Radio Listening Post Operations

An introduction to setting up a portable radio listening post for emergency/auxiliary communicators

Presented by:
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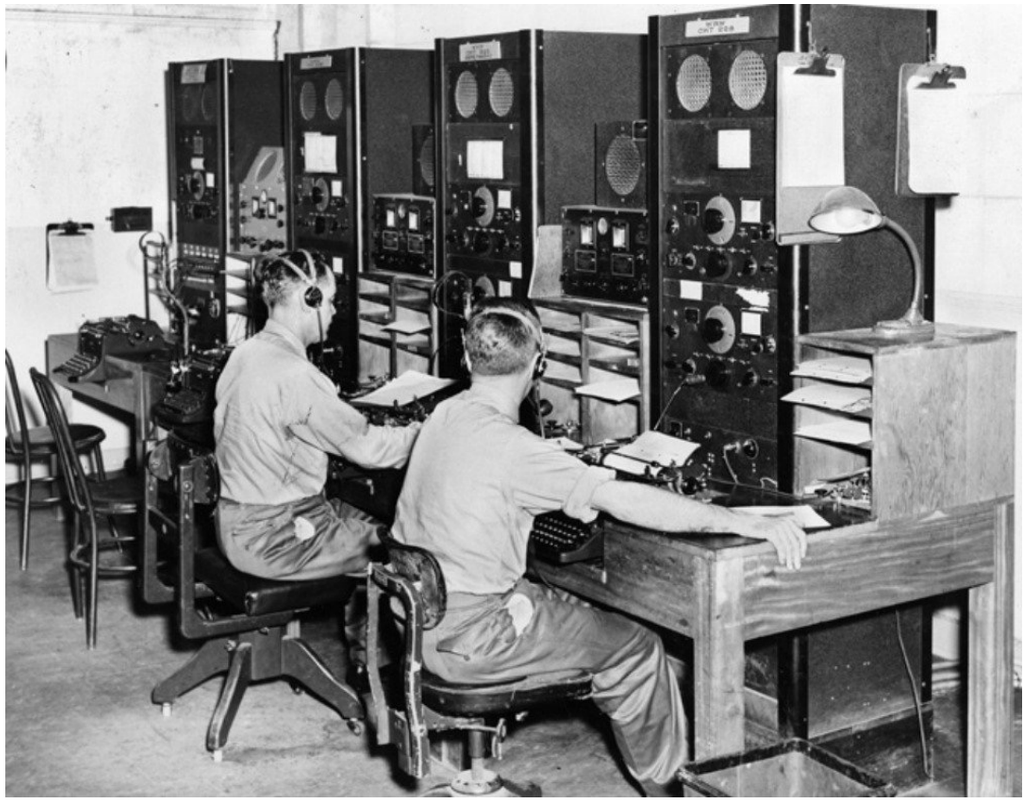
Agenda

- What is a radio listening post?
- Example: Operation Inauguration 2021
- Example: Hurricane Ida 2021
- Radio listening post uses
- Common listening post targets
- Wideband scanners
- SDR receivers
- Trunking scanners
- Digital scanners
- Listening post antennas
- Finding frequencies
- Locating the source of a radio transmission
- Listening post example recordings
- More information

What is a radio listening post?

A radio listening post is a fixed or portable position in which radio listening equipment is used to intercept and monitor radio traffic. Radio listening posts have been used since the invention of radio, especially by the military, to gain insight into information and events “as they happen”.

A family “gathered around the radio” to listen to the Grand Ole Opry is also a radio listening post, of sorts. For purposes of this presentation, we will focus on the use of a radio listening post for non-entertainment reasons.



