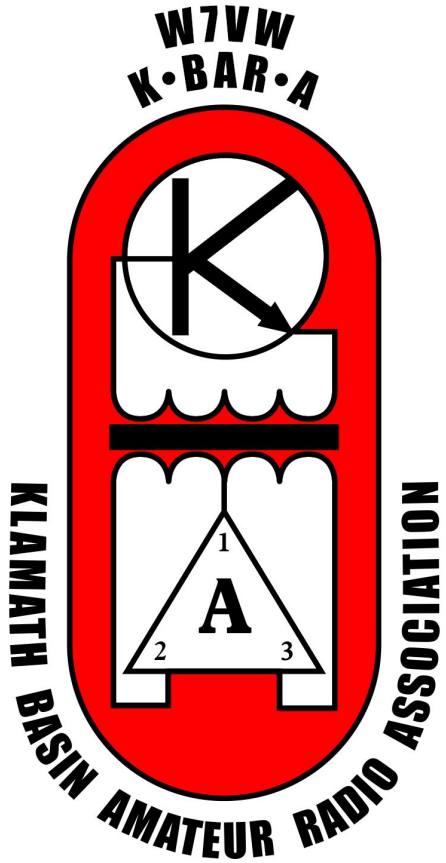




Radiosondes: Tracking, Recovering, and Reusing

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KK7DCI



Radiosondes

1. Introduction

1. What is a radiosonde?
2. Where and When are they launched?

2. Tracking

1. Online
2. Base Station

3. Recovering

1. Bare Minimum
2. Mobile Station

