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# **Hobo Experiment Procedure**

## **Balloon Fest, 2008**

**Date:** Saturday May 31, 2008

We will launch a tethered meteorological balloon to 1000 ft. elevation at the Tobin James Cellars, Paso Robles, Ca as part of the balloon fest, 2004.

**Purpose:** The purpose of this experiment is to measure relative humidity and how it changes with altitude. We want to see if the relative humidity in the air increases or decreases as the balloon rises. We will have several flights and compare the data to our hypothesis in order to come up with a conclusion.

**Equipment:** Meteorological balloon, helium, 1000 ft. of rope, line winder, Stopwatch, LabPro DAQ, Gondola, Relative humidity sensor, Laptop with vernier software, Thermometer, bright orange flags.

**Payload:** LabPro DAQ, relative humidity monitor, Gondola, rope, (maybe small camcorder)

**Weight:** ~ 930 g

### **LabPro Remote Data Setup:**

1. Connect sensors to LabPro and LabPro to computer (USB).
2. Verify fresh batteries in LabPro
3. Start Logger Pro software and open saved experiment file
4. Verify that "Interface is connected"
5. Open Experiment menu, select Show sensors:  
Ch1 = RH-sensor (percentage), Ch2 = altimeter (meters), Ch3 = thermometer (°C)
6. Open Experiment menu, select Data Collection: Mode = Time-based, sample at time zero 75 minutes, 60 samples/minute, over sampling (100x), samples = 4500
7. Open Experiment menu, select Remote Setup: Review Settings, Select OK
8. Verify that yellow LED on LabPro is turned ON and stays on
9. Disconnect the USB cable from the LabPro. Logger Pro and the Laptop may be shutdown if desired.

### **Flight Procedure:**

1. Fill balloon with helium so that it can lift 500g more than our payload.
2. Securely tie balloon closed and attach metal ring. Attach gondola also to the ring.
3. Start the written log.
4. When ready to launch, verify that the yellow LED light on the labpro is on.
5. Press Start/Stop button on the LabPro and stopwatch at the same time.
6. Verify that LabPro beeps once and green light flashes. If not connect to computer again.
7. Launch balloon and send it up slowly. About 1000 ft. or so.

8. Stop, and collect data for about two or three minutes.
9. Continue step 8, but faster. Only stop for about one minute to collect data.
10. When balloon reaches 1000 ft. stop for five minutes.
11. Bring balloon down slowly.

**Data Recovery:**

1. Verify that green light is still flashing on the LabPro every sample interval.
2. Press the Start/Stop button to stop collecting data. The LabPro should beep once and all lights go out.
3. Restart Logger Pro and the Laptop computer if needed.
4. Reconnect the LabPro (USB) to the computer and verify that the “interface is connected.”
5. “Remote Data Available” window opens: Select “Yes”
6. “Retrieve Remote Data” window opens: Select “Intro Current File” & “Make data available for multiple retrieval”, “OK”
7. Once data is verified and saved “Open Experiment menu and select Reconnect Interface”
8. “Remote Data Available” window opens: Select “NO” to erase data on LabPro

**Data Analysis Procedure:**

1. Repeat the above procedures as needed to get good data. Save each set even if not complete or good data.
  2. make sure all data sets are saved and labeled after each run.
  3. Analyze the data in the Logger Pro program
- When all flight sets are done:
4. Add a new calculated column named "Altitude"
  5. Graph #1: relative humidity vs. time
  6. Graph #2: Temperature vs. time
  7. Graph #3: relative humidity vs. altitude
  8. Annotate graphs with notes from experiment log
  9. Transfer graphs to PowerPoint
  10. In LabPro, select graph window, Ctrl-C to copy the graph
  11. Open PowerPoint Presentation, select new page, Ctrl-V to paste the graph on that page

**Filling the balloon:**

1. We will calculate the lift we will need in order to carry our payload.
2. Using the helium chart, we will decide how much helium is needed to get the desired lift.
3. We will bring our balloon to the helium station and fill the balloon with the calculated amount of helium.

**Sharing the Landing Station:**

1. We will be sharing our station with an intro team.

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2. We will make sure none of our data or equipment gets mixed up.
3. Offer any advice or help to the intro team.
4. Make sure that the LabPro is collecting data before they launch the balloon.
5. Make sure our balloons don't bump into each other.