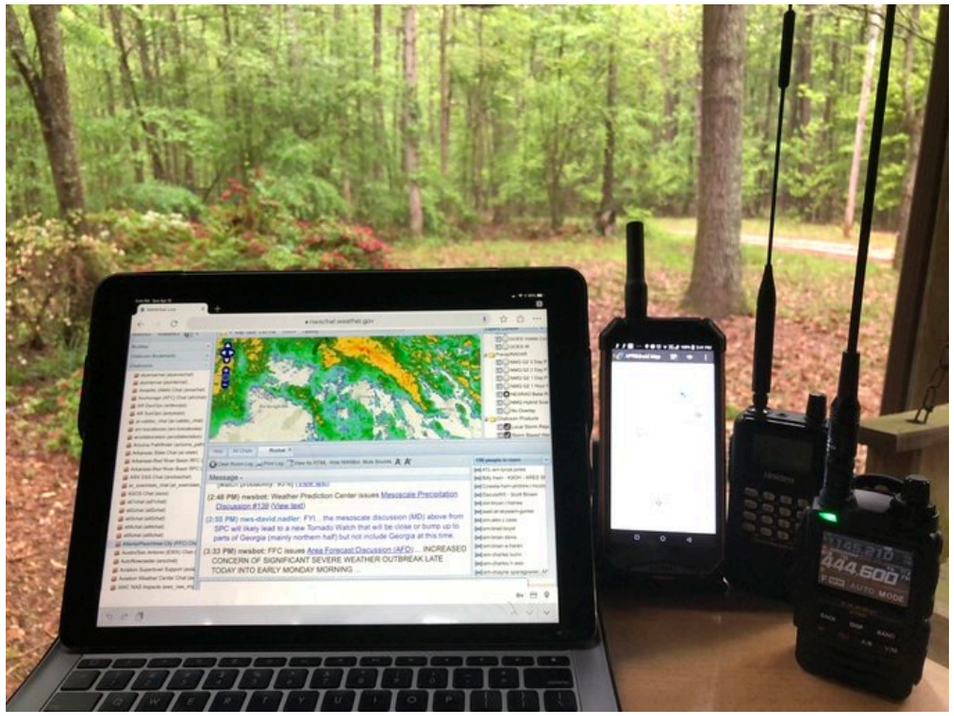
Operation Inauguration (1/2021)

- Mission – in January 2021, credible intelligence was received that there would be a possible protest of the Presidential Inauguration. As part of the Georgia AUXCOMM team, I was asked to assist GEMA in radio listening post operations to note protester radio traffic on VHF/UHF in Atlanta.
- Activities
    - Identifying likely frequencies on FRS, GMRS, Amateur Radio, Business bands
    - Setting up listening posts
    - Actively listening, noting suspicious traffic
    - Logging active frequencies
- Technologies used
    - SDR receivers
    - Scanners
    - Wide band receivers
    - VHF/UHF radios

Auxiliary Communications isn't always about message handling, it may be an important Listening Post Operation to help monitor and record radio traffic.

Hurricane Ida (8/2021)

- Purpose – assist GEMA in monitoring hurricane-related radio nets and information sources.
- Activities
    - Monitor hurricane watch net on HF
    - Monitor other local radio traffic via SDR, remote receivers, and “hotspot” digital modes
    - Monitor local media sources in the affected areas
    - Monitor NWSChat (Skywarn-certified only)
- Technologies used
    - HF amateur radio
    - SDR remote receivers
    - Amateur radio “hotspots” – D-Star, C4FM, DMR
    - Internet



The Times-Picayune | nola.com | The New Orleans Advocate

Louisiana Amateur Radio Emergency Service Section

Hurricane HWN Watch Net

News•Talk 99.5 FM WRNO

Radio listening post uses

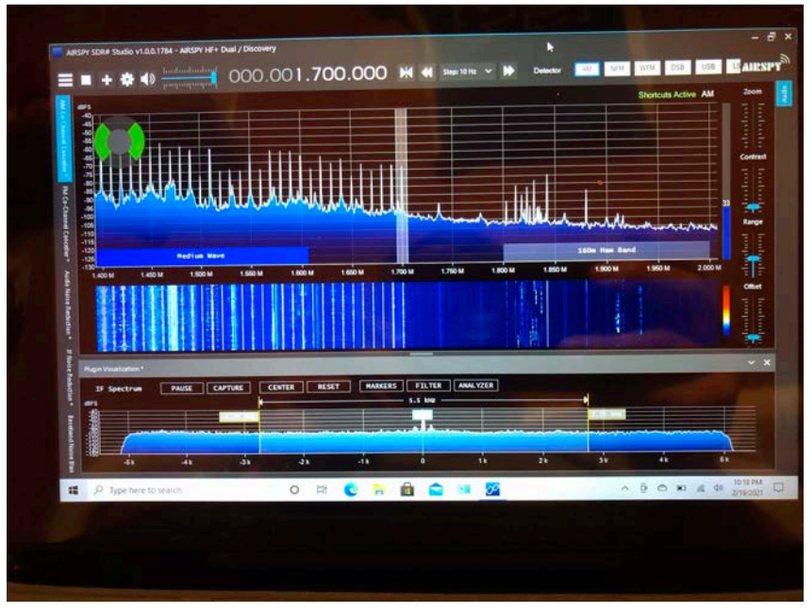
- Developing situational awareness
- Listening for emergency traffic
- Monitoring local news / information
- Monitoring WX information / Skywarn
- Identifying what local frequencies are in use
- Knowing who uses those frequencies
- Hearing “behind the scenes” information
- Detecting “secret” communications
- Improving your knowledge of the local radio landscape
- Understanding what radio systems are in use in a local area
- Getting unfiltered information ”as is happens”
- Locating sources of interference