3. Final Approach

4. Recovery

5. Reusing

1. Reprogramming
2. Donate!

6. Thank you!

1. Questions?
2. References

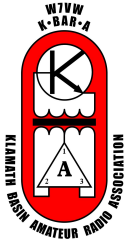
Introduction

What are radiosondes? Where do they come from? Are they just free for the taking?



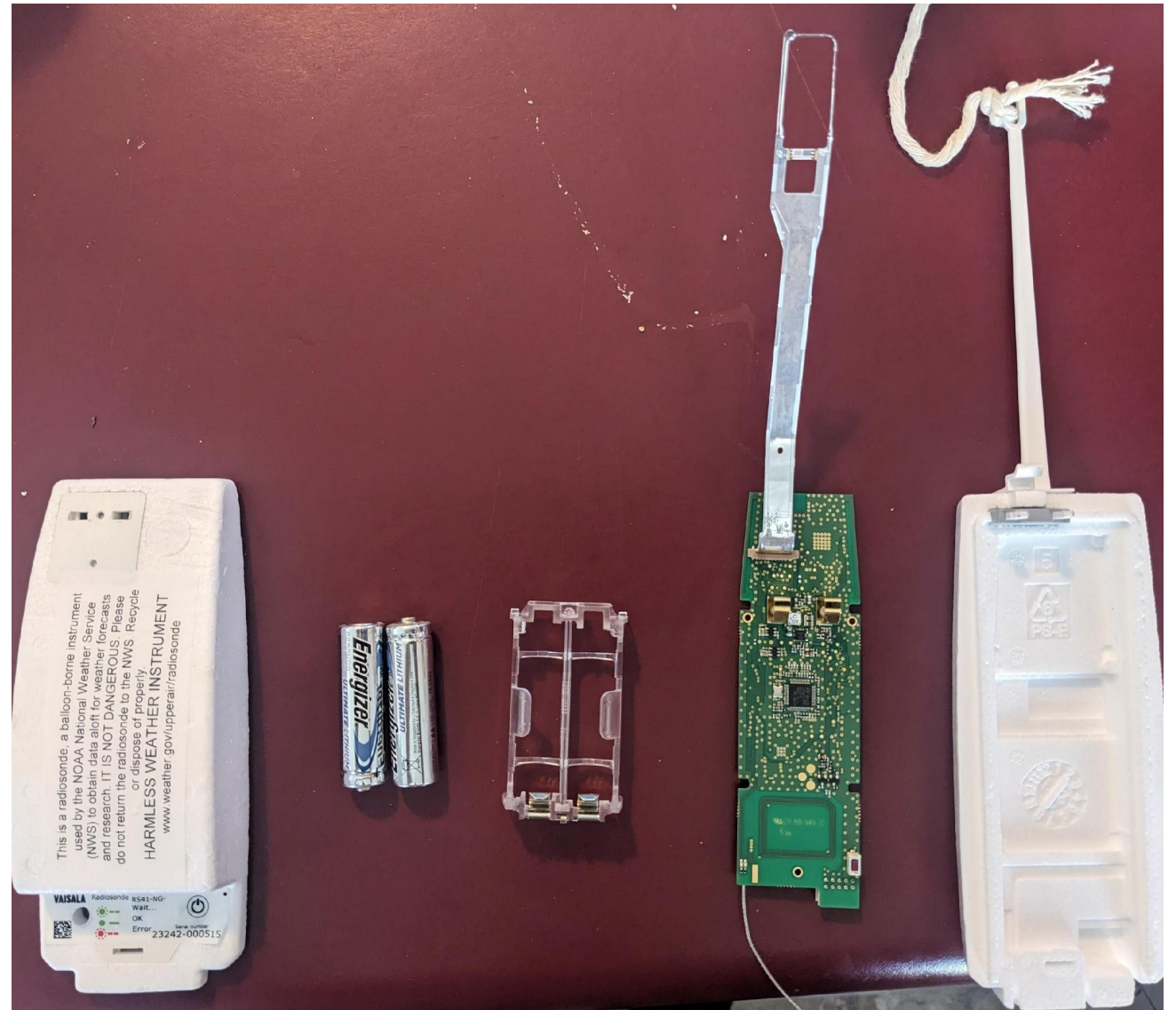
What is a radiosonde?

