



Meriden Amateur Radio Club, Inc

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W1NRG



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Motivating Amateur Radio Clubs to Open New Initiatives (MARCONI)

Program 2: FOX HUNTING

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Operational Guidelines

Statement of Program Purpose: Fox Hunting, the common name for hidden transmitter hunting, is an aspect of the amateur radio hobby that is open to all license classes and can also include participants who are unlicensed, such as family members, scouts, and those working towards earning an amateur radio license. It provides opportunities for Club members, with a modest investment in specialized equipment, to participate in an engaging Club activity on a regular basis.

Scope of a Fox Hunting Program: Fox Hunts require specialized direction-finding equipment, such as Yagi antennas, but do not require large amounts of planning or logistics. A hunt can literally be conceived on a Friday and executed on the next day, Saturday. Though hunts are outdoors, in many locations there is acceptable weather year-round. Hunts can be held as a one off, annually, quarterly, monthly, or weekly. Because of the low cost and availability of 2-meter radios, and the manageable size of 2-meter antennas, hunts are often restricted to the 2-meter band.

Typical Fox Hunting Scenario (Case Study): The Meriden Amateur Radio Club (MARC), in Connecticut (W1NRG), held occasional Fox Hunts for many years. However, there were often years-long periods with no hunts. The idea to hold a Fox Hunt resurfaced in the Club in 2019, to answer the need for an outdoor activity that would help bring Club members together and maintain contact with each other. When COVID-19 became an issue, the outdoor Fox Hunting Program was viewed as a COVID-safe activity. At that time, the most recent prior hunt was a distant memory and not much institutional knowledge existed. The decision was made to structure a hunt with an emphasis on making it easy and fun.

With winter approaching, a plan was made to maintain Fox Hunting interest via regular mentions in the Club newsletter, during meetings, through emails, and to spend the winter months getting direction-finding equipment built and tested. A wide variety of equipment was developed during those months, including Yagi's, loops, quads, simple dipoles, a Doppler, and both passive and active attenuators. In addition, a lot of options for mapping were explored. Club members collected street maps, topographic maps, and mapping apps for their phones. In retrospect, these winter months of preparation were an important part of the Club's continuing success with Fox Hunting. By early spring, lots of Club members had working direction-finding equipment, some testing had been done, and enthusiasm was high.

In keeping with the initial idea to make the hunt easy and fun, the hunt area was defined as a circle with only a two-mile diameter. And two hidden transmitters were activated. A 1-watt transmitter could be easily heard from anywhere in the search area and a second, milliwatt level transmitter allowed Hunters to get in close without too much need for extensive attenuation in their receivers.

That initial hunt was a big success. Enthusiasm for hunting grew some more, equipment was further refined, and new Hunters joined the ranks. Now, three years after that first hunt, the Club has maintained a schedule of weekly hunts, year-round. The search area has increased to fifty square miles and a dozen or more Hunters participate each week. Many Hunters are individuals who are not members of MARC. This is a good

opportunity to provide visibility for the Club, recruit new members and work cooperatively with other area Clubs and their members.

Getting Started: From MARC's experience, it is clear that the social aspect of Fox Hunting is important for maintaining interest. It's very common for a group of Hunters to linger with the Fox for 30 minutes or more after a hunt. Also, as a Club, MARC's low interest in hunting automated and unattended transmitters points to the importance of maintaining opportunities for socializing in the hunts. This seems to indicate a need for a critical mass of Hunters. Though one ham can hunt a Fox, the more who are involved, the easier it is to maintain interest and draw in new participants.

If initial hunts are designed to be easy, more Club members can, and likely will, participate. Some suggestions for making a hunt easy are:

- Define a small search area. Four square miles might work well for a first hunt.
- Do not hide the Fox in a residential area. Parks are a good choice, but don't let it be known that the Fox will be in a park. (That's too easy). In addition, hiding a Fox in a residential neighborhood may seem suspicious and frighten local residents.
- Operate both a 1 watt and a lower power transmitter, on a second frequency, to minimize the need for Hunters to have signal attenuators.
- Allow between 90 and 120 minutes for the hunt.
- Choose a day with somewhat mild temperatures and low wind.
- Transmit continuously, rather than intermittently.
- Establish the Club or a local repeater as a means to ask for hints, if needed.
- Do not discourage teams from forming, even those with multiple vehicles.
- De-emphasize competition and focus on creating a fun experience for all participants.
- Invite Club members who aren't ready to hunt to hide along with the designated Fox. Those members can participate without needing any equipment.