Common listening post targets

Useful Non-Amateur Bands

AM Broadcast	550 kHz – 1.8 MHz
Shortwave Broadcast	3 MHz – 25 MHz
Low-band VHF	30 – 50 MHz
FM Broadcast	88 – 108 MHz
Aviation (AM & FM)	118 - 144 MHz
High-band VHF	148 – 174 MHz
Marine	156 – 158 MHz
NOAA Weather	162.4 – 162.55 MHz
Military Aviation	225 – 389 MHz
Government	406 – 420 MHz
UHF	450 – 470 MHz

Source: ARRL



Interesting things to monitor

- Public safety
- Park rangers
- CB radio
- Railroads
- GMRS / FRS / MURS
- Air bands
- Local businesses
- Fast-food drive thru
- LF beacons
- Shortwave broadcasters
- Pirate radio
- BCB AM radio DX
- Utility stations
- Decoding digital signals (SSTV, WX Fax)
- Satellites

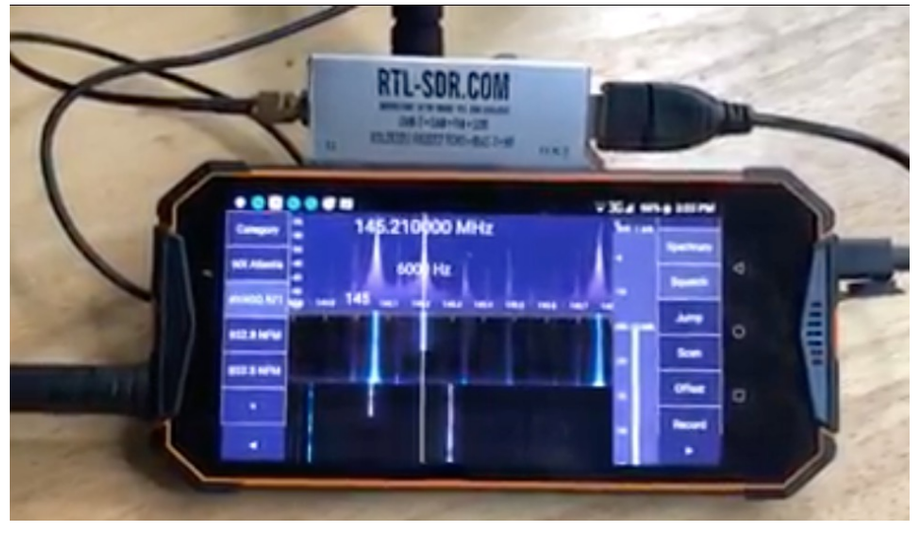
Wideband scanners

- Anyone remember frequency-specific scanners that required specialized RX frequency crystals?
- Most wideband scanners receive FM and AM, newer ones also digital modes
- Amateur radio equipment often has wide band RX capabilities
    - HT can be used to monitor non-ham VHF/UHF frequencies, sometimes Air band, CB, and HF!
    - Most mobile units also have wide-band RX
    - Most HF radios have continuous HF/VHF-low RX capabilities for general HF coverage
- A wideband scanner is very useful for finding and listening to a wide variety of FM radio transmissions.
- I use an Icom RC-5 for general scanning and fox hunting, because it also has a RSSI display with built-in attenuator.

