PCARA Update

Volume 15, Issue 4 Peekskill / Cortlandt Amateur Radio Association Inc. April 2014

Spring cleaning

What better way to celebrate Spring than to clean your shack? On April 27, 2014 you'll have an excellent opportunity to turn your no-longer-needed equipment and treasures into some extra cash. To help you with this, PCARA has taken a table at the Orange County Amateur Radio Club (OCARC) Hamfest on Sunday April 27, at the Wallkill Community Center in Middletown, NY. Whether you have anything to sell or not, please consider joining us. For more information on the OCARC Hamfest, please visit their website at: http://www.ocarc-ny.org/.

Mike N2EAB and Bob N2CBH man PCARA's club table at the 2013 OCARC Hamfest. Jim N2KLC checks the offerings.

Sound the horn and let loose the hounds! More accurately, gather your Yagis and attach your attenuators, the next PCARA Foxhunt is scheduled for May 10, 2014 at 3:00 pm. As in years past, the hunt will begin at the Beach Shopping Center in Peekskill, NY and end at a local restaurant of the Fox's choosing. For this hunt, the Fox will be played by Mike, N2EAB who is known to be very tricky. Details will be discussed at the April meeting.

This year the ARRL celebrates its first 100 years with the ARRL National Centennial Convention 2014 at the Connecticut Convention Center in Hartford, CT from Thursday, July 17, 2014 to Saturday, July 19, 2014. This is an opportunity for PCARA to take part in the historic event. At the March 2014 meeting there was a consensus that members would like to participate in the Convention and to pick one of the available days to attend. The date chosen was Saturday, July 19, 2014. Anyone interested in helping with planning and logistics, please contact us at mail'at'pcara.org. For further information on the Convention, please visit: https://www.regonline.com/builder/site/Default.aspx?EventID=1248082.

Our next regularly scheduled meeting is on Sunday April 6, 2014 at 3:00 pm at Hudson Valley Hospital Center in Cortlandt Manor, NY. I look forward to seeing each of you there.

- 73 de Greg, KB2CQE

PCARA Officers

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Greg Appleyard, KB2CQE, kb2cqe at arrl.net
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Hunt and Find Edition!

Net night

Peekskill/Cortlandt Amateur Radio Association holds a weekly net on the 146.67 MHz W2NYW repeater on Thursdays at 8:00 p.m. Join net control Karl, N2KZ for news and neighborly information.

Adventures in DXing

- N2KZ

HD Radio

It finally happened. I drove a vehicle fitted with a sound system that included HD Radio! I was given a 2014 Toyota Tacoma loaner when I brought my 2002 mini-van in for repair and the radio actually included HD Radio reception. An HD logo was even on the front panel. I smirked: "OK..."

Karl's experience of mobile HD Radio began in this Toyota Tacoma truck.

The first thing I learned about HD Radio? Trying to follow primary channels is not too difficult. If the digital signal is lost, the radio reverts to good old analog. I honestly could not tell when I was listening to a primary channel on FM or its HD twin. So, what is the point of HD?

Additional audio services available via HD Radio are another story entirely. My discoveries began on my drive from Danbury, Connecticut headed for Mt. Kisco. Although it wasn't hard to tune in stations I knew had HD digital, it was very hard to lock onto their HD2 or HD3 services for any period of time.

For example, I live on a fairly high hill. Everyday TV and FM reception from New York City is easy and multipath free. A perfect place to pickup an HD Radio signal? Maybe not! I tried for WCBS-HD2, a virtual channel of 101.1 WCBS-FM carrying the audio of WCBS-AM 880, and I could not resolve the digital HD Radio part of their broadcast at all!

I would slowly inch the car around my driveway and find a spot where it would almost lock in, then… poof! It would drop out again into silence. No high fidelity stereo WCBS Newsradio 88 for me! Without an analog signal acting as a backup, if you lose an HD2 or HD3 service, you lose it all!

On AM, it was a little different story. When I could lock onto a digital AM channel, the digital stereo audio would fade in over the analog slowly, but if you lost digital, it dropped back to analog immediately. I found WCBS-AM 880 to be the best choice for somewhat continual HD reception, but it took some getting used to.

How did AM HD sound? Do you remember playing beloved old cassette tapes? The thin cassette tape would be out of shape from being out in the sun or surviving days sitting in a car player during the summer. You revisited the tape and now it skewed funny across the tape playback heads. The spatial information, high-end fidelity and overall stereo would wow and fade back and forth. What's old is new again! That's how AM HD Radio sounds!

Overall, HD Radio did not have much to offer me. Some stations provided on-screen explanatory text, a station logo or even a picture of the artist being played. I also noticed the radio itself had several stock pictures to be used when nothing was sent from the station itself. The swinging young girl hipster representing 'Pop' stations made regular appearances on the radio's touch screen.

2014 Toyota Tacoma HD Radio touch-screen. As well as station logos, traffic and weather services are available.

The one feature that was really appreciated was hidden under the 'options' touch button. Hit 'options' on the touch screen and you were offered the ability to turn the HD Radio decoding off! What a relief! Ten years waiting to finally get an opportunity to hear HD Radio and all I wanted to do is turn it off!

It really is a shame. HD Radio has been around for over a decade, yet it still can't claim viability. There simply isn't enough signal strength to sustain reliable reception unless you are a mile from the transmitter tower. It makes you appreciate just how good analog AM and FM really are!

This reviewer found additional irony during my afternoon of trials. The AM system actually sustained much better overall reception compared to FM… with the proviso that you promised you wouldn't get seasick from the continuing rolls of changing phasing and equalization! It just isn't ready for everyday use.

The Toyota Tundra's radio also provided some

interesting 'apps' including the ability to bring in several levels of weather information. This model was not Wi-Fi capable, although it did offer a full package of channels via XM satellite radio. The XM reception was very good, holding lock except for impossible places like underneath rural steel bridges. One thing for sure, things have changed a lot since the era of AM car radios with mechanical pushbuttons!

Still Seeing The Light

What does 2700 degrees Kelvin mean to you? Warm light is always just right. To me, it is essential. I design light according to relative brightness and I always try to create an even and harmonious look to my house or anywhere I go. Why such a passion for home illumination? My college degree was in Technical Theatre with an emphasis on lighting design. I am a certified light bulb nerd.

Sometimes it is painful to adapt to technological progress. The Energy Independence and Security Act of 2007 is now in its final stages, taking the last remaining 40 and 60 watt incandescent light bulbs off the shelves forever. After all my hoarded light bulbs are used, burnt out and useless, great creativity will follow! One of the provisos of the EISA allows 'specialty' bulbs

The shelves are empty of 40, 75 and 100 watt standard incandescent bulbs at Karl's local Home Depot store.

to continue to be sold. This includes 3-way bulbs, industrial and rough service bulbs, appliance lamps, reflector lamps and decorative candelabra lamps. I'll be holding on until the last photon fades! Until then, I will do all I can to keep my light warm!

A Very Silent Key

We pause to remember Nancy Kott, WZ8C. Nancy served as manager of The International Morse Preservation Society — also known as FISTS — the premier CW enthusiast club throughout the world. Nancy passed on March 2 aged 58 years.

Nancy was a ball of energy, enthusiastically taking care of thousands of members' problems, requests and merchandise purchases and edited a full color FISTS newsletter for the masses. In her spare time, she attended many events representing FISTS including the Dayton Hamvention and also served as editor of the magazine *WorldRadio*.

Nancy was proud to be a member in the ARRL's A-1 Operator Club and really loved her code! It is hard to imagine that she will no longer be holding court at FISTS headquarters in Michigan. Others will carry on but it will never be the same without Nancy's signature charm and wit. Her smiles will be remembered a long time. Rest in peace. Dit dit.

Nancy, WZ8C operating as V31AN during a Texas DX Society/FISTS DXpedition to Belize in 2006.

