



NOVEMBER 2023

Volume 12 Issue 11

VE3ERC-LUB



President: Reg VE3RVH
Vice-President: Frank VA3FJM
Secretary: Tom VE3DXQ
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Repeater Trustee: Wes VE3ML
Website Admin: Ted VE3RTRQ
Lighthouse:
Maple Syrup Display:
Newsletter: Bob VE3IXX
ERC Website: <https://ve3erc.ca>

ERC REPEATERS

UHF 444.700 + TONE: 131.8
UHF 444.700 + TONE: 123.0
VHF 147.390 + TONE: 123.0
VHF 147.255 + TONE: 131.8
EMERGENCY SIMPLEX: 146.550
UHF-IRLP node 2404,ECHOLINK VE3ERC-L
VHF- IRLP node 2403,ECHOLINK VE3ERC-R

**In an emergency, tune
Into our repeaters,
UHF 444.700 or
VHF 147.390 or
HF 3.755 LSB or
Simplex 146.550
For coordination and
assignments.**



2 Metre antenna at the home of Dwayne VE3CQQ.
See Adventures in Building Antennas on page 6.



Radio Amateurs
of Canada

THE PREZ SEZ!

This club is Radio-ACTIVE
This club is Radio-ACTIVE

President's Update for November 2023

As the days of this past year slip by us, we are now entering the Christmas Season. But first, let us look back over this past year.

There were many presentations on various subjects such as "RT systems, HT Programming presented by Karen KD4DXX, and Wires-x net presented by Rod VA3MZD.

The Alma repeater is now VA3TET in memory of Al McDonald. We now have the Yaesu DR-2X connecting to Wires-X.

There was an interesting presentation by Mike Walker VA3 MW on Radio Flex promoting Remote Radio Operation.

Other issues of importance was the new installation by Ted VE3TRQ of hand held wireless microphones for a better connection with zoom club members.

The technical Committee upgraded the repeater system in Elmira with new equipment, new cables and added special connectors. This was great news. Many thanks to Paul, Ted and Tony.

Also the Field day and Point Clark events were a success. Other presentations by club members were well received. Many new Members throughout the year showed interest in the club.

In the Spring, Dave VA3 DAS has approval for the Elmira Club to visit the Ontario Data Centre in Guelph.

In Closing, Merry Christmas and Happy New Year to you and your family as we all look forward to the year 2024!

Thanks REG VE3RVH



In Memoriam



Joyce E. Hodge VA3WXU—SK

Former ERC President 2016-2017

Elmira Radio Club UHF repeater

By Ted VE3TRQ

Tony VE3DWI, Paul VA3PDC, and I were at the repeater site at the Feedmill on Wednesday. Tony replaced all cables between the repeaters, duplexers, and antenna 7/8" hardline. He also replaced the Kenwood UHF repeater with the Club's second Yaesu DR-1X Fusion Repeater, configured for 444.700 / 449.700 MHz. Tony kindly supplied a much better UHF duplexer for use with the UHF repeater. The Kenwood UHF repeater will find a home at the Firehall.

This was done to resolve issues of UHF repeater flakiness, and interference between simultaneous VHF and UHF signals on the feed lines when EchoLink was active on both repeaters simultaneously (especially during nets).

Unfortunately, the VHF repeater's IRLP/EchoLink node computer took the same day to throw a disk (SD card) error, and fail. That means IRLP node 2403 and EchoLink node VE3ERC-R are not available until I create a new SD card for the node computer. In the meantime, the UHF repeater's node, IRLP 2404 and EchoLink VE3ERC-L are connected to the VHF repeater. The only change in procedures for the nets, and for IRLP and EchoLink node access is to use 2404 and VE3ERC-L to access the VHF repeater until repair is complete.

I should have the failed node computer back up in a few days.

Ted VE3TRQ



Tony VE3DWI working on the repeater site at the Floradale Feed Mill.



From the PAST

With thanks to Tony VE3DWI
for sending these clips.



Before radar became widely used, defense forces had to rely on listening devices that looked like giant trumpets. These devices, which helped detect approaching aircrafts by amplifying sounds in the air, were first used by Britain and France during the First World War.

Adventures in Antenna Building

By Bob VE3IXX

Dwayne VE3CQQ had asked for some help setting up some antennas, so the intrepid team set to action. The last wind storm had taken down his G5RV and he had purchased an additional end fed antenna (MFJ-1982).

Already attached to the house were seven four foot poles (from Princess Auto) which were clamped to the back side of the house. See figure 1 and 2.

The top of the pole which was just over 28 feet up in the air, was the centre support of the G5RV. The two legs were attached to two high trees on either side of the house.

This pole also became one end of the end fed antenna (figure 3). The end fed which was approximately 130 feet long went directly back to a line of very tall



From left to right John VE3JWU, his brother Joshua VA3JWU, cousin Joe and Dwayne VE3CQQ.