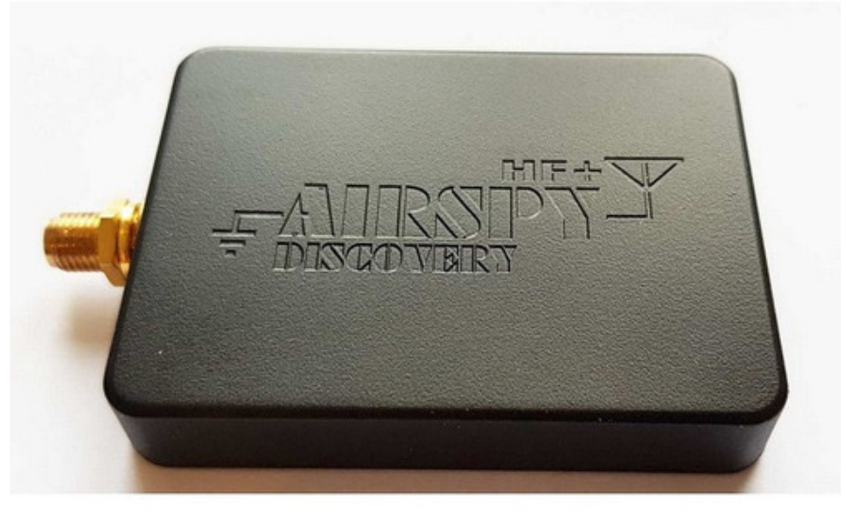
Icom RC-6 Receiver
100kHz – 1300MHz

SDR receivers

- SDR is one of the most exciting innovations to happen in the world of radio
- Software Defined Radio (SDR) gives you incredible flexibility to monitor a wide slice of frequencies & different modes inexpensively
- The RTL-SDR is a $25 dongle very portable SDR receiver that allows you to get started. It's great for VHF & UHF.
- The AirSpy HF+ and SDRPlay are higher end models that include HF and are more suitable for desktop shack monitoring. You can stream the audio on your LAN and even share it with others on a WAN.
- You'll need software to make use of the SDR. Popular software includes SDR#, SDR++, GQRX, SDR Touch.
- Web-based remote SDR receivers allow you to opportunity to listen around the world! Great to monitor local VHF, UHF, even HF from far away
    - http://www.websdr.org
    - http://kiwisdr.com/public/



My portable SDR listening post.
RTL-SDR and Android phone.



My shack listening post uses the AirSpy HF+ and AirSpy loop antenna.
I stream the audio on my LAN.

Trunking scanners

- A scanner allows a wide range of specific frequencies to be scanned for activity rapidly. A dedicated scanner operates much faster than the scanning function of amateur radio equipment.
- Trunking allows many users of a radio system to share a limited number of frequencies
- A talk group is a virtual channel that allows groups of users the ability to talk across a range of frequencies
- In order to monitor a trunking system, a trunking scanner is needed to follow the talkgroup across frequencies.
- Here in Fayette County, a Motorola Type II Smartnet trunking system is used. That will change to digital in the future.
- A non-digital trunking scanner is all that's needed to currently monitor public safety frequencies here in Fayette County.
- Note: Fayette County also simulcasts some of the traffic on VHF: FCFD 155.385 MHz, PCFD 154.235 MHz, Medic reports to Piedmont Fayette Hospital 155.340 MHz.

Uniden BC346XT

Uniden BCT15X

Digital scanners

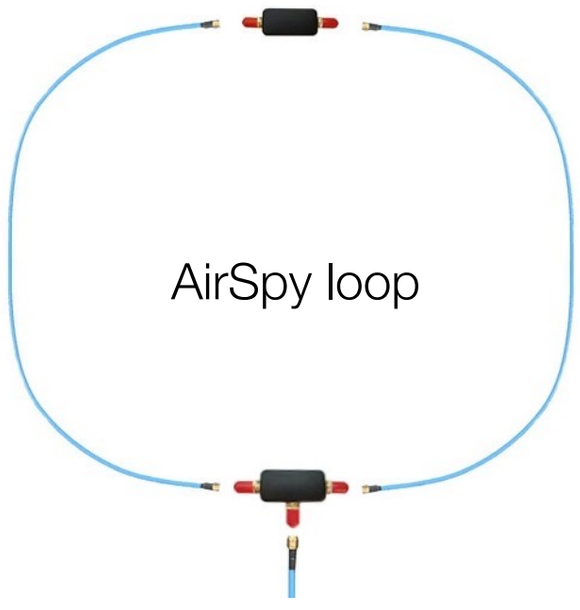
- Most business radio traffic is still FM, although some are switching to digital
- Many, if not most, public service agencies are switching to digital communications
- Even amateur radio has begun to embrace digital communications modes
- You will need a digital receiver to pick up digital radio transmissions
- Common digital modes are: P25, MotoTRBO™, Hytera XPT, X2-TDMA, NXDN, DMR, EDACS, LTR, C4FM, D-Star, and others
- Digital scanners are not inexpensive!
- Some SDR software allows decoding of digital radio traffic
- Technically, it is illegal to attempt decryption of encrypted radio traffic (which typically happens on secure digital radio transmissions)

