
The History Of Amateur Radio

OUTLINE OF AMATEUR RADIO HISTORY

1894-1899--Marconi conducts his wireless experiments in Europe and sends a message across the English Channel. First article on building a wireless set appears.

1901-Marconi sends a wireless signal across the Atlantic.

1900-1908--Thousands of Americans experiment with wireless. Few at this time are interested in it as a hobby only.

1904-J.A. Fleming develops the 2 element (Diode) vacuum tube.

1906-Lee deForest develops the 3 element (Triode) vacuum tube. R.A. Fessenden uses the Alexanderson Alternator to make the first voice & music transmissions.

1908-A possible beginning of amateur radio. Prior to this time, interest in wireless had primarily been either as an experimenter or as an entrepreneur. By 1908, definite hobby interests exist among users.

1909-The first radio clubs are formed. Spark and the longwaves (300-6000 meters) are king.

1912-The Titanic disaster points out the need for Wireless Regulation. The Radio Act of 1912 is passed, which limits "private stations" (i.e. amateurs) to 200 meters, a "useless" frequency. The number of "private stations" drops from an estimated 10,000 to 1200.

1913-Edwin Armstrong develops the regenerative receiver and also discovers that the "Audion" (Triode) can oscillate. CW is born.

1914-The ARRL is organized by H.P. Maxim to help relay messages, given the limited range on 200 meters at that time. (25 miles).

1914-1917--The number of amateurs increases from 1200 to over 6000. The ARRL has an effective traffic handling network set up. David Sarnoff, (future head of RCA) proposes a "Radio Music Box" receiver. deForest (and some

amateurs) make experimental broadcasts. The ARRL starts a little magazine, called "QST".

1917-The US enters WWI. All amateurs are ordered to dismantle their transmitters and receivers. With no radio operations, and 4000 hams in uniform, QST ceases publication.

1918-Major Armstrong develops the superheterodyne receiver while serving in France. C.W. is used by the military during the war.

1919-Secretary of the Navy Josephus Daniels tries to get the Navy a total monopoly on all wireless communications. The ARRL's "blue card" appeal saves the concept of private radio operations. Amateurs get back on the air in November, 1919.

1919-Woodrow Wilson becomes the first President to speak over radio when he broadcasts a speech to American Troops in Europe.

1919-1920--King Spark's last stand, with the success of CW in the war & the availability of tubes, Spark was doomed. Some amateurs experiment with broadcasting, including 8XK (KDKA). The number of hams = 5719.

1920-"Amateur Police Radio" becomes popular. Amateurs operated as an intersystem police communications service to relay broadcasts of crimes and stolen vehicles.

1921-The National Amateur Wireless Association becomes active. It's main success is the broadcast of the Dempsey-Carpenter fight. Many amateurs helped in this broadcast, from acting as relay stations to setting up receivers and loudspeakers in public places.

1921-1922--The Transatlantic tests are a success. Amateurs discover that frequencies below 200 meters (above 1500 kc) work even better. Amateur Broadcasting ("Citizen Radio") is popular with up to 1200 amateurs, but is prohibited in 1922 with the first broadcast regulations issued.

1923-The amateur census is at 14,000. Shortwave development continues. The MacMillian Arctic Expedition is the first to carry two way radio; an amateur 200 meter station. Over the next 10 years, dozens of Arctic and Antarctic expeditions, including those of Commander Byrd, used amateur radio as their primary communications.

1924-Amateurs get new bands at 80, 40, 20, and 5 meters. Spark prohibited on the new bands. Broadcast band expanded. The ARRL adopted Esperanto as the international auxiliary language

1925-The International Amateur Radio Union (IARU) formed. Amateurs finally are successful in working around the world on shortwave.

1926-Crystal control of transmitters developed. A Federal Court declared the Radio Act of 1912 to be unenforceable in regards to broadcasting & the shortwaves. The "Summer of Anarchy" commences in the broadcast world, but amateurs stay within their bands.

1927-The Radio Act of 1927 creates the Federal Radio Commission. The word "amateur" is used for the first time in a Federal Statute. The International Radiotelegraph Conference is held in Washington. 70 Nations send representatives. Amateurs, represented by the ARRL & the IARU, fight overwhelming odds, keep 160, 80, 40, 20 & 5 meters, gain 10 meters, but lose 37.5% of our overall frequencies. International callsign prefixes are assigned.

1929-1936--Despite the Depression, Amateur Radio enjoys it's greatest growth--from 16,829 to 46,850. Low cost components make it possible to build a quality station for \$50. VHF phone operation becomes popular with the superregenerative receiver (developed by Armstrong) and the modulated oscillator. Phone operation begins to appear on some HF bands. But C.W. & crystal control are still number 1.

1932-The Madrid Conference. No changes to Amateur Radio.

1933-1934--The Communications Act of 1934 creates the Federal Communications Commission. Amateur Licenses are reorganized into Class A, Class B, and Class C. Major Edwin Armstrong develops wideband FM.

1936-H.P. Maxim, founder of the ARRL & it's first President, dies.

1938-The Cairo Conference. Amateurs lose the exclusive use of 40 meters, now shared with Broadcasters. The FCC gives us 2 new "UHF" bands, 2 1/2 meters (112 Mc) and 1 1/4 meters (224 Mc).

1939-1940--We are joined in the "UHF" range by two new users--the first FM Broadcast Band (42-50 Mc) featuring stations such as W1XPW, W2XMN, and W2XOY; and the first Television Broadcast Band, above 60 Mc, with stations such as W2XBS.

1940-1941--With the war raging in Europe, our ability to have international QSO's is severely limited. When the US enters the War, all amateur activity is suspended

1942-1945--Except for WERS (the War Emergency Radio Service) on 2 1/2 meters, no amateur operations take place. New "UHF" tubes and circuits are developed as a result of the war.

1945-A major battle develops over postwar frequency allocations. The ARRL (amateurs), Major Armstrong (FM Broadcasting), and Brigadier General David Sarnoff (RCA/NBC Television), all fight over the low end of the VHF spectrum between 44-108 Mc. At one point, the FCC submits 3 Alternatives--#1 gives us a 7 meter band (44-48 Mc), #2 our 5 meter band (56-60 Mc), and #3 a 6 meter band (50-54 Mc). Alternative #3 wins and our 6 meter band is located between TV Ch 1 (44-50 Mc) and Ch 2 (54-60 Mc). FM is moved (over Armstrong's objections) from 42-50 to 88-108 Mc. The FCC moves our 2 1/2 meter band to 144-148 Mc (over the ARRL's objections) because they want it to be next to government & military allocations. On November 15, 1945, amateurs are allowed back on the air--but just on 10 & 2 meters only.

1945-CQ magazine is first published.

1946-The military leaves our HF bands in stages, hams gradually get their frequencies back, all except for 160 meters, which will be used for the LORAN Radio navigation system. The FCC creates the Tenth Call District (using the numeral -0-), and realigns the District boundaries. War surplus equipment finds its way into the ham market.

1947-The Atlantic City Conference--Amateurs lose the top 300 kc of 10 meters (29.7--30), and will lose 14.35--14.4 Mc on 20 meters. But they will gain a new band at 15 meters (21.0--21.45 Mc) in the future. To compensate hams for their loss, the FCC allows them to use the 11 meter band (26.96--27.23 Mc) on a shared basis with Industrial, Scientific & Medical devices. TVI is starting to become a problem--the ARRL determines that Ch 2 is very vulnerable to TVI & recommends it be eliminated, but the FCC removes Ch 1 instead. The Transistor is developed by Bell Labs.

1948-Single Sideband is fully described in the amateur publications. The FCC creates Class A & Class B CB radio between 460--470 Mc.

1951-The FCC completely reorganizes the amateur license system. The Class A, B, & C Licenses are replaced by the Advanced, General, & Conditional Class respectively. Three new license classes are created--the Amateur Extra, Novice & Technician. The Technician Class is created for experimentation, not communication, and has privileges only above 220 Mc. Novices are given limited HF CW subbands, 75 watts, crystal control only. They may also use phone on 145--147 Mc. It is a 1 year, non renewable license.

1952-The FCC allows phone operation on 40 meters, which had been CW only. The 15 meter band is opened. The Advanced Class is withdrawn from new applicants, although present holders can continue to renew, and the "exclusive" 75 & 20 meter phone bands are opened to Generals & Conditionals. Everyone, Conditional & above, has the same privileges.

1953-The FCC starts issuing "K" calls to amateurs in the 48 States due to the increased ham population.

1954-Depressed and broke from his patent fights with RCA over FM, Major Edwin Armstrong commits suicide. His wife continues the fight, winning the last battle in 1967, when the Supreme Court rules that Armstrong did indeed invent FM.

1955-Technicians are given 6 meter privileges to help populate the band & encourage experimentation. The ARRL & most hams oppose 2 meters for Technicians. Wayne Greene becomes editor of CQ magazine.

1956-1960--A gradual technical revolution on 2 fronts: Transistors find their way into the ham shack, first in power supplies, then audio sections, then receivers and finally QRP transmitters. But most equipment was still 100% tubes. Also, SSB is catching up on AM in terms of popularity. By the 1960's, SSB pulls ahead of AM.

1957-Sputnik, the first artificial satellite, is launched by the USSR. Amateurs copy it's beacon on 20 & 40 Mc.

1958-Explorer is launched by the US. Amateurs copy it's signal on 108 Mc. The ham population is 160,000--3 times the 1946 total. The FCC has to issue "WA" calls in the 2nd & 6th call areas, as the "W" & "K" 1x3 prefixes have run out. Slow Scan TV is first described in QST. In September, amateurs lose their shared use of 11 meters, as Class D CB is born.

1959-The Geneva Conference held, no major amateur changes. Technicians get the middle part of 2 meters (145-147 Mc), but not without some controversy over the purpose of the license. The FCC restates their "experimental, not communication" policy.

1960-Wayne Greene fired as CQ editor, forms 73 magazine.

1961-OSCAR I, the first amateur satellite, is launched. Thousands of Amateurs copy it's 50 mw beacon on 144 Mc sending out ".... .."

1962-CONELRAD is replaced by the Emergency Broadcast System. Amateurs no longer have to monitor 640 or 1240 kc while operating their stations.

1963-The ARRL, responding to some complaints about Generals being allowed on 75 & 20 phone, proposes an "incentive licensing" system. Under the ARRL proposal, Generals & Conditionals would lose 75, 40, 20 & 15 meter phone privileges over a 2 year period. The Building Fund, to construct the ARRL Headquarters at 225 Main St., Newington, is in full swing. The amateur

population is over 200,000, but CB licenses now outnumber hams.

1964-A ham in the White House? Barry Goldwater, K7UGA/K3UIG is the Republican Candidate for President. (He is defeated). Herbert Hoover dies at the age of 90. As Secretary of Commerce in the 1920's, and President of the United States from 1929-1933, his strong support of amateur radio was invaluable. He lived long enough to see his son (Herbert Hoover, Jr, W6ZH) elected President of the ARRL.

1965-The FCC comes out with it's own incentive licensing proposal. General/Conditional Class operators would lose 50% of the 75-15 meter phone bands. A new "Amateur First Class License", with a 16 wpm code speed, would be the stepping stone between the General and the Extra. Advanced Class amateurs would not be "Grandfathered" into the "First Class", rather, they would be bumped down to General upon renewal. OSCAR III & OSCAR IV allow 2 way QSO's via satellite.

1967-The FCC announced the new Incentive Licensing rules: over the next 2 years, General & Conditional operators would lose 50% of the 75-15 meter phone bands, the "First Class" idea was dropped, the Advanced Class was reopened to new applicants, Extra & Advanced Class operators get exclusive subbands on 80-15 and 6 meters, the Novice license term is doubled to two years, but Novices lose their 2 meter phone privileges, the FCC restates the "Technicians are experimenters, not communicators" policy, and states that the next license step for Novices is the General, not Technician, class.

1968-The FCC authorizes SSTV in the Advanced/Extra Class subbands. Generals & Conditionals get SSTV later.

1969-The FCC removes the ability for a Technician to hold a Novice license at the same time. The ARRL announces a new policy, they now consider Technicians to be communicators and petition the FCC to give them full VHF privileges, a 10 meter segment from 29.5-29.7 Mc, and Novice CW subbands. "Long Delayed Echoes" appear. Were they real, or a hoax?

