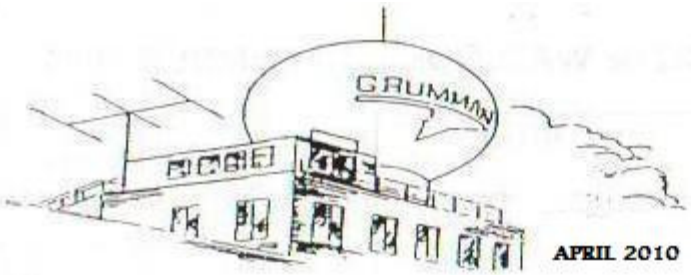

CQ de WA2LQO

APRIL 2010 VOL. 83, No. 4

Communications Systems (continued from March 2010)

By Bob Wexelbaum, W2ILP

After keyed CW, the next most popular mode for the pioneering radio amateurs and eventually for commercial radio broadcasting was amplitude modulated (AM) radio telephony. Fessenden had experimented with AM, by first transmitting audio frequency tones which modulated RF that was generated by alternators. The tones themselves were also generated by alternators. Later Fessenden transmitted audio frequency (AF) voice from carbon microphones that modulated RF alternators; but practical high power AM could not be developed before vacuum tubes were invented. Now let us get back to communication theory. Having lost the text book that I had used in college, in a doctor's waiting room, ["Principles of Communication Systems" by Herbert Taub and Donald Shilling (1971)], I obtained a used replacement for it via Amazon.com. It cost only about $8, including the shipping charge. Apparently most of the EE students who used this book didn't care to save it for their own reference. The copy I received was the Second Edition (1986) which was almost twice as thick as my lost copy. It contained even more mathematical evaluations and proofs. Neither copy was easy reading. Perhaps that is why they are available at low cost. Books that are written by college professors often do not contain the simplest basic concepts. Most of the problems at the end of the chapters rely on the stuff that was explained in class. That is how the professors can find the students who didn't pay attention to their lectures and only tried to read the complicated textbook. Perhaps that is also why the professors save all of the simple stuff for the lectures that they will be giving to their students, so that they themselves won't get confused with Fourier or LaPlace transforms and graphic functions on other planes, which may only be followed in the text. That being said let me try to explain the simplest basic concept of communications theory that is not explained in the textbook as well as it was by the instructor who taught the course. It applies to sampling theory in general and even to AM modulating. Sampling is, in my opinion, best described using visual concepts. In the visual example let us think about old motion picture cameras. Motion pictures are made by sampling the real world by developing a series of still pictures that are called *frames.* The motion picture film advances in the old film (not modern video) camera at a rate that permits one frame at a time to be exposed to it. Each frame is shot by a single snap of the camera's shutter. If the frame rate is too slow the resulting movie will flicker and action on it will appear jerky rather than smooth. This is because the sampling rate is too low. Even when the frame rate is increased to prevent flickering there is an undesired effect called *strobing.* The strobing effect is what makes the spokes on the wheels of the covered wagons in cowboy movies appear to be rotating backwards or even staying still, while the wagons are moving forward to escape capture by outlaws. In real life human eyes would see the wheel spokes as a blur, just as we see fan blades or propellers as a blur when they rotate at high RPMs. Obviously our eyes don't sample frames the way that cameras do. The human eye retinas collect, store and decay what we see continuously and our brains continuously merge images rather than individual frames. Getting back to RF and AF waves, we can now apply the sampling concept to them. Multiplexing of voice audio is a method of carrying more than one AF signal on a single pair of wires. If we want to carry several AF telephone signals on the same wires we can switch one microphone at a time to the line and simultaneously switch to several telephone receivers on the receiving end. Each time we switch we are sampling AF. How often must we sample so that the AF will be understandable? The very basic theory states that the sampling rate should be at least twice as fast as the highest audio frequency that we will be transmitting. In actual practice the

