The April 2023

NARA Newsletter

President's Message – Randy VE7FAA

How does a B.C. ham radio operator know it's spring? When the BC Public Service Net readjusts its schedule an hour forward to be consistent with the 0130 hrs UTS starting time.

The origins of the Nanaimo Amateur Radio Association date to the same year that the BCPSN was initiated 75 years ago, 1948 following the catastrophic Fraser River flooding in May and June of that year. Radio amateurs in Nanaimo at that time formed NARA, recognizing that a formal amateur radio organization was an important way to assist provincial emergency infrastructure.

As NARA celebrates its 75th year perhaps the only consistency since 1948 is the continued risk of natural disaster. While amateur radio in Canada has never had a mandate to do emergency work, being prepared to assist where possible remains an important part of the Amateur Radio Service.

On the topic of anniversaries, this issue marks the first year of the NARA Newsletter. We hope you've enjoyed the prior 11 issues. Your support and interest continue to make it a success. On that note, we wish the best of luck to the Cowichan Valley Amateur Radio Society newsletter, which recently started up. The more the better!

And yet another anniversary to mention: March 17 was one year since the fire that destroyed the NARA club house and recreation centre on Wingrove Street in Departure Bay. NARA remains as active as ever — perhaps even more so. Though it's taken some time we have the new club space at the 205 Collishaw Air Cadet Squadron on Nanaimo Lakes Road. Work there to install a station is now under way.

One of the first club events to be held at the Air Cadet site will be a GPS/Navigation/Safety/SAR workshop on April 15. It goes O930-1500 hrs. There will be coffee, pizza for lunch (no charge) and door prizes. Another event to put on the calendar is the NARA summer picnic, on July 15 at the Bowen Park lower picnic shelter. Details are on the NARA website.

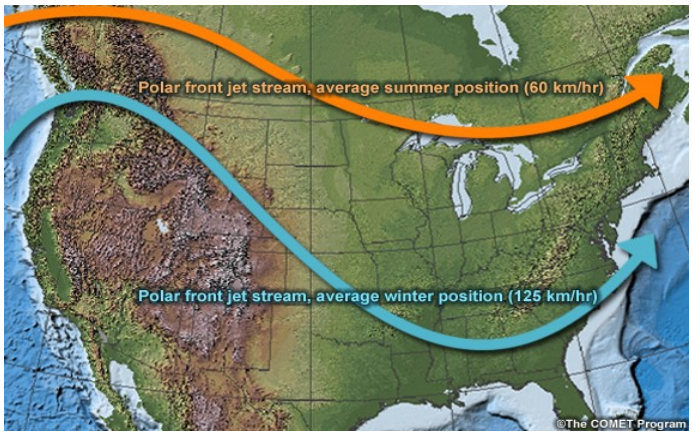
Finally, April 18 is World Amateur Radio Day. After Marconi set the technological infrastructure of radio in motion nearly 125 years ago, amateur radio in a changed and changing world continues to be a vital force. Celebrate it.

Island Events	Date	NARA Coordinator
Merville Flea Market	*April 16*	*Comox ARS*
Field Day at Sunnus Farm in Cedar	June 25/26	VE7PK
Canada Day	June 30/July 1	NARA
NARA Picnic	July 15	VE7PMD
Bathtub Race	July 23	VE7TOP
NIARS Campout	*August 17-22*	*NIARS*
VIEX	August 25	?
Velo Unpaved Bike Race	August 26	VA7DXX
Ham Happenings	September 17	NARA
Sweepstakes Contest	November 18	NARA
Canada Winter Contest	December	NARA

The Pica Balloon Project

A group made up mainly of NARA members is investigating the possibility of a pica balloon launch from Vancouver Island. This follows an initial Zoom meeting on March 11. Pica balloons are intended to rise to more than 45,000 feet, clear of aircraft, and travel around the planet via the jet stream for weeks or months.

Pica balloons typically carry small payloads of up to about 30 grams. It is intended that the first balloon to be launched by the group will carry a small 20m WSPR transmitter. If you have an interest in this project, please contact Devan VE7LSE at ve7lse@gmail.com.