1970-The amateur population is 250,000 but stagnant. The license fees & Incentive Licensing are blamed. Meanwhile, 2 meter FM is starting to boom. New equipment designed for the amateur market joins the surplus wide band commercial radios which were converted for use on 146.94. "Mhz" & "khz" replace "Mc" & "kc". Amateur Radio is dragged into the Vietnam War protest movement with the "Student Information Net" in operation on College Campuses nationwide.

1971-The Japanese are starting to dominate the amateur markets. National, Hammarlund, Hallicrafters and Gonset were beginning to fade away, but Drake, Ten-Tec, Heathkit and Collins were still going strong.

1972-A national 2 meter FM band plan was announced, 146.52 was chosen as the national simplex frequency. The FCC released the first repeater rules, expanded the Technician 2 meter allocation to 145-148 Mhz, and relaxed mobile logging requirements.

1974-The Electronics Industry Association proposed a new "Class E CB" using 2 Mhz of our 220 band. The FCC proposed a "Dual Ladder" license structure which would take privileges away from Generals and Technicians (again) and would create a new code free "Communicator" license. Both proposals eventually were scrapped. "WR" prefixes began to appear on repeater callsigns.

1975-1976--A new repeater subband is established at 144.5-145.5 Mhz. Technicians now have 144.5-148 Mhz on 2 meters, and finally have Novice privileges. Novices are given a power increase to 250 watts. The "mail order" Technician license is eliminated--applicants must appear at a FCC examination site. The Conditional class is abolished.

1977-The FCC expands CB radio from 23 to 40 channels. Hundreds of hams purchase "obsolete" 23 channel CB sets at fire sale prices and convert them to 10 meters.

1978-Technicians finally get all privileges above 50 Mhz, and can obtain a RACES Station authorization. The Novice license is made renewable. The FCC relaxed some of it's regulations, and instituted a new callsign system using 4 "groups", corresponding to the class of license held. "WR" repeater callsigns are phased out. The amateur population stands at 350,000--33% more than in the early 70's. "Packet" radio first appears on the hambands, on an experimental basis.

1979-The World Administrative Radio Conference, or WARC-79, takes place in Geneva. The ARRL, IARU & other groups have been preparing for years. We lose nothing & gain 3 new bands at 10, 18, & 24 Mhz, which are phased in over the next 10 years.

1980-Spread Spectrum appears on an experimental basis, and the FCC authorizes ASCII on the ham bands. Packet is starting to grow.

1982-The "Goldwater" Bill is passed. It allows the FCC to set industry standards regarding RFI.

1983-A ham in space!! Owen Garriott, W5LFL, becomes the first amateur to operate on board a Space Shuttle. He makes hundreds of QSO's on 2 meters. Another "Code Free" license idea pops up. Amateurs are overwhelmingly opposed, & the proposal is dropped.

1984-The 10 year license replaces the 5 year one. The FCC stopped giving examinations, turning the duty over to the new Volunteer Examiner Program. The HF phone bands are expanded. The amateur population is up to 410,000.

1985-State and local rules which restrict amateur antennas must now comply with the FCC's new policy, expressed in PRB-1. The FCC gives itself preeminence in antenna regulations, and states that local ordinances must provide for "reasonable accommodations" regarding amateur antennas.

1987-Novices & Technicians get 10 meter SSB privileges from 28.3-28.5 Mhz. Novices also get phone operation on portions of 220 & 1296 Mhz. The Element 3 written exam is broken into 2 segments--3A (Technician) and 3B (General). Technicians who passed their exam prior to March 1987 get permanent credit towards the General written exam.

1989-Amid growing calls for a code free license, the ARRL comes out in favor of one. (The ARRL's version does not include voice privileges on 2 meters).

1990-1991--MARS operations increased as amateurs became involved in Operation Desert Shield/Storm. As the war in Kuwait increases, tens of thousands of Americans discover Shortwave Radio, to get the latest news.

1991-Amateur Radio gets it's first code free license--the "No Code Technician". "Regular" Technicians are renamed "Technician Plus". The first all amateur Shuttle, the "Atlantis", goes into space.

1991-1998--Amateur Radio grows from 500,000 to over 710,000 hams. The ARRL is at its highest membership ever. Despite the "Doomsday" crowd, amateur radio is healthier than ever. The Internet hasn't killed us. Schoolchildren talk with hams in space. Our Public Service activities are wanted & appreciated. And Amateur Radio looks forward to the next Millennium, confident that it will evolve and grow.

Compiled from the following sources:

"Empire of the Air", by Professor Tom Lewis of Skidmore College, HarperCollins, 1991.

"200 Meters & Down, the Story of Amateur Radio", by Clinton DeSoto, The American Radio Relay League, 1936.

"QST", 1920---

"CQ", 1945---

"73", 1960---

Various issues of "Popular Electronics", "Electronix Illustrated", and "VHF Horizons", , old ARRL Handbooks, and, for events in 1967 & later.

The History Of Amateur Radio Chapter 1

OK, I knew it would happen. When I started this article, I expected three questions would be asked: "When did ham radio start?"; "Who was the first ham?"; and "Where did the word 'ham' come from?". To answer these questions, let's set the Wayback Machine to Warp Factor 9, and head back 100 years. Practical "wireless" had its start in 1896, when Marconi first sent a signal over a distance of two miles. By 1899, he succeeded in sending a wireless message across the English Channel, a distance of 32 miles. The year 1899 also marks the first construction project, which appeared in "American Electrician" magazine. In December, 1901, Marconi was able to bridge the Atlantic, a feat which caught the world's attention and fueled the imagination of thousands of potential amateurs, who took their first steps into wireless.

In the early days, everything was "spark". What exactly was spark? Well, sit down some summer night, listen to your AM or SW radio, and count the static crashes. Now turn on the vacuum cleaner, or an electric shaver, and listen to your radio again. Hear that noise? In short, spark wireless was merely a form of "controlled static". A high voltage inside a spark coil would jump across a gap, which was coupled to an antenna. The spark was keyed on and off to transmit the code. The signal generated was extremely broad. A "state of the art" 1906 spark transmitter operating on 400 meters (750 khz) would actually generate a signal from about 250 meters (1200 khz) to 550 meters (545 khz). Receivers were no better, before 1912 all systems were basically unamplified detectors. Tuners were primitive or nonexistent. As might be expected, by today's standards, the early wireless stations were terribly inefficient. Transmitting ranges varied from as little as 600 feet with a 1/2 inch coil to perhaps 100 miles from a kilowatt station and a 15 inch spark coil. Ships at sea with 5 kw transmitters might get as much as 500 miles maximum range.

It was into this world that the early amateurs ventured. Actually, if we were to concentrate on the years prior to 1908, it would be more appropriate to say "experimenters" rather than "amateurs". For in the first decade of wireless, there was little or no interest in personal communications with other stations; rather, the concentration was on technical development, either in the interest of pure science, or (more often than not) with an eye towards cashing in on this new medium. Experimenters were unorganized and, with the exception of those immediate stations with whom they ran tests, had no knowledge or interest in other pioneer stations. Any true "amateurs" prior to 1908 have been lost in pre-historic obscurity.

By 1908, however, the face of wireless began to change. Technical developments had reached their first plateau, and a number of major competitors had formed the first "wireless trust"--United Wireless. With a temporary truce in effect, equipment was now more readily available to the public. Along with this, new magazines, such as "Modern Electrics", were formed with wireless communication as the primary thrust. The circulation of "Modern Electrics" jumped from 2000 to over 30,000 in just two years. The year 1908 also saw the first "handbook", "Wireless Telegraph Construction for Amateurs". It is difficult to know exactly how many amateur stations were on the air in this completely unregulated, laissez-faire era, but reliable estimates put the number of "major" stations (i.e. those capable of communicating over 10 miles) at 600, while "minor" stations with a one or two mile range probably numbered 3000 or more. Thus, if a year had to be arbitrarily chosen as the start of amateur radio, it would probably be 1908.

As for the "first" amateur, that's a harder one. Without licensing, regulations, or a written record, there will never be a definitive answer to this question. However, the Wayback Machine has come up with the name W.E.D. Stokes, Jr.. He was a founding member and the first President of the first amateur radio club--the Junior Wireless Club, Limited, of New York City. This organization was formed on January 2, 1909. Other founding members who might lay claim to the title "first amateur" were George Eltz, Frank King and Fred Seymour. Later the same year, the Wireless Association of America, and the Radio Club of Salt Lake City were created.

By 1910, wireless clubs were springing up all over the country, and the first call book--"The Wireless Blue Book" was published. Since there were no regulations in this period, the call signs listed in the Blue Book were self assigned--which brings us to our third question--where did the word "ham" come from? Legend has it there was a phenomenal station on the air with a 5kw station, who could be heard at all hours of the day and night at distances of over 500 miles. The station operator used his initials for his callsign-H.A.M.. I don't know if this is the real story, but I've always liked this explanation best.

Amateur radio continued to grow. By 1911, Modern Electrics had a circulation of

52,000, and there were 10,000 amateurs in the country. With thousands of stations on the air, both amateur and commercial, interference was becoming a serious problem, especially in marine communication. Ships, because of their restricted antenna length, were limited to frequencies between 450 and 600 meters (666 to 500 khz). As we have seen, one spark station could take up this entire spectrum. Thus, it was imperative that all stations cooperate and stand by when the others were transmitting. Sadly, this often was not the case. In addition to interference between amateurs and commercial stations, there was more interference and sometimes deliberate jamming between commercial stations of different companies. Prodded by the Navy (which was using inefficient and outdated equipment and thus suffering from excessive interference), the U.S. Congress was starting to take a serious look at wireless regulation. However, before they could take up proposed legislation, an incident happened that would quickly and dramatically alter the structure of the wireless spectrum.

On April 15, 1912, the R.M.S. Titanic struck an iceberg in the North Atlantic and sank. Thanks to wireless, and the first S.O.S. in history, 713 lives were saved. However, it has been argued that the number of survivors could have been doubled or even tripled, if there were stronger wireless regulations in effect. We are going to leave the Wayback Machine hovering over the year 1912, keeping a sharp eye on the Titanic, and on a 22 year old experimenter in Yonkers, N.Y., who would soon make some major contributions to radio.

So, until then, keep that spark gap adjusted and those raspy CQ's coming.

The History Of Amateur Radio Chapter 2

Monday, April 15, 1912, 12:30 AM. The Wayback Machine is over the North Atlantic, at 41 degrees 46' North, and 50 degrees 14' West. Down below is a majestic ship, the largest and most luxurious ship in the world, on its maiden

voyage. In the wireless room is a 5kw Marconi station, and before it sit two tired operators, who make \$20 per month, not as employees of the shipping line, but rather as employees of the Marconi Company. The in basket is still full of messages, everything from personal telegrams to stock market quotations. They are so busy working Cape Race, Newfoundland, that they didn't even notice the slight grinding jar 30 minutes earlier. As the two wireless operators, Jack Phillips and Harold Bride, passed the routine traffic, the Captain came in, said the ship had struck an iceberg, and told them to send a distress call at once. The blue spark jumped across the gap as Phillips sent "CQD" (come quick danger). "Send S.O.S." Bride said, "It's the new call and it may be your last chance to send it". Thus began the moment in history that changed radio. Two hours later, Jack Phillips and over 1500 others were dead, the "Titanic" lay at the bottom of the ocean, and 713 survivors huddled in half filled lifeboats waiting to be rescued. The tragic errors in the story of the "Titanic" pointed out the need of wireless regulation.

The first ship to answer the distress call was the German Liner, the "Frankfurt". While the "Frankfurt" wireless operator was informing his captain, the "Carpathia" and Cape Race chimed in. When the "Frankfurt" operator came back to get more information, Phillips tapped back "SHUT UP, SHUT UP, YOU FOOL. STAND BY AND KEEP OUT". While this would seem bizarre by our standards, it made perfect sense to the operators of 1912. The "Titanic", "Carpathia", and Cape Race were equipped with Marconi operators and stations, while the "Frankfurt" utilized the services of Marconi's German competitor, Telefunken. This commercial war was extended down to the individual operators. No routine traffic would EVER pass from a Marconi station to a rival, and, even in an emergency, if Marconi stations were available, the others would be shut out.

