Meteorology Sensors for Unmanned Aircraft

Overview
Nearly all micro-meteorological data is collected via radiosondes attached to weather balloons that record and transmit weather data. Once the weather balloons burst at high altitude, the radiosondes fall back to Earth. Although radiosondes are found and reused after falling, 80% of them are never recovered. To prevent the loss of the radiosondes, we designed a meteorological sensing package that attaches to unmanned aerial vehicles (UAVs).

Objectives
The objective was to build a sensor package that measures micro-meteorological data such as humidity, air pressure, temperature, UV-radiation, wind speed and direction, and the GPS location. This sensor package was to be able to log the data via an SD card and be made for different types of UAVs.

Approach
• Meetings with sponsor to determine what was wanted and required for the project
• Selected adequate sensors from retailers that were sufficient for the project
• Researched ways to measure wind speed and direction on a drone
• Met with sponsor to discuss possible solutions on how measuring data should occur
• Chose an Arduino for an onboard computer and to create an open source project
• Ran tests for each individual sensor, then integrated all of the sensors into an imbedded system
• Created a universal code to sample data from each sensor and also log data to an SD card
• Created CAD models for housing of sensor package and also electrical board
• Fabricated prototype housing using 3D printing and also fabricated PCB to house sensors that needed to be free from the UAV
• Performed tests for each individual sensor, then for the imbedded system, then tested the package by flying the sensor package on a UAV
• We compared data to common weather data found in the area for the day
• Meteorological data was organized via an excel sheet for easy analysis and comparison for validation

Outcomes
• The sponsor is able to acquire meteorological data that can be analyzed
• The project makes it so that a meteorological sensor package is retrievable and always able to be re-used in the future
• Since the project is open source, it can be improved upon and can be modified to introduce new sensors for more data