CQ *de WA2LQO*

COMMUNICATIONS SYSTEMS (Continued from June 2012)
By Bob Wexelbaum, W2ILP

Now I am going to talk about modes other than voice that are commonly used by radio amateurs.

CW: The first mode is keyed Continuous Wave known simply as CW. This was originally hard keyed by a telegraph key or bug, which caused transients that resulted in splatter that usually produced actual bandwidths of well over 100 Hz rather than a theoretical bandwidth of zero. We now can use digital computer techniques which can shape the dots and dashes of Morse Code using software with the resolution of computer clocking rates, which can result in very narrow bandwidths. CW is in fact a digital mode. Morse Code is a code of varying length. The more common characters, such as 'e' which is dit, and 't' which is dah, use only one pulse. The dah is usually three times longer than the dit. Other characters, (letters, numbers and punctuations) contain longer lengths of combinations of dit and dah elements. Numbers require five elements. The space between elements is about the time of a dit and between characters, about the time of three dits. The speed of communicating data using CW is basically limited by the ability of the operator to copy by ear and to mechanically key by hand. Good operators can comfortably communicate at 20 to 25 words per minute (wpm). Experts have been able to work at over 40 wpm, but the majority of CW runs at 20 wpm or less. CW can be transmitted and received very much faster using computer software, but this is not commonly done because other digital modes offer greater advantages, and traditional CW operators enjoy using their own skill, unaided by computers. Many hams still only operate CW. Some are not only mike shy…They are computer shy. Remember…It's a hobby.

ALL KEYBOARD MODES: There are many computer keyboard modes that can now produce better communicating results than CW. We can call them "keyboard modes" rather than "digital modes", because they all use a keyboard to enter text messages, rather than a key or a microphone. Manually transmitting these modes may be limited by the real time typing speed of the operator, which might be about 45 wpm or so for those who have been trained to use more than two fingers, but that does not tell us what the top throughput of each mode may be. When we type in real time the data stream fills up a RAM buffer in our computer and the buffer is then transmitted out at a rate that is much faster than our typing speed, and depends on the mode being used. In most cases there will be pauses to fill in the times between when the buffer is unloaded and is ready to be reloaded with new text. However there can also be digitally stored messages, which are called "Macros", which can transmit commonly, used information (such as CQ calls) at the top speed that a mode may be capable of, when commanded by the touch of a single button.

RTTY: The oldest keyboard mode is RTTY or "ritty" (radio teletype), which evolved from TTY (land-line telegraph). The first RTTY used by hams employed the electro-mechanical teleprinters that had originally been used by newspaper reporters. Like CW, these devices used hard switching technology which resulted in broader bandwidths than digital computer generated RTTY. It is a nit picking point to remind you that computer generated RTTY is more correctly referred to as MMTTY, which is also the name given to its computer software. There are only two frequencies involved with RTTY. One called 'space' and the other called "mark". RTTY involves switching between two frequencies, by what is called Frequency Shift Keying (FSK). The RF carrier is always on, resulting in 100% duty cycle, because the transmitter is always generating RF on one of the two frequencies. The difference between the two frequencies, called the spacing, is normally 170 Hz, but other spacings, including 200 Hz, have also been used. Since software has been designed to virtually eliminate splatter on either of the frequencies, we can assume that the required bandwidth of 170 Hz

MMTTY is very close to 170 Hz. The code used for RTTY is the traditional TTY code. It is the fixed length, five bit code known as Baudot Code. The permutations of Baudot Code allow for only transmitting capital letters. A shifting scheme allows for also transmitting numerals and some punctuation. The code used by computer keyboards and for computer displays is an eight bit code, called ASCII. The computer can easily convert one code into the other, but it is a shame that Baudot Code must still be used for the traditional purpose of being compatible with old teletype technology. This is sort of like using a horse to pull an automobile…but it is better than CW which is in my mind like a rickshaw pulling a horse. Most hams are using computer cards that send audio tones to their SSB transceivers, which means that they are using Audio Frequency Shifting (AFSK), but the resulting SSB signal is the same as it would be by actually shifting the transmitter RF frequency, which was done before computers and SSB transceivers were available. MMTTY is sent at 60 wpm or about 45.5 baud.