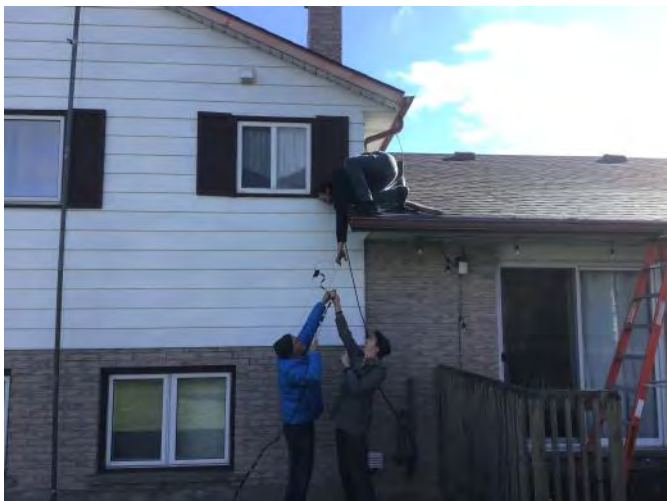
Figure 1 and Figure 2



Figure 3

evergreen trees. All the set-up with the G5RV went smoothly with almost absolute precision, But the trees in the far back proved to be the "fly in the ointment."

Anyone who has had to run a line over a tall tree would empathize. It took an interminable amount of time to get a line over the tall trees. We tried fishing line and lost a number of weights. We tried using a sling shot. We even tried throwing a weighted line by hand.



Myself VE3IXX and John VE3JWU passing up the end-fed line to Brendan VA3BVB on the roof.



The crew watching Brendan connect the line on the roof peak.

Either we missed the higher spot, or it got tangled in lower branches, or the weight got stuck in a branch too high to reach and one time the line snapped and we lost the weight. Refusing to give up, we eventually succeeded only through sheer persistence. The method that finally worked was the fishing line. Once this was done, the final connection was made to the mast.

By this time it was starting to get late and the hungry crew stopped for a well-deserved hamburger. Because of commitments, there was not enough time to test out the antennas. This would have to wait for another time, and perhaps another story!



The fishing line method finally provided the most success.

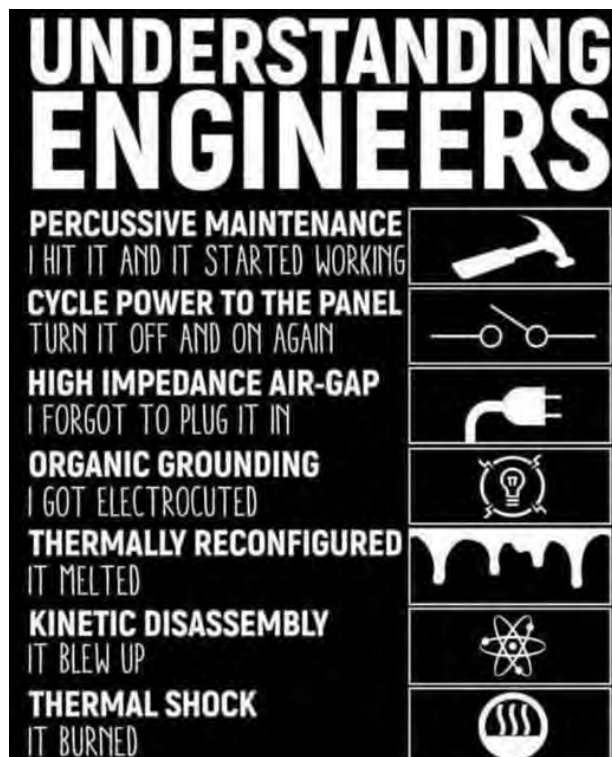
CONTRIBUTIONS TO VE3ERC-CLUB NEWSLETTER

Do you have an article you'd like to submit? Or photos? Do you have any comments you'd like to make?

Perhaps you'd like to share a photo of your shack, a special project you are working on or a special interest!

SEND THEM TO:

Bob bobve3ixx@gmail.com
(519-787-2279)



Thanks to Rod VA3MZD.

WEDNESDAY NITE NET CONTROLLERS

DECEMBER 6 - TOM VE3DXQ
DECEMBER 13 - TED VE3TRQ
DECEMBER 20 - TONY VE3DWI
DECEMBER 27 - BRIAN VA3DXK
2024 JANUARY 3 - BILL VA3QB
JANUARY 10 - BOB VE3IXX
JANUARY 17 - REG VE3RVH
JANUARY 24 - M E E T I N G
JANUARY 31 - FRANK VA3FJM
FEBRUARY 7 - TOM VE3DXQ

CORRESPONDENCE

If you like toe-tapping Ham Radio music video check out what Randy VA3XV sent:

My other hobby... Here is a video I made for the N. Ontario guys & gals, which I have on YouTube.

<https://youtu.be/clu6Wz9eBFc>



Tips and Techniques

Do you have umpteen of those power cords kicking around? Here's a solution to keep them untangled and out of the way. Toilet roll tubes are good for something other than burning them. Throw them in a box or corner of the shack until you need one.