sampling rate must be much higher. Twice the rate is only a limit that definitely must be observed. There is an effect which must be considered that is called *aliasing.* Aliasing of electrical waves is similar to the strobing effect of camera frames. There are several methods to reduce aliasing. The simplest one is to increase the sample rate. The sampling limit criterion was formerly known as Nyquest's Theorem. The theorem is not mentioned by name in my textbook. This may be because a Russian engineer named Vladimir Kotelnikov independently formulated the same sampling theorem in 1933, years before Nyquist and others documented it. AM radio is the result of modulating a CW radio frequency with audio frequencies. This results in generating a signal that has a carrier frequency, around which there is an upper and a lower sideband. The carrier frequency remains constant, while the sidebands carry the audio waveform. The carrier detection voltage can be used to develop automatic gain control (AGC) at the receiver, and to drive an S meter. It does not vary with the transmitted AF. The AF is detected and the RF that it is its envelope to is rectified and filtered, so that it is as smooth as the audio wave that was transmitted. We can also apply sampling theory here, because we must use an RF frequency that is at least twice as high as the highest audio frequency that we want to modulate with. This is why we can not modulate VLF with telephone quality audio or LF with 5 kHz audio. This limitation is not the same as the bandwidth limitation. When we use AM we generate sidebands that require a bandwidth that is twice as large as the highest audio frequency that is to be transmitted. This is because there are two sidebands, an upper and a lower one, being transmitted. The FCC requirement for commercial AM broadcasting on MF is that the signal should not be more than 10 kHz wide in bandwidth. The same limitation applies to hams that may still use AM. Hams can not transmit music. Thus the bandwidth limit is not a serious problem for them. Hams can use what was once considered telephone quality and this is limited to about 3 kHz. Commercial AM broadcasting is limited to 5 kHz. Fixed RF frequencies are assigned to AM broadcasters and the bandwidth limitation further prevents the stations from interfering with each other. Hams can use any frequency within their bands where their mode is permitted but they must tolerate interference from each other, which usually can only be eliminated by QSYing. (To be continued)

PRESIDENT'S NOTE by ED GELLENDER, WB2EAV
April 2010

We are getting close to that time of year again for Field Day. Hold the dates – June 26 and 27. We are planning to hold it at the Dix Hills Park and Golf Course for the third year in a row…We must like the place. It is now time to start planning. Watch this spot the next few months for more specifics and directions

As you may have heard, now that the International Space Station is nearing final completion, the US Space Shuttle fleet is about to be retired. After being the primary method of building the space station, it is now for the Russians to operate and maintain it. Personally, I think it's a national embarrassment. Also, the recent plan to return men to the Moon and then go to Mars seems to have been dropped for budgetary reasons, but that one does not bother me anywhere near as much. Going to the Moon is OK, but I really suspect that going to Mars is just too much human stress, considering how well robotic exploration has been doing lately. To me it has nothing to do with the vastness of space, gravity, solar flares or anything like that. It is simply that being stuck in a can not much bigger than a Toyota Prius for a couple of years is more abuse than anyone can take.

On the other hand, I have recently learned that a new era of manned space flight has begun, although you have to be open-minded about it. Back in 1930, a young lab assistant at the Lowell Observatory in Flagstaff, Arizona was laboriously comparing photographs taken with the huge telescope when he found the anomaly that turned out to be Pluto…now known as "Ex-planet number 9". Clyde Tombaugh became quite famous as a result and parlayed it into a serious career in astronomy until his death in 1997. In 2005 a space probe to Pluto was launched and his family donated half of the ashes from his cremation to go along with it. Now, part of Clyde Tombaugh is halfway back to Pluto…a new kind of manned space flight. Unfortunately there is no return trip, so Clyde will keep going to infinity and beyond.

Another echo of 1930 was in the news recently. Elinor Smith, a quite attractive 17 year old girl fascinated with aviation, flew an airplane under the four bridges across the East River. Most people thought she wouldn't live to see 18, but she was a leading aviatrix of the thirties and a friendly competitor to Amelia Earhart. Eventually she settled down, taking flying more seriously, marrying and raising a family. She died last month at 98. She has single-handedly disproved the old adage about there being old pilots and bold pilots, but no old, bold pilots. Ed, WB2EAV

GRUMMAN AMATEUR RADIO CLUB
MINUTES OF GENERAL MEETING 3/17/2010
By Karen, W2ABK, secretary.