Sacking Sackville

The second week of March saw the world come tumbling down, especially if you were passing the Tantramar Marshes outside of Sackville, New Brunswick, Canada. For 67 years, 13 tall towers hoisted the signals of Radio Canada International to the world. Final broadcasts were made last October 12 and the antenna tuning doghouse huts, support poles and wiring have all since been removed. Now it is the towers' turn to come down.

Over the period of about ten days starting March 14, all 13 towers will have their guy wires released, one by one, in a calculated sequence. When each tower's final wire is released the tower should fall in a predetermined direction and crash to the ground. Some towers will be immediately recycled. Others, long ago painted with lead paint, will first be cleaned before eventual meltdown.

Local travellers have become fond of the site as a landmark signaling that they were almost home. "When they are gone, there will be a blank spot on our marsh" said Sackville Mayor Robert Berry. "I know when I come from either direction, especially from the Nova Scotia side and over the hill, and I see them I'm

saying 'I'm home.'"

The marshes also served as the tower site for 50,000 watt CBC AM station CBA 1070 until it moved its tower back in 1968. CBA has now been off the air since April 7, 2008. Also emanating from Sackville was Radio Canada's Northern Service which broadcast for decades on 9625 kHz to Northern Quebec, Labrador and Nunavut until it went silent at the end of 2012.

Radio Canada International site on the Tantramar Marsh, near Sackville, NB.

Similar activity can be found at the Voice of America's former transmitter site in Delano, California. Once known for its multiple megawatt transmissions, that site is also being slowly demolished and prepared for its new identity as a real estate development. How sad to see the megaliths of the shortwave age falling like extinct dinosaurs. I can still hear the CBC's piano interval signal of a single finger playing the opening notes of the national anthem 'O, Canada.'

I was very lucky to visit the Montreal headquarters of Radio Canada back in 1967. My Dad was a big fan of World's Fairs and decided we should visit Expo '67 commemorating the 100th anniversary of the formal confederation of the country. I remember touring the studio complex in downtown Montreal and having the honour and privilege of meeting real radio stars like Ian McFarland, Basil Duke, Duncan Nicholson and Elaine McMaster. I had a fascinating discussion with the staff regarding how they picked broadcast frequencies and all the strategy within. It was a wonderful visit for a 13 year old DXer!

For more information on Sackville see: WA2WHV's http://hawkins.pair.com/rci1.shtml and M0MTJ's page http://www.mds975.co.uk/masts/sackville.html.

Monitoring convention

Years later, in 1990, I renewed my friendship with Ian McFarland at the first *Monitoring Times* convention in Knoxville, Tennessee. Legendary pirate broadcaster (and now owner-operator of licensed shortwave station WBCQ Monticello, Maine,) Allan Weiner and I drove down to attend.

It was a wild experience. Our carrier current AM radio station was squelched by the hotel staff since we were interfering with the hotel's TV reception. We reverted to a low power FM broadcast! That weekend, the hotel was also hosting a national clown convention. Poses with wacky clowns with big red shoes and oversized fly-swatters made great souvenir pictures of the event. I miss the glory days of shortwave! Good times!

Late-breaking news

The 1420 kHz WLNA Peekskill / 1260 kHz WBNR Beacon simulcast has flipped to Cumulus Media's "Real Country" format. This is traditional hillbilly-style music with an older audience in mind. The local morning show and all other signs of local humans are gone. They seem to be still broadcasting the Dave Ramsey talk show during PM drive and NBC Radio Newscasts. See http://realcountryhv.com for the schedule. Press notes suggest the station duo is contracted for covering Army football and some NASCAR events.

Late weather

The National Weather Service's KWO35 on 162.55 MHz is said to be testing on low power from a new location near Times Square. They are looking for signal and interference reports. Details are in the statement extract below.

"National Weather Service New York NY
1130 am EST Wed Mar 26

The New York city NOAA weather radio transmits on a frequency of 162.55 MHz which is very close to the U.S. Coast Guard channel 16 broadcast frequency. After many months of troubleshooting frequency interference issues... it was determined to relocate the transmitter to a new location. The transmitter is currently being tested near Times Square in order to determine if the interference continues.

KWO-35 listeners are encouraged to provide feedback on the broadcast transmission while it's being tested for interference. If any interference issues are heard... listeners should report their findings via e-mail to nwroutage'at'noaa.gov. It is important to provide your contact information as well as the frequency in which the NWR broadcast is interfering."

Until next month,

- 73s and good DX de N2KZ 'The Old Goat.'

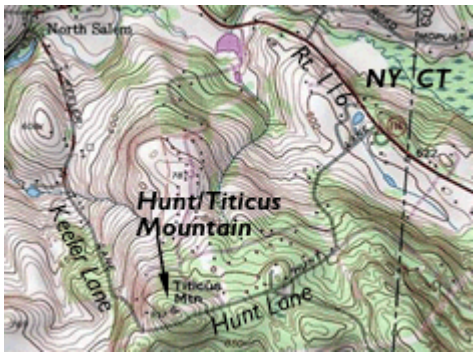
Mountain hunt - W2CH

With the disaster of Malaysia Airlines MH370 recently in the news, I was reminded of a mid-air collision in December 1965 when Eastern Air Lines Flight 853 collided with TWA Flight 42 over Carmel, NY. The Eastern Air Lines airplane crash-landed on **Hunt Mountain**, while the TWA plane managed to land safely at JFK. This is the only large airplane crash that I can remember in Westchester.

My other reason for remembering the crash is that on August 7, 1965, I was up on Hunt Mountain with Steve WA2USG, using his call WA2USG/2 in a VHF contest. We were operating 2 meter AM with my Gonset Communicator III transceiver and a Cushcraft 2 meter beam. Power was provided by a car battery, which had been brought up in my father's 1960 Buick. We were located in the small park at the top, on a picnic table and bench, for the CQ VHF Contest. I have a B&W photo from that day, taken by WA2USG.

Ray WA2ZPD (now W2CH) operating his Gonset Communicator from Hunt Mountain in the CQ VHF Contest, August 1965.

It's interesting to think that we were there on the mountain, just months before the two aircraft collided, with one plane crashing on the slopes. The hillside was probably the only open area where a landing could be attempted.



Hunt Mountain, located in North Salem, NY

[Hunt Mountain, aka Titicus Mountain, is 952 feet high and located in North Salem, NY, near the Connecticut border. See *PCARA Update* for Nov 2012 where Karl, N2KZ describes the area. - *Ed*.]

In 1966, a group of us operated the same contest nearby, but over the state line in Connecticut, using WA2USG/1. There was myself, then WA2ZPD, Steve WA2USG, Gus WB2MOG, Charlie WB2HZY and Bob WB2DXL. We took a generator, plus equipment for 6 meter and 2 meter AM. I have a photocopy of the CQ VHF Contest certificate from August 1966, where we came in Second Place for Connecticut as WA2USG/1.

When we operated overnight, we didn't have any tents or shelter — we had good weather that August — though we did hear "noises" in the woods at night.

Ray's photo of the 6 meter station on the hill shows L to R Bob WB2DXL (now W2RO), Steve WA2USG (N1MH), Gus WB2MOG (SK) seated by the station, and Charlie WB2HZY (SK).

We also investigated southwestern Vermont as a possible VHF site. We went on a dirt road off VT Route 9, near Bennington, to look for a high spot called the Dome, but did not operate. We went in Steve's 1959 Buick Sedan. He obtained that car while a student at Case University in Cleveland, after White Plains High School. He then went on to Rensselaer Polytechnic Institute (RPI), in Troy, NY before starting work for DEC, in Maynard, MA. Upgrading to Advanced class, he became WA1LKF, then obtained his Extra Class license and now holds Vanity call N1MH.