- According to <https://www.weather.gov/upperair/factsheet>, “The radiosonde is a small, expendable instrument package (weighs 60 to 80 grams) that is suspended below a large balloon inflated with hydrogen or helium gas.
- As the radiosonde rises at about 300 meters/minute (about 1,000 feet/minute), sensors on the radiosonde transmit pressure, temperature, relative humidity and GPS position data each second.
- These sensors are linked to a battery powered, 300 milliwatt or less radio transmitter that sends the sensor measurements to a sensitive ground tracking antenna on a radio frequency typically ranging from 400 to 405.9 MHz.”



What is a radiosonde?

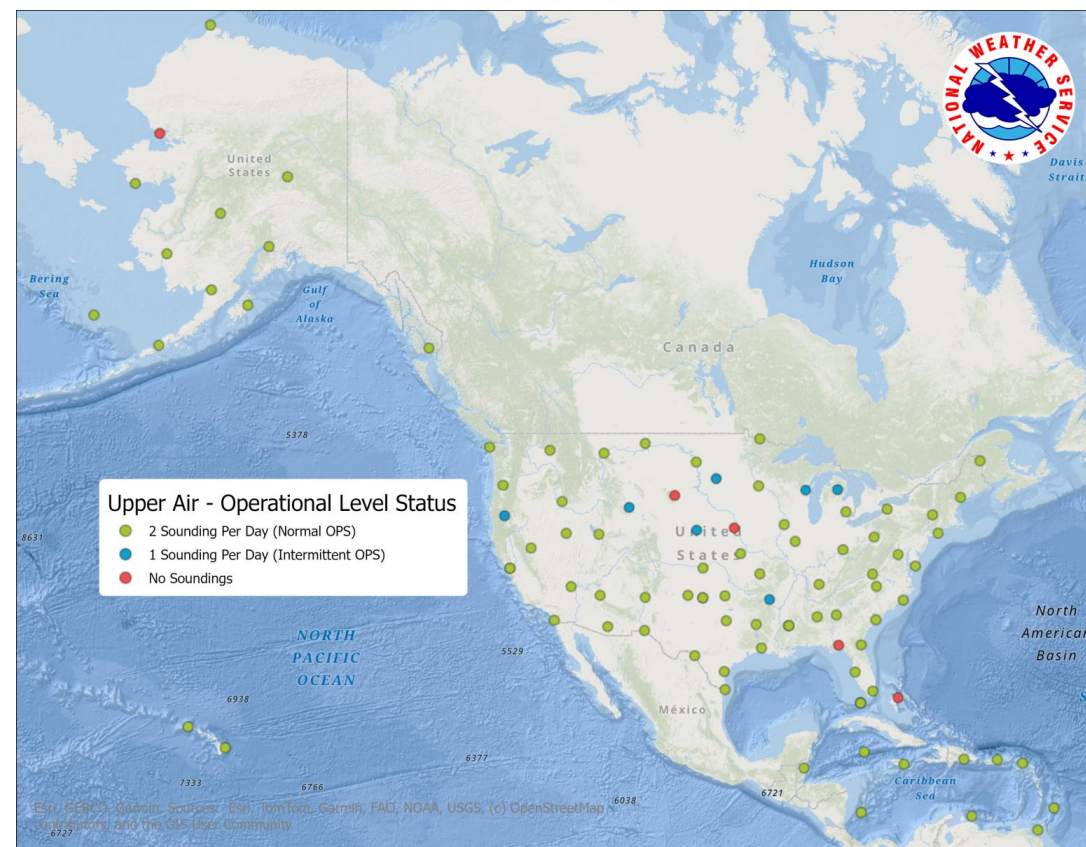
- Styrofoam Shell
- Circuit Board
 - STM32 Microcontroller
 - uBlox GPS Chip
 - Si4032 Radio Chip
 - SWD debug port
- Sensor Boom
 - Humidity Sensor
 - Temperature Sensor
- Battery Holder
 - Easily removable
 - Uses 2 Lithium AA cells





Where and When are they launched?

- Medford NWS Office
 - 00Z Daily
- Weather Sites worldwide
 - 2 per day is typical
 - 00Z and 12Z
 - Some sites launch additional sondes at 06Z and 18Z
 - Special sondes may be launched weekly
- Other sites
 - Military sites
 - Third party observatories





Can we just keep it?

- Simply put, YES!
- According to [The National Weather Service](#), there is no need to return radiosondes back to the NWS.

