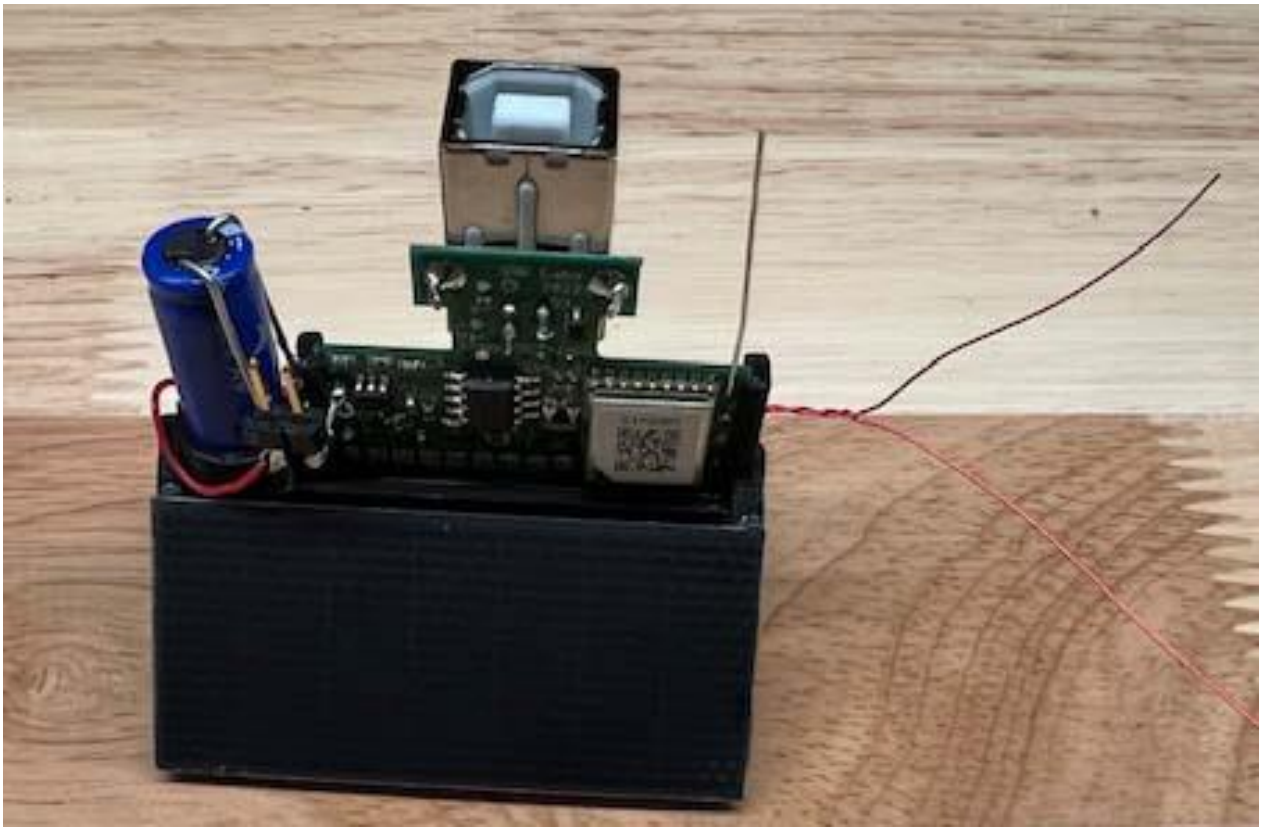
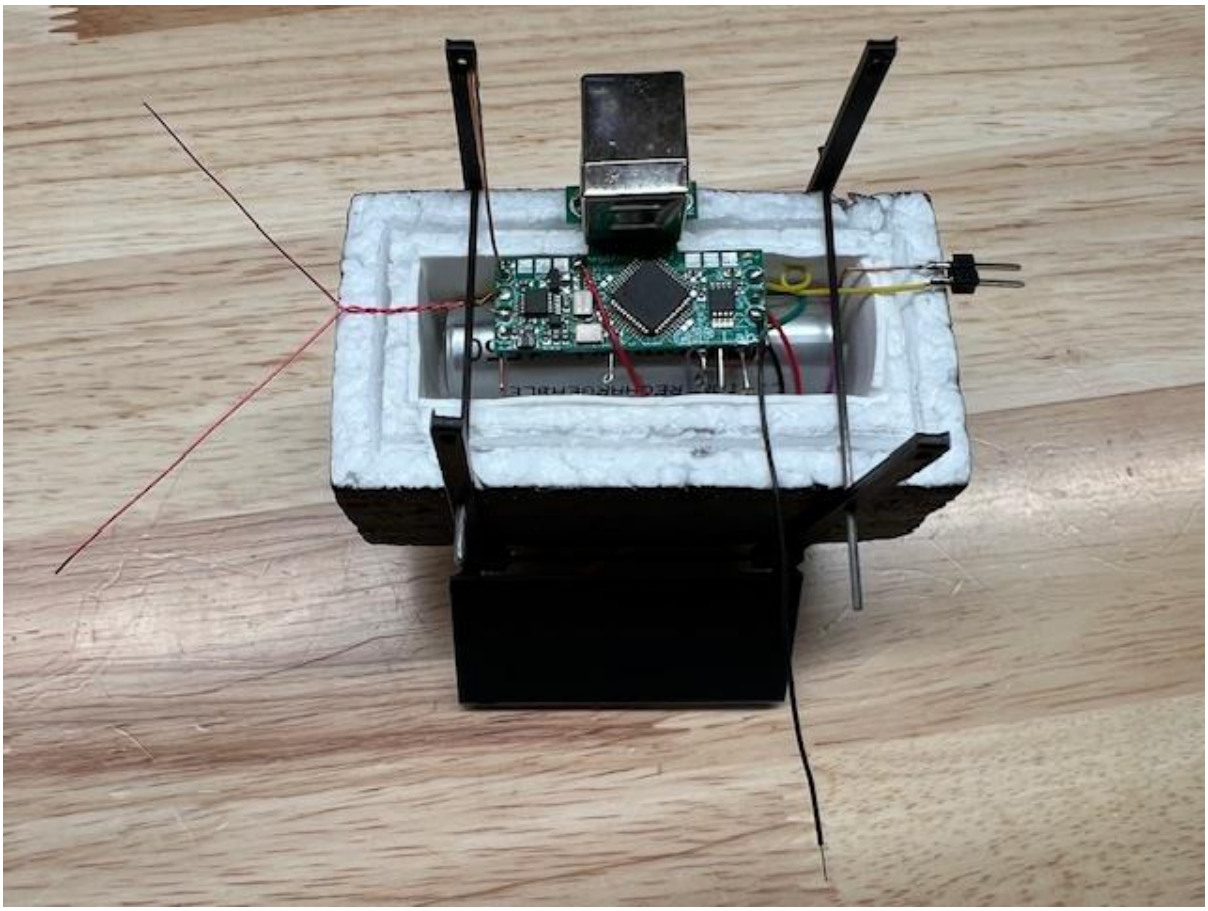
Goal
To design a Pico-Balloon that could operate 24 hours a day.