The meeting was called to order by Ray at 5:20 PM.

TREASURERS REPORT – Ed, WB2EAV

Finances continue to be in good shape.

REPEATER REPORT - Gordon, KB2UB

The repeaters are working fine. We have not heard from Bill, N2NFI, with regard to IRLP.

VE REPORT – Bob, W2ILP

There were three applicants. One Technician, one General, One Extra. All passed. VEs were W2ABK, WB2IKT, AB2ZW and W2ILP.

NET REPORT - Zack,WB2PUE

Thursday night 330 net had a good turnout. Sunday morning 40 Meter net had a few check ins.

OLD BUSINESS

Commercial license exam fees have been increased to $50 for 2010. No applicants yet.

NEW BUSINESS

Starting to plan for Field Day.

PROGRAM

Ray, W2DKM brought in a DVD of a Las Vegas show. This humorous show was something different. It featured ventriloquist/impersonator Terry Factor's show at the Mirage. Terry doesn't need a ham license to throw his voice.

The meeting was adjoined at 6:45 PM

GARC NETS:

40 Meters: 7.289 MHz at 7:30 AM EST Sundays.

Net Controller: Eugene, W4JMX

2 Meters (via repeaters): 146.745 MHz (-.600 kHz) at 8:15 PM EST Thursdays.

145.330 MHz (-600 kHz) at 8:30 PM EST Thursdays

Net Controller: Zack, WB2PUE

[Tone for both repeaters is 136.5 Hz] **(ARES/RACES) Mondays**

MEETINGS

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

GARC WEB SITE

The web site of the GARC 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 website for this month is the website of Tom, W5KUB. I had mentioned his site before but it is now new and much improved. Tom is the ham video expert who took videos and still pictures at the recent Dayton HamVentions. He will be recording the next convention in real time, but on his website there are lots of videos and slides of previous conventions. In one I saw vendors at Dayton with background music "Taking Care of Business", which was most appropriate. Depending on when you get to the site there can be other streaming videos…some that might take you elsewhere. Tom's work has become more professional each year. On the website you can sign on and chat with others who are connected at the same time you happen to be there. I was there when Tom was there in real time, and I promised that I would advertise his site in this newsletter.

Here it is;-
http://w5kub.com

What could be easier?

PUZZLE

Here is another Cryptogram:

TIJVIALQH YGZ YW ZDLQHV LV HYYX LZ'V TDJZ VISJEJZIV GV WEYK ZDI

YZDIE JQLKJAV – IOUISZ TIJVIAV. –DYKIE VLKSVYKQ--

Solution to the March 2010 Cryptogram: TELEVISION IS AN INVENTION THAT PERMKITS YOU TO BE ENTERTAINED IN YOUR LIVING ROOM BY PEOPLE YOU WOULDN'T HAVE IN YOUR HOME. --DAVID FROST—
In this cryptogram , since there are no other Cs or Ws:-* WOULDN'T or SHOULDN'T *wouldn't or shouldn't have been an incorrect solution. –w2ilp-

CQ de WA2LQO
April 2010
Volume 83, Number 4
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CONTRIBUTING WRITERS
All the members of GARC (we hope!)

CQ de WA2LQO is published monthly by the Grumman Amateur Radio Club for its members and friends. Send articles and amateur equipment advertisements to: W2ILP Articles may be sent by e-mail or postal mail. They can be in MS Word format or simply in plain text. Articles will only be edited when permission is granted by the author.