This shows the typical path and speed of the jet streams across north America during summer and winter

How is DX – David VA7DXX

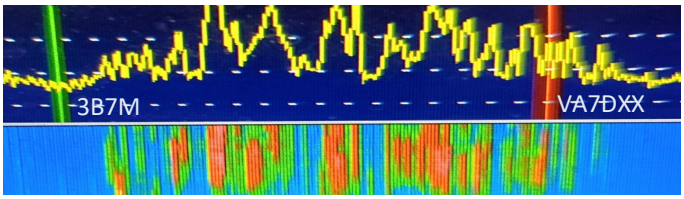
In contrast to the very weak signals from 3Y0J on Bouvet Island, the DXpedition to St Brandon Island in the Indian Ocean, signing 3B7M, peaked to S8 with me on 20m CW in early March.

Although not that high on the American west coast wanted list at position 54, 3B7M made quite a splash on the HF bands. Eight operators from the Slovak republic made some 120,000 contacts during their stay on St Brandon Island, which, apart from the occasional fishermen, is uninhabited.

I did manage to work 3B7M, over the North Pole, on CW on several bands but my 20m QSO was a bit of a whoops! I had not had my first coffee of the day, or that's my excuse! I started calling 3B7M and after a few calls some kind person sent "VA7 UP" on the DX stations frequency. Oh dear, I had forgotten to press the split (frequency) button on my radio! So, now I really am a fully qualified member of Gerry's Wrong Button Club!

The 3B7M DXpedition team on St Brandon Island

As you likely know all of these major DXpeditions operate split frequency and the trick is to find out exactly where the DX station is listening. It's rather like using a repeater on the VHF/UHF bands but not knowing the input frequency of the repeater! You find the input frequency to a DX station by listening to other stations who have just had successful contacts and it's somewhat of an acquired art mixed with some luck! So, as well as listening to the DX station, in case they reply to you, you also have to listen around inside the pile up itself.



The large pile up for 3B7M on 20m CW in early March

On the evening/night of March 23-24 there was an extremely strong geomagnetic storm (G4) and associated massive aurora. Forecasters did not see this one coming and its cause was unclear, though likely a ripple effect from a near miss CME. The aurora was seen as far south as New Mexico and was the most intense in six years. It was so far south that it blocked the path between my station in Ladysmith and my regular CW contact with Boston on 80m. Even the relatively local DXpedition CY0S on Sable Island was not audible on 80m that evening.

April sees several more DXpeditions in the pipeline including: Mayotte (FH), Turks & Caicos (VP5), Austral Islands (TX5XG), South Cook Islands (E51), British Virgin Islands (VP2V), Jamaica (6Y), Uganda (5X2I), Maldives (8Q7KB) and Monaco (3A). Monaco is a rare DX country of some 2.1 square kilometres on the north shore of the Mediterranean Sea and often described as a concrete jungle with few good antenna locations. Italian operator Ennio will sign 3A/IW1RBI. Also, from Monaco special callsign 3A8AB will be on the air during April.

As a part of DXing I enjoy collecting QSL cards, even though I do regularly update my contacts to the ARRL's Logbook of the World. The latest card I received was from the J28MD Djibouti Dxpedition in October/ November of 2022. Djibouti was a new country for me from Canada as were the more recent DXpeditions to Crozet and Bouvet. Speaking of the 3Y0S Bouvet operation I heard that a third Vancouver Island station VE6SH/7 also made contact on 30m FT8.

The Djibouti October/November 2022 Dxpedition QSL card

Inside the envelope of QSL card which I recently received was an advert for a piece of software called 'BBLogger'. This is a piece of free logging software. If you are intending to go DXing or indeed contest operation, then logging software is essential. I have not tried BBLogger,

but it looks like a very good layout on the screen and appears to be fully featured, plus the price is right. Features include the usual CAT control, cluster integration, awards management, LoTW, QSL labels, etc. If you are interested to look at this software, you can check it out and download BBLogger from http://www.on4ya.be/bblogger-1-0-3-0/.

NARA Navigation Workshop

Are you interested in APRS, GPS, maps, navigation, Search and Rescue and associated topics? If you are then consider signing up for the NARA Navigation workshop which is being held on Saturday, April 15 at the Air Cadets location at 719 Nanaimo Lakes Road. There is no charge.