Design
After doing research on groups.io pico-ballooning and other mixed media, it became evident that to be successful, it would require a battery that could handle the cold temperatures encountered at high altitudes. After a lot of searching, I found and selected a Tadiran Lithium battery TLI-1550ES. Though not perfect, it provides the best operating temperature range, capacity and mass of any I found. Additionally, I would use a similar platform to what was used for ALP40-A, which circled the globe over 6 times in 74 days.



ALP40-B
In this design, I would still use the QRP Labs U4B as the tracker, the Anysolar IXOLAR High Efficiency Solar MD SM141K07TF panel and GPS/HF dipole antennas. The actual structure (3D printed ABS and 1 mm carbon fiber rod) would have to be modified to accommodate the battery. I decided to make a reasonably sized Styrofoam box with a lid for the tracker and battery, which would insulate the two of them from the harsh conditions and low temperatures.



An air gap between the two layers of Styrofoam was used to increase the insulating factor. Aerogel was used under the battery to increase the insulating factor as well. The exterior of the box was painted flat black to absorb heat from the sun/earth. I added an external air temperature sensor, Innovative Sensor Technology P10K.520.6W.B.010.D. The U4B software was modified to transmit alternately PCB temperature and outside air temperature. The Yokohama balloon was stretched to 103”, the payload had a mass 40 grams and float was 5 grams. Hydrogen was used to inflate the balloon.