Uniden SDS100

Whistler TRX-2

Listening post antennas

- Most portable scanners come with antennas
- Most desktop scanners and SDR receivers do not come with antennas
- Select an antenna based on the following:
    - Portable vs. fixed use
    - Visible vs. hidden use
    - Target bands (HF, VHF, UHF)
    - Omnidirectional vs. Directional
- My favorite listening antennas
    - AirSpy loop for HF / VHF
    - Discone antenna for wide-band (25-1300 MHz), 6m/2m/70cm TX!, fixed use
    - Telescopic wide-band for portable



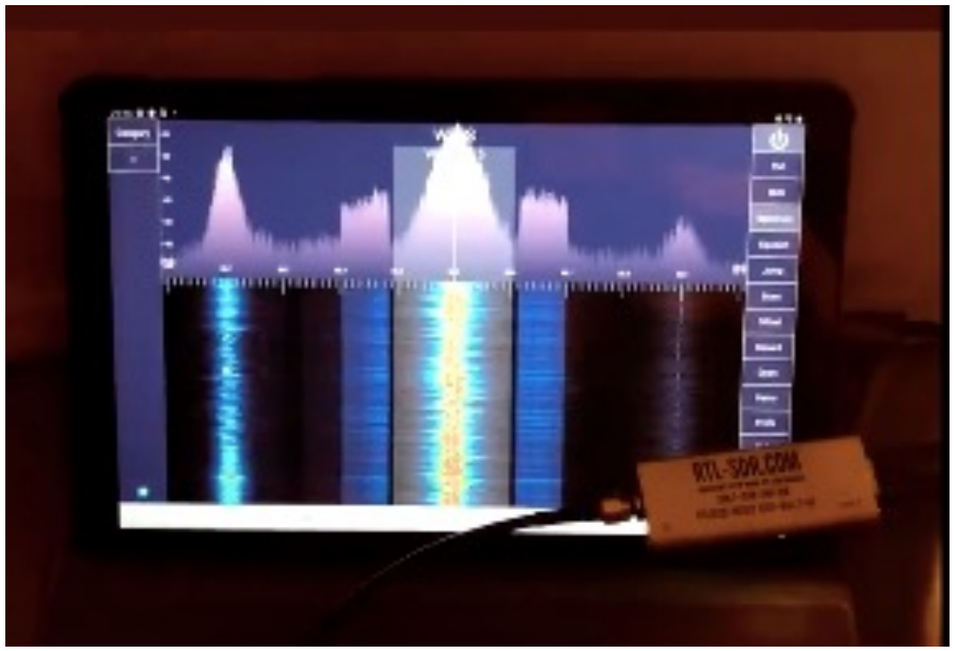
Discone antenna

Telescopic scanner antenna

Finding frequencies

- Add non-ham radio frequencies to your HT and regularly scan for radio traffic (UHF, business band, FRS, GMRS, etc.)
- Turn on the “Close Call” function on a scanner to find nearby radio transmissions
- Use a dedicated frequency counter to locate nearby radio transmissions