ELECTRONIC SUBMISSIONS
For insertion to the WA2LQO website, information may be sent to Pat Masterson.
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EDITORIAL

As we age our short term memory begins to fail, and we tend to forget much of the more recent people and stuff that we have come across. I remember my High School friends and teachers more vividly than the friends and teachers I had during my college days. I could have gone to Stuyvesant H.S. or the H.S. of Science but I went to James Monroe H.S. because it was in my neighborhood. It turned out to be an excellent school and being in the Honor Classes I met some interesting intelligent kids there. Abe Berger went there some years before I did, and knowing that made me appreciate him more than if he held a PhD. I have mentioned my college Communications text book was written by Shilling and Taub, but I never had either as my teacher. I forgot who my communications teacher was. When I was a member of the American Society for Quality Control (ASQC), I met Shilling in the flesh, as he lectured about production sampling using statistical probability. I also heard Taub lecture at an IEEE meeting. BTW Taub's wife was the head of the science department at James Monroe HS, again proving that we live in a small world…. especially when we can remember to connect the dots.
73,
Bob w2ilp (Impossible Life Probabilities)

GARC VE EXAMS

We are continuing to proctor exams for all classes of ham licenses on the second Tuesday of each month, starting at 5:00 PM.
The present exams are:-
Element 2: Technician
Element 3: General
Element 4: Amateur Extra Class

The fee for 2010 is $14.00 for all exams taken in one sitting. The ARRL-VEC now charges $15 but W5YI-VEC has decided not to change the required fee.

Applicants for upgrades should bring their present license and a photocopy of it and know their FRN number.

New, first time applicants should be aware that their Social Security number will be required on their application form, unless they register with the FCC for an FRN.

All applicants should bring picture ID such as driver's licenses.

Until further notice exams will be given at:-
Briarcliffe College
1055 Stewart Avenue
Room: Long Beach #5
Bethpage, NY
Briarcliffe, Bethpage is located in a building that was formerly part of the Grumman complex.

All applicants should contact W2ILP to register, so as to confirm location. If no applicants apply, the exam session will be cancelled.

For any related information e-mail w2ilp@optonline.net or phone-
(631) 499-2214

Study material is available at the web sites of the ARRL
http://www.arrl.org
or W5YI
http://www.w5yi.org
All VECs use the same Q &A pools.

Since the beginning of the VE program the GARC has provided opportunities to take the ham exams monthly, during all 12 months of every year.

Bob Wexelbaum, W2ILP and the GARC VE team.

GRUMMAN AMATEUR RADIO CLUB OFFICERS FOR 2010

President	Ed Gellender	WA2EAV	X02-14	516-575-0013
Vice President	Gordon Sammis	KB2UB	Retiree	631-666-7463
Secretary	Karen Cefalo	W2ABK		631-754-0974
Treasurer	Ed Gellender	WB2EAV	X02-14	516-575-0013
1Yr Board Member	Zack Zilavy	WB2PUE	Retiree	631-667-4628
1YrBoard Member	Dave Ledo	AB2EF		
1Yr Board Member	Bob Christen	W2FPF		
2 Yr Board Member	Bob Wexelbaum	W2ILP	Retiree	631-499-2214
2 Yr Board Member	Jack Cottrell	WA2PYK	Retiree	516-249-0979
Trustee WA2LQO	Ray Schubnel	W2DKM	Retiree	

STANDING COMMITTEE CHAIRMEN

Contact VE:	Bob Wexelbaum	W2ILP	Retiree	631-499-2214
Webmaster	Pat Masterson	KE2LJ	Retiree	813-938-4614

GRUMMAN AMATEUR RADIO CLUB
Sixty Six Years 1944 -2010
P.O. Box 0644
Bethpage, NY 11714-0644

FIRST CLASS

DO NOT DELAY

SILENT KEYS

ABE BERGER, W2BLH

Abe passed away on 3/14/2010 at the age of 95. He was a long time member of the GARC and the first member to make video recordings of GARC Field Days. Abe was licensed as W2BLH while attending James Monroe H.S. in The Bronx, NY. He had worked as an industrial arts teacher. As an EE, Abe worked for Fairchild Camera before working for Grumman. His son, Larry Berger, WA2SUH has offered to make Abe's video recordings available.

JOHN KOSZEGHY, K2OB/K3BB

John passed away on 1/11/2010. He had worked at Flight Test at Grumman. Ray, W2DKM saw the announcement in the Grumman Retiree Newsletter. John was an avid DXer who supported DX contest work from the club station on the roof of Plant 5 and authored a book about Quad antennas. He had left Grumman to work for NGC at NATC, Patuxent River, MD and later retired to Land-O-Lakes, FL.