73' Tony VE3DWI



Using a TYT TH-9800 mobile transceiver as a cheap base station

by Daniel Romila VE7LCG

Disclaimer: I am not connected to any seller. I am that kind of guy that takes the new rig out of the box, installs all the cables and starts operating without even looking at the user manual. This comes with experience and works for me, but might not work for you.

Some 5 years ago I was promoting using a walkie-talkie as a base station for participating in the weekly local nets. With some additional filtering the handheld transceiver can permanently remain in the charger cradle (it is absolutely essential that the supplementary filtering really works, and that the charger no longer gives a "hum" during transmission). Add an external hand microphone, a simple dipole antenna along the wall and you could get a comfortable cheap base station for participating on the air.

This performed well for 5 years and then suddenly didn't seem to work anymore. In the simplex part of the net, I had problems to being heard at less than 5 kilometers. This was because in the five years that passed since I was promoting the cheap handheld as a modest base station a lot of tall buildings were raised everywhere. I started to have problems in reaching repeaters even with 50 Watts, and my voice was distorted because of multiple reflections from the nearby buildings. I needed a new multiband base transceiver, something reliable with at least 50 Watts, but still cheap. After some research, the TYT TH-9800 was the model I decided to buy.

I live in a small one-bedroom apartment and the "radio shack" is limited to a corner desk. I have some shelves under the desk. This includes a soldering station, transceivers and oscilloscope. There are additional electronic components in other drawers.

You can see the TH-9800 on the right corner of my desk in the following picture:



TH-9800 is a quad band transceiver, with FM only Tx and with AM and FM capability for Rx. No SSB! It covers the CB band, 10 meter band, 6 meter band, 2 meter band, 70 centimeter band and the FRS/GMRS band. There is a special version which replaces 440 MHz with 220 MHz. On my version of TH-9800, there are four selectable levels of power: 5W – 10 W – 20W and 50 W (40W in the 70 centimeters band). This is what it claims in the user's manual, and I

have strong reasons to suspect the actual power is greater.

As you noticed from the transceiver front panel picture, TH-9800 has two transceivers (more precisely one transmitter and two receivers). It can be a crossband repeater by simply activating an option in the menu.

I would like to start with two observations that are useful for any transceiver, not only the TYT TH-9800:

- If the specs say that during the transmission the current consumption is 8.5 Amps (as with the TYT TH-9800), expect spikes of 10 to 15



No.	Rx Lower	Rx Upper	Tx Lower	Tx Upper
30M	26.00000	33.00000	26.00000	33.00000
50M	47.00000	54.00000	47.00000	54.00000
60M				
108M	108.00000	133.99500		
150M	134.00000	180.00000	134.00000	174.00000
250M				
350M	350.00000	399.99500		
450M	400.00000	512.00000	400.00000	480.00000
850M	750.00000	950.00000		

Amps in consumption. That means the power supply has to be strong enough to handle the extra power.

- The manufacturers give generously long cables for power supplying your transceiver. Long cables can cause trouble. My TYT TH-9800 influenced the charger of the walkie-talkie next to it. Every time I pushed the Tx button the walkie-talkie's charger LED turned RED, and stayed

Red for many minutes after. If you still do not feel like cutting the power cables short just braid the two wires, as in the picture below. This totally eliminated all my Tx keying problems. It also eliminated any interference to the computer, monitor, Internet router and so on. My desk is crowded, and all the equipment works at the same time as the TH-9800 transceiver, and they are all happy together.

- Program your transceiver with your computer and with the programming cable for your transceiver, but do not forget to disconnect the programming cable from the transceiver when you use the transceiver as Tx/Rx. The GND of your transceiver is not the same as the GND of your computer. The computer uses a switching power supply and your power supply for the transceiver might also be the same, as is mine. A lot of "hum" will be introduced into your transmission from the computer if you forget the connected programming cable. It happened to me.



My TYT TH-9800 transceiver is from 2023, and I suspect it has a newer firmware than many previous models. This model has been around since 2014 or even earlier. There were a number of complaints during the years. Most of the complaints were settings in the transceiver's menu; the manufacturer corrected the complaints and now the default settings are indeed the default settings.

I was immediately capable of reaching repeaters at more than 100 kilometers distance in the 6-meter and 2-meter bands. I even received some distant 10 meters repeaters. I do not have any 10-meter repeater in a 1000 kilometer radius. I did not want to force the 70 centimeter band before obtaining a good antenna for it, with a good SWR, but it worked OK on all local repeaters.

I preferred to do the programming with its own TYT program. The free CHIRP program is only experimental for this TYT TH-9800. What I did not like about programming with CHIRP is not the fault of TYT, but the fault of CHIRP. I wanted to import repeaters to program into the memories from repeaterbook.com, with CHIRP, but the resulted import does not have all data in the columns they are supposed to be. Maybe it works for the repeaters from your area, but for my repeaters of interest the imported data is a mess, and cannot be used in any transceiver. Another big problem with CHIRP is that it filters the imported repeaters by country. I live close to the Canada - U.S. border. Strangely, CHIRP asks for my latitude and longitude, which I supplied but it limits me to only one country.