The session starts with coffee at 9:30 am with workshops, a pizza lunch provided and door prizes. Contact NARA secretary Devan VE7LSE at ve7lse@gmail.com.

World Amateur Radio Day

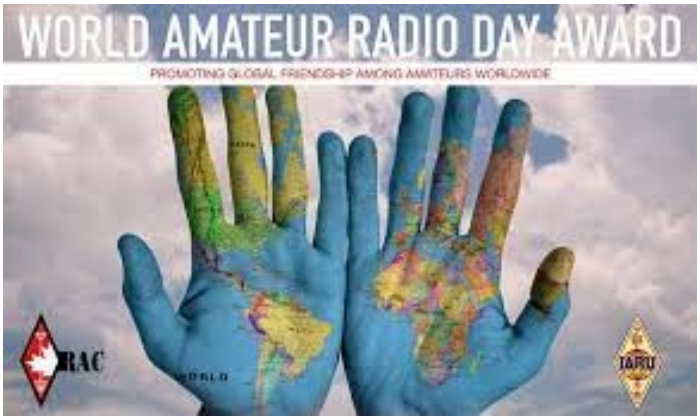
On April 18 we celebrate World Amateur Radio Day, which commemorates the founding of the International Amateur Radio Union in Paris in 1925. In 1927, and as a result of IARU action, amateur radio gained bands of frequencies at 160, 80, 40, 20 and 10 metres; those bands are the ones recognized today. Since 1925 amateur radio has gained several additional HF bands thanks to the hard work of the IARU volunteers and national societies around the world.

If you are a keen radio amateur, then it is important to support the work of the IARU in maintaining the status quo of our amateur bands through their work with the International Telecommunications Union. You can support the work of the IARU by joining your national society, which in Canada is the Radio Amateurs of Canada.

Each year a small portion of your RAC subscription is passed to the IARU to support their work. It is worth remembering that the three million (plus) radio amateurs around the world cannot enjoy our unique hobby without access to all the radio bands which we use; our most precious assets.

Demonstrating the continuing support of amateur radio by the IARU, several amateur radio volunteers will represent the IARU at the ITU Conference Preparatory Meeting in Geneva, Switzerland, ending on April 6. Amateur Radio volunteers presently in Geneva might activate the ITU station 4U1ITU if time permits. The next ITU World Radio Conference (WRC) takes place in Dubai, UAE, from Nov. 20 to Dec. 15, 2023.

In Canada World Amateur Radio Day is celebrated by the Radio Amateurs of Canada through the operation of the official RAC stations being on the air. RAC official stations will operate across Canada from 0000Z to 2359Z on April 18 using the call signs are VA2RAC, VA3RAC, VE1RAC, VE4RAC, VE5RAC, VE6RAC, VE7RAC, VE8RAC, VE9RAC, VO1RAC, VO2RAC, VY0RAC, VY1RAC and VY2RAC. Contact with any of the official RAC stations of April 18 qualifies you for the RAC Get on the Air certificate. RAC encourages every amateur in Canada to get on the air and make some contacts.



RAC's World Amateur Radio Day certificate. If you work any of the official RAC stations on April 18 you qualify for this award

Comox Valley ARS – Swap Meet

The Comox Valley Swapmeet takes place on April 16. The location is the Merville Hall at 1245 Fenwick Road, off Highway 19A. Doors are open to the public at 10 am. There will be a talk-in station using the Mt. Washington repeater (146.780 MHz, - shift & 141.3 Hz).

Special Prefixes – King Charles III Coronation

The coronation of King Charles III takes place on May 6, 2023. During the period from May 5 to July 2 amateurs in Canada will be able to use special prefixes. In place of their normal VE7 prefix amateurs can use CK7 and in place of the normal VA7 prefix amateurs can use the CJ7 prefix.