PSK-31: Next we come to Phase Shift Keying (PSK). The most common PSK used by hams is now BPSK-31. BPSK means Binary Phase Shift Keying. This means we modulate by inverting or not inverting the RF signal. When we invert we change the relative phase by 180 degrees. Only two phases are involved: 0 and 180 degrees. This gives us the ability to operate within a bandwidth which is less than that of MMTTY. This phase shift causes the signal to shift $+/-$ 15 Hz. This adds to 30, but in actual practice the bandwidth required is 31.25 Hz. That is why the mode is called BPSK–31. Quadrature Phase Shift Keying (QPSK) is also available and can be selected using the software.. QPSK employs four possible phases: 0, 90, 180, and 270 degrees. The 31.25 BPSK bandwidth was chosen to enable a desired message rate. The message rate is improved by using a digital code of variable length called Varicode and not the Baudot code that is used for RTTY. Like Morse Code, Varicodes can permit the most common letters to have shorter transmitting time. Although the Bandwidth required for BPSK-31 is less than that of RTTY the speed of data transmission is actually about 60 wpm. PSK systems have a 100 % duty cycle because the RF carrier is always on in one phase or another. PSK is comparable to FM but unlike FM it requires the ability to transmit only two tones rather than a broad spectrum of audio frequencies.

(to be continued)

SAVE THE DATE!   ANNUAL GARC PICNIC ON AUGUST 15   by Jack Cottrell, WA2PYK
Date: Wednesday, August 15th
Time: The actual meeting starts at 5:30 PM, but those who can should be there by 3:30 PM to help set up. We must start cooking by 5:00 PM.
Place: Marjorie Post Park in Massapequa – located on Unqua Road between Sunrise Highway and Merrick Road. We have the big Gazebo, which makes it an all-weather operation. (upon entering from Unqua, go left towards Merrick Road, then right and around towards the back)
Come to the General Meeting on July 18th at Ellsworth Allen Park in Farmingdale to discuss picnic plans. Any comments or suggestions? Call 516-259-0979 or e-mail: jjcottrell@optimum.net

PRESIDENT'S NOTE by Ed Gellender, WB2EAV

   Well, Field Day is now over and we can sit back and think about how it went. Everyone had a great time. I can't remember the last time that we had such nice weather; sunny and warm without being really hot. Usually FD is hot and muggy…and then it rains for a few hours.
   Without any rabid CW ops in attendance, there were only 14 CW contacts (on 40m.). There were 341 phone contacts (32 on 75; 159 on 40; 77 on 20; 33on 15). The long overdue sunspot cycle finally kicked in and the bands were open.   The rigs performed fine. We kept one rig on 20 Meters and switched the other between 40 and 80 Meter dipoles.   We have come to realize for ourselves something that has been known for over a hundred years….that an 80 Meter dipole is one long sucker; It took up half the park.
   We owe Bill N2SFT big time. He has this delightful accessory that has a fishing reel on a large slingshot. By shooting a fishing sinker and monofilament line way up into the trees, he enabled us to put our antennas near the tops of some really old and large trees. With that technique, lots and lots of rope is needed - in two sizes - to build up to running up the actual antenna support lines.
Ed, WB2EAV   Page 2

The meeting was called to order by Karen at 5:50 PM.

TREASURER'S REPORT – Ed, WB2EAV

Finances continue to be in good shape.

REPEATER REPORT – Gordon, KB2UB (not present)

The 145.33 MHz repeater site was hit by lightning, which caused a leak in the roof. It is now up and running again, but it is in need of updates.

NET REPORT – Karen, W2ABK (not present)

Thursday night nets were cancelled due to repeater problems..

Sunday morning net at 7:10 AM on 7.289 MHz had 1 check-in and was noisy.

Sunday morning net at 7:20 AM on 14.289 MHz had 1 check-in and was noisy.

Sunday morning net at 7:30 AM on 21.289 MHz had no check-ins.