The TYT program worked without any problem. The settings from the transceiver itself give priority to whatever you decide in the program. For example, the microphone has 4 programmable keys, and one has to set on transceiver's menu whatever is user programmed into those keys to be kept from one radio session to another, otherwise it reverts to default. From the multitude of options TYT TH-9800 gave me, I choose:

- P1 for switching between working memorized channels and free selectable frequencies.

- P2 for REVERSE; that means I work a repeater, but can listen to the other station directly if I wish.
- P3 for switching between left side being the active main one or the right side to be the active main.
- P4 for selecting the four levels of Tx power, between 5 Watts and 50 Watts. I do suspect this power is above the specs.

The audio reception quality is good enough, through its 4 centimeter diameter speaker. The transmission works in FM only, and has 3 levels of maximum modulation deviation. I use the default called WIDE in TYT terms. I verified the other ones, and they work, but my voice was not so full and it lacked bass. I let the default emphasis option (ON), and the default of not using the compander. I listened to myself on EchoLink and there was no background noise, once I unplugged the programming cable from the transceiver.



I do not think I will switch off the computer/monitor, so my transmission has to be clean with all other equipment working on the same desk. And indeed, the TYT TH9800 is up to the task. Not only did I verify by hearing myself on EchoLink, but I also asked correspondents and they all said it is OK, once I remembered to disconnect the programming cable (LOL). I thank VA7ISI and

VE7CZV for help through the VE7RSC Surrey repeater. VE7CZV told me there was some small background noise, and in that moment, I remembered I had forgotten to disconnect the programming USB cable (LOL).

The Tx seems to be tolerant with various antennas.

The TYT TH-9800 transceiver even forgave an accidental mismatch (I switched to the 6 Meter band on a 2 Meter antenna) and it did not shut off.

The sensitivity of TYT TH-9800 is declared as being 0.2 μ V, but I suspect it to be better than that. This is because it is a bit more sensitive than my old Kenwood 7950 transceiver in the 2-meter band (Kenwood 7950 only has the 2-meter band). I just verified the tuning of Kenwood 7950 and it was OK.



The front panel of TYT TH-9800 is detachable and a cable is provided for remote operation. I do not have a car nor do I intend to ever have a car, so I do not use this option.

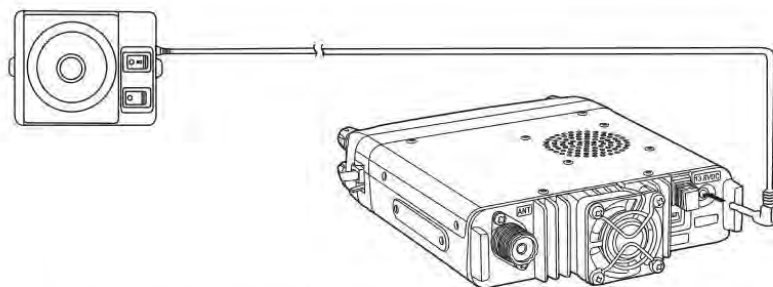
I liked the transceiver came with all the cables and brackets. I use the car bracket for keeping it on the desk, and I can adjust the angle in 3 mechanically fixed positions.

This transceiver is incredibly small in size and is only 1.2 kilograms. It is suitable for work as a base station on the desk, next to a computer/monitor that is also in running at the same time. In order to help the night operation, the microphone has a switch for turning the illumination of the keys on or off. There is a headphone jack in the back of the transceiver. Like most transceivers, the headphones jack is MONO, which means that if you connect a normal headphone only the left side will have audio in it. Another thing I do not like about this TYT TH-9800 transceiver is that the audio out comes from a class D audio amplifier, so none of the headphone output is at ground. I bought some cheap headphones, with bigger speakers inside, in order not to disturb my roommate and

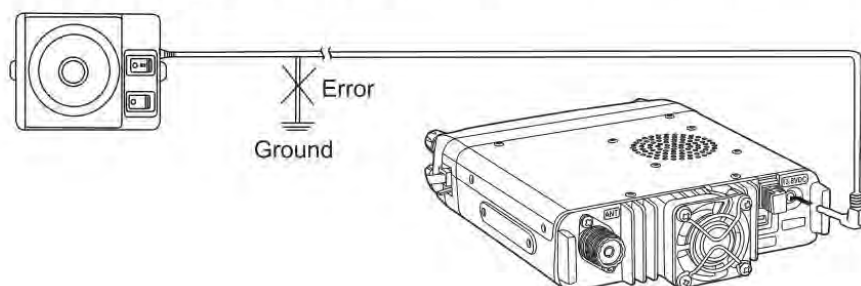
neighbors. I will cut the normal stereo connector of those headphones and I will solder a MONO jack, to hear both LEFT and RIGHT speakers of the headphones. From the user's manual:

External Speaker

If you plan to use an external speaker, choose a speaker with an impedance of 8Ω . The external speaker jack accepts a 3.5mm mono (2-conductor) plug.