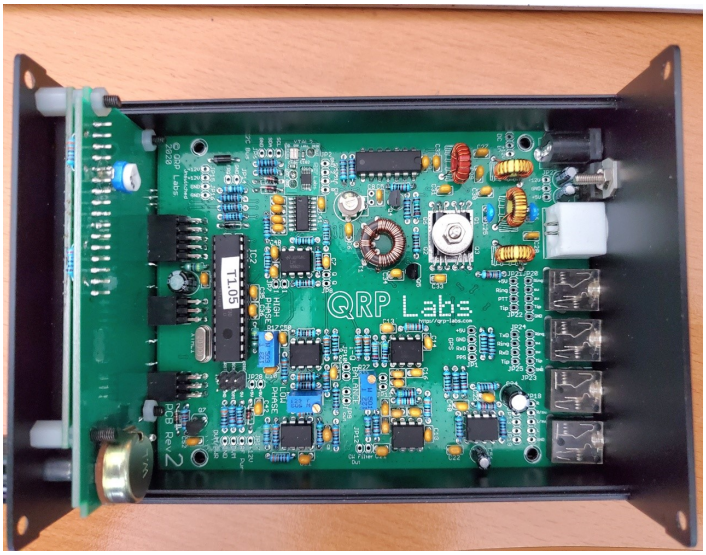
Building Kits – David VA7DXX

I have recently rediscovered the delights of building radio kits. I was building my own transmitters and VHF convertors just after I received my licence, and later in my teens started to build Heathkit projects. However, the last serious project I built was an Elecraft K2 and ATU, about 15 years ago. The K2 is an all-band HF CW/ SSB transceiver which runs 100 Watts output. Actually the K2 is two projects, the 10-Watt transceiver and the 100-Watt amplifier which is later mounted inside the same case as the radio. In past NARA field days Gerry VE7BGP and others have operated this radio.

In 2020 I purchased a 'QRP Labs QCX + CW transceiver' but the kit laid in a drawer and it never got built. In February this year, following a visit from a radio amateur friend from Vancouver, I was inspired to get out my soldering station and build this kit. The QCX + CW kit is a small transceiver designed for one band only. I chose to build the transceiver for the 30m band. It took me just over a day to build, including winding five toroid coils and about 45 minutes to test and align the radio. All of the test gear needed to align the radio is cleverly built into the circuitry, and you peak and null several circuits using headphones and a bar graph – rather like an S-meter – on the small LCD display.

The QRP Labs QCX+CW Transceiver can automatically display received and sent CW on the small screen

I finished aligning this 5-Watt output radio one evening, put it on my 30m dipole and called CQ. Using the reverse beacon network I immediately got two reports, one from California and the other from Wisconsin. I then tuned to the bottom of the band and heard the commercial RTTY signal from Germany, which is a great propagation beacon for the 30m band. This small transceiver can be purchased with a metal enclosure. The complete price is $82 (US), a real bargain, if you have reasonably accurate soldering skills and are prepared to build the radio kit yourself. Having completed the radio and got it running I ordered the matching single band 50W power amplifier at a cost – with enclosure – of $50 (US).



The circuit board layout of the QCX+CW Transceiver kit

If you are interested in the WSJT-X range of digital modes – or JS8call - then the QRP Labs QDX five-band HF digital transceiver is a great way to go. This 5-watt radio, with embedded SDR receiver and sound card has no controls; it is a black box entirely CAT controlled from your PC. This kit, together with the metal case is another bargain at $89 (US).

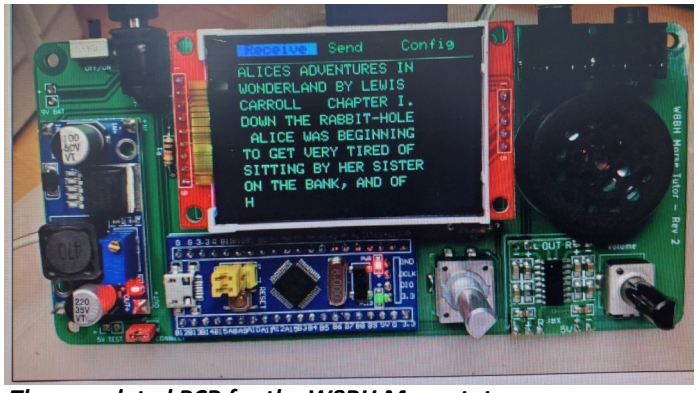
So, I am back into building kits again and can highly recommend the QRP Labs projects; their products are very well designed and have an excellent reputation. Their website at https://qrp-labs.com/qcxp.html is well worth looking at if you are interested in building some low power equipment.