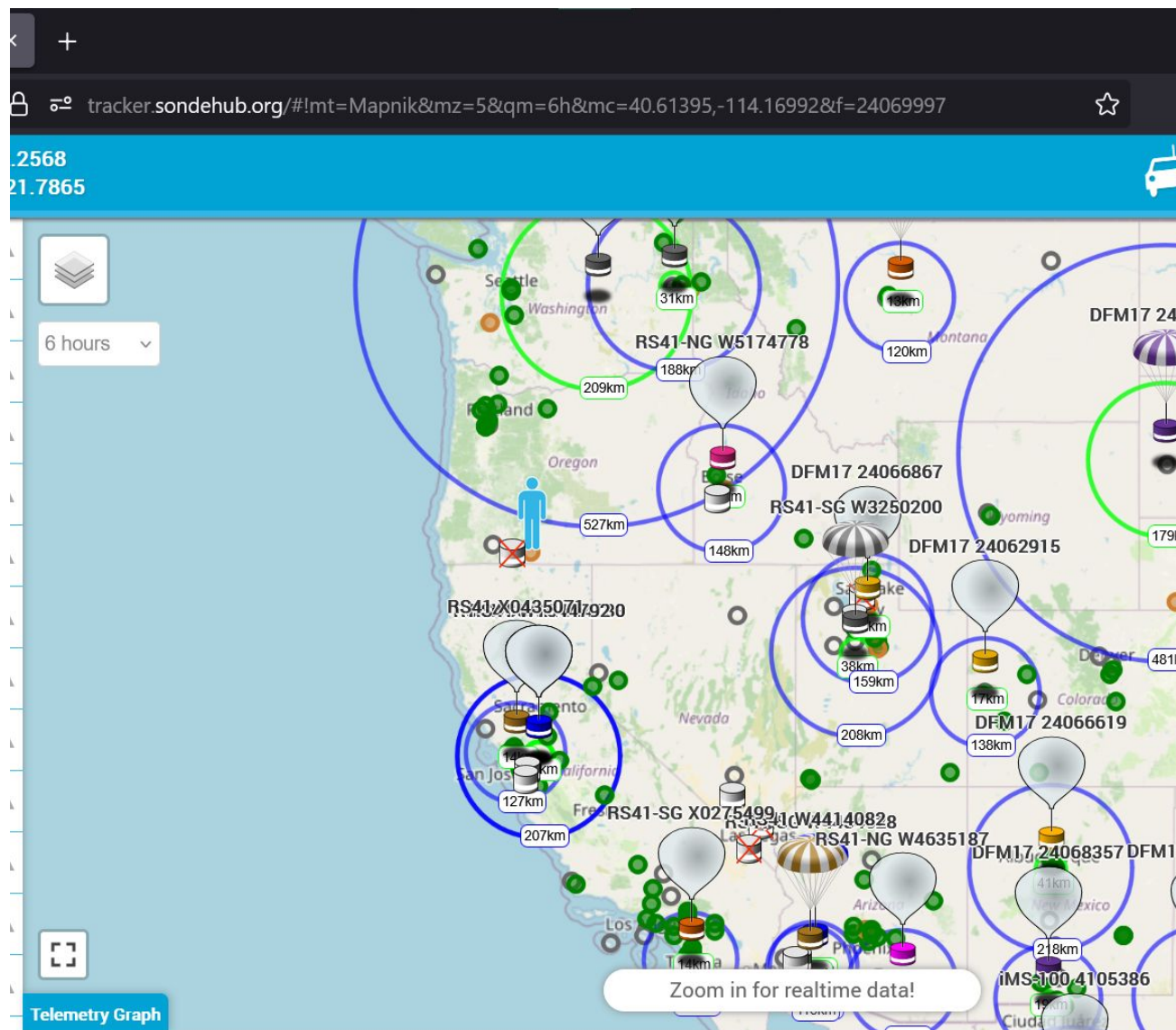
Tracking

Now that we know what a radiosonde is, let's see if there are any in our area!



Online Tracking

- tracker.sondehub.org uses data submitted by users around the world to create a powerful, interactive map of all active radiosondes.
- Users with a decoding station (described later in this presentation) can feed data to sondehub to help others track radiosondes





Base Station

- A few options exist; I'll describe what I'm familiar with.
- Hardware:
 - Small PC or Single Board Computer with Linux
 - Internet connection
 - SDR Dongle and antenna
 - Low-Noise Amplifier (Optional)
 - SAW Filter (Optional)
- Software
 - Docker
 - radiosonde_auto_rx



Base Station

- Your setup doesn't have to be fancy; this is the basic mag-mount antenna that came with my NooElec SDR stuck to my window A/C.
- Has helped track over 700 sondes since February 2024 (as of May 2025)
- May upgrade to vertical dipole mounted higher up