For more information on the mid-air collision, see: http://en.wikipedia.org/wiki/1965_Carmel_mid air_collision. There is a contemporary report at: http://www3.gendisasters.com/new-york/18621/north-salem-ny-airliners-collide-in-mid-air-dec-1965 .

- Ray, W2CH

Foxhunt fun

Join us!

One PCARA activity that *everyone* can enjoy is the annual **Foxhunt**, scheduled for Saturday May 10, 2014. Last year's hunt suffered a late date change. This year, the May 10 date is firm, so we are hoping for plenty of participation.

Happy hunters wave their antennas at the first PCARA foxhunt in May 2003.

What's a foxhunt?

In amateur radio, a foxhunt is a Direction Finding event with a competitive element. In the PCARA version, our "fox" sets up a mobile or portable station in an unannounced location, transmitting on a 2 meter simplex frequency, 146.565 MHz FM. After the introduction, transmissions are on a 10 minute cycle with 3 minutes on and 7 minutes off. That long gap between transmissions allows the hunters to drive from the starting point to the next location, ready for the next bearing. Full rules are published in the *PCARA Update*.

Making and doing

Licensed radio amateurs and short wave listeners can join the Foxhunt as hunters. Equipment can vary from the very simple to the quite complicated. Hint: assemble your equipment a week or two before the event, so you can check it out and practice on a steady signal.

Fox reception

The first requirement is a receiver for the fox frequency. The usual choice is a 2 meter handi-talkie or dual band HT covering both 2 meters and 440 MHz. Inclusion of 440 MHz will let you monitor the third harmonic when close to the fox.

There is a wide choice of VHF/UHF handi-talkie equipment available — from classic manufacturers such as Icom, Kenwood and Yaesu, from Alinco, and from low-cost China brands such as Baofeng, TNT and Wouxun.

One valuable feature in a foxhunt HT is a good **S-meter**, to show how signal strength changes with antenna direction, and how close you are to the Fox. Signal strength is usually indicated by a bar-graph on the liquid crystal display — the more meter segments, the better. Another feature to be aware of is the type of **antenna connector** on the radio as you will probably want to remove the stock rubber duck and attach an external antenna. You may also need to wire in an attenuator. The old connector standard for handi-talkies was BNC, but modern HTs tend to use SMA connectors, so you might need an adapter.

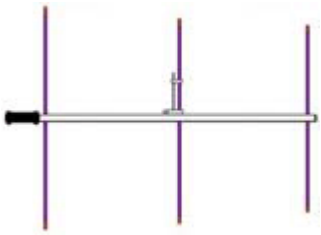
Kenwood TH-F6A VHF/UHF handi-talkie has an SMA female antenna connector.

Even if you do not have a handi-talkie, it is still possible to participate with a portable scanner-receiver that covers 2 meters. A mobile radio is also helpful, to monitor the fox's frequency while on the move in your vehicle.

Find your antenna

Most fox-hunters employ an external antenna connected to the 2 meter handi-talkie. There are several requirements for this antenna — it should be directional, so you can move the antenna around and peak the signal in the direction of the fox. It should not be too large, and it should be rugged enough to survive fast exits and rapid returns to your vehicle.

One antenna used in previous PCARA foxhunts is a Yagi beam made of aluminum tubing. A commercial example is Arrow Antennas' 146-3 handheld portable Yagi, costing $69.00. This antenna has a 37½ inch boom, with 40½ inch reflector, so it might not be too easy to get into and out of a small vehicle.

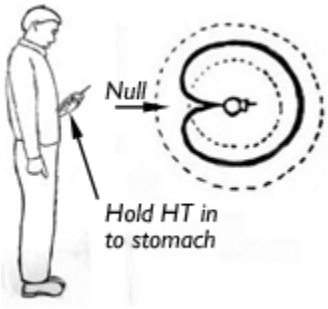


Arrow 146-3 portable Yagi.

A better choice for smaller cars might be a "tape measure" Yagi, which can be home-brewed from lengths of "Stanley"-style steel tape plus PVC pipe and fittings. The antenna elements can then be folded over to fit inside a compact vehicle. Assembly instructions are available from originator Joe Leggio, WB2HOL at http://theleggios.net/wb2hol/projects/rdf/tape_bm.htm and from the Camden County ARS website at http://ccars.org/projects/tapeyagi/.

A smaller directional design that your editor prefers is the HB9CV antenna, with both elements fed. This antenna is more popular in Europe than North America. Constructional details for the HB9CV, plus the folded "ZL-Special" variant are in the September 2005 issue of *PCARA Update,* pages 6-7. Back-issues available at: http://home.computer.net/~pcara/newslett.htm.

Mike N2HTT (left) and Mike N2EAB (right) discuss a 3-element tape-measure antenna



Using body fade — a handi-talkie held close to the body has a directional antenna pattern with a deep null to the rear.

Even if you do not have a directional antenna, you can still use the **body fade** effect with your HT's own antenna. The body changes the antenna pattern to a cardioid, with a deep null behind you. Hold the radio close in to your stomach and slowly turn around until you see or hear minimum received signal. The transmitter should then be directly behind you.

Doppler direction finding

Another technique for rapid direction finding from a vehicle is known as "Doppler" — the antenna is rotated rapidly in a horizontal circle, or the rotation is simulated by electronically switching around multiple antennas that are positioned around a horizontal circle. Motion of the receive antenna changes frequency of the incoming signal by Doppler effect. The resulting frequency modulation can be filtered out from the FM receiver's audio, then used to determine direction of the signal.

I have seen this technique used in UK foxhunts. It allows continuous readout of direction to the fox while a hunter is in motion, and while others might have stopped to take a bearing. During the early stages, Doppler allows a rapid approach to the target. It is not so useful later on, when investigation on foot could be needed to pinpoint the fox's hideout.

Ramsey Electronics sells an inexpensive "Doppler Direction Finding Kit" based on a design by Mike Cossor, WA2EBY — see *QST* May-June 1999. The DDF1 display unit has a circle of 16 LEDs to indicate direction. The kit includes an array of four "homebrew" mag-mount vertical antennas plus switcher, that mounts on the roof of a vehicle.

Ramsey DDF1 Doppler direction finder as used by Ray, W2CH.

Ray W2CH and Marylyn KC2NKU tried out the Ramsey DDF1 equipment during a PCARA Foxhunt in May 2007. They found the "fridge magnets" supplied with the four quarter-wave antennas were insufficient to keep the array in place on the roof of Marylyn's vehicle. Even when augmented with sticky tape, the antennas would not stay put at highway speed, so Ray had to use a conventional antenna to complete the hunt.

Ramsey Electronics Doppler DF antennas mounted on the roof of the KC2NKU/W2CH vehicle.

Modern Doppler direction finding equipment employs digital signal processing to pick out the Doppler tone that is introduced onto the FM carrier. Combining Doppler directional information with the output from a GPS receiver allows a "moving map" display on the screen of a notebook PC. "PicoDopp" kits for this type of equipment are available from Bob, WB6EYV at Doppler DF Instruments, see

Global TSCM Group's DF2020T Radio Direction Finder Kit assembles in 10-15 minutes.

http://www.picodopp.com. More complete kits are available from Global TSCM Group in New York City at: http://www.kn2c.us.

Don't be late — attenuate

As you approach the fox's transmitter, you may find that signal strength increases to such an extent that you can no longer see peaks and nulls on the S-meter, or hear any change in signal-to-noise ratio while swinging the antenna. This is the point where you need to reduce or *attenuate* the strength of the incoming signal. A simple solution is to insert a resistive attenuator into the antenna cable. Fixed attenuators with BNC connectors are available, and they can be connected in series for additional effect. More convenient is a *variable* attenuator such as MFJ's MFJ-762, which provides 0 to 81 dB of attenuation in 1 dB steps by pressing the appropriate buttons.