VE REPORT – Bob, W2ILP (not present)

There were three registered applicants; One passed Technician and two upgraded to Extra Class.

4 VEs were: W2ABK, Karen, W2ILP, Bob, WB2IKT, George, WB2EAV, Ed.

OLD BUSINESS

We need programs for our meetings.

NEW BUSINESS

The time and location for the GARC August picnic is official. *See Page 2 for details.*

PROGRAM

We discussed plans for Field Day, which will be history by the time you read this newsletter.

GARC WAG NETS: HF: 7.289 MHz at 7:30 AM EST Sundays (Early bird 7:00 AM EST)

Net Controller: Eugene, W4JMX

As per Gene's recent message, operation on 14.289 MHz or 21.289 MHz may be attempted if 40 Meters is not usable. Comments or suggestions may be e-mailed to Gene. His e-mail address is:- w4jmx@earthlink.net

 2 Meter Nets (repeaters): Net Controller, Karen, W2ABK **Thursdays: 146.745 MHz at 8:15 PM, 145.330 MHz at 8:30 PM. Both repeaters (-600 kHz) and 136.5 Hz tone.**

ARES/RACES NETS: Mondays.

MEETINGS: General Meetings of the GARC are held on the third Wednesday of each month, starting at 5:30 PM, at the Ellsworth Allen Park in Farmingdale. Driving directions and map can be obtained from http://www.mapquest.com. It is suggested that the GARC web site be checked to be certain of the meeting location, which may change after this newsletter is distributed. Board meetings are held a week before the General Meeting at the Bethpage Skating Rink Center.

WEBSITE: The GARC web site can be found at http://www.qsl.net/wa2lqo. Webmaster is Pat Masterson, KE2LJ. Pictures of GARC activities, archives of newsletters, roster of members, and other information about the GARC may be found there**.**

INTERNET LINK OF THE MONTH FOR INTERNERDS

The link for this month is:- Http://www.militaryaerospace.com/index.html
This is the address of *Military and Aerospace Electronics News.* When you get to the site you will see headlines of news items that change as often as new information is available. There are usually informative videos there. At the site you can subscribe to newsletters that will be sent to your e-mail address when important news occurs. All is free and available to anyone. Any new developments, contracts, demonstrations, etc. involving aircraft of any type: military, commercial, private, corporate, airline, etc. are covered in as much detail as we might be interested in.

Some time ago I recommended a video that showed an expert demonstration of radio controlled (RC) airplane models. It is interesting to see how greatly remote control of model planes has advanced technically since the days of rubber band powered control escapements and thyatron tube receivers. The modern ground "pilots", many of which are hams, have learned to fly their models and performing all sorts of stunts; It is apparent that this takes a huge amount of skill and practice. There is proportional radio control of all airplane surfaces; rudder, elevator, ailerons, and trim tabs, just as exists on a full size aircraft. Now let me discuss the military unmanned aircraft which are called drones. The drones are piloted by men on the ground. They function in a manner similar to the RC "pilots". The military systems must be able to operate with immunity to jamming and use very secure radio communication. It is, however, an interesting point to notice how much the military drones cost when compared to RC models that are designed, developed and flown by hobbyists, who like radio amateurs and model railroaders, do it "just for fun." On page 6 of this newsletter I have copied an article about the crash of a military drone that was flown from NAS PAX. It was built be Northrop Grumman, and piloted by four men on the ground.

I don't know if any members of the GARC already subscribe to *Military and Aerospace Electronics News.* Although I am now retired I remain interested in avionics. My interest is based on the same sort of curiosity that many hams have. We enjoy seeing how military and commercial technology progress is evolving…along with the amateur radio progress that we can read about in *QST*.

PUZZLE

Last month I presented this question, taken from the Amateur Extra Class Exam. .
When may the control operator of a repeater accept payment for providing communication services to another party?
  A. When the repeater is operating under portable power
  B. When the repeater is operating under local control
  C. During Red Cross or other emergency service drills
  D. Under no circumstances
The correct answer is D.