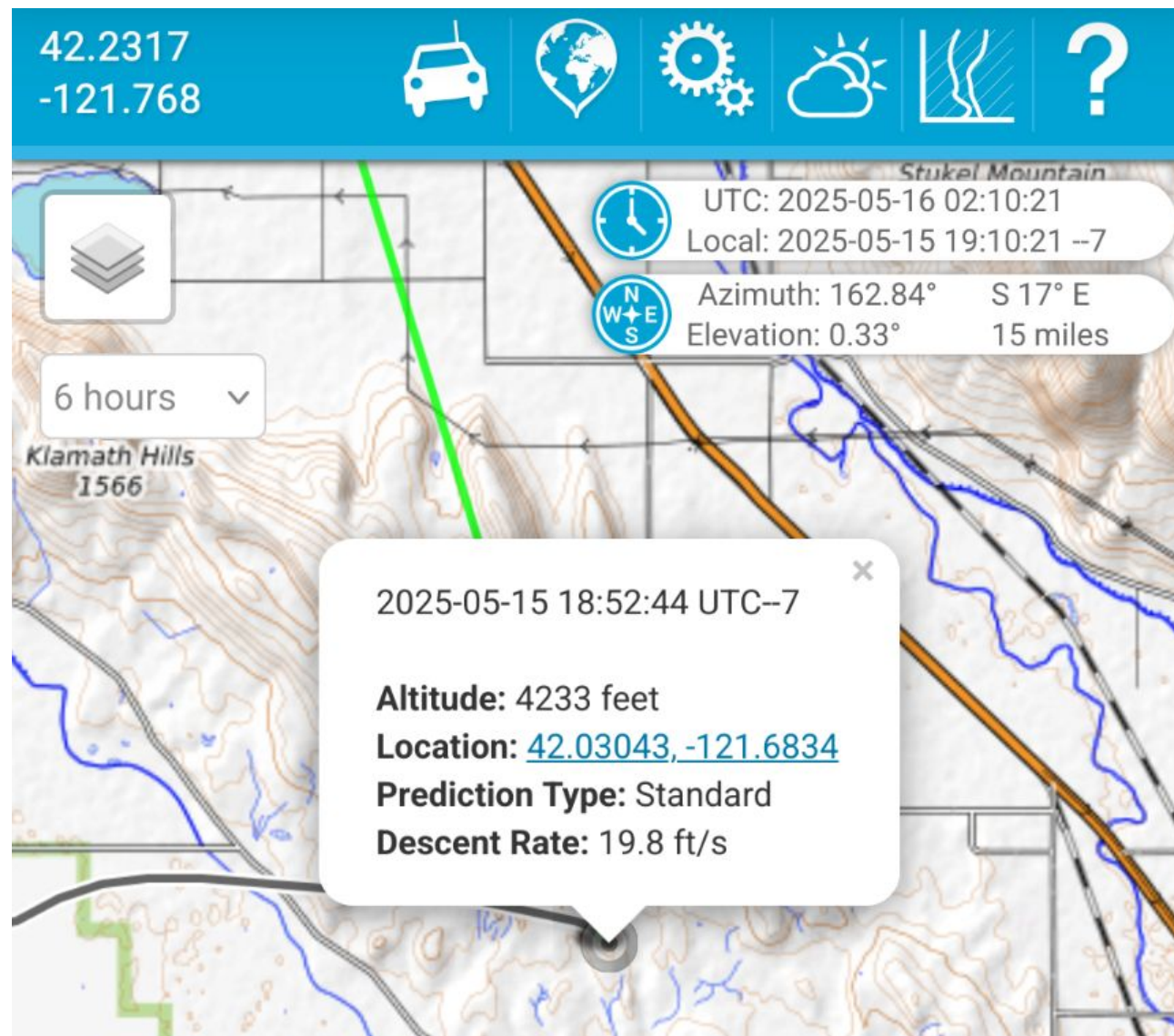
Recovering

Now the part everyone really cares about: Going out and finding one for yourself!



Bare Minimum

- My first couple of recoveries were performed using just a smartphone and my HT:
- Enter frequency into HT (or mobile rig) and set to Narrow-FM
- Copy coordinates of predicted landing location into navigation app
- Drive towards predicted landing location with radio turned on and squelch very low
- Follow “Final Approach” and “Recovery” steps later in this presentation





Mobile Station

- Smartphone or separate “Hot Spot”
 - “Net Analyzer” app
- Single-Board Computer
 - SDR
 - USB GPS
 - Power supply
 - Chasemapper and radiosonde_auto_rx
- External UHF Antenna