MFJ-762 switched attenuator

Another approach is to use an active "offset attenuator" which is inserted into the antenna cable and provides an attenuated mixing product on an adjacent frequency, for example 500 kHz or 1 MHz away from the real fox frequency. This overcomes the problem of a powerful main signal leaking into a poorly-shielded transceiver. You can homebrew this type of attenuator from a kit, for example http://www.west.net/~marvin/k0ov.htm. Or you can purchase a commercial unit such as the Offset Fox Hunt Attenuator (OFHA) from Arrow Products, http://www.arrowantennas.com/main/4ofha.html. Be careful not to transmit into your active attenuator!


Arrow Products' offset fox hunt attenuator.

Close harmony

When you are really close to the 2 meter transmitter, but you still cannot see where the fox is hiding, a dual-band transceiver will allow you to monitor the third harmonic. For example, if the fox was transmitting on 146.565 MHz, the harmonic frequency to tune to would be 439.695 MHz — or as close as your receiver will allow. A small UHF antenna may then prove more useful than a full-size two meter beam for those final steps toward the fox's lair.

Fox-craft

Just to give you an idea how crafty a fox can be, I remember an evening event in the UK where the hunters were led into a quiet Industrial Estate with no vehicles visible. The fox was finally found, hidden behind a large steel dumpster, underneath a tarpaulin "tent". Some members may remember PCARA's hunt in November 2007 when Sharon KC2LLC was hiding in the bushes off Lakeland Avenue, using a portable transmitter set-up designed by son Wires, KC2FYY. *Nobody* found the fox that time, though some came close. Full details are in the *PCARA Update* for December 2007.

Keep up-to-date

For the latest news and developments in amateur DF technology, pay a visit to Joe Moell, K0OV's "Homing In" web site: http://www.homingin.com.

Good luck with your fox-hunting efforts. Bring along your map, compass and competitive edge. You will enjoy both the hunt and meeting up with your fellow hunters at the diner afterwards. See you there!

- NM9J

In search of elephants

During the Old Goats Net for Thursday February 27, our master of ceremonies Karl N2KZ asked the following question: *"What is an Elephant Cage?"* Some of us guessed that it might be a large Faraday cage for shielding electrical equipment — but that answer was incorrect. The correct answer was — a type of **Wullenweber** antenna array intended for HF direction finding.

Elephants can remember

For those interested in the technology, Henry KB2VJP provided some additional information on the Wullenweber from the "Practical Antenna Handbook" by Joseph J. Carr K4IPV (SK) and George Hippisley W2RU. That triggered memories from your editor's time in the UK. Back then, design and purpose of the "Elephant Cage" were secret, though a few details were known. This article has now been compiled from openly-published material.

German origins

The original Wullenweber antenna was developed during World War II by the German Navy's "Nachrichtenmittelversuchskommando" (NVK) or Communications Research Command.

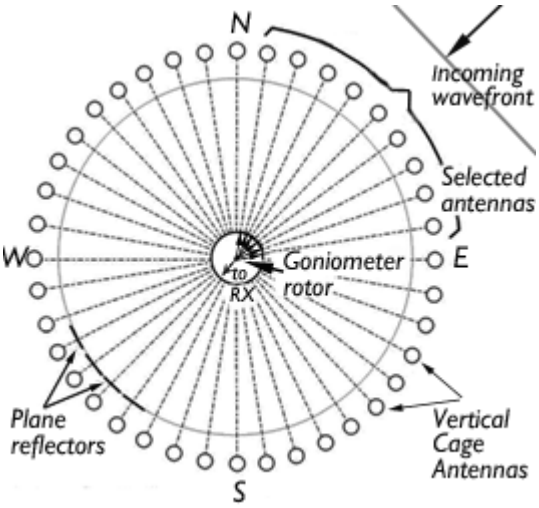
NVK was cooperating with Telefunken to develop high frequency direction finding equipment that would cover parts of the world where the German Navy was active, including German U-Boats. NVK's antenna design was based on work by Dr. Heinrich Stenzel in the field of acoustic direction finding (sonar). Dr. Stenzel had suggested using delay lines to compensate for different arrival times of an audio frequency wavefront at the elements of a curved receiving array.

Wo sind die Elefanten?

The Germans' HF antenna design was first employed during World War II in the northeast part of occupied Denmark. It consisted of forty vertical monopole antennas, arranged in a circle 120 meters in diameter (394 feet). Each vertical antenna was constructed as a wire cage, 28 feet high, fed against ground, with a capacity hat on top and a flat metal reflector of steel wires behind. The array was designed for a frequency range of 6 - 20 MHz.

Appearance of an original World War II Wullenwever antenna array as seen from the side. 40 vertical cage antennas were arranged around a 394 ft diameter circle.

Each of the forty antennas was connected by an equal length of coaxial cable to a central "compensator" which selects a group of antennas through a "commutating feed" or "goniometer" rotor. As the rotor turns, it adds a new antenna at the front of the revolving group and drops another antenna at the back. The delay line components are also shifted from one antenna to the next — so as the rotor turns, the directional beam pattern also rotates. When wired for a null indication, the beam was sufficiently narrow to determine direction of an HF transmitter to an accuracy of a few degrees.



Plan of the WWII Wullenwever array. 40 vertical antennas with wire reflectors are arranged in a circle, and cabled to the central goniometer rotor. The rotor selects a group of antennas plus suitable delay lines, to compensate for different arrival times of the incoming wavefront.

NVK group leader Dr. Hans Rindfleisch coined the cover-name "Wullenwe**v**er" for this type of array, probably taken from the popular German hero Jürgen Wullenwever, who, while Mayor of Lübeck 1533–1535, conspired to increase that city's influence over Denmark. After World War II, one of the remaining arrays was removed from Germany and reassembled in the USA, where it was renamed to "Wullenwe**b**er". Some of the German scientists moved to the USA as well.

Here come the elephants

After World War II, development of the "Wullenweber" antenna continued in the USA throughout the 1950s. In the days before communication satellites and the Internet, a great deal of military traffic still traveled by short wave — so there was a lot of interest in intercepting radio messages and determining exactly where they originated.

One of the largest Wullenweber installations commissioned by the U.S. Government was designed and manufactured for the U.S. Air Force by Sylvania Electronic Systems. It was known as the "AN/FLR-9 Receiving Set Countermeasures". One of the first AN/FLR-9 antennas was installed at **RAF Chicksands** in England.

The name of this particular RAF base comes from the medieval **Chicksands Priory**, located between Bletchley and Cambridge in Eastern England. During World War II the Priory became an RAF wireless intercept station, with multiple antennas strung across the estate and hundreds of operators listening for enemy signals. It turned out to be in just the right place for reception of German High Command in Berlin, with intercepted messages being passed to Bletchley Park, only 17 miles to the west. Bletchley Park was the center of British code-breaking efforts in World War II.

Chicksands Priory in Eastern England.

When the US Air Force arrived at RAF Chicksands in the early 1950s, the center of attention had switched from Germany's High Command to Cold War enemies in Eastern Europe, in particular the Soviet Air Force. As part of a Signals Intelligence effort known as "Iron Horse", a Sylvania AN/FLR-9 or "Flare 9" antenna was installed at Chicksands during 1963-64. At the same time, a companion FLR-9 station was being built at San Vito Air Station in Italy. While a single fixed DF station can give the direction to an unknown transmitter, two or more DF stations can pinpoint the exact location, at the intersection of the bearings from each site.

The FLR-9 antenna system was approximately three times the size of the first Wullenwever in Denmark, with an outer circle of 48 antennas, 1200 feet in diameter. The ground screen extended out to a diameter of 1440 feet, or over one quarter of a mile.

AN/FLR-9 antenna array at RAF Chicksands.