The wireless controversy would continue after the "Carpathia" picked up the survivors. A wireless message was received, allegedly from the "Carpathia", which said "ALL PASSENGERS OF LINER "TITANIC" SAFELY TRANSFERRED TO THIS SHIP AND "S.S. PARISIAN". SEA CALM. "TITANIC" BEING TOWED BY ALLEN LINER "VIRGINIAN" TO PORT". Other wireless messages appeared, also stating that ALL passengers were safe, and the ship was being towed in. There was just one problem--these messages were not coming from the "Carpathia". For one thing, her wireless had a maximum range of 150 miles. For another, the "Carpathia" wireless operator had made only a few transmissions to the "Olympic" (sister ship of the "Titanic" and another Marconi operation), in which he tapped out the list of survivors, some coded messages from Bruce Ismay, President of White Star Lines, then shut down his station. So complete was the radio silence from the "Carpathia", that they refused to answer the calls from Navy cruisers sent to the scene by President Taft. The White Star Line, owners of the "Titanic", were still insisting that everyone was safe and the ship had not sunk. But even as they made these claims, they had all the horrific details from the "Olympic". And so would the rest of the world, thanks to a 21 year old operator named David Sarnoff, who managed to detect the faint signals

of the "Olympic", and broke the story. Faced with the truth, and hounded by thousands of reporters and outraged relatives of passengers, the White Star Liner officials finally broke down and revealed all.

Meanwhile, the "Carpathia" steamed towards New York City. When she passed within range of shore stations, there were "frenzied attempts by amateur wireless operators which formed a hissing mixture from which scarcely a complete sentence was intelligible". It didn't matter, because the radio silence continued.

At the Port of New York, the "Carpathia" was met by Senator William A. Smith of Michigan, a no nonsense Populist who was the Chairman of the committee investigating the shipwreck. He immediately slapped subpoenas on everyone possible, including Harold Bride and Harold Cottam, wireless operator on the "Carpathia". Marconi himself, who was in the U.S. at the time, (and had planned on taking the "Titanic" back to England), was also summoned to appear.

The hearings revealed the information given above, plus the disturbing fact that the "Californian" was just 10 miles from the "Titanic". Not only did the "Californian" not have a full time wireless operation, but the ship's captain ignored the eight distress rockets sent up by the "Titanic". As to the origin of the false messages concerning the saving of the ship and passengers, no answer was ever found. However, Senator Smith sarcastically noted that, in the interim, the "Titanic" was quickly reinsured, and stock in the Marconi Company jumped from \$55 to \$225 per share. The Senator DID find out the cause of the "Carpathia" radio silence--it was Marconi himself. He had sent wireless messages to Bride and Cottam stating "MARCONI COMPANY TAKING GOOD CARE OF YOU-KEEP YOUR MOUTH SHUT-HOLD YOUR STORY-YOU WILL GET BIG MONEY-NOW CLEAR". It turned out that Marconi had an agreement with the New York Times for an exclusive story. Thus, essential information for desperate relatives and official inquiries from the President of the United States took a back seat to Marconi's interest.

When Marconi got on the stand, Senator Smith pounced on him with astonishing vehemence. Marconi had been lionized by the nation, and now the Senator was treating him like any other entrepreneur who put profit above the public. Senator Smith was warned that his attack on a man as popular as Marconi was political suicide, but he didn't care. In his obsession with his belief that the unregulated wireless spectrum was partly to blame in the "Titanic" disaster, he painted Marconi as a man willing to subordinate the public good to his goal of a complete wireless equipment AND spectrum monopoly. Senator Smith used the "Titanic" hearings to condemn the laissez-faire status of the wireless, and appeal for the international regulation of radio.

On May 18, 1912, Senator Smith introduced a bill in the Senate. Among its provisions: 1) ships carrying 50 passengers or more must have a wireless set with a minimum range of 100 miles; 2) wireless sets must have an auxiliary

power supply which can operate until the wireless room itself was under water or otherwise destroyed; and 3) two or more operators provide continuous service day and night. In response to the interference generated over the years, and especially when the "Carpathia" was within range, a provision was added that "private stations could not use wavelengths in excess of 200 meters, except by special permission". To avoid "ownership" of the spectrum by the Marconi Company, licenses would now be required, issued by the Secretary of Commerce. Each Government, Marine, or Commercial station would be authorized a specific wavelength, power level, and hours of operation.

The initial legislation had considered the elimination of all private, non commercial (i.e. amateur) stations, but Congress realized that would be difficult and expensive to enforce. Therefore, since it was a "well known fact" that long wavelengths were the best, and anything below 250 meters was useless, except for local communication, it was decided to compromise and give the amateurs 200 meters, where they could work 25 miles maximum and would die out of their own accord in a few years.

The History Of Amateur Radio Chapter 3

Amateurs entered the summer of 1912 with a new Radio Act in place. Thanks to the Titanic disaster and the fear that commercial interests would try to monopolize the radio spectrum, the government stepped in and set up a licensing structure administered by the Secretary of Commerce. In the new law, amateurs (actually "private stations") were limited to a wavelength of 200 meters and a maximum power of 1kw. Since the known usable spectrum at that time ran from about 300 to 3000 meters (1000 khz to 100 khz), it was widely believed that amateur radio would fade away, without expensive government enforcement. At first, it appeared that the bureaucrats were correct. Before the Radio Act, there

were an estimated 10,000 stations. Now, there were only 1200 licenses issued by the end of 1912. Amateurs were finding it difficult to get their spark stations going on 200 meters, and, when they did, they discovered their maximum range was 25-50 miles, instead of the 250-500 mile range they had on the longer wavelengths. Amateur radio was slowly heading for oblivion.

The big stumbling block to effective communications on 200 meters (or indeed any wavelength) was the spark transmitter and unamplified detector, both of which were extremely inefficient. On the transmitting end, no method, other than spark, was known. As for the receiver, there had been two developments in the vacuum tube area. J.A. Fleming had developed the diode detector in 1904. It cost a lot of money, provided no amplification, and used expensive batteries. It was not practical at the time, but it was covered by a patent. In 1906, Lee deForest took Fleming's valve, added a third element, called a grid, and named the result the Audion. In the right circuit, the Audion could amplify by a factor of 5x. Still, because of the cost, battery requirement, and the ever popular patent fights of the time, it went unnoticed and unused until 1912, when a 22 year old amateur made an important discovery.

Edwin H. Armstrong was an experimenter and almost militant individualist. He had obtained an Audion for use in his station. Dissatisfied with the poor amplification, he tried different circuits. At one point, he "fed back" a portion of the output back to the input to be re-amplified. Instead of just a 5x amplification, the output was now 100x stronger than the input. He also discovered that if too much feedback was used, the tube began to oscillate. This regenerative circuit was the most important discovery in radio in years. One tube could amplify more than 100x, two tubes in series could give a gain of 2000+. In addition, an alternative to spark was now available. Instead of a raspy, broad inefficient signal that took up hundreds of khz, the Audion could be made to oscillate a stable, pure signal on one frequency. In fact, that's where the phrase c.w. comes from, (a continuous wave on one frequency rather than a broad, intermittent wave on many). Although it would take 10+ years to develop the stability in transmitters and receivers to fully utilize c.w., King Spark was doomed.

Realizing the importance of his regenerative design in both transmitting and receiving, but lacking the money to develop it, in January 1913 Armstrong had the diagrams of his circuit notarized. This was only the first of many spectacular inventions Armstrong would come up with. Within 10 years, he would also develop the superheterodyne (now used in ALL receivers), and the superregenerative (the basis of all VHF and UHF receivers from the 20's to the 50's, and still used today in children's walkie-talkies). Even his first design, the regenerative circuit, is used by Ten-Tec and MFJ in their receiver kits. The crowning achievement in Armstrong's career came in the 30's, when he developed Frequency Modulation. With all due respect for those who flock to Loomis, Tesla, or Marconi as the father of radio, my vote goes to Armstrong, for without him, wireless would be stuck at the 1912 level. Armstrong had a

tempestuous life, full of public and private battles, advancements, setbacks and lawsuits, before his tragic death in 1954. The final legal battles didn't end until 1967. The Wayback Machine will devote an entire column to Armstrong this fall.

Meanwhile, back in 1913, word of the regenerative circuit spread quickly throughout the amateur world. Experimenters who added the Audion to their receivers discovered that distances of up to 350 miles were now possible on 200 meters. The Audion, already scarce and expensive, became even more so under the laws of supply and demand. The search for an Audion to the amateur was like the Quest for the Holy Grail. In fact, it was this search which led to the second pivotal event in amateur radio history.

Hiram Percy Maxim was a 44 year old engineer and inventor who had a 1kw amateur station in Hartford, CT. He wanted an Audion for his receiver and was unable to locate one. Finally, he heard of an amateur in Springfield ,MA, who had one for sale. Hartford was (and still is) only 30 miles from Springfield, yet Maxim's station could not cover the distance. He found a station midway between the two cities that was willing to relay his purchase offer. Maxim thought about this and eventually realized that a national organization was needed to coordinate and standardize message relay procedures, as well as act as a national lobby for amateur radio interests. On April 6, 1914, Maxim proposed the formation of the American Radio Relay League. With the backing of the Radio Club of Hartford, who appropriated \$50, and some volunteers, Maxim developed an application form explaining the purpose of the ARRL and inviting membership. These were sent out to every known major station in the country.

Maxim, like Armstrong, was a prolific inventor. Unlike Armstrong, however, Maxim was also an expert in publicity and public relations. By July, national magazines such as Popular Mechanics were writing favorable reports about the ARRL. Maxim also traveled to Washington, D.C., to explain the ARRL to the Department of Commerce and the Commissioner of Navigation.

The P.R. blitz paid off. By September, 1914, there were 237 relay stations appointed, and traffic routes were established from Maine to Minneapolis, and Seattle to Idaho. Realizing that long distances on 200 meters were not possible at that time, even with a regenerative receiver, Maxim got the Department of Commerce to authorize special operations on 425 meters (706 khz) for relay stations in remote areas.

Boosted by the publicity, the number of amateur stations, as well as the relay stations in the ARRL, continued to grow. By 1916, there were 6000 amateur licenses, (of which 1000 were ARRL relay stations) and 150,000 receivers in use. The emphasis in the ARRL was on the word RELAY; ARRL stations were expected to handle traffic on the 6 Main Trunk Lines (3 North/South and 3 East/West) that served more than 150 cities. And there was traffic. The general population (to whom phones were a luxury, long distance an exotic concept, and

telegrams expensive) flocked to the idea of coast to coast free messages. As a P.R. exercise to test the system nationwide, on Washington's Birthday, 1916, a test message was sent to the Governors of every State, and President Wilson in Washington, D.C.. The message was delivered to 34 States and the President within 60 minutes. By 1917, the system was so refined that a message sent from New York to California took only 45 minutes. To deal with the increasing number of relay stations, the ARRL started a little magazine, which they called QST.

Other amateur activities in this period brought favorable publicity to the hobby. In March 1913, a severe windstorm had knocked out power, telegraph and telephone lines in the midwest. Battery powered amateur stations handled routine and emergency traffic until regular service was restored. This was the first documented emergency communications in amateur radio history. In 1915, amateur station 2MN determined that the powerful Telefunken station at Sayville, Long Island, was sending information concerning Allied and neutral shipping to submarines at sea. Thanks to the work of this amateur, the government took over the station.

However, the war in Europe was getting closer. In April, 1917, based on continued violations of our neutrality and unrestricted submarine activity, Congress declared war against Germany.

With the U.S. now in World War I, a message went out from the Secretary of Commerce to all private stations. By order of the Chief Radio Inspector, all transmitting AND RECEIVING stations were to be closed AND DISASSEMBLED, and all antennas taken down. Complete radio silence was to remain until the war ended and the order was revoked. Amateurs by the thousands packed away their stations and marched off to war. The 200 meter band was silent. In September 1917, with no radio activity permitted and 80% of the amateurs at war, QST ceased publication.

Would amateur radio survive the war?

The History Of Amateur Radio Chapter 4

By the time World War I ended in November, 1918, almost 5000 amateurs had served in uniform, with many giving their lives overseas. Amateurs had proven themselves to be invaluable to the war effort. The Army and Navy were faced with an absolute lack of trained radio officers, instructors, operators, and even state of the art equipment. Amateurs stepped in and provided the knowledge, men and sometimes even the equipment necessary to help win the war. An interesting example of this was the case of Alessandro Fabbri, a wealthy yachtsman and radio amateur, who had top notch stations on board his yacht and on Mount Desert Island, Maine. The Navy commandeered the stations (and the yacht), made Fabbri an ensign, and placed him in command. Largely with his own money, he expanded his operation and improved his equipment. Fabbri's station was used to pass most of the official communications between the battlefronts in Europe and Washington. The traffic often amounted to 20,000 words a day, most of them in cipher. Captain (later Major) Edwin Armstrong, whose regenerative receiver was being used worldwide, was in charge of the Signal Corps' Radio Laboratory in Paris, where he developed the superheterodyne receiver. Thousands of amateurs served as Navy radiomen and Signal Corps operators. It would seem from the information above that amateurs had conclusively proven their worth and that the Navy would return the amateurs' frequencies back to them once the war had ended. Sadly, this was not the case. A string of events conspired against the amateur, and almost eliminated all privately owned stations.