Final Approach

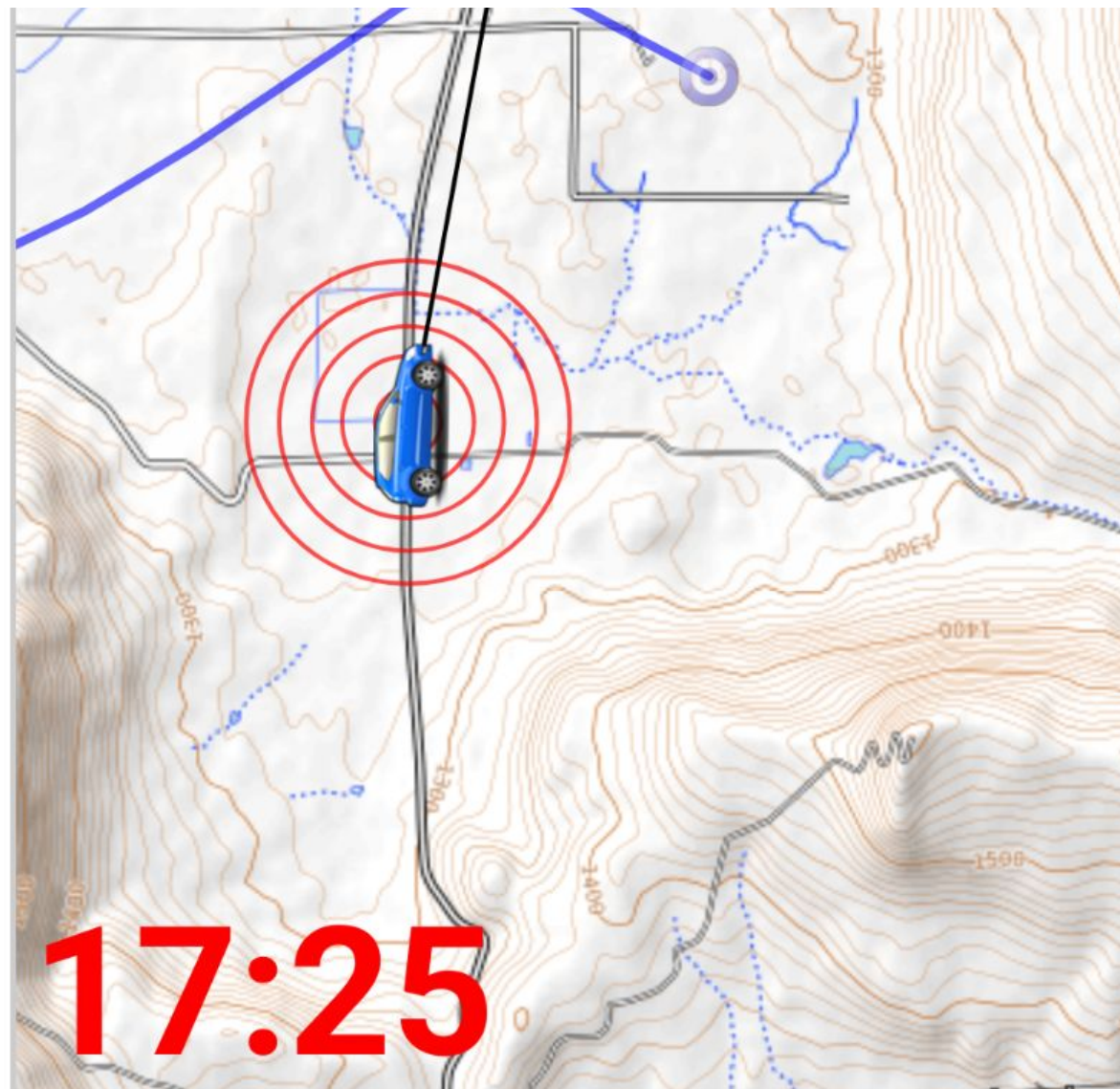
- Without Mobile Station:
 - Listen for distinct “squawking” noise from radio
 - SAFELY check website for updated landing prediction
 - Keep eyes peeled for orange parachute, white sonde, and long string