Large antenna with big ears

The AN/FLR9 was designed to monitor the entire short-wave frequency spectrum from 2 to 30 MHz, compared with just 6 - 20 MHz for the original Wullenwever. It did this by nesting three different antenna systems within its 1440 foot diameter circle. The outer ring of antennas consisted of 48 vertically-polarized sleeve monopoles, spaced 78 feet apart. These antennas were 105 feet high and covered the "A Band" frequency range of 2 - 6 MHz, with optional coverage down to 1.5 MHz if needed. Just behind the "**A**ble Band" antennas was a second ring of 96 smaller sleeve monopoles, 35 feet high, covering the "B Band" frequency range of 6 - 18 MHz.

The two outer rings of sleeve monopoles shared a common circular reflecting screen. This screen was supported on 96 steel towers, 120 feet high, positioned around a circle 1075 feet in diameter. Four sets of wooden beams were supported between the steel towers, and it was on these horizontal beams that 1056 vertical steel wires were mounted, 3 feet apart. Each of these vertical reflecting wires was grounded at the base to a buried ground screen, made of stainless steel wire mats.

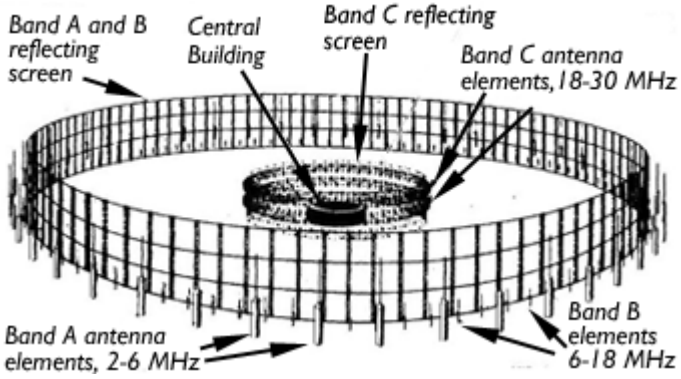
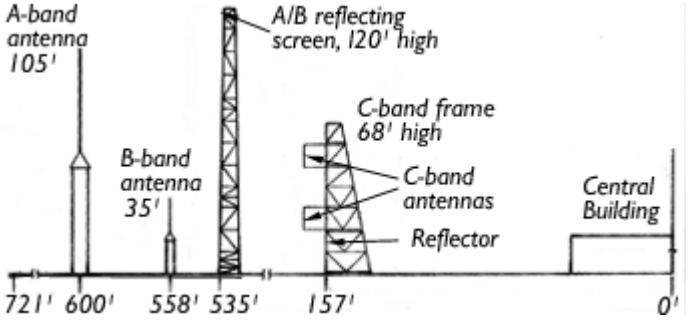


Diagram of the AN/FLR-9 antenna system for HF direction finding over the range 2-30 MHz.

The 120 foot tall circular reflecting screen was highly visible and inspired the alternative name of "Elephant Cage" for the top-secret AN/FLR9 antenna. As one of the military personnel in-charge pointed out, it must have been highly effective as no elephants were ever seen running around outside the cage.



Cross section through AN/FLR-9 antenna system, showing heights and radial distances in feet from center of the array. The buried ground screen extends out to 1440 ft diameter.

The third antenna ring was positioned *inside* the giant reflecting screen. Coverage of "Band C", 18 - 30 MHz, was provided by an inner ring of 96 horizontally-polarized twin bow-tie antennas mounted 10 feet out from a wooden support structure that was 68 feet high, built on a 315 foot diameter circle. On the outer face of the wooden structure, just behind the bow-tie antennas was an inner reflecting screen consisting of 44 horizontal steel wires, suspended 18 inches apart, and bonded to multiple ground rods.

Antennas for C Band, 18-30 MHz, consisting of 96 pairs of stacked bow-tie dipoles.

Although this third antenna array was *inside* the main reflecting screen, horizontally polarized signals for "Band C", 18-30 MHz, had no trouble passing through. That's because the outer screen and its associated antennas were *vertically* polarized.

Connection central

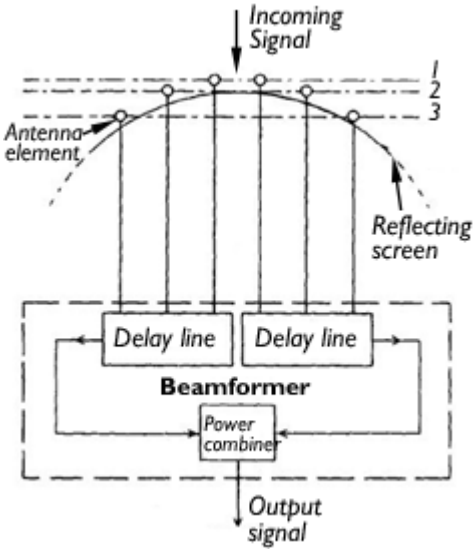
At the center of the array was a circular building that housed the antenna combining equipment. Each of the individual antennas for "Band A", "Band B" and "Band C" was wired to this Central Building *via* its own 75 ohm coaxial cable. The ⅞" diameter foam-dielectric coaxial cables were buried underground.

Each individual antenna had its own RF amplifier, outputs from which were then split by individual power dividers. Antenna outputs could be selected and combined in different ways, in order to provide multiple patterns:–

1. The signals from all antennas in one Band could be added together. For example signals from each of the 48 vertical antennas for "Band A" (2 - 6 MHz) were passed through the individual RF amplifiers, then applied to four-way power splitters. When signals from all 48 antennas were added together, the pattern became omni-directional, suitable for monitoring signals from all 360 degrees around the compass.

2. In order to provide a narrow beam for accurate direction finding, outputs from a group of adjacent antennas could be combined in a goniometer to form a "monitor beam". For example, on Band A the goniometer would connect outputs from 16 consecutive antennas through delay lines to correct for different arrival times of the incoming wavefront. Signals from the desired direction would then add in phase while signals from other directions would not. This gave a high-gain narrow beam in the direction of the center antennas, similar to the original German Wullenwever.

3. For general monitoring in a particular direction,



Beam-forming in a Wullenweber array. In this example, signals from six adjacent antennas are passed through delay lines to compensate for different arrival times of the incoming wavefront at pairs of antenna elements. (1, 2, 3).

outputs from a smaller number of adjacent antennas could be passed through delay lines to correct for different arrival times, then combined together to provide a wider "sector beam". Six different beams could be active simultaneously for use by the reception teams.

Out of the cage

The circular Central Building in the middle of the "Elephant Cage", containing the RF amplifiers, combiners and goniometers, was far too small to also house the receiving equipment and operators. Radio reception, transcription and interpretation took place in a separate "Operations Building", well outside the cage. At RAF Chicksands, the Elephant Cage was installed on a hilltop, half a mile away from the windowless Operations Building. Cables from the Central Building were routed down an underground tunnel to the distribution and receiving equipment in the Operations Building.

What was being monitored?

Capability of the FLR-9 antenna included a detection range of 0-4000 nautical miles on each of the three bands between 2 and 30 MHz, with an azimuth coverage of 360 degrees. Minimum gain was 10 dB, with the highly-directional monitor beams having a minimum gain of 15 dB.

A 4000 mile circle around RAF Chicksands shows coverage extending across all of Europe, plus North Africa and the North Atlantic. Allowing for the vagaries of ionospheric propagation, this still puts a large number of targets on air, land and sea within monitoring range.

No doubt, during Chicksands' operational span from roughly 1962-1996, the main target for the USAF would have been Eastern bloc operations, especially aircraft and missiles of the Warsaw Pact. Just like today's intelligence revelations, there were rumors that the giant antenna was used to monitor additional activities, of both friend and foe.

People who worked with the "Elephant Cage" equipment say that during the stations' lifetime, early vacuum tube RF amplifiers were replaced by solid state units, which were easier to maintain and keep in adjustment. At the same time, monitoring of Morse code and RTTY

Chicksands' Elephant Cage sat on a hilltop.

signals was transferred from human operators to automatic decoding by computer.