This month I will ask a question taken from the new Amateur Extra Class Exam.
Witch of the following HF digital modes can be used to transfer binary files?
  A. Hellschreiber
  B. PACTOR
  C. RTTY
  D. AMTOR

GARC Officers

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2 Yr. Board Member: Jack Hayne, WB2BED

2 Yr. Board Member: George Sullivan, WB2IKT

Newsletter

CQ de WA2LQO is published monthly by the Grumman Amateur Radio Club for its members and friends.
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Contributing writers: All GARC members (we hope). To submit articles or ham equipment advertisements contact the editor. Articles will only be edited when permission is granted by the author.

GARC Webmaster

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GARC VE Exams

We normally proctor exams for all classes of ham licenses on the second Tuesday of each month, starting at 5:00 PM. The exams are given at Briarcliffe College, 1055 Stewart Avenue, Bethpage, NY in room: Long Beach #5. Ham Exams are: Element 2 – Technician, Element 3 – General, Element 4 – Amateur Extra Class. All applicants must pre-register by contacting W2ILP. Time and location of exams are subject to change. If there are no applicants VE sessions will be cancelled. The fee for 2012 remains $14 for all exams taken at one sitting. New first time applicants should be aware that their Social Security Number will be required on the application form unless they register with the FCC for an FRN. Applicants for an upgrade should bring their present license and a photocopy of it. All applicants should bring picture ID such as a driver's license. Study material may be bought from the ARRL-VEC or W5YI-VEC http://www.arrl.org or http://www.w5yi.org.   All VECs use the same Q & A pools. The Amateur Extra Class Exam will be using a new set of Q & As, starting on July 1st, 2012. Study guides for the new Extra Class test were released on January 2012.

Commercial FCC Radio Operator Exams

We are certified by the National Radio Examiners to administer exams for all classes of FCC commercial radio operator and maintainer licenses. All Commercial Operator License Examiner Managers (COLEMs) use the same commercial license pools. Administrating fees vary. For information or to register contact W2ILP.

Editorial

Although I was invited by three clubs, I did not attend any Field Day events this year. I presently find that FD has become too much of a chore and I try to eliminate stressing myself whenever possible. As Dirty Harry (Clint Eastwood) said, "A man's got to know his limitations." On my birthday this month I will be 79 years old. I am, however, continuing to run VE/CE sessions and to operate in WAG nets from home. I have tried to work Gene, W4JMX on Sunday mornings. I now can run up to 700 Watts PEP on 40 Meters, using my old Heathkit HA-14 linear amplifier.   The last two weeks I have been unable to hear Gene because of the high noise level on 40 Meters. Also, my 40 Meter dipole favors east-west rather than north-south. I will continue to try every Sunday, in the hope that propagation improves.

Grumman Amateur Radio Club
Sixty Eight Years 1944-2012
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Northrop Grumman Drone Crashes

I heard that an unmanned aircraft that was manufactured by Northrop Grumman had crashed. I did not know how much relative information might be classified and thus I did not ask any NG employees for details. I relied on another source for the below information. It was "Military and Aerospace News". See page 4.
–w2ilp–

PATUXENT RIVER, MD. 12 June 2012. An RQ-4 Global Hawk unmanned aerial vehicle (UAV), made by Northrop Grumman Corp. and operated by the U.S. Navy, crashed across the Chesapeake Bay from the Patuxent River Naval Air Station, Md., during a routine training flight. No injuries or property damage, other than the loss of the more than the $100 million unmanned drone, have been reported.

The crashed Northrop Grumman RQ-4, one of the Navy's Broad Area Maritime Surveillance-Demonstrators (BAMS-D), is one of five unmanned aircraft that the Navy acquired from the Air Force Global Hawk program for maritime intelligence, surveillance, and reconnaissance (ISR).

The UAV has a range of 10,500 nautical miles, operates for more than 30 hours, and achieves speeds of 391 mph. A crew of four military personnel operates the drone from the ground.

The Maryland station at the mouth of the Patuxent River (NAS- PAX) contains the Navy's test pilot school, drone operations, and principal research center for aircraft and support systems.

The cause of the UAV crash is under investigation. A U.S. Coast Guard patrol boat is enforcing a safety zone around the crash site.