Note: External speaker output adopts double port BTL. Please be aware that the speaker can't connect to the ground otherwise the speaker will fault. The wrong connection way is as below:



One complaint some users had about this transceiver is that one side works only on two bands, while the other side works on all frequencies. This creates confusion and many users contacted the vendor and manufacturer to return their "defective" TH-9800 transceivers. But the user manual is in English and clearly describes the characteristics and all operations, including that as a repeater.

After several hours of having this transceiver, I felt like it had always been there. I would like to caution the reader that he/she might not have such a comfortable experience with TH-9800 as I have had. After several hours of installing it I was already giving advice through the VE7NWR repeater to people digitally connected from other countries who had TYT equipment for years. If I am asked how to do something on TH-9800 without having it in front of me I do not know. But when I touch it, somehow, I enter the designer's mind, and I succeed in everything I want to do. Most probably there are transceivers from other manufacturers that would give me learning difficulties.



If you want a lot of transceiver, a lot of power (50 Watts), this TYT TH-9800 is a good option to consider. One does need to get used to the menus and operating style, which is not suitable for everybody. A video showing manual programming, some simple settings and operation can be found at:

<https://www.youtube.com/watch?v=TboouM-v1w4>

VE3ERC Elmira Radio Club Inc.

Minutes from Nov 22, 2023

1. Call to Order & Welcome

The meeting was opened at 7:30 pm by our Club president Reg VE3RVH

2. Roll Call: VE3TRQ Ted, VE3RVH Reg, VE3IXX Bob, VA3PDC Paul, , N4WXU Judd, VE3FE Mike, VE3RKS Roger, VE3DCC Rich, VE3CZ Linda, VA3MZD Rod, VA3DAS Dave, VE3DXQ Tom, VA3JGK Gary, VA3PT John, VE3MXT Marianne, VE3MRJ David, VE3JMU Jim, VE3WBE Ron, Guest Andy, VA3BYP Graham, VA3MRJ David, VE3KCY Ken, VA3MW Mike, VE3DWI Tony.

3. Adopt Agenda : Ted VE3TRQ showed the agenda on the flat screen tv and Agenda was accepted.

4. Presentations/Speakers/ Workshop: - Remote Operation by Mike Walker VA3MW. The presentation was done over Zoom. Mike mentioned that many people are moving into places that do not have room for HF antennas, making remote operation more popular. The Flex radio is best suited for this purpose, other radios are used, but have more complex setups.

5. Secretary's Report: Tom VE3DXQ asked if there were any errors or omissions from the OCT [2023 minutes](#) none were mentioned.

6. Treasurer's Report: Ted VE3TRQ gave the treasurers' report as well as a detailed handout to those present showing income from Dues, and sale of Equipment. There were some expenses like bank charges, and Audio Equipment for our meetings. Ted said we are in good shape and have enough to replace repeaters if needed. Ted made a motion to have the treasurers report accepted. Seconded by Tony VE3DWI carried.

7. President's Report: Reg VE3RVH thanked Tony VE3DWI, Ted VE3TRQ, and Paul VA3PDC for their work updating the Elmira repeaters. There was a round of applause for their work. Reg VE3RVH also mentioned how the Club has grown since 1995.

8. Committee Reports: Repeater technical committee- Tony VE3DWI said that the UHF repeater is now operational again. He said there was no interference from the VHF repeater. He said they took out all the equipment except the VHF repeater. Also they replaced all the cables and connectors with "N" type connectors. He said they removed the Kenwood repeater and replaced it with the Yaesu repeater that was at the fire hall. The Yaesu had the proper type of duplexer. The Kenwood will be going to the Firehall. Ted said the VHF repeater Echo-Link/IRLP-R node is out of service. SDR card failed on that node. Ted VE3TRQ said this will be repaired soon.

9. Unfinished Business: Club Christmas Party- TED VE3TRQ said there were two suggestions for a venue. One was the Concordia club in Kitchener or the Mandarin in Guelph. Dave VA3DAS said the Concordia club may have a separate room depending on numbers of people. Ted said the Mandarin also has a number of rooms where groups can go. Ted VE3TRQ said last year we had 30-35 people. Date will be determined by number of people's availability. Dave VA3DAS suggested a daytime or lunch dinner. Ted put the question to club members present if a Lunch time venue was better. Majority agreed to a lunch time venue. Ted said he would put out an email to get an Idea of numbers and then call the restaurant.

RAC Insurance- Tom VE3DXQ. Tom advised he sent the form in to RAC on Nov 6, and has heard nothing back as Yet. Tom VE3DXQ also wanted to know if the firehall had a mail box. Ted VE3TRQ said it does not and that in the past mail from RAC went to either the Treasurer or the Secretary. Tom also mentioned that he had issues retrieving email from VE3ERC@gmail.com due to google security measures. Paul VA3PDC said I will not likely hear anything from RAC until January.

10. New Business: Nomination Committee for 2024 AGM

Tom VE3DXQ asked Rich VE3DCC if he would stand for nominating committee and that it usually is comprised of 3 people. Rich said things do not start happening with this usually until April. He said to think about it. This item is tabled until January.