- Putting a Fox Hunt session on YouTube will aid in publicity and let members see what the event is all about.

Equipment for Hunting: Experienced Hunters will sometimes purchase direction-finding equipment costing several hundred dollars. However, to get the uninitiated involved in hunting, there needs to be a low barrier to entry. Most hams own a 2-meter handheld radio and many also own a 2-meter mobile radio. Those radios can be used for Fox Hunting without incurring any cost. Some Club members may already own a three element, 2-meter Yagi antenna, such as the ones that are commercially available. Those antennas are popular for satellite communication. The 'Tape Measure' Yagi can also be made at a very low cost. Plans are readily available online.

As the Hunter draws closer to the Fox, the signal strength will become so great that the Hunter can no longer determine a direction. Providing two, or even three transmitted signals, at different power levels, each on its own frequency, can alleviate this difficulty. Also, tuning the Hunter's receiver 5kHz or 10kHz off the transmitter's frequency can attenuate the signal. This method works better on some model receivers than on others.

Dedicated attenuators for each Hunter are also an option but may be a cost that many new Hunters aren't willing to take on. Both passive and 'offset' attenuators are available. Passive attenuators are essentially resistors and are the least expensive. Offset attenuators include a frequency mixer that creates a signal that can be greatly attenuated at a frequency near the transmitter's frequency. Some commercial firms offer offset attenuators.

Hunters who have one available should bring along an extra 2-meter radio in order to monitor the repeater during the hunt.

Equipment for the Fox: For any given hunt, there are several Hunters who generally use their own funds to obtain equipment. There is a good rationale to invest in the Fox's equipment in an effort to make the hunt more fruitful for all participating Hunters.

A 1-watt, 2-meter, FM transmitter may be the best choice for the Fox's primary signal. More power will overload the Hunters' receivers more easily and less power may not be heard everywhere in the search area. Ideally, transmission should be continuous during the 90 or 120 minutes of the hunt. Intermittent transmissions are easier for the Fox but make the job of the Hunters more difficult. Advanced and experienced Hunters may relish in additional difficulty, but beginning Hunters are better served by a hunt in which they have a very good chance of success.

Many handheld radios have a 1-watt power setting. However, care must be taken to not overheat the HT with a long, continuous transmission.

Modern mobile 2-meter radios often have a low power setting of five watts. That can be attenuated on the way to the antenna, to produce the desired 1-watt signal. A mobile radio will draw more power than an HT and should be equipped with at least a 12Ah battery. Especially on 80 and 90 degree days, there is a danger that the mobile radio will overheat. One or more 12 volt 'muffin' fans can help keep the transmitter cool.

An older model mobile radio, such as the Yaesu Memorizer, from the late 1970's, has worked very well for the MARC. The low power setting is 1 watt, and it has held up through hundreds of Fox Hunts without a need for a fan.

To provide a good quality signal to the Hunters, the transmitting antenna should be at least as high as a vehicle's rooftop. A quarter wave mag mount antenna can work well. And, the vehicle should be clear of obvious obstructions, such as dumpsters, metal fencing, and metal buildings.

A second, and even a third transmitter, each on its own frequency and transmitting at its own power level, should be considered almost a necessity for beginning Hunters. A transmitter at 15mW and another at 1mW could eliminate the need for an offset attenuator for the dozen or more Club members who may hunt. A 1mW signal can have a range of up to ¼ mile. Depending on terrain, the 15mW signal may be heard in many parts of the search area.