Elephants' graveyard

Following the early installations in Britain and Italy, additional AN/FLR-9 antenna systems were built during the 1960s for the USAF in Japan, the Philippines, Alaska, and Turkey. The US Army installed its own version of the AN/FLR-9 in Germany and in Thailand. The cost of an AN/FLR-9 was estimated at $15-25 million each! Further variants of the original Wullenweber design were constructed for both the Eastern and Western blocs to keep a watchful eye on each other's signals.

With the ending of the Cold War and break-up of the Soviet Union in 1991, the main justification for these expensive installations diminished and most have now been dismantled. USAF operations at Chicksands ceased in 1995 and the Elephant Cage array was dismantled in 1996. The site is now used by the British Army and incorporates the UK's Military Intelligence Museum. For a fascinating Google map that lets you zoom in on abandoned and remaining AN/FLR-9 sites, see the following link: http://maps.google.com/maps?q=http://bbs.keyhole.com/ubb/download.php?Number=113991&t=k&om=1

Although some military traffic has shifted from short wave to VHF/UHF and satellite, this does not mean short wave monitoring and direction finding have ceased. HF is still in use by the military and there is still a need to keep an eye on the short wave spectrum to find out what the enemy is up to. I do not know *exactly* how this is done nowadays, but "Elephant Cages" have probably been replaced by receivers at multiple sites measuring arrival times of signals from desired directions. These receivers could be located at ground stations, in aircraft, on sea-going vessels or on orbiting satellites. I imagine that monitoring is not confined to the HF spectrum, as satellites and aircraft would provide line-of-sight coverage for VHF/UHF as well.

Amateur elephants

Over the years, I have bumped into several radio amateurs on both sides of the Atlantic who were involved in radio interception. Perhaps you know someone as well?

They cannot say anything about matters that are still secret, but it's fascinating to speculate on RF innovations that might have been inspired by this work and found their way into our hobby.

I sometimes wonder what would happen if radio amateurs had access to a huge antenna like a Wullenweber. Perhaps we could install one for Field Day, using Walter Panas' ballfield netting as a reflecting screen?

Letting the imagination wander... Suppose you had unlimited funds and you needed to set up an inconspicuous DX-spotting network to monitor signals from anywhere on earth — how would you set about it with modern technology? Maybe you would include a bunch of remote-controlled software-defined radios connected to your own private Internet. Perhaps incorporate "CW Skimmer" and "Reverse Beacon" techniques as well? And your antenna should be less conspicuous than a 1960s Elephant Cage!

No doubt government agencies have been working along similar lines for years, with RF and computer technologies that we don't even know about yet.

- NM9J/KB2VJP

References: *The Unsinkable Aircraft Carrier* by Duncan Campbell (1984). *The Puzzle Palace* (UK edition 1983) & *Body of Secrets* (2001) by James Bamford. *Technical Manual AN/FLR-9 V7/V8* (1976). *Practical Antenna Handbook* by Joseph J. Carr & George Hippisley (1989-2012). *ARRL Antenna Book,* (22nd edition 2011).

Aviation systems - N2CBH

With the recent tragic events surrounding the disappearance of Malaysian Airlines' Flight 370, there has been a lot of speculation and misinformation about airliners and their electronic systems. I have some experience as a private pilot with basic navigation and communications — or "NAVCOM" systems as they are called — so I thought it would be instructive to discuss the basics. This is mostly RF-technology and that is what amateur radio operators deal with.

VHF radio

Some basic systems are common to all airplanes — general aviation, cargo or air transport. Let's start with radio communications. For most communication between the cockpit and tower or air traffic control, the VHF spectrum from 108-136 MHz is employed. The lower part of this range, 108-118 MHz, is used for **ILS** and **VOR** signals. **Two-way communications** and **ATIS** occupy 118 – 136 MHz.

Icom IC-A210 VHF airband transceiver

Preparing for departure

ATIS stands for "**A**utomatic **T**erminal **I**nformation **S**ervice". This is a broadcast from any control-tower airport that gives current information for approaching or departing aircraft. It will include the active runway, local barometric pressure (to calibrate the altimeter), weather conditions including visibility and any NOTAMs that might impact takeoffs and landings.

A **NOTAM** or "**No**tice **T**o **A**ir**m**en" describes a possible navigation hazard — such as a radio tower whose beacon is unlit. The first thing a pilot will do before taxiing to the active runway is to listen to the ATIS broadcast for that airport. When contacting the tower, the pilot will identify his or her aircraft, its intentions and that the ATIS broadcast has been listened to. The current ATIS broadcast is given an alphabetic identifier such as "Information **I**ndia" for the letter **I**. Yes, pilots use the same phonetic alphabet that we use for clarity. ATIS is a VHF **AM** broadcast, just like the two-way VHF-AM communications with ground or tower control at controlled airports.

A typical first communication might go like this: *"Dutchess Ground this is Cessna 9991 requesting taxi to the active runway, we have information **India**."*

The ground frequency controller will then either give permission to taxi to the active runway or ask the pilot to standby. The ground controller will then instruct the pilot to contact the tower on a frequency he will announce.

On the way

Once aloft the pilot puts other systems into use that will guide him to his destination and allow him to be informed of conditions ahead. A flight that is in uncontrolled airspace will have little communication until nearing the destination airport. For controlled airspace — near major cities with busy airways — the tower at the departing airport will hand the pilot off to the regional center. In our area that is New York Center. Once contacted, the regional controller will issue the pilot a "squawk" code for the on-board transponder. Squawk code is a term for the response code programmed into a transponder. I will cover this topic in detail later.

More acronyms

Systems that are typically put into use once aloft include the **VOR** receiver, **NDB** receiver, transponder, communications transceiver and nowadays **GPS**.

Home on the range

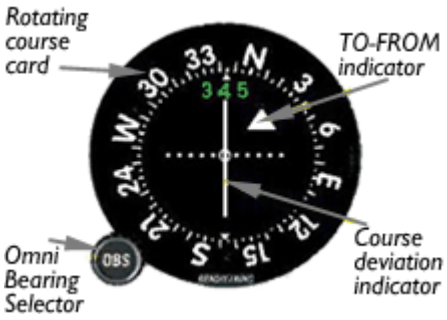
VOR stands for **V**HF **O**mni-directional **R**ange. This system is VHF-based (108-118 MHz) and is used as a bearing indicator for the pilot while aloft. A VOR or VORTAC station on the ground transmits two types of signal on VHF. One modu-


VOR installation

lated signal is the same for all directions while the other varies in phase, depending on your bearing from the transmitter. The VOR receiver compares the phase-shifted signal to the reference signal and determines bearing based on the comparison.

VOR has been in use since 1946, having been developed before World War II in the U.S. and is the standard navigation system used worldwide. VOR allows a pilot to fly what are known as "Victor Airways" — which are basically low-altitude highways in the sky that allow aircraft to fly in straight lines. Flights are often planned to fly from one VORTAC to another.

The dial of the VOR receiver has a "To" and "From" indicator to let the pilot know the course to or from the ground station. There is also a **C**ourse **D**eviation **I**ndicator or **CDI** which will let the pilot know if he is flying off course from the bearing to the station. This is a real advance in navigation in that it allows the pilot to correct for wind drift and fly in a straight line. When flying directly over a VORTAC system the pilot will know immediately as the "To" and "From" indicators on the cockpit display flip. That is the signal to switch VOR frequencies and fly a new heading based upon bearing to the next VOR station.



VOR Receiver indicator

[For a description of the local VOR installation "CMK" see *PCARA Update* for March 2012, p 2. - *Ed*.]

No direction home

An older and less accurate navigation system still in use is the **NDB** or **N**on-**D**irectional **B**eacon. The system is also referred to as ADF (automatic direction finding) or RDF, radio direction finding. Sound familiar? The techniques we use for foxhunting have uses in air navigation.