Guelph Data Centre Tour- Dave VA3DAS said his two contacts are agreeable to have our group go on a Tour. He also said that in past tours that they were taken to Dinner for their time and effort. He also said we need a liaison from our club who can co-ordinate with them for this tour. This would involve visiting Guelph a few times.

11.ANNOUNCEMENTS: Paul VA3PDC mentioned that Winter Field day is the last weekend in January. Also today was VE3FE Mike's Birthday.

Next Meeting: Jan 24, 2024

12. Adjournment – VE3RVH Reg Adjourned the meeting at 8:50 pm.

Thanks to Mike VE3MKX for sending the following:

ADSB Aircraft Tracking

2023-09-13

Have you ever wondered about that aircraft flying over your head? Perhaps you are already aware that most aircraft are required to transmit location data. Anyone can easily receive that publicly available broadcast data. Maybe you already receive that data and are feeding it to one or more of the flight trackers. This article will help explain the fascinating hobby of aircraft tracking and will help you set up a receiving system or tell you why it is desirable to send the data to other flight trackers.

Most aircraft worldwide are required to transmit data using a system known as ADS-B meaning Automatic Dependent Surveillance-Broadcast. ADS-B is a surveillance technology in which an aircraft determines its position using satellite navigation or other sensors and periodically broadcasts the position, enabling the aircraft to be tracked. The information can be received by air traffic control ground stations as a replacement for secondary surveillance radar, as no interrogation signal is needed from the ground. It can also be transmitted and received point-to-point by other aircraft or ground-based receivers. ADS-B is "automatic" in that it requires no pilot or external input. It is "dependent" in that it depends on data from the aircraft's navigation system. ADS-B currently transmits data on 1090 MHz in a well-defined format. Particularly in the United States, 978 MHz is also used. Generally, all aircraft excluding many military flights will transmit ADS-B. Reception at a ground station near the aircraft is fairly easy. Sometimes, an aircraft does not transmit position information. In that case, a technique called multilateration or MLAT can derive position by using four or more receivers and a technology called Time Difference of Arrival. See

<https://www.multilateration.info/surveillance/multilateration.html> .

Building a receiving system is straightforward, requiring only an antenna, a software-defined radio receiver, a processor like an old laptop or a Raspberry Pi, and some readily available open-source software. See below for more details. To feed the received data to a flight tracking service requires an internet connection. You can see the current near real-time worldwide flight information at

<https://globe.airplanes.live/> . The real power of this technology, besides the clear advantages for air

traffic control, is almost real-time visibility of almost all aircraft. For the hobbyist or enthusiast, a very modest effort will often make a huge difference in the quality of the tracking information. In many areas, large gaps exist in the feeder coverage, and more feeders are always valuable, particularly for MLAT.

Most flight tracker services are for-profit commercial enterprises. They aggregate the data provided usually by volunteers and use that data to make a profit. The exception is airplanes.live. That tracker is community-driven and is operated by a dedicated group of self-described “gentlemen nerds.” The tracking data is actually free and is available on at least one flight tracker (airplanes.live) without any restrictions. Often the commercial flight trackers will offer a super platinum premium all-access membership to verified feeders, basically giving access to the same data which is freely available at airplanes.live.

You can find out more about airplanes.live at <https://airplanes.live/>. Several gurus and enthusiasts are behind this growing flight tracker. They are all around the world, as are the feeders. In order to ensure that the flight tracker remains fully open and accessible, the airplanes.live operators have implemented legal measures to ensure that the site cannot be sold out from under the volunteer feeders and that the tracking information remains publicly accessible.

As mentioned above, building a feeder is a fairly straightforward exercise that would be a very good group or club project. The system consists of only an antenna, a software defined radio receiver, a processor like an old laptop or a Raspberry Pi, and some readily available open-source software. The cost of a Pi-based feeder system can be as low as \$60 to \$350, though use of some available components like an old laptop or computer running Ubuntu will reduce the cost at the expense of increased power consumption. Bear in mind that this article is intended to be an introduction rather than a fully verified step-by-step implementation recipe. Read on for an overview as well as some links to expert advice.

1. Antenna. The frequency of interest is 1090 MHz, and the signals will come from anywhere. Thus, an omnidirectional antenna with some gain is very desirable. An adequate outdoor antenna is at <https://www.ebay.ca/itm/334811187263>. In practice, though, height is considerably more important than antenna gain. Many feeders place an antenna in a house attic with good results, but mounting on an outdoor tower is better. Still, as a starter, a short lower gain antenna like <https://www.nooelec.com/store/sdr/sdr-addons/1090mhz-ads-b-antenna-5dbi-sma.html> is perfectly fine when mounted indoors, perhaps in a window. Cabling should be 50 ohm low-loss (at 1090 MHz) cable like LMR-200, observing the appropriate connectors and gender and site-dependent length. A cable like <https://www.amazon.ca/dp/B07S8V44VK> is suitable. For outdoor installation, lightning protection like <https://www.amazon.ca/Lightning-Arrestor-N-Female-Protects-Antennas/dp/B07JY6TD2T> is crucial.