There are many other kit manufacturers and if you enjoy building things as part of your amateur radio experience it is worth looking around. Kits are certainly an inexpensive way of getting on the air.

My next build project will be the W8BH Morse tutor. This Morse tutor will do lots of clever things and is ideal for both the beginner and for those who want to improve their Morse speed for contesting and/or DXing.

Apart from being able to adjust the speed and output tone of the W8BH tutor you can also adjust the spacing between characters. This adjustment of the spacing between letters ability is called the Farnsworth method and is used in Morse teaching. With the W8BH Morse tutor you can also play a text file stored on a mini-SD card.

Bruce W8BH does not sell kits but together with a friend we have ordered all of the parts including the printed circuit board, the display, and the CTM32F103 32-bit microcontroller. I also have the files if anyone wants to 3D print a case for the tutor. In all, the cost of the parts, less case, will be about $50. I have a few spare kits of parts and if any NARA member is interested, I will supply a set of parts on a first come basis. The programming for the microcontroller will have been completed and will come with this set of parts. I emphasize that this is not a NARA club project. Full details of the W8BH Morse tutor are available at http://w8bh.net/MorseTutor1.pdf. If you are interested to build the tutor please contact me at va7dxx@gmail.com



The completed PCB for the W8BH Morse tutor

If other NARA members have recently built kits, it would be good to know more and describe their experiences in the NARA Newsletter at news@ve7na.ca.

Lightning Protection Basics for the HF Station

The ARRL recently published – thanks ARRL – a short article by Walt KC1DON on basic lightning protection. Although we don't typically get too much lightning around Nanaimo, it does happen and it's worth knowing the basics. Here are some of the highlights.

Lightning as a natural phenomenon is usually (about 90% of the time) a downward negative electric discharge, with the earth as the anode. The length of the discharge is usually 1 second or less, and the potential can vary between 40 and 120 kV. Once the arc is established, the rise time to peak current is about 0.3 seconds, during which time the peak current flow can be from 5 to over 200 kA. If we consider the time integral of the lightning current over the entire flash duration, the energy released is something on the order of 10 billion watts. The key takeaway with this amount of energy is, we don't need to take a direct hit to cause harm to people or damage equipment. A lightning strike will induce hazardous voltages in nearby conductors through induction or via any reasonably conductive material.

I am assuming that nobody will be operating their station when lightning is anywhere in the vicinity, and all equipment is de-energized and grounded per recommendations in the ARRL Handbook. Even in this condition, the two routes that damaging amounts of energy can be coupled to a transceiver are via the power supply and the antenna connections, with the antenna connection being far more vulnerable. These two routes require different protection strategies.

Protecting the antenna connection is a little more challenging. As a kid I would unscrew the feed line PL-259 and stick it in a pickle jar, which sort of worked. In modern times we have coax antenna switches, and it goes without saying your transceiver should always be switched to a dummy load of an appropriate power rating when not in use. The dummy load is highly recommended to avoid transmitting into an open circuit when one inevitably forgets to throw the switch. Some switch manufacturers such as Alpha-Delta and Daiwa also incorporate gas discharge tube (GDT) surge protection. Look for a switch that grounds all unused connections and be sure to ground the switch body itself. 450-ohm ladder line can be protected by old-time knife switches, which are getting scarce. The second step is to add a GDT- type lighting arrestor which will shunt current to ground when the gas ionizes at a given voltage. As with SPDs, not all GDT arrestors are suitable for amateur use. Ideally, we want a device having a low let-through energy and minimal insertion losses. As part of my professional work with industrial radio modems, I found the Polyphaser IS-NEMP series offers the happy combination of low VSWR from 1.8 MHz through low-band VHF and a very fast-acting GDT. The housing and connectors are built to mil-spec standards. Again, there are less expensive arrestors of dubious provenance available through online sources. I caution some of these will demonstrate much greater VSWR than is advertised.