Like VORs, NDB transmitters are often located at airports. NDBs operate within 190-535 kHz, below the AM broadcast band, and transmit a carrier which is identified by an amplitude-modulated callsign in slow Morse.

In the cockpit there is an NDB receiver with a dial that looks much like a compass and a needle that indicates bearing to the beacon station. If a pilot knows where the NDB is located he can fly to it using the needle bearing of the NDB. As long as the nose of the aircraft is pointed in the same direction as the needle indication, you will eventually get to the station.

NDB receiver dial

I say eventually because, unlike VOR, the NDB has no indication of course deviation — so it is quite possible that you could fly in a complete circle, being blown around by the wind and still be pointed at the station. NDBs are typically used locally so this sort of navigation error should not occur — although they can be used from quite a distance due to the propagation advantages of LF/MF radio waves.

As a historical note it is thought that the Japanese planes that attacked Pearl Harbor in December 1941 used NDB to find Oahu. They may have used a local broadcast station as a beacon. On older navigation maps AM radio stations with their call signs would be indicated for long distance reception. I have an aero map from 1940 of the New York City area and WOR 710 is indicated as being in the Newark NJ vicinity. Hey, 74 years later it still is!

Who goes there — friend or foe?

A key system that allows air traffic control to keep track of aircraft in flight is the **transponder**. We have heard this term used a lot during the recent Malaysian aircraft disappearance and I have yet to hear anyone discuss what it is and what it is used for.

A transponder, or "transmitter-responder" is a UHF transmitter/receiver using 1090/1030 MHz that can be interrogated from the ground to broadcast or "squawk" the particular code identifying an aircraft. The system is used by air traffic control to positively identify aircraft shown on radar. If you have ever seen a busy radar screen with what appears to be a lot of alphanumeric characters spread across the screen, that is the transponder information for perhaps dozens of airplanes in a given airspace.

General aviation aircraft flying in uncontrolled airspace will squawk a 1200 code. All other aircraft approaching or departing a controlled airport will be given a code to squawk by air traffic control. The pilot then enters the squawk code on the front of the transponder. Once set, radar tracking can positively identify the aircraft as its signature is being continuously transmitted in response to interrogation pulses from the ground.

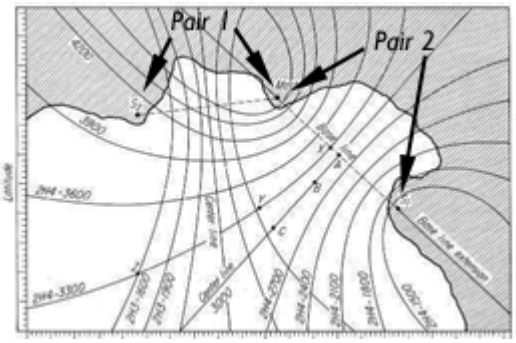
Radar screen showing transponder 'squawk' codes and aircraft heights (hundreds of feet).

Long range positioning

GPS (**G**lobal **P**ositioning **S**ystem) has become the standard for navigation in our autos in the last several years and now is used by virtually all aircraft.

Prior to GPS, pilots had to rely on ground-based **LORAN** for navigation assistance. LORAN stands for **Lo**ng **Ra**nge **N**avigation. The most recent version of LORAN was LORAN-C which operated in the LF spectrum between 90 and 110 kHz.

LORAN uses the principle of time delay for radio propagation from different locations. Pulsed signals from a pair of synchronized LF transmitting sites are received and the difference in time of reception measured. This time difference puts the aircraft on one of a set of hyperbolic curves between the two sites. To obtain an accurate location, a second pair of LORAN stations must be received, the time difference measured, then a calculation is performed within the receiver to fix the position.



LORAN chart showing hyperbolic curves of equal time delay for pairs of stations.

The US and Canada have completely phased out LORAN, which has led to some controversy as the only long range system now available for pilots is GPS. A backup system is needed in case of widespread GPS loss, perhaps due to meteor collision, solar storms, deliberate hacking or other interference. GPS allows you to pinpoint exactly where you are and is a valuable system to airmen.

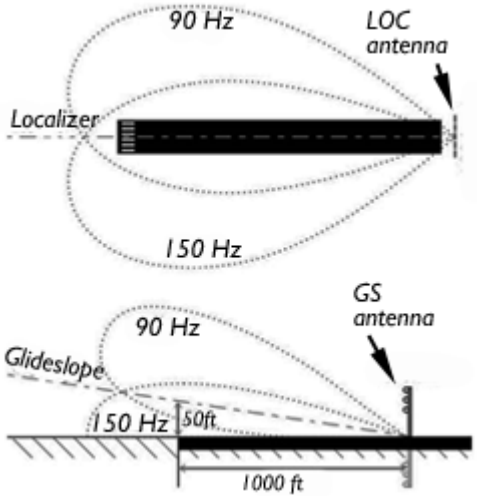
Aeronautical DX

Long range communication such as is needed for transoceanic flights continues to rely on HF single sideband. Yes, SSB is a vital part of the long range communication systems that cockpit crews rely on to converse with ground stations. You can hear some of this traffic on your amateur transceiver if you know where to listen. For example, you can listen to weather information on 3485 kHz, just below the 80 meter amateur band. [For more frequencies, see *PCARA Update* for Oct 2012, p 8 -*Ed*.] Like the military, aviation uses upper sideband (USB) throughout the HF spectrum, unlike our amateur standard of LSB below 14 MHz. Aviation communication takes place in some 15 bands between 2850 kHz to 24890 kHz.

Instrument landing

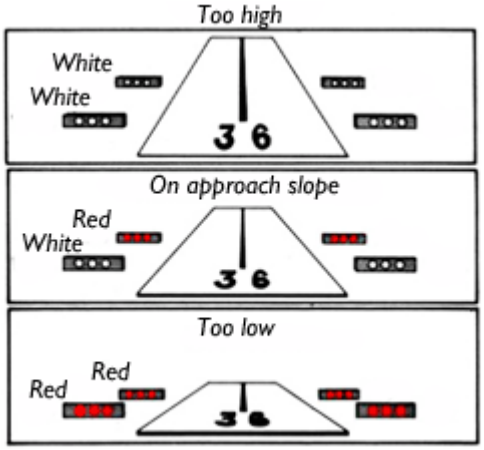
Another system that is utilized by all commercial aircraft is the **ILS** or **I**nstrument **L**anding **S**ystem. This system consists of a pair of signals emanating from highly directional antennas located at the airport. This allows a guided approach to an airport runway with both lateral and vertical guidance.

The localizer (**LOC**) of the ILS performs the lateral guidance. It broadcasts a pair of signals in the range 108-112 MHz. One, modulated by a 90 Hz tone, is beamed to the left of the approach and the other, modulated by a 150 Hz tone is beamed to the right of the runway. These transmissions are equally modulated and the ILS receiver performs a depth of modulation analysis. If the detected signal is predominantly 90 Hz the aircraft is approaching left of the runway, if predominantly 150 Hz it is to the right of the runway. A scale calibrated according to the ratio of these signals allows the pilot to determine how much correction is needed. The system assists the pilot to get the nose of the aircraft centered over the approach by indicating when the tones are of equal amplitude in the detected output.



Vertical navigation is handled by the **GSI** or **G**lide **S**lope **I**ndicator, operating in the range 329-335 MHz. This antenna system, often accompanied by a set of VASI lights, is to one side of the runway. Transmissions are similar to the localizer in that they broadcast a pair of signals with equal modulation depth. A 90 Hz tone signal is beamed above the glide slope and a 150 Hz tone is beamed below the optimal glide slope. If the aircraft vertical position is on glide slope then there will be equal amplitude signals detected from the receivers.

