack of visibility-Aircraft corrosion-Excess weight-Snow and ice)***
- ***Some of the common ways how pressure affects aircraft:(Air pressure on the wings-The effect of pressure on the engine-Effect of pressure on hydraulic and electrical systems***

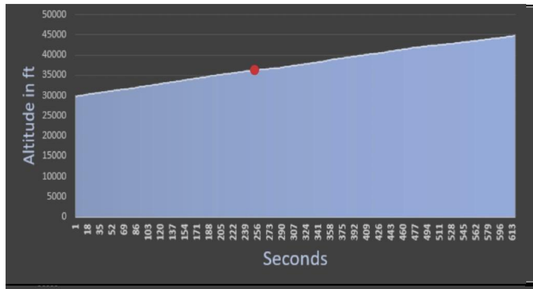
Design

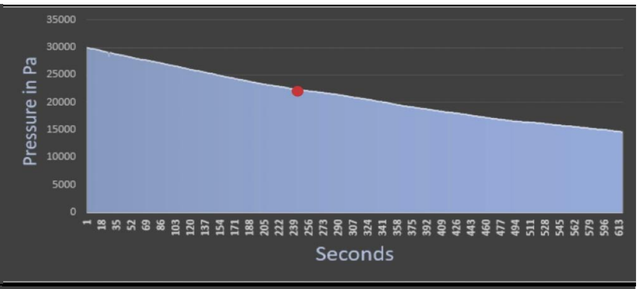
For the DEMOsat project the AVA team assembled an octagon design that was made with foam core and styrofoam material. Inside the octagon are three 12v heaters that are powered by four 9v batteries to help keep the humidity sensor, pressure sensor, and arduino stay in temperature. The overall mass of the satellite is less than 600 grams.

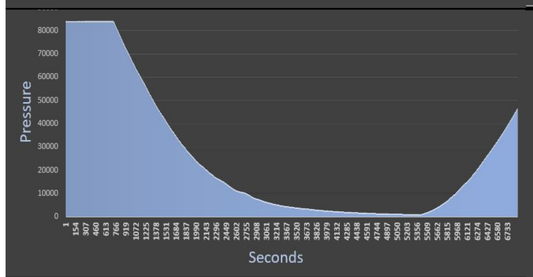
Sensors

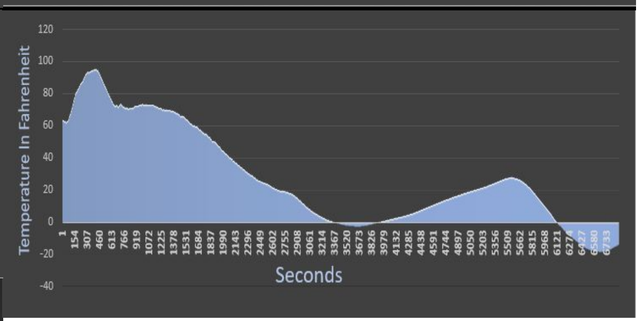
- *Sparkfun Altitude/Pressure Sensor Breakout - MPL3115A2*
- *Temperature / Humidity Sensor - DHT11*
- *Micro SD Card*

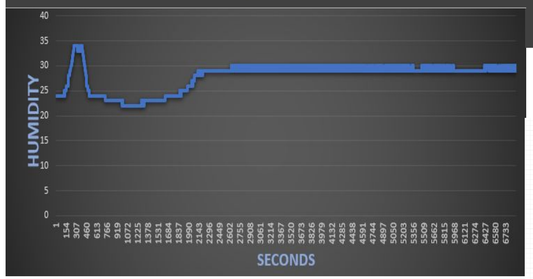
Results

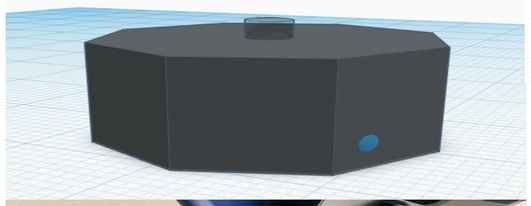




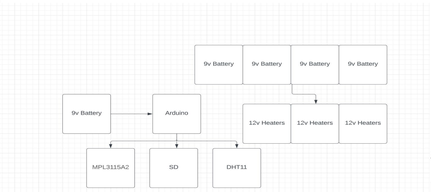


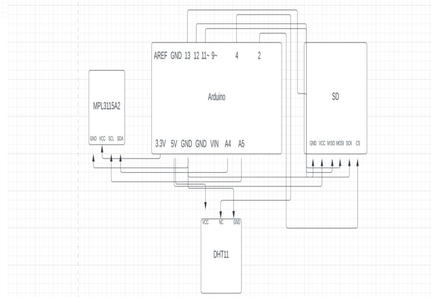






Block Diagram





Using pressure and altitude data we received. Our best assumption is that 36,377 ft and 22,296.75 pascals is the best midpoint for commercial planes. We found this mid point because we know that the best altitude for commercial planes to fly is between 30,000 ft and 40,000 ft and we also know that between 20,000 pascals and 25,000 pascals is the best pressure for commercial planes to fly in.

Testings

The AVA team was able to do several test to see how the satellite was performing. For example we were able to perform a whiplash, dry ice, and vacuum test. The dry ice reached under -5 celsius and our satellite was able to stay at 31 celsius for 90 minutes. Performing these test helped us see if our design needed any improvements. For example, we had many problems with our pressure/altitude sensor. It wasn't able to give us accurate data for neither pressure and altitude but we later found out that we actually needed to fix our code because the sensor was only able to receive data for only one. So we decided to only receive data from pressure and than be able to calculate it into altitude.

Conclusion

Overall the DEMOSAT that we made performed very well at the day of launch. The satellite was able to receive accurate and consistent data for 120 minutes. We were able to assume that 36,377 ft and 22,296.75 pascals is the best midpoint for commercial planes. It seems odd to us that the humidity sensor started receiving constant data after 38,000 ft. Although we were not able to measure altitude we were able to calculate the pressure into altitude in a website. We were very limited to receiving data because we were not able to get hands on all the sensors that affects planes and due to a certain sensor failing.

Seconds	Pressure	Temperature (F)	Humidity	Celsius
2400	16831.75	30.99	29	2
2401	16809.00	30.99	29	2
2402	16787.25	30.99	29	2
2403	16768.75	30.99	29	2
2404	16754.50	30.88	29	2
2405	16737.25	30.88	29	2
2407	16721.50	30.76	29	2
2408	16709.50	30.76	29	2
2409	16699.00	30.65	29	2
2410	16688.25	30.54	29	2
2411	16679.25	30.54	29	2
2412	16666.50	30.54	29	2
2413	16651.00	30.54	29	2
2414	16630.75	30.42	29	2
2415	16618.00	30.31	29	2
2416	16601.50	30.31	29	2
2417	16590.00	30.31	29	2
2418	16579.25	30.20	29	2

Acknowledgements

Tom Dillon, Community College of Aurora, and COSGC