The villain in this play was the Secretary of the Navy, Josephus Daniels, a puritanical landlubber and teetotaler, whose opinions often got him into trouble. He was the type of individual that H. L. Mencken and Sinclair Lewis satirized as "one who is terrified that somewhere, someone is having fun". For years, he had demanded that the Navy have exclusive control of the radio spectrum. Now, it appeared, he had his chance.

The effects of the first modern global war, along with the Bolshevik Revolution in Russia, had temporarily turned the country extremely conservative. It was in this mindset that the Espionage Act of 1918 and Prohibition were passed. Hundreds of suspected communists and anarchists were deported in the "Red Scare". Even the great Socialist Eugene V. Debs was imprisoned for disagreeing with the government. Seizing the opportunity, Secretary Daniels urged the passage of legislation giving the Navy a monopoly on radio communications. As a result, the Poindexter Bill was introduced in the Senate, and the Alexander Bill in the House. Political observers gave both bills an excellent chance of passing.

Back at the ARRL, things looked bleak. All memberships had lapsed (along with

all amateur licenses), 80% of the amateurs were still overseas, QST had ceased publication, the unpaid printing bill was \$4700, and there was \$33 in the treasury. However, action was needed immediately to defeat these bills. Hiram Percy Maxim and the other board members dug into their own personal funds and sent out a "blue card appeal" to all known amateurs or their families asking them to write their Congressman and urge defeat of these bills. It worked. Thousands of letters poured into Washington from amateurs or (more often than not) their family members asking that amateur radio be saved. Congressmen who opposed a military monopoly of the airwaves also joined in, lending their support to amateur radio. Overwhelmed by this grassroots opposition to Naval control of the radio spectrum, Congress killed the bills in committee. This 1919 letter writing campaign had a profound historical impact on all of radio, for, had these bills passed, not only would amateur radio have disappeared forever, but all private communication activities (such as broadcasting, business radio, CB, GMRS, Cellular etc.) either never would have evolved, or would have been delayed by years or even decades.

With the bills defeated, Maxim and the ARRL Board of Directors issued \$7500 worth of bonds to League members to get QST going again. At the same time, pressure was brought on Washington to lift the radio ban and allow amateurs back on the air. Partial success was achieved on April 12, 1919, when the Navy removed the ban on receiving, but not transmitting. Thousands of amateurs and other listeners removed the seals from their receivers (which had been placed there by Government Radio Inspectors), strung up their antennas and warmed their filaments with the sounds of the government stations. But they wanted more. Their fingers fondled their telegraph keys as they waited for the lifting of the transmitting ban. Finally, in November 1919, after a Joint Resolution had been introduced in Congress demanding that the Secretary of the Navy remove the restrictions on amateur radio, the transmitting ban was lifted, licenses were reissued, and amateurs were back on the air.

Now began the "second war", Spark vs. CW. Remember that amateurs were allowed, in effect, just one frequency - 200 Meters. A spark station on 200 meters actually generated a signal from 150 to 250 meters. With the sensitive regenerative receivers now in use, the practical range was several hundred miles. Transcontinental relays now took less than five minutes. The number of licensed amateur operators stood at 5719 in 1920, 10,809 in 1921, and 14,179 in 1922. And all were operating on 200 meters! To quote Arthur Lyle Budlong in "The Story of the American Radio Relay League", it was "Interference, Lord, what interference! Bedlam!". Something had to be done.

And it was. Various transatlantic tests were conducted from 1921 to 1923. The results overwhelmingly showed CW was far superior to spark. Postwar vacuum tube production was at its peak. In 1921, an RCA 5 watt tube cost \$8, and, as a single tube CW transmitter, could outperform a 500 watt spark station. A 50 watt tube cost \$30, and was five times more effective than the best 1kw spark station.

Since CW took only a fraction of the bandwidth that spark did, over 50 CW stations in the same area could occupy the 150 to 250 meter range, vs. one spark station.

The transatlantic tests also revealed some other interesting facts. Due to the excessive interference on 200 meters, some stations had dropped down to 100 meters where, to their surprise, they found conditions much better. Throughout the 1922-24 period, hundreds of tests and casual contacts were made on the 100 meter wavelength which conclusively showed not only CW's superiority over spark, but increased range on the shorter wavelengths. Once again, the scientists came forward and said that long distances on 100 meters were mathematically impossible, and once again, the amateurs proved them wrong. During 1924, several CW contacts were made at distances exceeding 6000 miles. On October 19, 1924, a station in England worked New Zealand, a distance of almost 12,000 miles. Amateur communications had now reached halfway around the world. Although it would take a few years to discover the role that the ionosphere played in shortwave communications, there is no doubt that amateurs pioneered the practical uses of shortwave.

The phenomenal success of CW convinced the vast majority of amateurs to buy that vacuum tube. A few still clung to their spark sets, screaming "spark forever", but by 1924, spark was almost extinct. The 150 to 250 meter region was now orderly, filled with thousands of CW stations living in peaceful coexistence with each other (and the occasional spark renegade). Legally, however, amateurs could not go below 150 meters. True, many were already on 100 meters without a problem, but amateurs wanted a slice of the shortwave spectrum allocated to them. After all, it was amateurs who discovered the short waves, now, with world wide interest being shown here, they wanted protection. Negotiations were ongoing with the Department of Commerce to give the amateurs specific frequencies.

On July 24, 1924, the Department of Commerce authorized new amateur frequency bands. They were 150 to 200 meters (1500 to 2000 kc), 75 to 80 meters (3500 to 4000 kc), 40 to 43 meters (7000 to 7500 kc), 20 to 22 meters (13,600 to 15,000 kc), and 4 to 5 meters (60,000 to 75,000 kc). Except for a portion of the 150 to 200 meter band, spark was prohibited. Spark would survive in the hands of a few rebels until 1927 when it was banned altogether. CW was here to stay. By January, 1925, the 80, 40, and 20 meter bands were filling up with amateurs, drawn by the promise of transcontinental, daylight DX.

The Wayback Machine is going to hover over the 1920's for one more month, checking out an amateur with the call 8XK, and his activities on the night of November 2, 1920. In the meantime, take a sip of that Prohibition bootleg gin, check out those new SW bands, and join us next month on board the Wayback Machine.

The History Of Amateur Radio Chapter 5

On November 2, 1920, Warren G. Harding was elected President of the United States. Millions read the election results in the newspapers the next day. In the Pittsburgh area, however, hundreds heard the election returns the moment they were wired in, thanks to Dr. Frank Conrad, a Westinghouse employee, who broadcast the results over 8XK, his amateur station. This station would evolve into KDKA, and the night of November 2, 1920 has been called the start of the multi billion dollar broadcast industry. But was it? This month the Wayback Machine looks at the evolution of broadcasting, and the amateur's role in it.

The idea of broadcasting was first considered by Lee deForest in May, 1902, when he wrote that "Ultimately, wireless telephony will be possible". He urged the financial backers of the deForest Wireless Telegraph Company to develop and patent the concept. The stockholders, however, were more interested in immediate profits (through massive stock sales) rather than genuine development, and refused to finance the necessary research. Undaunted, deForest in 1907 formed the deForest Radio Telephone Company. In a statement that for 1907 must have appeared radical and even bizarre, but was amazingly prophetic, he wrote "I look forward to the day when opera may be brought into every home. Some day the news and even advertising will be sent out over the wireless telephone".

Despite deForest 's intense interest in this area, he was not the first to broadcast the human voice and music over the airwaves. That honor belongs to Reginald Aubrey Fessenden, a Canadian Professor. He was the first to recognize the inherent flaw in the concept of spark transmissions, and set out to find an alternative. His quest led him to Schenectady, N.Y. and the services of General Electric's most brilliant scientist, Charles Steinmetz. Fessenden explained his

idea: an alternator capable of generating waves of 100,000 cycles per second (3000 meters). Steinmetz and his assistant, Ernst Alexanderson, worked for almost two years, and finally produced an alternator that met Fessenden's requirements. The Alexanderson Alternator, as it was now known, was delivered to Fessenden's station in the fall of 1906. On the evening of December 24, 1906, ship and amateur operators heard something in their headphones they had never heard before: someone speaking! A woman singing! Someone reading a poem! Fessenden himself played the violin. (The Alexanderson Alternator would play a prominent role in early high power stations and will be fully covered in a column exploring Schenectady's contribution to the development of radio and television).

Not to be outdone, deForest continued his radio telephone experiments in the period 1907-1910, broadcasting from the Eiffel Tower, and live from the stage of the Metropolitan Opera, where Enrico Caruso was singing.

However, all of these transmissions had a major problem: without a pure, stable, direct current CW carrier to modulate, all the signals had a background whine and distortion. Real development in the area of modulated carriers would have to wait until Armstrong discovered the oscillating properties of a regenerative circuit.

By 1916, both Armstrong's circuit and the Audion were widely circulating in the radio world, and broadcasting surfaced again. Lee deForest resumed his transmissions, with programs of "good music, culture and lectures". deForest can be credited with two "firsts" in 1916; the first advertisements (for his Audion and other products), and the broadcast of the first Presidential election, between Woodrow Wilson and Charles Evans Hughes. (Unfortunately, deForest signed off before the California results were in, so he declared Hughes the winner over Wilson).

Also, in 1916, amateur station 2ZK broadcast one hour of music each night. David Sarnoff, who had manned his station during the Titanic disaster, also got into the act. He wrote a memo to his employers at American Marconi suggesting a "Radio Music Box", which would become a "household utility". He went on to describe his vision of radio broadcasting, and then turned to finances. He predicted an income of \$75,000,000 or more each year from the sale of receivers. Marconi, still focusing on ship to shore telegraphy, took no action on the memo.

After amateurs had returned to the air in November 1919, hundreds of them began to explore the area of broadcasting. In May, 1920, amateur station 8XK joined many other hams in the transmission of music. Incidentally, it WAS LEGAL for amateurs to broadcast music, news, sports, lectures, advertisements or indeed just about anything else they wanted. The Radio Act of 1912, still in effect, did not mention "amateurs", rather, one paragraph made a general reference to individual private or commercial stations. The only real restriction was the 1 kw power limit and the 200 meter wavelength, after that, the

government didn't care. Thus, those amateurs who had built equipment to modulate their CW transmitters eventually played a phonograph record or two, sang (or tried to sing), or broadcast some form of entertainment.

With all of the above documented evidence, why is November 2, 1920 considered the start of broadcasting? The answer lies not at the transmitter, but at the receiver. Prior to that night, all broadcasts had, in effect, been from one amateur to another, or to a commercial station. The November broadcast, though, was designed and promoted by Westinghouse as a transmission to the general public. Starting in September, stores were selling basic receivers for \$10.00 to receive 8XK. Westinghouse, in effect, had seized deForest's and Sarnoff's idea, and was marketing it to the general public. Thus, it was the makeup of the listening audience that defined the start of broadcasting.

When the word of this successful transmission got out, more amateurs got into the act and set up their own little broadcast stations. By the end of 1921, it was estimated that about 1200 amateurs had made at least one broadcast. Some had a regular schedule of programs and would evolve into commercial stations, others did it just out of curiosity. But there were listeners. Over 400,000 people heard the Dempsey-Carpentier fight on July 2, 1921. Radio sales were approaching 100,000 per year, not counting crystal sets which were selling at the rate of 20,000 per month. However, with this explosive growth came two problems for the amateur.

The first was an identity crisis; what should the role of the amateur be in broadcasting? Some thought we should stay out of it and just stick to traffic handling on CW. Others envisioned the amateur as a jack of all trades, expert CW operator and relay station, as well as community broadcaster. In fact, a new name evolved to describe this amateur/broadcast hybrid, "Citizen" radio or wireless. Even QST was confused; for a period of time in 1921, the word "Citizen" replaced "Amateur" on the front cover.

The other problem was frequencies. Everyone, amateur, broadcaster and hybrid was on 200 meters. Tuning across the dial in 1921, one would mostly hear CW, a few spark holdouts and the new broadcasters. While the amateurs were used to the interference, the general listening public was not. They had purchased their radios to hear music, not CW. Complaints started to pour into the Secretary of Commerce. Legally he was powerless, as the Radio Act of 1912 offered no solutions. However, a conference was called for all interested parties, held in Washington in February 1922 to try to resolve the impending crisis.