The **VASI** lights or **V**isual **A**pproach **S**lope **I**ndicator is a set of lights, one on top of the other, that work in conjunction with the ILS system. If the aircraft is above glide slope on approach then both sets of indicator lights will be white. If it is below glide slope both will be red. If the aircraft is precisely on glide slope they will indicate red over white. We used to have a saying in pilot training about remembering the VASI indications — if you are white you are out of sight, if you are red you are dead meaning two whites meant you were high and out of sight and two reds meant if you didn't do something to correct the situation... Well, you get the idea!



Visual Approach Slope Indicator

Emergency locator

The **ELT** or **E**mergency **L**ocator **T**ransmitter is another key system present on virtually every aircraft. Much has been said about ELT in the last several weeks, so I will attempt to describe what they are and how they work. (I will leave speculation to the journalists and other soothsayers.)

ELTs are VHF (or UHF) transmitters and on commercial aircraft there are two. One is located in the nose of the aircraft and the other is in the tail. If a plane goes down, the ELT is activated and broadcasts a distress beacon on 121.5 MHz, 243 MHz and — on newer systems — 406 MHz UHF.

A word about 121.5 MHz — this is the emergency distress frequency that any aircraft in distress can tune to and be assured it will be heard as all tower, regional centers and uncontrolled airports monitor the channel continuously. The newer 406 MHz ELT system is digital and can provide searchers with more specific information relating to the particular aircraft to which it is attached. Until recently all ELT frequencies were monitored by satellite. 121.5 and 243 MHz satellite monitoring was eliminated in 2009. The higher-powered and more accurate 406 MHz system is still monitored by satellite.

The reason that 121.5/243 ELT monitoring by satellite ended was because too many false indications were detected. Today VHF ELTs are only monitored by ground stations, limiting their effectiveness. Some aircraft only have VHF ELTs which could make rescue difficult. It might be hours before anyone would be alerted to a 121.5/243 signal, particularly in remote areas.

Once the general area of a downed aircraft is known, UHF ELTs work better for two reasons. First the area of coverage of a UHF system is more limited, so the search area is reduced. These ELTs are monitored by satellite so the general area is known from that source. Once search-aircraft and on-foot rescuers are dispatched, the smaller area can be covered more quickly.

The direction-finding that is done by aircraft and on foot is similar to our fox-hunt techniques, so foxhunting is a valuable skill that can be pressed into action if an aircraft should go down. When we carry out a foxhunt on 2 meters, we can switch to UHF when we think we are getting close enough to pick up the third harmonic of the fox. The UHF signal will be very weak until close by.

The second reason 406 MHz systems are more effective is that they provide specific data about the aircraft, similar to the squawk code of a transponder. A registered 406 MHz ELT system allows look-up of information such as tail number, home airport, type of aircraft, and emergency contact. If a 406 MHz ELT is detected by satellite this information is routed via NOAA's US Mission Control Center in Suitland, MD to the Air Force Rescue Coordination Center at Langley AFB, VA so search and rescue operations can be dispatched.

Newer 406 MHz ELTs can interface with the on-board GPS and broadcast the last known position of the aircraft. The satellite system that monitors all this is called SARSAT – **S**earch **a**nd **R**escue **S**atellite **A**ided **T**racking — and is administered by NOAA. In addition to monitoring aircraft ELTs, the SARSAT system monitors maritime and even pedestrians equipped with a portable ELT. Here are statistics from NOAA's website for rescues using this system in 2013:

Total rescues: 261
At-sea rescues: 140 people in 47 incidents
Aviation rescues 34 people in 16 incidents
Terrestrial rescues: 87 people in 58 incidents.

So according to the statistics air travel is still pretty safe!

Reporting system

One last abbreviation to discuss in this article is **ACARS**. We have all heard this one a lot in the last few weeks. ACARS stands for **A**ircraft **C**ommunications **A**ddressing and **R**eporting **S**ystem. This is used by commercial airlines to transmit and receive data pertaining to the aircraft — including call sign, speed, altitude, position and the like. It is a service which airlines have to subscribe to and, as the saying goes, you get what you pay for. Some airlines subscribe to more services than others so the amount of information gathered depends on the particular carrier. ACARS communications are conducted in the aviation VHF spectrum and can be monitored directly by ground stations or by satellite, using the SATCOM system which is a commercial service subscribed to by the carrier.

Final thoughts

I would like to offer my own thoughts on the recent Malaysian aircraft loss. Like everyone else, I do not know what occurred and I won't speculate on the cause.

Whatever happened on-board, I believe the pilots of Flight 370 would have first attempted to fly the plane to safety. In pilot training there is one thing drilled into your head for when the aircraft is in distress. An engine-out scenario generates an automatic response. First, find a suitable landing strip by scanning the area. Next trim the airplane for best glide slope under a no-power condition. Trimming the elevator trim tab provides the most time aloft. Fly to the selected landing zone and land the plane. That's it.

There is a checklist of things to do to prepare for impact but that is only carried out when you have the landing field in view and are on final approach. The procedure in a commercial airliner is a bit more elaborate but the basic procedure is the same.

I think the pilots of Flight 370 will have gone back to their training and attempted to do what every good pilot is trained to do, bring down the stricken aircraft in the safest way possible. In the coming months we will likely get to the bottom of what really happened — until then, we can only wonder.

Just a start

During research for this article, it struck me that aviation is a lot like ham radio. Training, practice and being prepared are similarities that come to mind — in addition to similar techniques of communication and direction finding. Another thing that struck me is that this introduction is a book in the making and I have only just scratched the surface!

- 73 de Bob, N2CBH

Peekskill / Cortlandt Amateur Radio Association

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Archive: http://home.computer.net/~pcara/newslett.htm

PCARA Information
PCARA is a **Non-Profit Community Service Organization**. PCARA meetings take place the first Sunday of each month* at 3:00 p.m. in Dining Room B of the Hudson Valley Hospital Center, Route 202, Cortlandt Manor, NY 10567. Drive round behind the main hospital building and enter from the rear (look for the oxygen tanks). Talk-in is available on the 146.67 repeater. *Apart from holidays.

PCARA Repeaters
W2NYW: 146.67 MHz -0.6, PL 156.7Hz
KB2CQE: 449.925MHz -5.0, PL 179.9Hz
N2CBH: 448.725MHz -5.0, PL 107.2Hz

PCARA Calendar
Sun Apr 6: PCARA meeting, Hudson Valley Hospital Center, 3:00 p.m.
Sat May 10: PCARA Foxhunt. 3:00 p.m. start from Beach Shopping Center.

Hamfests
Sat April 5: Scout Troop 139/Crew 7373 HAMFest, Conlon Hall, 19 N. William St, Bergenfield, NJ. 9:00 am
Sat Apr 12: Splitrock ARA N. Jersey Hamfest, Roxbury Snr Center, 72 Eyland Ave, Succasunna, NJ. 8:00 a.m.
Sun April 27: Orange County ARC Hamfest, Town of Wallkill Community Center, 2 Wes Warren Drive, Middletown, NY. 8:00 a.m. **Club table**.
Sat May 24: Bergen ARA Hamfest, Westwood Reg HS, 701 Ridgewood Road, Township of Washington, NJ.

VE Test Sessions
Apr 5: Yonkers PAL Ham Radio Club, 127 N Broadway, Yonkers. 2:00 p.m. Michael Rapp (914) 907-6482.
Apr 6: Yonkers ARC, Yonkers PD, Grassy Sprain Rd., Yonkers. 8:30 am Contact John Costa, (914) 969-6548.
Apr 10: WECA, Westchester Co Fire Trg Cen, 4 Dana Rd., Valhalla, NY. 7:00 pm. S. Rothman, 914 831-3258.
Apr 21: Columbia Univ VE Team ARC, 531 Studebaker Bldg, 622 West 132nd Street, New York, NY. 6:30 pm. Alan Crosswell, 212 854-3754.

Peekskill / Cortlandt Amateur Radio Association Inc.
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