2. Software Defined Radio. For a feeder, many SDRs exist, some good and some not so good. Generally, they are implemented as USB plug-in dongles like <https://www.nooelec.com/store/nesdr-smartee-sdr.html>. Ideally, look for an SDR that is in a

metal case for good heat dissipation, has a low-noise amplifier in the front end, and has a 1090 MHz band-pass filter. A source for an ideal SDR is being developed by airplanes.live. In the meantime, particularly in areas of high ambient RF noise, adding a filter and low noise amplifier between the above SDR and the antenna will work. Such a device is at

<https://www.ebay.ca/itm/266260156842>.

3. Processor. Many feeders use a Raspberry Pi or equivalent, though current availability is problematic but improving. A complete starter kit is at

<https://www.pishop.ca/product/raspberry-pi-4b-starter-kit-pro/>. Almost any older laptop or desktop will work very well. The processing load from a feeder is very small. The processor will also require an internet port, with Wi-Fi being a simple implementation. The network usage is also quite small, though definitely dependent on the number of aircraft signals received by the feeder.

4. Software. The operating system of choice is a Linux variant like Raspbian or Debian or Ubuntu. For airplanes.live, the actual ADSB software is open source and easy to implement. The steps below will install and activate the needed software:

a. Start with fresh up-to-date Raspberry Pi OS Lite installation, or for a laptop, a Linux variant like Ubuntu.

b. Next install the software that controls the SDR, namely `readsb` and `tar1090` packages by following the explanation at [https://github.com/wiedehopf/adsb-](https://github.com/wiedehopf/adsb-scripts/wiki/Automatic-installation-for-readsb)

[scripts/wiki/Automatic-installation-for-readsb](https://github.com/wiedehopf/adsb-scripts/wiki/Automatic-installation-for-readsb) .

c. To control and optimize your installation, `graphs1090` is extremely useful.

<https://github.com/wiedehopf/graphs1090>.

d. Finally, send the aircraft tracking data to the airplanes.live flight tracking service.

<https://github.com/airplanes-live/feed>.

If you are already a feeder to one of the commercial tracking services, you can easily also feed to airplanes.live. In place of all the instructions above, simply do the airplanes.live software installation described in paragraph 4, step d.

The aircraft tracking system at airplanes.live has a very active and friendly user community, particularly since it is built and maintained by gentlemen nerds. The best way to get support with a feeder is on the airplanes.live Discord server at <https://discord.gg/jfVRF2XRwF> or by an email to help@airplanes.live .

Anyone is encouraged to set up a new feeder, or to add airplanes.live to an existing feeder. Currently, almost 1,200 feeders to airplanes.live exist worldwide, and you can easily become one of them!

Last month there was a solar eclipse and amateurs all over the Americas were invited to participate by making contacts during the eclipse to study the ionospheric impact.

Dan, KB6NU, in his blog, included this article detailing this experiment as well as proposing future experiments to include ham radio. Included here is a shortened version.

Ham Radios Crowdsourced Ionospheric Science During Eclipse

Amateur radio operators who study space physics and the upper atmosphere probed the ionosphere's response to the 2023 annular solar eclipse using shortwave transmissions.

by Kimberly M. S. Cartier 26 October 2023

On 14 October, millions of people in North, Central, and South America peered through safety glasses and other viewing aids at the partially obscured Sun. Simultaneously, thousands of folks experienced the annular solar eclipse in a different way: through transmissions sent and received over amateur radios.

Before, during, and after the eclipse, ham radio operators pinged signals off the ionosphere and connected to people hundreds or thousands of kilometers away. The experiment, part of NSF and NASA's Ham Radio Science Citizen Investigation (HamSCI), is gathering hundreds of thousands of those contacts to investigate how the ionosphere responds to the temporary loss of sunlight during an eclipse.

This is our way of remote sensing the ionosphere," said Nathaniel Frissell (call sign W2NAF), a space physicist and electrical engineer at the University of Scranton (W3USR) in Pennsylvania and the lead HamSCI organizer. "People have been doing this for about 100 years, and it's gamified," he said. "We used this idea to create a ham radio contest that would actually be a scientific experiment."

Bending Through the Air

Earth's ionosphere, 80–600 kilometers above the ground, is a natural conduit for radio communication and navigation. Its charged particles bend the path of radio waves into an arc, enabling them to travel around the curvature of the planet from transmitter to receiver.

The ionosphere is densest during the day as high-energy sunlight ionizes molecules in the atmosphere, and it splits into four distinct sublayers segregated by density and ionization fraction, Frissell explained. A dense ionosphere helps radio transmissions travel longer distances and makes communications clearer.

At night, electrons recombine with positive ions to form neutral molecules, Frissell continued, lowering the percentage of ionized molecules and reducing the number of sublayers to just two. The lower density and fewer sublayers mean that some radio frequencies will be weakened as they travel, some will shift to higher or lower frequencies (Doppler shifting), and others might pass through the ionosphere entirely.

Depending on their frequency, radio waves will refract off the different sublayers, which are at different altitudes, affecting a signal's range. That dependence makes shortwave, or high-frequency, radio communication networks an excellent tool to probe ionosphere fluctuations.