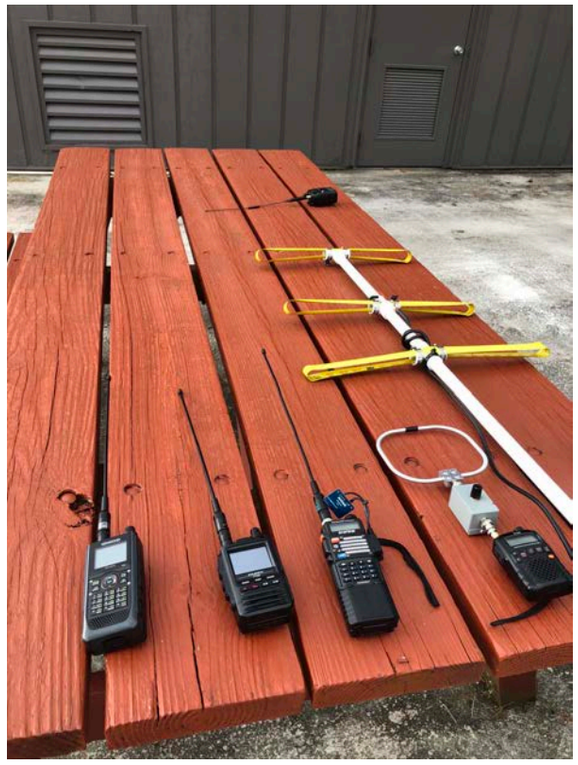
- Watch the spectrum display of an SDR to visually identify radio transmissions across a band segment
- Use online resources to locate frequencies used in a local area. https://radioreference.com is the absolute best online resource for frequencies.



Locating the source of a radio transmission (aka “Fox hunting”)

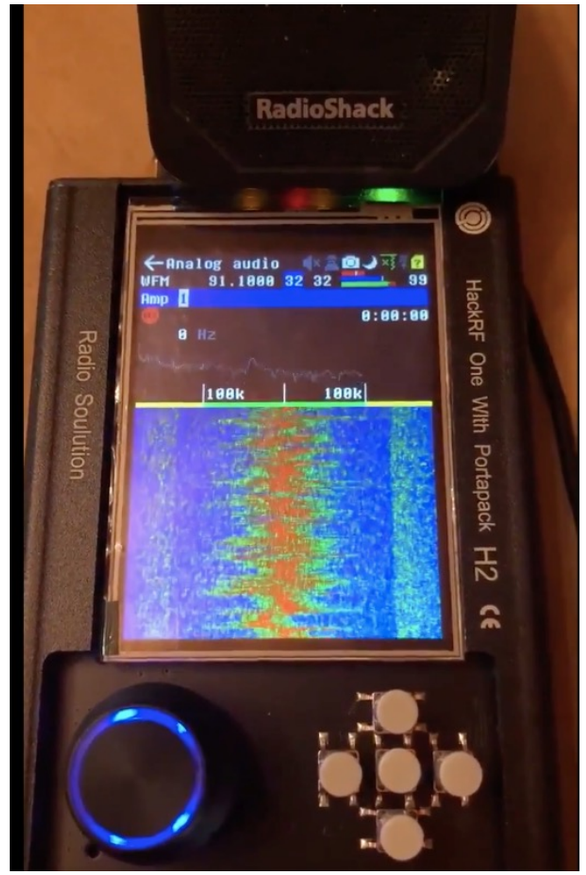
- Goal – locate hidden radio transmitter
- “Radio scavenger hunt”
- Gear
    - Radio receiver
    - Directional antenna – Yagi or loop
- Procedure
    1. Finding the signal
    2. Triangulating the source
    3. Attenuating & finding the fox

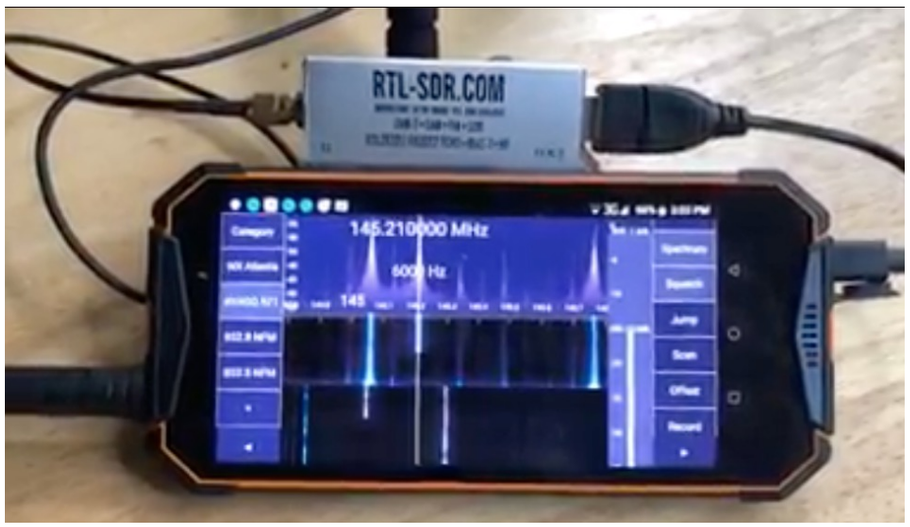
[Intro to Fox Hunting Presentation]