Even though he was exceeding his authority under the Radio Act, Secretary Hoover was able to get the following proposals accepted at the conference: 1) Henceforth, special broadcast licenses would be issued. Two frequencies would be available for broadcasters immediately, 360 meters (833 khz) for regular transmissions, and 485 meters (619 khz) for crop reports and weather forecasts.

2) After the marine interests had abandoned the 220 to 545 meter range (1363 to 550 khz), it would be turned over to broadcasting. 3) Broadcasting was forbidden by amateurs, who were defined for the first time by name as stations operating "without pay or commercial gain, merely for personal interest". 4) "Quiet Hours" were imposed on all amateur stations effective from 8:00 to 10:30 PM daily, and on Sunday morning.

The fact that the number of broadcast stations dropped from 1200 to 30 immediately after these regulations went into effect shows just how many amateurs were, in fact, pioneer broadcasters.

This agreement, however, was built on a house of cards. Secretary Hoover has stretched his authority under the Radio Act of 1912 well past the breaking point. In 1926, the cards came tumbling down, and the "summer of anarchy" was ushered in. How would amateurs fare with no enforceable regulations in place? Stay with us next month as the Wayback Machine explores the events leading up to the creation of the Federal Radio Commission.

The History Of Amateur Radio Chapter 6

The Radio Act of 1912 was hopelessly obsolete by the early 1920's. Conceived in an era of long and medium wave spark telegraphy, the Act was totally inadequate when it came to broadcasting and the shortwaves. The Department of Commerce gamely tried to stretch the Act to meet new requirements; the 1922 and 1924 "regulations" that banned broadcasting by amateurs, set up the broadcast band, and carved out the 160, 80, 40, 20, and 5 meter bands, were really nothing more than "gentlemen's agreements", valid as long as they weren't challenged.

For a time, they worked. Amateurs enthusiastically settled in on their new bands and began working the world, while the number of broadcasters in the new 550 to 1500 kc region jumped from 30 to almost 600 in just 3 years. Technical advances had not kept up with this growth, however, and there were problems. Crystal control of transmitters was still a couple of years away, and the unstable broadcasting stations drifted from their assigned frequencies, sometimes to the point of interfering with adjacent channels. Even stations off frequency by 400-600 cycles could cause ear splitting heterodynes. Most receivers of the 1920's were either regenerative or TRF (Tuned Radio Frequency), good on sensitivity, poor on selectivity. As a result, the 1920's broadcast band was saturated with only 600 stations. (Compare that to today's medium wave where tight frequency control of 20 Hz, coupled with directional antennas and selective superheterodyne receivers, allows over 4000 stations to occupy the AM broadcast band without undue interference).

The Department of Commerce, therefore, issued regulations mandating such solutions as time sharing (where two or more stations occupied the same frequency at different times of the day), and daytime only operations. Stations were constantly moved to another frequency, or told to decrease power, in order to minimize interference. The Department also went after stations whose transmitters drifted onto adjacent channels. An interesting example of this was the Los Angeles station of "Sister" Aimee Semple McPherson, an evangelist who was the leader of the International Church of the Foursquare Gospel. Her station was notorious for drifting up and down the broadcast band. When the Federal Radio Inspectors tried to keep her on frequency, she imperiously wrote to Secretary Hoover, demanding that his "Minions of Satan" stay away from her transmitter. The Almighty would choose her Wavelength, she wrote, not the Department of Commerce.

Many of the stations that had been moved, told to reduce power, or share their frequency, did what any patriotic American would do--hire a lawyer. Once the legal bloodhounds began digging, certain things came to light.

Article I, Section 8, of the Constitution allows the Federal Government to regulate INTERSTATE commerce. Furthermore, it is an accepted fact that a Federal Agency cannot issue any regulations, unless it was given the power to do so by Congress. Thus, the lawyers for the disgruntled stations challenged the Secretary's "regulations" on two fronts, first, that the Radio Act of 1912 gave the Department no authority to regulate broadcasting stations, and second, that since many stations could not be heard across state lines, there was no "interstate commerce" and therefore no Federal jurisdiction. (This is the argument used by "Radio Free Berkley" and other low power pirate stations).

The Day of Reckoning arrived in 1926 when an Illinois District Court held that there was no Federal Law to permit the Secretary of Commerce to assign

broadcasting licenses or frequencies. The Attorney-General admitted that the Federal Government had no control over radio, except what was specifically authorized in the 1912 Act.

Pandemonium broke out. Stations, liberated from all Federal control, upped their power, jumped frequency, and/or began full time operations on daytime or time shared frequencies. Smaller stations were jammed off the air. Unlicensed transmitters appeared out of nowhere, dropped down on any convenient (or inconvenient) frequency, and began broadcasting. Anarchy was King.

Amateurs, of course, could have legally joined in this RF Orgy. There was nothing preventing them from going back to broadcasting, moving to new frequencies, exceeding the 1 kw limit, or anything else they desired. To their credit, they did nothing of the sort. One reason was the immense respect they felt for Secretary Hoover, a man who over and over publicly supported amateur radio in any way possible. They would abide by their "gentleman's agreement" with him. The other reason was common sense. They knew that Congress would soon rectify the problem by passing appropriate legislation. The broadcasters were "big boys" with a lot of money, powerful corporate backers, and 6 million listeners; they could afford to violate the spirit of the law and get away with it. Amateurs did not have this luxury. They realized that any violations of the 1922 and 1924 agreements, even if they were legally unenforceable, would cost them dearly in political support. So, while the 550 to 1500 kc segment was a free for all, the amateur bands were disciplined and orderly, as hams mastered the art of crystal control, and improved their operating skills.

Incidentally, one area in which those skills were honed was expeditions. From the Arctic to the Antarctic, from MacMillan to Byrd, amateurs provided the necessary communications of almost every major explorer. Also, in the area of emergencies, amateurs provided communications during snow and ice storms, hurricanes, earthquakes, and floods.

The Federal Government quickly moved to end the chaotic mess on the broadcast band. On February 23, 1927, the Radio Act of 1927 was approved. This law defined "amateur radio" for the first time in a Federal statute, and created the Federal Radio Commission, which was given the power to classify and regulate all aspects of all radio stations for "the public interest, convenience or necessity". Criminal penalties were written into the 1927 Act for violations of the Act, or any regulation thereunder.

The Commission immediately went to work. "Minions of Satan" got Sister Aimee's station back on frequency, and shut down the transmitter of KFKB, the station of "Dr." John Brinkley, graduate of the Eclectic Medical School and proponent of prostate operations and (get this) goat gland transplants to cure all medical ills. Patients by the thousands listened to KFKB's broadcasts, and flocked to Kansas to have the operations, picking out their goat from the pens

next to the hospital as they went in. (Do you think I could make this up?). Unfortunately, after the Commission shut him down, "Dr." Brinkley went to Mexico by the Texas border, set up a 150,000 watt station, and continued his fraudulent operations.

In regards to amateur radio, the Commission, in effect, kept the status quo for the 15,000 hams. All agreements and regulations enacted by the Department of Commerce were maintained and incorporated into current regulations. About the only change that hams noticed was the addition of a prefix on their calls, thus 1AW became W1AW, 1JS became W1JS etc..

However, the existence of a sympathetic Commission and friendly regulations wasn't enough. Radio was truly international, and, as a result, an International Radiotelegraph Conference was scheduled in Washington, D.C., for October 4, 1927. Word was filtering out of Europe and the Far East that many governments were anti amateur radio.

How would our hobby fare at this conference? Stay with us next month as the Wayback Machine shows us the answers.

.....Bibliography and Suggested Reading.....

1. Empire of the Air, by Tom Lewis, 1991, HarperCollins Publishers. -- An OUTSTANDING book by Professor Lewis, of Skidmore College, which covers the early years of broadcast radio and television. In particular, the book concentrates on the three men who are the foundation of broadcasting; Lee de Forest, Edwin H. Armstrong, and David Sarnoff. Well written, compelling and absolutely fascinating, this book should be required reading for any amateur.

2. 200 Meters and Down, the Story of Amateur Radio, by Clinton B. DeSoto, 1936, the American Radio Relay League Publisher. A history of amateur radio from the first spark gap to 1936. Complete, detailed and easy to read, this book is an ideal companion to "Empire of the Air".

3. Titanic, End of a Dream, by Wyn Craig Wade, 1979, Rawson, Wade Publishers. -- Unlike "A Night To Remember", which focused minute by minute on the actual sinking, this book concentrates on the Senate hearings that were held in New York and Washington, D.C.. There is an excellent section on Marconi, the wireless monopoly, and the events that led up to the Radio Act of 1912.

The History Of Amateur Radio Chapter 7

Our Founding Fathers knew that the United States would have to enter into legal and binding agreements with foreign countries, thus in Article II, Section 2 of the Constitution, they gave the President the power to make treaties, with the approval of two-thirds of the Senate. Over the years, the Supreme Court has ruled that provisions of a treaty are constitutional and legally binding, even if the exact same provisions contained in a law not covered by a treaty would not pass the constitutional test.

Under the Radio Act of 1927, and the regulations issued by the Federal Radio Commission, amateurs were "in the catbird seat" (to use a popular phrase of the day). They had over 2700 kc of spectrum between 160 and 20 meters, plus another 15,000 kc at 5 meters. They had a Secretary of Commerce (Herbert Hoover) who was a strong proponent of amateur radio. Congress was supportive and sympathetic. Nothing could go wrong--or could it?

Yes it could. An International Radiotelegraph Conference was scheduled for Washington, D.C., on October 4, 1927. Here, participants from 74 nations would gather to hammer out an international treaty covering the entire known radio spectrum. Once this treaty was accepted by the Senate, it would become Law, and supersede anything contained in the 1927 Act. Although amateurs could count on the full support of the U.S. Delegation, we had only one vote, the same as any of the other 73 participants.

So how much support could we count on from the other countries? Sadly, not much. Democracy was still a foreign idea to most nations; many hovered in that gray area between Old World Monarchy and Fascism/Communism. Communications were a government monopoly. Individual private stations were feared; they could compete with the Government Stations, or they could be used in anti-government activities. This attitude was even present in the representatives from England and France. As for the other countries, many were

blatantly anti amateur radio. Germany, for example, stated that private stations could violate "the rights of the State". Switzerland was on the record against amateur radio. Japan would tolerate amateurs, however they would have to use "phantom" (i.e. non radiating) antennas. In other words, you could have a transmitter, you just couldn't radiate a signal!!!! One proposal would only give amateurs frequencies below 13 meters (above 23 Mc).

Fortunately, the ARRL and the International Amateur Radio Union (founded in 1925) were well aware of this hostility and had made detailed preparations. The IARU and the ARRL both had made presentations to the various delegations prior to the start of the conference. Support of the amateur community was also received from private radio interests and radio manufacturers. The ARRL and the IARU would both have delegates attending the conference.

And so, after the opening session, which was addressed by President Calvin Coolidge and Secretary of Commerce Herbert Hoover (who was also president of the Conference), the delegates divided themselves into subcommittees and began to work.

England, the European country most favorable to amateur radio, made it's first proposal: Amateurs would be allowed the 150 to 200 meter band (1500 to 2000 kc) with a maximum power input of 10 watts. The ARRL/IARU delegates, K.B. Warner, H.P. Maxim and C.H. Stewart, as well as W.D. Terrell, who was Chief of the Radio Division in the Department of Commerce, indicated that this was unacceptable. The British then came up with a compromise position: amateurs would have the 150 meter band, as well as bands at 2.75, 3.66, 5.50, 11.00, 22.00, and 44 Mc. Except for the 1500-2000 kc segment, each band would be 100 kc wide. The total amateur allocations under the British proposal were 1100 kc, of which 900 kc was in the known usable spectrum below 15 Mc. This was a 60% reduction for American hams in the frequencies below 15 Mc, and a whopping 93% reduction when you counted our 4 to 5 meter band!

Nevertheless, many delegates urged the U.S. and ARRL/IARU representatives to accept this proposal. They pointed out that it was far more generous than many countries were willing to give on their own. With the use of cw and crystal control, it was argued, there would be enough room for all amateurs. Many were afraid that if the British compromise wasn't accepted, a more restrictive band plan for amateurs would take it's place.

The ARRL/IARU delegates had one thing in their corner, however; the strong support of Secretary Hoover and the American Delegation. With that, they found the strength to (carefully) carry on. They were diplomatic, but they were persistent. Maxim, Stewart and Warner proceeded step by step.