KC1DON suggests two comprehensive resources are Grounding and Bonding for the Radio Amateur (2nd Ed., ARRL), and a three-part series, "Lightning Protection for

the Radio Amateur (2nd Ed., ARRL), and a three-part series, "Lightning Protection for the Amateur Radio Station," by Ron Block, KB2UYT (now NR2B), which was published in the June, July, and August 2002 issues of QST. The later articles are available for free online at http://www.arrl.org/lightning-protection.

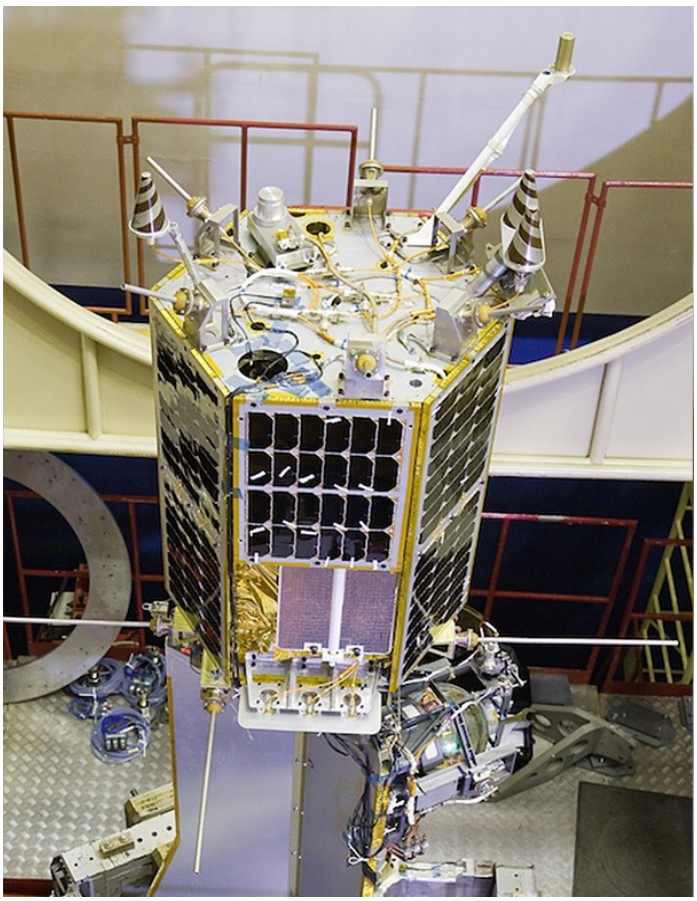
Getting Started with Satellite Operations (Part 5): Introduction to Linear Satellites Bruce VE7PTN

Welcome to the fifth article in my series on operating amateur radio satellites. Last month's article was about gearing up for satellite operation. Unfortunately, an important paragraph was omitted from that article. So, I'll begin this month's article with that missing paragraph:

When it comes down to bang-for-the-buck, for amateur radio, the best investment is in a good antenna (or six!). This is very true for satellite operation and the most popular choice by far is the Arrow II Portable Antenna by Arrow Antennas (http://www.arrowantennas.com/arrowii/146-437.html). An attractive feature of this antenna is that there are separate connections for the VHF and UHF antennas making it easy to use two radios for full duplex operation. There is a model that includes a built-in duplexer; but unless you have a low-power full-duplex radio like the Kenwood TH-D72A, the duplexer is not that useful. I recommend the "10BP" model – it does not have the duplexer but does have the "backpack" option that allows the boom to be split into two sections for easier transportation. A less popular option is the Elk Antennas dual band log periodic antenna (https://elkantennas.com/product/dual-band-2m440l5-log-periodic-antenna/). By design, this antenna has a single antenna connection without the need for a duplexer.

OK. Now on to the topic for this month: an introduction to "linear" satellites. These satellites are quite different from the FM satellites that I have discussed so far. There are two main differences: first, they function as linear transponders, meaning that they will retransmit all signals that are received within their pass band, and since the passband is wider than the bandwidth required for a QSO, multiple QSOs may occur simultaneously; second, the supported modulations are SSB and CW, not FM. Most of the linear satellites have an inverting transponder; a Lower Sideband (LSB) uplink is retransmitted as an Upper Sideband (USB) downlink (or vice versa). The convention is to use whichever sideband on your uplink such that your downlink will be USB. So, if the satellite is inverting then your uplink should be LSB; if it is non-inverting then your uplink should be USB. A handy summary of linear satellite frequencies and modes can be found on the AMSAT website at https://www.amsat.org/linear-satellite-frequency-summary/.

