Design Evaluations

Anemometer

Sunflowers (Group C)

Using a bicycle hub is a good concept, but it is unclear how they would drive nails into it to attach the plastic shells. The dual post design would be difficult to set up, so the sensor should be mounted on the bicycle hub. The magnetic pickup is unlikely to work with thin metal strips, a better sensor design would be needed. The metal base is not needed, since it will be attached to the weather station that serves as a base.

BrunchBunch (Group E)

Very light on details, but again a bicycle wheel is a good start, but the (unspecified) wind cups couldn't just be attached to the rim if proper operation is expected. The generator/motor concept is good, but a suitable part number or specific item means availability might be compromised.

ToastQuartet (Group F)

Entirely wooden design would be fairly heavy. The suggested wooden bearing (“spike”) is unlikely to allow free rotation in anything but hurricane force winds. The sensor pickup being a single metal strip although good in concept would not give the resolution required except in high winds. Using metal cones is a durable idea, but no source for these parts is indicated. Wires usually come with plastic insulation, rather than the “rubber coating” cited. The 6” long arms wouldn't clear the 8” wooden circle.

Wind Direction

Jokers (Group A)

The mechanical design is unspecified. The battery is not needed since 5V is supplied by the microcontroller. The voltmeter cited is actually the analog to digital converter on the microcontroller, I think they missed the whole idea. Using discrete resistors would provide only 8 or 16 direction resolution.

Sunflowers (Group C)

Some mechanical components are specified, but it's unclear how they are assembled into a working instrument. The battery is not needed since 5V is supplied by the microcontroller. The voltmeter cited is actually the analog to digital converter on the microcontroller, I think they missed the whole idea. Using discrete resistors would provide only 8 or 16 direction resolution.

Fruity (Group H)

Some thought was given to the mechanical details, but it is unclear how it is assembled

into a working instrument. The metal springs are drawn on the metal plate in one view and protruding from the side in another. No basis for the estimated cost can be found. Using ball bearings as part of the electrical circuit may be problematic.

Barometer

Jokers (Group A)

Unfortunately mercury won't be allowed, but the concept is good. The all glass construction is very fragile, and it's unclear why it needs to be glass. The ammeter cited would actually be the analog to digital converter of the microcontroller, I think they missed the concept entirely.

ToastQuartet (Group F)

Unfortunately mercury won't be allowed, and using water in this configuration with a sealed tube end means a tube about 10 meters long, and water (by itself) isn't conductive, so the instrument won't even work in principle with water as a medium. However, with a saline solution of ethelyne glycol which does conduct, and a valve at the upper end of the tube to create a vacuum this should work. The glass tube is very fragile, and it's unclear why it needs to be glass. The ammeter cited would actually be the analog to digital converter of the microcontroller, I think they missed the concept entirely. The cited web reference is not very useful practically.

Fruity (Group H)

This design was late. Attaching a coat-hanger wire to the delicate movement from an aneroid barometer will not work. Soldering to graphite and steel wool is problematic. Some thought went into the instrument though, so that's a good sign. There doesn't seem to be anything pushing the graphite and steel wool together, so there may be a conductivity problem. The high resistance of the graphite will mean the circuit uses *less* power.

Thermometer

PorridgePeople (Group B)

The concept is good, although likely a copy of the design at http://eelabinstruments.com/insmain.pdf, which is a good sign because they actually read it, other groups have obviously not researched enough. The battery is not needed, as 5V is supplied by the microcontroller. The breadboard is not needed due to the simplicity of the circuit, a terminal strip may be all that is required. The specified thermistor may not be available, so available alternatives may need to be substituted, but this won't affect the circuit, other than possibly the voltage dividing resistor. No packaging is specified, but the simplicity of the circuit allows for significant flexibility. An electronics store in Ottawa is Active Electronics on Merivale, since Mississauga is a bit far to go shopping.

Fruity (Group H)

This design was late. The concept is good, but packaging is a little flaky, mentioning both super-glue/duct-tape and metal screws being driven into a tofu container. In fact it is unclear what function the tofu container actually serves. The garbage bag covering the entire instrument is not needed and will likely adversely affect correct measurements. It's unlikely the outside temperature will rise to 100 degrees C, so the maximum voltage calculation is a bit suspect. The LM335 should not be driven with a “surplus of power” since the power budget for the station is very tight. The LM335 is actually more accurate than the 5 degrees Kelvin cited. The provision for airflow within the cigar tube means they missed the concept (described in class) of sealing it and providing thermal contact using thermal grease.

Ombrometer

PorridgePeople (Group B)

The concept of using a weight sensor is good, but the estimated cost of $80 is a little steep, and isn't supported by a part number or availability determination. A decorated bucket is unnecessary.

Eggcellent (Group G)

The mechanical design leaves a little to be desired. For example what keeps the wood dowel horizontal, and how does it pivot within the hole in the triangular piece. The string to empty the bucket may not empty it completely, since as soon as some water is poured out, the contraption will pivot back. The rheostat at the end of the lever arm is unlikely to do anything unless some linkage is provided to rotate the wiper arm.

Hygrometer

PorridgePeople (Group B)

There is no indication how two mercury thermometers can be measured and turned into suitable signals for the microcontroller. The fan is not required, as this will be outdoors. No mechanism to keep the “wet bulb” wet is provided.

BrunchBunch (Group E)

The rain-fed reservoir is a nice concept, but wouldn't work in winter below zero. The two thermometers aren't described, but would presumably be similar to the designs from the thermometer groups. Using the computer to calculate the humidity based on the psychromatic formula means they understood well the ability of the base station to aid in instrumentation.

Eggcellent (Group G)

There isn't any source or availability for the $30 hygrometer. Beyond the microcontroller

interface, there isn't much science involved here.

Photometer

Sunflowers (Group C)

The cadmium sulfide cell will alter resistance (actually photoconductivity) according to light intensity, so it doesn't need filters to get the different light levels, it can be hooked up almost directly to the analog to digital converter. The filters would be useful to isolate different parts of the spectrum, specifically UV, but at different sensitivities according to the spectral response of the cell, so only two or three would be required based on the number of wavelength bands to be measured. The glass box is fragile, and the size is unspecified (we don't want to have an aquarium sized object hanging from the weather station), but is unlikely to be needed. If the cells are placed on the sides of the box, they would be reading reflected (or refracted) light rather than direct sunlight.

BrunchBunch (Group E)

The solar cell idea is a simple design. Mechanical mounting details are not provided.

Eggcellent (Group G)

The solar cell idea is a simple design, but why four are required is unclear. Mechanical mounting details are not provided.