An HT or mobile radio will require its own automation or a very diligent and tireless human 'Fox'. Even for a first, trial hunt, the Fox will need a way to keep the transmitter keyed and a continuous source of audio. A simple approach might be something like an elastic band to keep a PTT depressed and an audio recording played on a cellphone with a series of short 'beeps' and periodic identification. Some companies offer a product that automates a radio for Fox Hunts.

The person assuming the role of the Fox should also have an HT to monitor the local repeater. It may be necessary to move a hundred feet away from the 1-watt transmitter to be able to hear the repeater.

Conducting a Fox Hunting Session: Many Fox Hunts use a designated starting location and ask Hunters to check in before the beginning of the hunt. This may be a good idea for advanced and competitive hunts but isn't necessarily the best for a beginning Fox Hunt.

MARC has always allowed Hunters to begin from any location and we don't ask for check-ins. Some Hunters choose to start from their homes and others have spots they've chosen where they expect to receive a better than average signal. Some are out running errands, hear some chatter on the repeater, and decide to join in the hunt.

It's very important for the Fox transmitters to be operating as expected. Lots of things can go wrong with batteries, antennas, connections, frequency, and power settings, etc. If there are any difficulties, it's best to resolve them quickly. One method to identify potential technical issues is to put out a call on the repeater five minutes before the start of the hunt and to ask Hunters to listen for a short transmitter test. A test transmission

of one or two seconds can give everyone confidence that the Fox is on station and the signal can be heard. But one or two seconds of transmission probably won't give anyone a chance to sneak in a bearing before the hunt begins.

Fox Hunting Challenges: To the uninitiated, Fox Hunting may appear to be easy. "Take a bearing to the Fox. Plot it on a map. Move to another location. Plot the second bearing. Find the Fox where the bearings cross." In reality, Fox hunting can be difficult. It is a skill that can be learned, and some people have more innate talent for it than others.

Most Hunters rely on bearings and relative signal strength to locate the Fox. Some bearings are completely wrong. They are actually reflections from a hill or a building. Experience helps the Hunter have a better idea of which bearings to discard. Even signal strength can be misleading. Though we expect a greater signal strength as we approach a Fox, some terrain can make that not be the case. A good signal can become a weak signal as you travel down from a small hill and into a valley, while moving closer to the Fox.

A team of two almost always has an advantage over a single Hunter. And, by forming a team, a Club member with no equipment can join the hunt. One member of the team can focus on driving and the other can focus on the hunt.

When the time remaining in the hunt grows short, it's often a good idea to provide a hint, via the repeater. Many Hunters would rather get a hint and find the Fox than to use up every available minute and then go home without finding the Fox.

Hunter Costs: A Hunter who owns an HT with a decent signal strength meter can build a 'Tape Measure' Yagi for just a few dollars and can be successful in a hunt. Having a mobile radio with which to monitor signal strength while moving isn't a necessity but is helpful. Having a second HT to monitor the repeater also isn't

essential but is helpful. A commercial antenna, costing about \$100, offers little advantage over a tape measure version.

If three transmitters are employed, at different power levels, and the receiver is tuned slightly off frequency to attenuate the signal, an attenuator won't be necessary to begin hunting. If participation becomes regular, an offset attenuator, for about \$30 or \$60, can be worthwhile.

A map of the area is very inexpensive, and a magnetic compass can also be inexpensive.

Fox Costs: If purchased new, a mobile radio for use as a transmitter is about \$200. A commercial 15mW transmitter is about \$100 and it's best to have two. The controller for the mobile radio is another \$100. A battery and magnetic mount antenna might total \$60. To outfit a Fox could be close to \$600. On the other hand, obtaining a used or free 2-meter radio and getting by with one 15mW transmitter, the cost might be only \$275.

If cost is the issue that's keeping your Club from creating a Fox and holding Fox Hunts, reach out to the MARC. Our Club has homebrewed several solutions that your Club may be able to duplicate. MARC would be pleased to have your Club join us on one of our weekly Fox Hunts.

Fox Hunting Rewards: The rewards of Fox Hunting should be obvious and may well invigorate Clubs looking for a community activity.

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MARCONI PROGRAM

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