Let's look at the specifics for one of the most popular linear satellites, RS-44.



Russian linear satellite RS-44 showing the antennas, 435 MHz top and 145 MHz bottom (photo from AMSAT-UK website)

The RS-44 satellite was launched by Russia for amateur radio use on Dec. 26, 2019, from the Plesetsk Cosmodrome. Its transponder is a "V/u" inverting type; the uppercase V indicates that the uplink is in the VHF band and the lowercase u indicates that the downlink is in the UHF band. The passband is 60 kHz. Allowing for 5 kHz per QSO, this satellite supports about 13 channels for simultaneous use (Table 1). For example, a signal uplinked at 145.955 MHz LSB will be downlinked at 435.650 MHz USB at mid-pass and would not interfere with QSOs on adjacent channels. Just like FM satellites, the UHF frequencies have the most Doppler Shift.

In Table 1, at the bottom of this page, there are five rows for the UHF frequencies to show how they vary from Acquisition of Signal (AOS) to Loss of Signal (LOS) as the pass progresses. Of course, this frequency cheat sheet represents a perfect world, and sadly this is not the world that an amateur radio satellite experiences. Each satellite goes through incredible temperature fluctuations on every pass, so the actual frequencies will shift a bit. For RS-44, I typically find that the downlink on RS-44 is 0.4 to 0.8 kHz lower than the table would suggest. Speaking of the table, it is an excerpt from a super-helpful spreadsheet that is maintained by Paul Overn (KE0PBR) and found on his website at: https://ke0pbr.wordpress.com/2018/12/31/my-frequency-cheat-sheet/.

Of course, to work linear satellites you will need a VHF/UHF radio with the SSB mode. So, most handhelds are not going to fit the bill here. Last month I recommended the Yaesu FT-818 (two needed), Icom IC-705 (two needed) or the Icom IC-9700 (only one needed). Getting two of the Yaesu FT-818s is the cheapest option but comes with limited power and no waterfall display or QSO recorder. The most expensive route is the two IC-705s but is the most portable. So if you are interested in roving this might be the way to go. The IC-9700 is the middle cost option and has the advantage of higher transmit power. The 9700 also has a dedicated satellite mode with coordinated crossband tuning (e.g., tune VHF up frequency and the UHF side goes down by the same amount), which makes operation much easier. You are probably realizing that there will be more knob-twiddling for linear satellites compared to FM, and this is true. So it is helpful to have your "handheld" antenna mounted on a tripod, at least until you get more comfortable with operation.

To get started, as always, I recommend that you start with listening. The procedure here is very similar to FM satellites. Find a satellite pass that works for your schedule and location, point your antenna, and tune your radio. Just remember that for linears, you have the whole passband to search and not just a single frequency. By convention, CW operation tends to be in the lower half of the passband while SSB voice is in the upper half. Linear satellites tend to be higher orbits than FM satellites, so the pass lasts longer (e.g., about 20 minutes for RS-44). When you find a QSO in progress, notice that constant tuning is required to keep the signal readable. You can use your tuning dial for this of course, but if your radio is equipped with Receive Increment Tuning (RIT) then you may find this feature is useful for fine tuning. It is particularly useful if you have your passband channels set up as memories in your radio and/or tuning software. The RIT setting will stay in place as you switch channels so your new channel selection will already be tuned for the appropriate offset for the day.

Low-tech mount for Arrow II antenna. Built from 3/4" PVC water pipe. Joints friction-fit only to allow for repositioning. The Arrow boom is loose in the PVC tee so that it can rotate for polarization matching during the pass.