Final Approach

- With Mobile Station:
 - Drive safely! Keep your eyes on the road, not your screen.
 - The “Range Rings” option in Chasemapper is helpful for determining range at a glance. This is especially helpful if map tiles are not loading.
 - Sonde location will continue to update as long as station is receiving packets

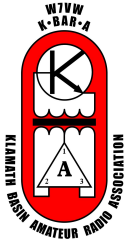




Recovery

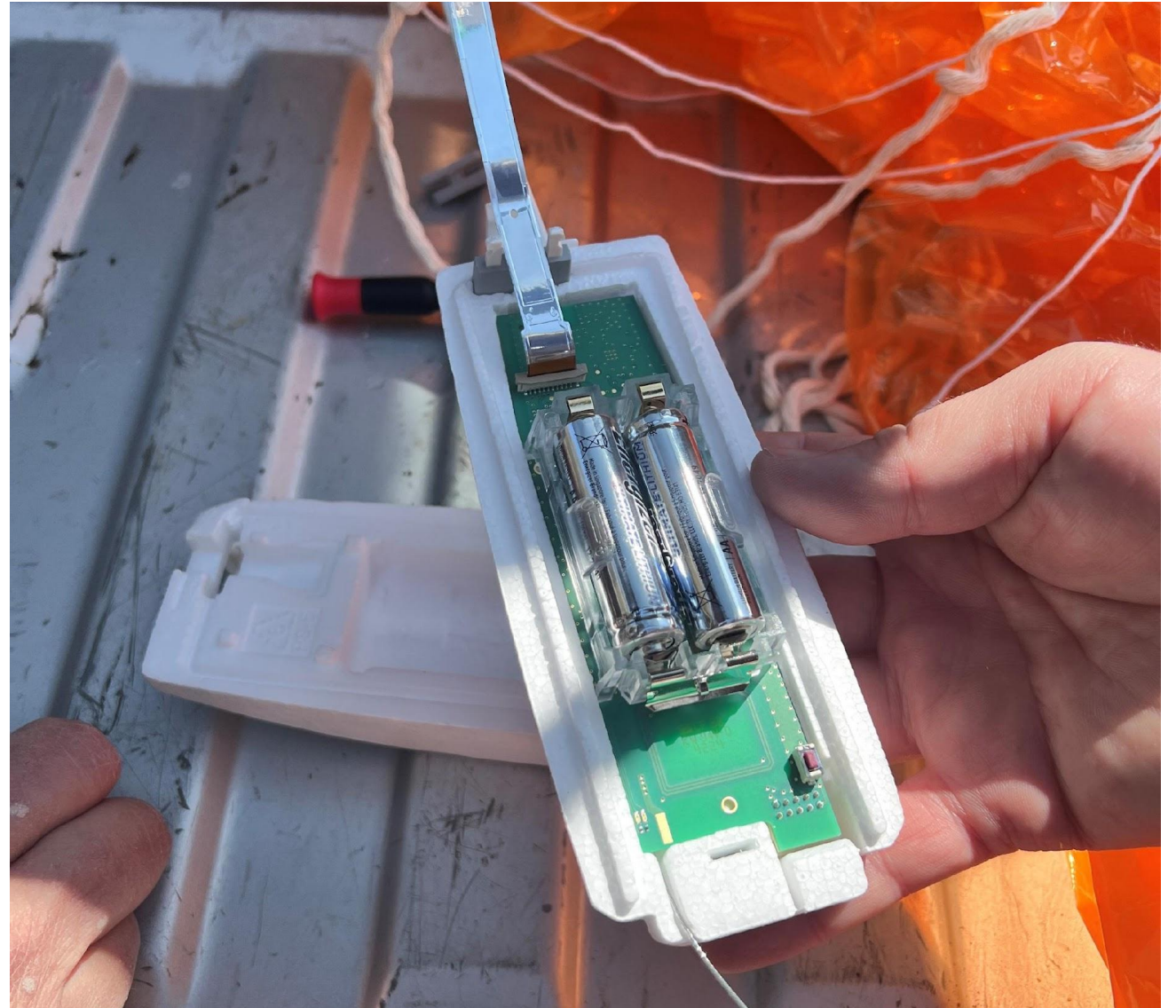
- When you have determined that you are very close to the sonde, find a safe place and pull over.
- Use RDF techniques when receiver becomes overloaded
 - Tune slightly off frequency
 - Remove Antenna
 - Use “Body Shielding”
- Keep eyes peeled for orange parachute, white sonde, and long string