"An eclipse is like temporary nighttime," Frissell said, allowing scientists to test whether the temporary darkness has the same effect on the ionosphere and radio communications as nighttime.

HamSCI was developed by ham radio operators who are also space physicists, atmospheric scientists, and communication engineers. The organizers use amateur radio to better understand ionospheric physics and its response to space weather, investigate how ionospheric disturbances affect ham radio communications, and grow awareness of and participation in the hobby's global community.

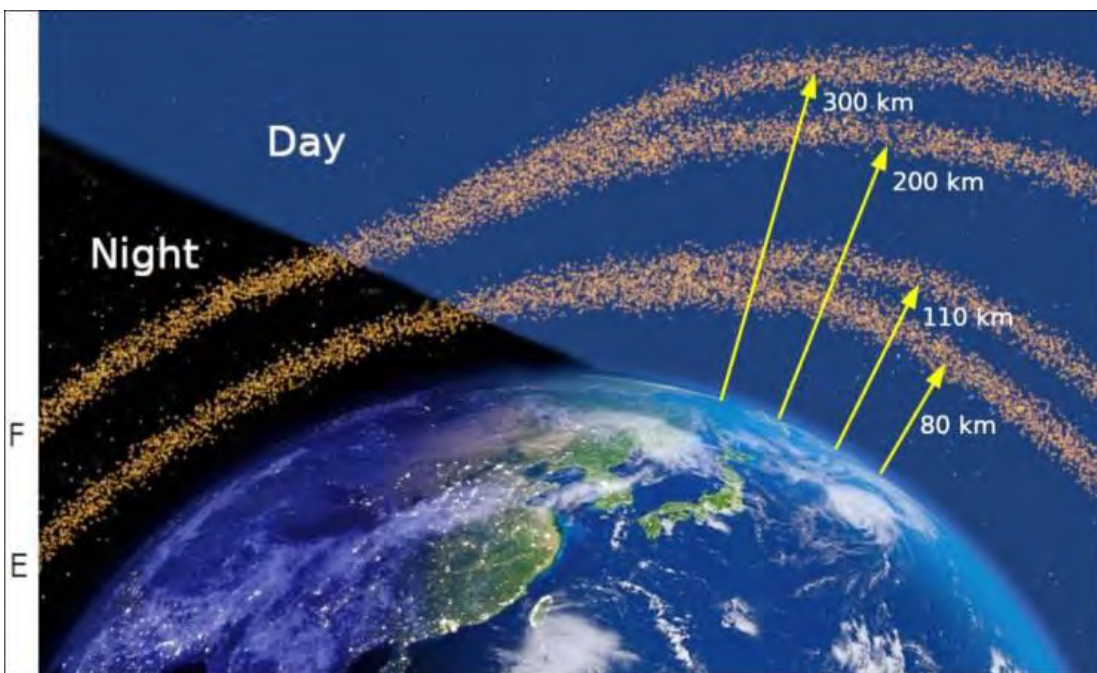
The participation statistics look promising, the team said. One count during the contest showed 8,300 active receivers around the world, picking up more than 3,000 reports per second.

"When my station was transmitting, we would easily get 500 reception reports globally in a 15-minute period," Frissell said.

Logs from the SEQP are self-reported; a few days after the eclipse, 139 logs had been submitted, each containing potentially hundreds of contacts. "There are likely more coming," Frissell said. "I haven't submitted my SEQP log yet!"

Repeating the Experiment

The 2023 SEQP was one of several events that HamSCI plans to hold as part of its Festivals of Eclipse Ionospheric Science. "An eclipse is the closest thing you can get to a controlled experiment in space," Collins said. "That's the appeal."



Experiments, after all, should be repeatable. There is an SEQP contest for the April 2024 total solar eclipse, and HamSCI will be looking to see whether the ionosphere responds the same way (near solar maximum) as it did in 2017 (near solar minimum), Frissell said.

Each contest also provides opportunities for the team to engage with students and

increase interest in amateur radio. Many ham radio operators got involved with the hobby when they were young, and for some it drove them to pursue a STEM (science, technology, engineering, and mathematics) education. "It gives a really solid STEM canon that has been boiled down into very straightforward training," Collins said.

Results from 2023

According to Frissell, no one had yet used amateur radio data to study the ionospheric response to an annular eclipse. The HamSCI participants didn't know what, if any, ionospheric response they would be able to see. At the top of their list of science questions: "Can the annular eclipse be observed in high-frequency communications?" Frissell asked.

The answer came quickly and was a resounding yes! As the eclipse began to locally collapse sublayers of the ionosphere, the distance a wave had to travel to reach the ionosphere changed. This Doppler shifted the frequency before it arrived at a receiver, and that Doppler shift appeared very clearly in preliminary data.

Answering other science questions—about the size and duration of the ionospheric disturbance, how different ionosphere layers responded, and whether eclipse communications resemble those taken at dawn and dusk—will have to wait until contest participants submit their communication logs.