RS-44 (DOAFF-8)												Beacon:	435.605	
VHF	Up - LSB	145.995	145.990	145.985	145.980	145.975	145.970	145.965	145.960	145.955	145.950	145.945	145.940	145.935
AOS	Down - USB	435.620	435.625	435.630	435.635	435.640	435.645	435.650	435.655	435.660	435.665	435.670	435.675	435.680
2		435.615	435.620	435.625	435.630	435.635	435.640	435.645	435.650	435.655	435.660	435.665	435.670	435.675
Mid		435.610	435.615	435.620	435.625	435.630	435.635	435.640	435.645	435.650	435.655	435.660	435.665	435.670
4		435.605	435.610	435.615	435.620	435.625	435.630	435.635	435.640	435.645	435.650	435.655	435.660	435.665
LOS		435.600	435.605	435.610	435.615	435.620	435.625	435.630	435.635	435.640	435.645	435.650	435.655	435.660

A "frequency cheat sheet" for RS-44, taken from the spreadsheet provided by Paul Overn (KE0PBR) as found on his website:

After hearing a few QSOs you should notice that they are somewhat different from FM satellite QSOs. The first difference to note is that an operator will call "CQ" (something I said NOT to do on FM satellites). This is because other operators will need to find you in the passband and may need some time to get you dialed in. Another difference with linear satellite QSOs is that they may be much longer. Since many simultaneous QSOs may happen, there is no worry about monopolizing the pass as there would be for FM. And because it is SSB, it is possible to read signals from more than one operator on the same frequency at the same time (within reason). So once contact is established between two stations and grid squares exchanged, there may often be some rag-chewing unless one of the stations is a rover and there is a queue of stations waiting to work them.

I'll finish up this month's article with a list of popular linear satellites and their operating considerations (i.e., quirks). Next month's article will cover how to operate linear satellites.

AO-7 (https://www.amsat.org/two-way-satellites/ao-7/)

* Launched in November 1974, making it the longest operating communications satellite ever.

* Operates in one of two modes and may randomly switch between modes; Mode B is the easiest to operate (U/v: UHF up and VHF down); Mode A is VHF up and 6m down.

* High orbit gives it a huge footprint and long passes.
* Relatively weak downlink; VHF downlink so more susceptible to QRM.

* The Mode B uplink frequency is outside of the satellite sub band in UHF band plan; satellite operation in this range is not permitted in some countries but is grandfathered in US and Canada.

CAS-4A / CAS-4B (https://www.amsat.org/camsat-cas-4a-4b-linear-transponder-payloads-launched/)

* Orbits west to east.

* Lower orbit makes these faster satellites with smaller footprint compared to AO-7, FO-26, and RS-44.

*VHF downlink so more susceptible to QRM.

FO-29 (https://www.amsat.org/two-way-satellites/fo-29-jas-2/)

* Probably the loudest of the linear satellites and easiest to operate

* Orbits north to south/south to north.

* May be inactive at times so check AMSAT status page.

JO-97

* Relatively loud and easy to operate.
* A good performer but not as popular as other satellites for some reason.
* Orbits north to south/south to north.
* VHF downlink so more susceptible to QRM.

RS-44 (https://amsat-uk.org/2020/04/30/dosaaf-85-rs-44-amateur-radio-transponder-activated/)

* The most popular linear satellite. Best choice for getting started and for DX (Japan and Europe contacts are possible with a good station setup).
* Prone to fading out during the pass; when launched it did not separate from the rocket upper stage and now tumbles while orbiting leading to fading.
* Orbits north to south / south to north.

XW-2A (https://amsat.org/wordpress/wp-content/uploads/2015/09/XW-2CAS-3-Sats.pdf)

* Lowest orbit / fastest linear satellite makes it tricky to work without automated tuning software to keep up with the Doppler Shift.
* Transponder shuts down every few seconds and then restarts; watch left side of your waterfall for the telemetry signal to restart, indicating that transponder is also active.
* VHF downlink so more susceptible to QRM.
* Orbits north to south / south to north.

Homemade tripod adaptor for Arrow II antenna (top). Built from 3/4" PVC conduit, ABS sheet and U-bolts with a shoe to fit the tripod head. Adapted to the Arrow's boom using a 3/4" hose barb that is stiffened with a 7/16" x 2" bolt inserted inside (not visible). The U-bolts are loose enough to allow the shaft to rotate for polarization matching during the pass

The volunteer group of NARA members producing this newsletter would like to thank all those who provided material for this month's issue.

The NARA newsletter is normally published on the last Friday of the month preceding the month of issue.

News items and comments should be mailed to:

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