The 160 meter band was the first agreed on--1715 to 2000 kc. Next, it was decided that the remaining amateur bands would be at the 80-40-20 meter spots.

How wide they would be was the next argument. On the 80 meter band, everyone was at a stalemate until it was suggested that the band could be 3500-4000 kc on a non-exclusive basis. This was accepted by all the delegates. Each country could decide for themselves how much of the 500 kc they would allocate to amateurs. Next on the agenda was 20 meters. The U.S. wanted 14,000 to 16,000 kc. There was no way any of the other delegates would agree. After much debate, the U.S. delegation realized that 400 kc was the maximum they were going to get, and acquiesced.

With 160, 80, and 20 out of the way (and the U.S. assured of at least adequate domestic and international allocations) the subcommittee turned to 40. The American delegation wanted 7000 to 8000 kc; the most any other country was willing to offer was 7000 to 7200. Germany, in fact, put a high power station on 7200 kc in order to thwart a larger amateur allocation on 40 meters. Back and forth the debate went, the other delegates finally offered 225 kc. Maxim and Stewart felt they had played their last hand and wanted to accept the proposal, Warner, however, still pushed for 400 kc. More debate followed. Finally, the other delegates agreed to 300 kc. Additional bands were set up at 10 and 5 meters.

When the dust had settled, the Conference had approved the following amateur bands: 1715--2000, 3500--4000, 7000--7300, 14,000--14,400, 28,000-30,000 and 56,000--60,000 kilocycles. This was a 37.5% reduction in the frequencies amateurs had under the U.S. regulations, however, it was a vast increase for the amateurs of most other countries. Furthermore, the frequencies approved by the Conference established amateur radio under international law-something which had not existed before. Given the circumstances, this was a major victory for amateur radio.

Initially, there was some opposition by a minority of U.S. hams to the ratification of the Treaty. The ARRL and the vast majority of amateurs, however, supported it, knowing that a small loss in frequencies was insignificant in comparison to the international recognition now given to amateur radio. The Senate agreed and, on March 21, 1928, ratified the Treaty.

As a postscript, Herbert Hoover, the Secretary of Commerce who had always supported amateur radio 100%, was elected President of the United States in November 1928. Although most remember his administration as coinciding with the depths of the Great Depression, it was also the time of the greatest growth in amateur radio history. From the 1929 total of 16,289 to the 1933 count of 41,555, amateur radio grew 255% in 4 years. Before his death at the age of ninety on October 20, 1964, Hoover would live to see his son, Herbert Hoover Jr. W6ZH, elected President of the ARRL, and see an amateur running for President of the United States (Senator Barry Goldwater, K7UGA/K3UIG). Whatever historians may think of his administration, hams will always remember him as a Friend to Amateur Radio.

Next month, the Wayback Machine will begin to explore the battle over the VHF spectrum in the mid 40's. Did you ever wonder what happened to TV Channel 1? The Wayback Machine will have the answers.

The History Of Amateur Radio Chapter 8

OK, as you can probably guess, with all the recent attention on the Vanity Call Sign System, not to mention the half dozen calls that I've held in the past 27 years, this month's Wayback Machine is going to focus on call signs in amateur radio history.

Prior to 1912, getting a call sign was easy, just make one up and get on the air. Legend has it that's how the word "ham" came to mean amateur radio-the letters H-A-M were in fact the initials of the three operators of a powerful station in the early 'teens. With the passage of the Radio Act of 1912, the first licenses were issued. Call signs at that time for "private stations" (amateurs) consisted of a number followed by two (later three) letters, i.e. 1AW, 1TS, 8XK etc.. Other countries adopted this system. This was adequate in the early, spark days of amateur radio, but as the shortwaves were developed, and c.w. became universal, problems appeared. Dave Sumner, Executive Vice President of the ARRL, and Trustee of NU1AW, the station of the International Amateur Radio Union, picks up the story.

"When transoceanic amateur communication started becoming commonplace in 1924, a problem immediately became apparent: call signs were all of the "one numeral followed by two or three letters" format, with no built-in means of determining who was where. At first, an informal system of prefixes (called "intermediates" at the time) was used by amateurs where "a" stood for Australia, "b" for Belgium, "c" for Canada, "f" for France, "g" for Great Britain, "j" for Japan,

"u" for United States, "z" for New Zealand, etc. The single-letter system was fine until it became apparent that Amateur Radio was spreading to too many countries for this system to accommodate.

In January 1927 QST, a new intermediate list was unveiled as the work of the Executive Committee of the International Amateur Radio Union. The new list took effect at 0000 GMT (UTC) February 1, 1927. It was a two-letter system with the first letter indicating the continent (E for Europe, A for Asia, N for North America, F for Africa, etc.) and the second letter indicating the country (mostly following the old system). Thus, stations in the 48 United States used the intermediate "NU."

The new system was quickly overtaken by events. The regulations adopted by the Washington International Radiotelegraph Conference later the same year included the allocation of a series of "call signals" such as K, N, and W for the United States, and mandated that stations have a call signal from the series. The Washington regulations were to become effective on January 1, 1929, but August 1928 QST noted that Canadian amateur calls had changed to VE in April and September 1928 QST announced the effective date of October 1, 1928, in the United States for the W prefix (K outside the 48 states). Thus, United States amateurs sported voluntary NU prefixes for just 20 months before they became Ws.

The founding president of the International Amateur Radio Union was, of course, Hiram Percy Maxim, 1AW, who remained in that office until his death in 1936. The call sign NU1AW commemorates HPM and the IARU's creative, if short-lived, solution to the problem of international identification of stations.

As trustee of NU1AW it is my intention to use the call sign as a "permanent special event station" operating in connection with World Telecommunication Day, significant IARU anniversaries, the IARU HF World Championship, and other events that will call attention to the contributions of the IARU to organized Amateur Radio.

73, David Sumner, K1ZZ

(My thanks to K1ZZ for allowing me to reprint the above).

Thus, the call sign structure was set up for the rest of the '20's and the 1930's. Stations in the 48 States had a 1x2 or 1x3 callsign beginning with "W" and containing a numeral from 1 to 9. Stations in Alaska, Hawaii, or other U.S. Possessions had a "K" prefix. Incidentally, note that I said 1 thru 9; this is because the numeral -0- WAS NOT available to amateurs at that time. As a result, the call sign districts had different boundaries than they do today; for example, the western sections of New York and Pennsylvania were in the 8th call district then, as opposed to the 2nd and 3rd today.

When amateur radio resumed after World War II, the increased number of amateurs necessitated the addition of the tenth call district and the numeral -0-. Except for the redrawing of the boundaries, things remained the same until 1951-53.

In 1951, the FCC eliminated the old Class A, Class B, and Class C licenses, and replaced them with the Novice, Technician, Conditional, General and Extra Class licenses. (What happened to the Advanced Class? The Wayback Machine will tell you in a few months). With this change came the first "distinctive" call signs. Novices, who at that time could only get a one year, non renewable license, had a special 2x3 call sign with the letter "N" following the "W"; i.e. WN2ODC, WN6ISQ etc.. When they upgraded, the "N" would be dropped.

This system barely had a chance to settle in before the next change hit in 1953. Due to the increase in the number of amateurs, the FCC was running out of "W" 1x3 call signs. So 1x3 "K" calls began to appear in the 48 states, with the U.S. Possessions receiving 2x2 and 2x3 "K" calls, such as those issued today. Novice calls in the 48 states continued to have the distinctive "N" (such as KN4LIB) which disappeared upon upgrading.

Barely 5 years later, the growth of amateur radio, particularly in the 2nd and 6th call districts, caused another problem for the FCC, they were running out of "K" and "W" calls. So, in 1958, the FCC began issuing 2x3 "WA" calls, to be followed by "WB" when necessary. For some reason, Novices under this new system were given "WV" instead of "WN" as their prefix. The "V" would change to an "A" or "B" upon upgrading. (After only a few years of this, the FCC decided that their original idea was better, and went back to the Novice "N" prefix). With the uneven amateur population in the ten call districts, it took time for the "K" calls to run out in the other areas. As late as 1964, you could still get a "K" call in the 1st, 3rd or 7th call areas, while the 2nd and 6th districts were well into the "WB's."

The 60's had some other call sign oddities. For a period of time, you could hold BOTH a Novice and Technician Class license simultaneously; the FCC gave you 2 call signs at once (such as WA/WN2ORS) and you used the appropriate call based on the amateur band and your privileges on it. The FCC also allowed you to have two calls if you maintained two homes in separate call areas; for example, Senator Barry Goldwater, K7UGA, also held K3UIG which he used while he was in Washington. (In theory, under this system, an amateur could hold four call signs if he/she had a Novice/Technician license and two separate addresses).

Except for the Novice and the distinctive "N", there was no way under this system to tell what class of license an amateur held. As older hams became Silent Keys and the number of available 1x2 calls slowly increased, the FCC instituted a program whereby those who held an Extra Class license for more than 25 years

would be eligible for a 1x2. The length of time one needed to be an Extra was gradually reduced, until July 1977, when any Extra Class could apply for a 1x2.

There was one block of call signs that were unavailable to ANY amateur, regardless of license class. These were calls in which the suffix began with "X", such as W1XW, W3XCV, WB6XXK etc.. The FCC reserved these calls for experimental stations; for example, W2XB, W2XOY, W1XMN and KE2XCC were originally call signs of early TV and FM broadcast stations. While the FCC has relaxed their position on the 1x2 and 1x3 "X" suffix calls, the 2x3 call signs (such as KA6XYZ) are still reserved for experimental use. By the mid 70's the 2nd, 4th, 6th and 8th call areas had run out of "WB's." For a period of time, the FCC recycled older "WA" and "WB" calls that had been vacated, but when those ran out, they went to "WD's." Before the "WD" prefix could become popular, however, an incident occurred that would change the whole call sign structure.

In early 1977, an FCC employee was indicted for taking bribes offered by amateurs wanting special call signs. He was convicted and sent to jail. Partly as a result of this scandal, the FCC on February 23, 1978, adopted the call sign structure we have in place today. For 18 years, until the opening of the Vanity System, it had been impossible to request a specific individual or club call. Given the passionate love affair that some of us have with our calls, the FCC stands to make millions.

So, as you contemplate the call of your dreams, Form 610V in hand, take a moment to tune in NU1AW and work a piece of history. Meanwhile, the Wayback Machine is preparing for it's next journey to another moment in amateur radio history. I hope you're on board.

The History Of Amateur Radio Chapter 9

If Arthur Miller, Tennessee Williams, or Eugene O'Neill had been amateur radio operators, one of them certainly would have written a play about the VHF frequency allocation battle of the mid 1940's. For, except for sex, this event had all the elements of great drama--Power, Passion, Politics, Greed, and sudden twists and turns in the plot were the hallmark of this epic battle. It hastened the destruction of probably the greatest man in the history of radio, solidified the stranglehold of another in his quest for total television domination, doomed a viable alternative in the infant television industry, and gave birth to the predecessor of CB radio. Got your attention? Then let's open our Playbills and read the

CAST OF CHARACTERS

THE ARRL AND THE 50,000 AMATEUR RADIO OPERATORS--

Prior to World War II, hams were virtually the only major users of the "UHF" spectrum (as the frequencies above 25 Mc were then known). They had the use of the 10 meter band (28-30 Mc) and 5 meters (56-60 Mc) since the late 1920's, as well as a small slice of spectrum at 400 Mc. In the late 1930's, the FCC had allocated two new bands to amateurs--2 1/2 meters (112-116 Mc) and 1 1/4 meters (224-230 Mc). Except for 10 meters, most of the operations on these frequencies were done with very simple equipment. Modulated oscillators and superregenerative receivers were the mainstay of their activities. For those not familiar with this type of equipment, a modulated oscillator was a tube coupled to a tuned circuit directly on the desired frequency which was modulated by another tube. Since crystal control and frequency multiplication were not used, the resulting signal varied in both frequency and amplitude when the oscillator was modulated. The only way to receive such an unstable signal was with a superregenerative receiver. Invented by Major Edwin Armstrong in the early 20's, the "supervene" was extremely sensitive, but very broadbanded. It gave off a loud "rushing" noise (like an FM receiver unscelched). A complete 'phone station of this type could be built with only 3 tubes--an important consideration for the Depression era hams.

Except for limited operation on the 112-116 Mc band in World War II under WERS (War Emergency Radio Service), amateur stations had been silent since December 7, 1941. Now, late in 1944, with the end of the war in sight and new VHF/UHF tubes in production for the War effort, the ARRL was making plans for more bands above 25 Mc.