Listening post example recordings

- Longwave NDB FFC – 2/14/2021
  - AirSpy SDR on 316 kHz, Loop antenna, Windows tablet
- SSTV decode – 12/26/2020
  - Icom IC-R5 & SSTV app on iPhone
- Pirate Radio – 10/31/2020
  - IC-705 on 6.882 MHz
- SSTV decode – 10/5/2020
  - IC-705 & SSTV app on iPad
- Air Force One on 127.900 – 7/15/2020
  - Yaesu FT-3D
- VHF Monitoring on 145.210 – 6/16/2019
  - RTL-SDR & Android Phone



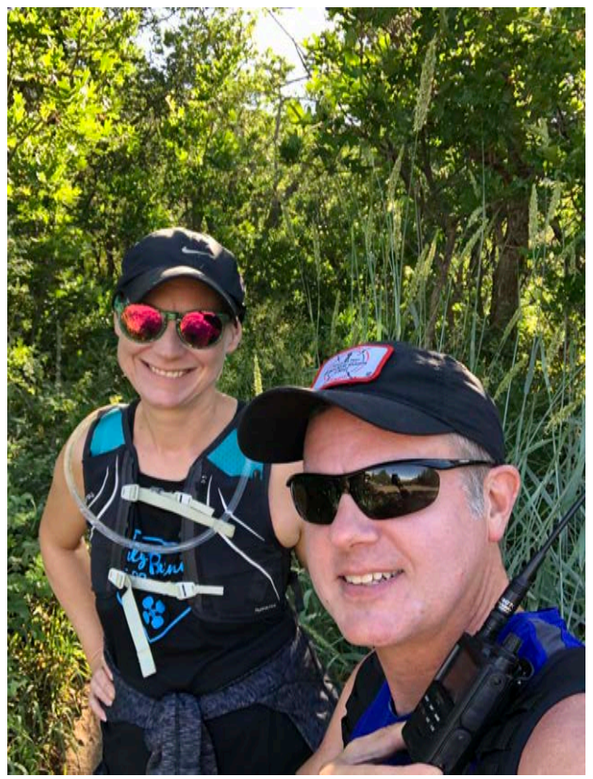


Suggested resources

- Best radio reference website – https://radioreference.com
- CISA NIFOG / AUXFOG - https://www.cisa.gov/safecom/field-operations-guides
- Best SDR website – https://rtl-sdr.com
- Online SDR stations that you can listen to from a web browser or app:
    - http://www.websdr.org
    - http://kiwisdr.com/public/
    - https://www.broadcastify.com/listen/
- Spectrum Monitor magazine - https://www.thespectrummonitor.com
- Lots of great YouTube videos out there about scanning and radio listening

Image source: Dreamtime

About the presenter



- Joe got his start in radio by listening! Growing up, he listened to police scanners, shortwave radios, and other radio traffic until the “ham radio bug” bit him.

- Joe is a licensed amateur extra class operator as KI4ASK and holds a GMRS license as WRCL957. His wife Mary Catherine is licensed as KI4HHI. They enjoy POTA, SOTA, fox hunting, and working amateur radio satellites. They were on the cover of CQ Amateur Radio magazine in February 2020. They enjoy sharing the hobby with others and have been interviewed on YouTube and spoken at hamfests.

- Joe Domaleski, currently serves as the Public Information Officer (PIO) for Georgia AUXCOMM and is a board member. He has attended FEMA COML, COMT, and AUXC training.

- Joe is also active within ARRL, having previously served as an appointed Assistant Section Manager in the Georgia Section from 2017-2021. He has completed all three levels of the ARRL Emergency Communications courses and is an ARECC training mentor. He also serves as a volunteer examiner within the ARRL, W5YI, W4VEC, GLAARG, and Laurel VEC programs.

- Joe has a BS in Mathematics/Computer Science from UNG and an MBA from GSU. He is a proud Army veteran. He currently owns and operates Country Fried Creative, a digital marketing agency. He is the past Board Chair of the Fayette County Chamber of Commerce.

- Joe and Mary Catherine Domaleski have three grown children and reside in Fayetteville, GA where they are active with the Fayette County Amateur Radio Club, Fayette County ARES, and North Georgia GMRS.