Safety & Etiquette

- Do not trespass. If sonde lands on private property, seek permission from the landowner to retrieve it.
- If there is still gas in the balloon, do not approach it. Contact the fire department and inform them of the situation. Many launch sites, including Medford, use hydrogen instead of helium.
- To stop transmitting its live location, press and hold the power button on for 10 seconds. Removing the batteries also works.
- Mark sonde as “recovered” on sondehub so other chasers don’t go after a sonde that’s gone





Fun for the Whole Family!



Reusing

I've recovered a radiosonde, now what do I do with it?



Re-Program

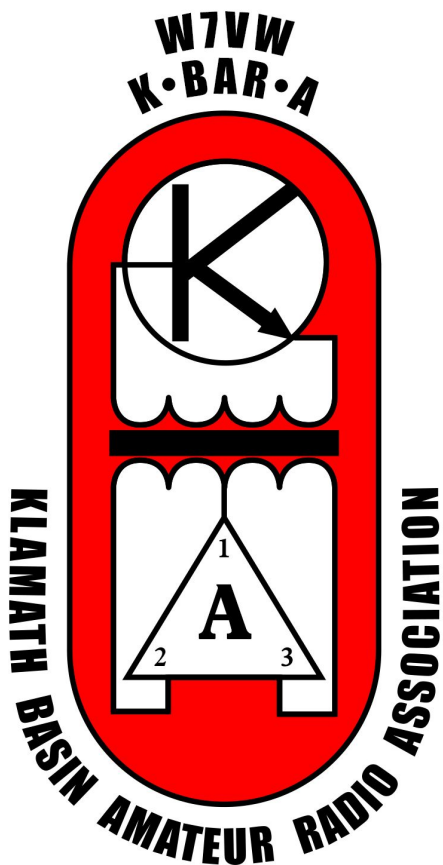
- RS-41 sondes include an “SWD debug” port on the bottom of the PCB, but use a non-standard pinout
- Using the onboard SI4032 chip, RS-41 sondes can be programmed to operate in the 70 cm amateur band.
- Other sondes can be programmed for other bands, and use different interfaces
- After being reprogrammed to operate in the amateur band, sondes can be re-used for amateur high-altitude balloons





Donate to W6SUN, Mount Carmel High School Amateur Radio Club

- If you don't want to keep the sonde that you've recovered, but would like to contribute to the HAM radio community, consider donating it to W6SUN
- This High School Amateur Radio Club regularly launches high altitude balloons equipped with repurposed radiosondes.
- As of April 2025, the qrz.com listing has the correct mailing address.



Thank you!

I would love to answer any questions and respond to any feedback



References

- Introduction

- <https://www.weather.gov/upperair/factsheet>
- <https://www.weather.gov/upperair/>
- https://github.com/bazjo/radiosonde_hardware/tree/master/Vaisala_RS41

- Tracking

- tracker.sondehub.org
- https://github.com/projecthorus/radiosonde_auto_rx/



References

- Recovering
 - <https://github.com/projectthorus/chasemapper>
- Reusing
 - <https://github.com/mikaelnousiainen/RS41ng>
 - <https://github.com/Nevvman18/rs41-nfw>
 - <https://www.qrz.com/db/W6SUN>