MAJOR EDWIN H ARMSTRONG--

The unquestioned "Father of Modern Radio", Major Armstrong had experienced several setbacks in the 1920's and 30's, partly because of his secretive nature and uncompromising attitude.

He had delayed in obtaining his original patent on the regenerative detector, and when he did finally apply, he omitted the oscillating properties of the circuit. Lee De Forest challenged Armstrong on this invention by submitting a circuit of his own that he claimed he developed in mid-1912. Armstrong initially won, based on the fact that De Forest's design was basically uncontrolled feedback. When, however, Armstrong flaunted his court victory (by flying a flag with his patent number on it where De Forest could see it), and when Armstrong refused to grant De Forest a license to manufacture regenerative receivers, De Forest went back to court--and this time won. In two separate cases, the Supreme Court ruled that De Forest, not Armstrong, was the inventor of regeneration. This was bad enough, but then Armstrong lost another court battle. Although he had invented the superheterodyne receiver while in France in 1918, it was based partly on a crude, barely functional converter designed by a Frenchman. Despite the obvious superiority of Armstrong's design, the courts ruled against him again.

Desperate for a success to reverse these setbacks, Armstrong turned to the idea of FM. At that time, the late 1920's, the concept of FM was known, but it was widely believed that it was impractical, if not impossible. Armstrong, however, proved them wrong, and by 1933-34 had developed an operational, noise free, wideband FM system. He offered it to RCA, which had the first right of refusal. RCA, for reasons we will see in a moment, declined to fully develop FM, and Armstrong turned to GE. In Schenectady, NY, he found an ally in W.R.G. Baker, a GE Vice President, who saw the potential in FM. With GE's help, he continued to develop FM, got the FCC to allocate a slice of the VHF spectrum for FM broadcasting (42-50 Mc), and set up his first FM broadcasting station--W2XMN in Alpine, NJ. With two other pioneer FM stations, W1XPW in Meriden, CT, and W2XOY in Schenectady coming on the air in 1939-1940, the new Yankee Network was up and running. Armstrong was convinced that, once the war ended, FM would completely replace AM as the broadcasting standard, and he wanted a large chunk of VHF frequencies to accommodate it.

BRIGADIER GENERAL DAVID SARNOFF AND RCA--

For the first forty five years of it's corporate life, RCA WAS Sarnoff and vice versa. From his humble beginnings as a telegraph boy and the wireless operator who copied the "Olympic" wireless signals about the doomed "Titanic", he had risen quickly in the Marconi organization, and was with RCA from the start. Sarnoff had watched the progress of his old friend Armstrong as he developed FM. However, he had other plans for RCA. Sarnoff was convinced that television was the future and radio was the past. Throughout the 1930's, he had poured millions of RCA's dollars into an all electronic television system, to replace the crude mechanical "spinning disk" sets that were in the experimental stage. By the late 1930's, he had a viable, all electronic system ready to go. On April 20, 1939, at the New York World's Fair, Sarnoff introduced commercial television to the world, using the slices of VHF spectrum that the FCC had set aside for

experimental television.

Sarnoff's interest in the VHF frequencies extended beyond obtaining large allocations for television; he also wanted to minimize the frequencies available for FM broadcast. To him, radio was simply radio, an old technology made obsolete by television. He also realized that the public had a limited amount of disposable income available, and he wanted every spare dollar to be spent on TV sets, not FM radios. Sarnoff saw FM broadcasting as a serious threat to his beloved child, and he wasn't going to allow FM to gobble precious VHF frequencies that he felt rightfully belonged to television.

WILLIAM PALEY AND CBS--

Although only a supporting player in this drama, William Paley and his CBS Network almost changed the course of TV history, and, at one point, had both the FCC and the Supreme Court on their side. Paley, through the genius of Peter Goldmark, one of CBS' top engineers, had developed a working color television system with brilliant, lifelike colors more than a decade before RCA's color system was remotely viable

In 1940, as CBS was looking for a way to get past Sarnoff and RCA's stranglehold of patents on their all electronic black and white system, Peter Goldmark came up with the solution. Going back to the 1920's and the mechanical spinning disk, Goldmark developed a hybrid electronic-mechanical system. Using the spinning disk (which CBS now called the color wheel) with red, blue and green filters, he scanned it with an electron beam. On the receiving end, a similar "color wheel" synchronized to spin at the same speed detected the color signal. On August 28 and September 4, 1940, CBS gave demonstrations of their color TV system to the FCC. The FCC was very impressed with the vivid, sharp clarity of the colors they saw on the screen. By contrast, RCA's color system was an embarrassing flop.

In addition to wanting television to start off directly with color, Goldmark was also convinced that the postwar TV frequency allocations should be on UHF, not VHF. In fact, CBS was so sure that their UHF color system would become the industry standard, that they had no plans to apply for any VHF TV license.

And so, the players in this drama wait in the wings for their cue to come out on the stage. How will they react to the FCC's first VHF allocations proposal, issued in late 1944? Who will live past ACT I? Who will make it to the final curtain call? "The Wayback Machine", with front row seats, will have the answers.

The History Of Amateur Radio Chapter 10

In our last installment, we learned that the "UHF" spectrum above 25 Mc., which during the 1930s was populated only by amateurs, was now in the center of a battle being fought on many fronts. Amateurs wanted their 10, 5, 2-1/2, and 1-1/4 meter bands back. Major Edwin Armstrong wanted to increase the 42-50 Mc. allocation in the new FM broadcast service. General David Sarnoff of RCA wanted huge chunks of VHF space set aside for television, as well as limited spectrum for FM, a potential rival. And William Paley of CBS wanted UHF -- not VHF allocations for CBS' "color wheel" TV system, which they wanted the FCC to adopt as the television standard, in lieu of RCA's competing system. In addition to these major players, other minor characters were also clamoring for VHF frequencies -- the growing aircraft industry, police departments who were tired of the interference-prone 1700 kc. police band and wanted to use FM on vhf -- and even businesses to whom the idea of personal two- way communication was now possible. Thanks to the war and the introduction of new VHF and UHF tubes, the frequencies above 25 Mc. were now the most sought after slice of the RF spectrum.

During late 1944, the FCC held hearings on post-war VHF allocations, in which there were 231 witnesses and 4200 pages of testimony. In November 1944, the first proposal on VHF/UHF allocations was released. See if you could have lived with it...

23.5-27 Mc. -- Industrial Applications
27-29 Mc. -- Amateur 11 Meter Band (yes, that's right!)
29-43 Mc. -- Police, Fire, Emergency, and Local Government
43-58 Mc. -- FM broadcasting
58-60 Mc. -- Amateur 5 Meter Band (note only 2 Mc.)
60-102 Mc. -- TV channels 1-7 (the RCA system)
102-108 Mc. -- Non-government Emergency
108-132 Mc. -- Aircraft

132-144 Mc. -- Government
144-148 Mc. -- Amateur 2 Meter Band
148-152 Mc. -- Government
152-218 Mc. -- TV Channels 8-18 (yes, up to channel 18 and again, the RCA system)
218-225 Mc. -- Amateur 1-1/4 Meter Band
225-420 Mc. -- Government
420-450 Mc. -- Amateur 70 cm Band
450-460 Mc. -- Facsimile Broadcasting
460-956 Mc. -- UHF Television using the CBS color wheel system

So, under this proposal, our 10 meter band was moved down 1 Mc., we would lose 1/2 of our 5 meter band, we lose 112-116 Mc. but gain 144-148 Mc., our 1-1/4 meter band stays the same, and we gain a large chunk at 420 Mc. The FM broadcast allocation is increased by 85%, police agencies leave the crowded medium wave area for VHF-FM, aircraft has their piece of the pie, and both CBS and RCA have home turfs to battle out the TV standards war. Note also the 450-460 Mc. range allocated to "Facsimile Broadcasting." For those of you who think FAX machines are a recent invention, it may interest you to learn that 60 years ago, a reliable mechanical-electrical FAX system was in use. By the mid-1940s, it was widely believed that every home soon would have a FAX machine. During the night, as you slept, the machine would be tuned to various stations in the 450-460 Mc. range and would print out the next day's newspapers, magazines and catalogues, for you to read in the morning. Another proposal was for a "Veteran's Band", which would be a 2000 Mc.-wide slice of the spectrum above 10,000 Mc. This proposed band would be available for war veterans (and ONLY war veterans) in any way they desired.

The ARRL was quick to object to the proposed allocations. It was not acceptable to amateurs to move our 10-meter band down 1 Mc., to eliminate 50% of 5 meters, and to upset the harmonic relationship of our bands by moving us from 112 up to 144 Mc. The FCC capitulated on 10 and 5 meters, as we will see in a moment. As for the 144-148 Mc. band -- the FCC was firm. 112- 116 Mc. was going to aircraft. Furthermore, the FCC wanted our amateur bands above 100 Mc. to be next to government allocations, so that in time of war or national emergency, they could be used for the expansion of essential governmental radio services. The needs of the government, per the FCC, outweighed the need for a strict harmonic relationship between the amateur bands.

Meanwhile, while the ARRL was arguing over our allocations, General Sarnoff was conducting his campaign behind the scenes. He couldn't eliminate the CBS color wheel UHF system because, at that time, CBS was producing beautiful, lifelike color pictures that impressed the FCC. But he could attack FM. A big deal was made out of the claim that FM broadcasting needed to be moved higher in the VHF range to eliminate interference caused by Sporadic-E skip. Sarnoff, of course, wanted these frequencies for TV. He never explained, and no one

seemed to ask, how TV would not be affected. In fact, TV, with its amplitude modulated video signal, would be more susceptible to "E" skip than FM with its capture effect. RCA however had power, money, and influence, and Major Armstrong found he was no match for the corporate giant.

On January 15, 1945, the FCC issued a revised allocation proposal:

25-28 Mc. -- Fixed, Mobile, Industrial, Scientific and Medical
28-30 Mc. -- Amateur 10 Meter Band
30-44 Mc. -- Police, Fire, and Various Governmental Allocations
44-50 Mc. -- TV Channel 1 (now you know where it was!)
50-54 Mc. -- Amateur 6 Meter Band
54-84 Mc. -- TV Channels 2-6
84-102 Mc. -- FM Broadcasting
102-108 Mc. -- Possible Facsimile Broadcasting
108-132 Mc. -- Aircraft
132-144 Mc. -- Government
144-148 Mc. -- Amateur 2 Meters
148-152 Mc. -- Government (note 2 meters sandwiched between two government bands)
152-162 Mc. -- Police, Fire, and Other Local Government
162-170 Mc. -- Government
170-180 Mc. -- Navigational Aids
180-216 Mc. -- TV Channels 7-12 (note that TV only gets 12 channels here)
216-220 Mc. -- Government
220-225 Mc. -- Amateur 1-1/4 Meter Band
225-420 Mc. -- Government, Including Military Aircraft
420-450 Mc. -- Amateur 70 cm Band
450-460 Mc. -- Air Navigation
460-470 Mc. -- A New "Citizens' Band" (which would eventually evolve into Class A and Class B CB, then into GMRS and the new FRS)
470-480 Mc. -- Facsimile Broadcasting
480-940 Mc. -- Experimental TV (for the CBS system)

Yes, this proposal sounds a lot like what we have today, but the battle was only beginning. Major Armstrong was not giving up on an FM band in the 43-58 Mc. area. He didn't want the thousands of FM receivers and dozens of stations now on the air to suddenly become obsolete. CBS was still convinced that UHF was the place for TV, and their system was the best. During the first half of 1945, the battle would rage with many more proposals to come forth.

The History Of Amateur Radio Chapter 11

In our last installment, we saw how the FCC shifted from an initial VHF/UHF band plan that was radically different from today's allocations, to a proposal which closely parallels the frequencies we have today. Amateurs were happier with the January 1945 plan over the November 1944 one, as it restored our ten meter band back where it belonged, and gave us a full 4 Mc at six meters.

One person who was not happy with the January 1945 plan was Edwin Armstrong, inventor of the Regenerative, Superregenerative and Superheterodyne receivers, and the Father of FM. He wanted the FM Broadcast band to stay in the 42-50 Mc area: instead, he suddenly saw it transferred up to 84-102 Mc., which would make every FM station and receiver obsolete. He knew that David Sarnoff of RCA was behind this, as RCA wanted television in the frequencies now occupied by FM. Sarnoff and the RCA engineers had an interesting argument, FM they said, should be moved higher in frequency to avoid the Sporadic E skip.

Armstrong fought back. He pointed out that FM, due to its capture effect, was less susceptible to skip interference than television, which used AM for the video carrier. He ran tests and submitted data showing that the skip interference to FM would be far less than imagined, and certainly a fraction of what TV would endure. The ARRL, by the way, was in favor of moving FM up to the 84-102 Mc area. To counteract the arguments that FM receivers would become obsolete by the move, QST in the May 1945 issue ran the schematic of a 1 tube converter, which Hallicrafters said they could build for \$5.60.

In late May, 1945, the FCC announced the three alternatives that were being considered for the disputed 44-108 Mc region. They were:

ALTERNATIVE #1 --

44-48 Mc--Amateur (We would have a 7 meter band under this proposal)

48-50 Mc--Facsimile Broadcasting

50-54 Mc--Educational FM Broadcasting

54-68 Mc--Commercial FM Broadcasting

68-74 Mc--TV Channel 1
74-78 Mc--Aeronautical fixed and mobile
78-108 Mc--TV Channels 2-6

ALTERNATIVE #2 --

44-56 Mc--TV Channels 1 & 2
56-60 Mc--Amateur 5 Meter Band
60-66 Mc--TV Channel 3
66-68 Mc--Facsimile Broadcasting
68-72 Mc--Educational FM Broadcasting
72-86 Mc--Commercial FM Broadcasting
86-104 Mc--TV Channels 4-6
104-108 Mc--Non-Government fixed and mobile.

ALTERNATIVE #3 --

44-50 Mc--TV Channel 1
50-54 Mc--Amateur 6 Meter band
54-84 Mc--TV Channels 2-6
84-88 Mc--Educational FM Broadcasting
88-102 Mc--Commercial FM Broadcasting
102-104 Mc--Facsimile Broadcasting
104-108 Mc--Non-Government fixed and mobile.

Except for the 44-108 Mc region, which was still up in the air, the 25-44 and 108 Mc and higher frequencies were fairly well established at today's allocations. The only major exception was the 470-480 Mc band, which was still allocated to Facsimile Broadcasting. The FCC indicated that tests would be run through the summer months to determine which Alternative was the best.

Reaction was quick to the proposals. Except for the ARRL, almost none of the major players liked Alternative 2, so the choice lay between 1 and 3. The ARRL found #2 acceptable because it preserved our 5 meter band. Of the other two alternatives, the ARRL was strongly opposed to #1. A 44-48 Mc seven meter band would have too much skip, was too close to our ten meter band, and too far from two meters. In the end, the ARRL came out in favor of Alternative #3 because, it was believed that the FM band should be as far as possible from our ham bands in order to avoid IF interference to FM receivers.

Naturally, Major Armstrong was in favor of Alternative #1. He continued to make extensive tests and bombarded the FCC with the results. However, Armstrong never realized that the political clout of General Sarnoff and RCA could overcome any test results. The Major thought he had the summer to complete his tests. Instead, on June 27, 1945, the FCC decided on Alternative #3, with a few minor changes to bring the allocations in line with what we have today. FM was definitely at 88-108 Mc, and amateurs had a six meter band at 50-54 Mc, nestled snug between TV Channels 1 and 2.

Armstrong was stunned, but he didn't give up. As late as 1947, he was still submitting data to the FCC in regards to the effect of skip on FM Broadcasts. But it was too late. For a period of time, there were two FM Broadcast bands, as stations in the new 88-108 Mc allocation coexisted with the older ones between 42-50 Mc, but by 1947, the old FM band was a memory, and sat waiting for TV Channel 1 to take over.

However, a new controversy was brewing. With thousands of amateurs on our new six meter band, and thousands of TV's pouring out of (mostly RCA) factories, a new concept was entering the amateur language -- TVI. In our next installment, we will look at the TV wars of the 1940's and why the ARRL wanted channel 2, instead of channel 1, eliminated.

I hope your six meter QSO's aren't causing interference to the "Texaco Star Theatre."

The History Of Amateur Radio Chapter 12

November 15, 1945. The day that amateurs had waited for, ever since December 7, 1941. Finally, after three years and 11 months of wartime radio silence, amateurs were allowed back on the air! Granted, we didn't have everything back yet. The initial authorization allowed amateur operations on 10 meters (28-29.7 Mc), five meters (56-60 Mc), and the new two meter band at 144-148 Mc. And there were restrictions on these limited frequencies. Our old pre-war five meter allocation was temporary. The new post-war band was shifted to six meters (50-54 Mc), but the actual transition would not take place until March 1, 1946. So, we were back on the 56-60 Mc segment for only 3-1/2 months.

On the new two meter band, the frequencies 146.5-148 Mc were unavailable

within a 50 mile radius of Washington, DC and Seattle, Washington. The military was still using these frequencies, as well as our 160, 80, 40, and 20 meter HF bands. The military also occupied our new UHF and microwave allocations. It would be months, maybe a year or more, before the Armed Forces would fully vacate our bands and return them to us.

But amateurs didn't care. Unlike 1919, when there was open hostility to us by the military and the threat of our elimination, the post WW II Armed Forces, as well as the FCC, were fully aware of the tremendous assistance that amateurs had given throughout the war and they were eager to give us back our frequencies. The ARRL was working closely with the FCC and the military to get our bands back.

One band, however, was apparently not coming back. Our 160 meter band, the birthplace of our post 1912 operations, was fully occupied by the military with its new LORAN Radio Navigation System. The Armed Services and the FCC made it clear that this segment was to remain for the use of LORAN. Over the years, the ARRL obtained small concessions -- a 25 kc segment here and there, 25 watt power limitations, day and night restrictions; but from the 1940s right up to the early 80s, our 160 meter band sounded like a huge broadbanded buzzsaw as LORAN completely dominated it.

But this was a minor blot on the landscape as amateurs rushed to get back on the air. Ten meters was the band they went to first and the 28-29.7 Mc range became crowded with those making up for lost time. Two meters was next; hams modified their old 2 1/2 meter equipment to operate on the new band, and soon the rushing sounds of the superregenerative receiver were everywhere. The more adventurous were trying out something called FM. Five meters was quiet. Since the band was available for only 105 days, many hams spent that time converting their rigs to the new six meter band.

On March 1, 1946, our old five meter band died and the new 50-54 Mc segment was born. Also on that date, to compensate amateurs for the loss of 29.7-30 Mc, we were given an 11 meter band at 27 mc. That's right, the present day CB band was once an amateur allocation.

By May 1946, we had our 80/75 meter allocation back. We also had a temporary allocation from 235-240 Mc, which would soon be shifted down to 220-225 Mc. On November 2, 1946, the FCC finally released our 40 and 20 meter bands. By the end of 1946, we had our full HF spectrum back, 80/75, 40 meters (which was CW only), 20, 11 and 10 meters. Note that there was no 15 meter allocation then. Our 15 meter band did not appear until 1952. The military restrictions on our two meter band were lifted in June 1947, and, except for 160 meters, the military was off of our bands.

By 1947, every amateur band from 80 thru two meters was full of stations. But

there was trouble brewing. Amateurs weren't the only ones taking to the airwaves. Television was growing by leaps and bounds. In 1946, there were only 7,000 TV sets. In 1947, the number jumped to 180,000, and by 1948, there were over 1 million TVs in use. Amateurs, who were used to harmonically related bands and an empty VHF spectrum, were not prepared for the TVI their neighbors were experiencing. A typical unshielded amateur transmitter, operating on 14, 28 or 50 Mc, could wipe out all the TVs in the neighborhood. QST ran a series of articles on proper shielding and filtering of stations and hams gradually learned to eliminate harmonics from their transmitters. But there was one band where shielding and good design didn't seem to help -- six meters. Our 50-54 Mc segment was sandwiched right between TV channel 1 (44-50 Mc) and channel 2 (54-60 Mc). At that time, only channel 2 was actually being used for TV. The channel 1 range was still part of the old pre-war FM Band (42-50 Mc) which was being phased out in favor of the new 88-108 Mc allocation. We were causing interference to WCBS and the other handful of stations on channel 2. And the problem would only get worse when channel 1 became available. Tests were run and an interesting solution was proposed. Because a television video signal is amplitude modulated, operates with a wide bandwidth and uses the lower portion of the TV channel, it was determined that channel 2 was twice as susceptible to interference from a 6 meter station than channel 1 was. The ARRL's proposal to the FCC? Eliminate channel 2, keep channel 1. But this idea didn't sit well with the stations already on channel 2, nor did it win the approval of Major Armstrong, who was still fighting the grand battle to keep FM Broadcast in the 42-50 Mc range. And so, in August 1947, the FCC withdrew channel 1 from the TV allocations. By the end of 1947, all the pre-war FM broadcast stations had disappeared from the 42-50 Mc range, which was then turned over to Public Service. Amateurs learned to operate in the lower portions of 6 meters to avoid TVI to channel 2.

In our next installment, we are going to look at a major upheaval that began 30 years ago and pitted amateur against amateur, and (according to some) the ARRL against hams. I'm talking about incentive licensing, and how it changed the entire licensing structure.

The History Of Amateur Radio Chapter 13

Mention November 22 to many people in the US, and they will immediately associate it with the date that President John F Kennedy was assassinated. But for amateur radio operators, especially those licensed for more than 30 years, it means something totally different: INCENTIVE LICENSING. In a three- stage process starting on November 22, 1967, and ending on November 22, 1969, the FCC instituted "incentive licensing," ostensibly designed to encourage amateurs to upgrade, but in reality a process under which most amateurs lost up to 50% of the frequencies they usually operated. Incentive licensing (or incentive punishment as some have called it) has been blamed for the demise of many American amateur radio equipment manufacturers such as Hammarlund and Hallicrafters, a temporary decline in the number of licensed hams, and bitter feelings against the ARRL and FCC that last to this day. As we approach the 30th anniversary of incentive Licensing, let's take a look at the events that led up to this controversial decision. In order to do so, we must go back to 1951.

Prior to 1951, a rather simple license structure existed in this country. Amateurs had a Class A, Class B or Class C license.

Class A conveyed all amateur privileges on all frequencies, including exclusive access to the 75 and 20 meter phone bands. Class A required passing a comprehensive theory exam, and a 13 WPM CW test, which included sending as well as receiving.

Class B conveyed all CW privileges on all bands, and allowed phone operation on 160, 11 and ten meters in the HF spectrum, and on all VHF/UHF frequencies. Note that 75 and 20 phone operation was limited to Class A hams. What about 40 and 15 meters? Well, 40 at that time was CW only. And as for 21 Mc, It wasn't a ham band back then! 15 meters was given to us in 1947 in exchange for the 14.35-14.40 mc segment of 20 meters, but the 15 meter band actually wasn't available to hams until 1952. In addition, 160 meter access was severely restricted at that time because of LORAN Radionavigation and 11 meters was a secondary US only allocation, with limited popularity, so the Class B ham who wanted HF phone action went to ten meters by default. Class B hams passed the same 13 WPM code test as Class A, but a less comprehensive written test.

Class C gave the exact same privileges as Class B, but the exam was given by mail, under the supervision of a Class B (or higher) license, to those who couldn't walk the 175 miles (uphill both ways through the snow!) to a quarterly FCC examination point.

In 1951, the FCC reorganized the entire license structure. Class A was replaced

by the Advanced, Class B by the General, and Class C by the Conditional. Three new licenses were created at that time, the Extra, Technician and Novice. The Extra (actually "Amateur Extra") had a 20 WPM code requirement and a written exam more difficult than the old Class A. In order to qualify for the Extra, one needed to be licensed as a Class B or General for at least two years, in addition to passing the test. However, if you held a Class B, or General license (or higher), and you were licensed prior to April, 1917, you could get an Extra with no additional test. Technicians had to pass the General theory and a five WPM CW test. They had privileges above 220 Mc only. Novices had a basic 20 question written exam, the five WPM code test, and limited CW privileges on 80, 11 and two meters, as well as voice privileges on two meters. This was a one-year, non-renewable license. The Advanced was available until December 31, 1952, for upgrades/new licenses, at which time it was withdrawn from availability. Those holding Advanced class licenses could continue to renew, but no new licenses were issued. In 1952-53, the FCC also dropped a couple of other surprises -- phone operation was allowed for the first time on 40 meters, 15 meters was finally opened, the 14.35-14.4 Mc segment of 20 meters was removed from the amateur service, and, in the biggest bombshell of them all, Generals (former Class B) and Conditionals (former Class C) were given access to all former exclusive Class A phone frequencies. Now, Conditional, General, Advanced and Extra Class operators had the exact on-the-air privileges. During the 1950s, Novices were given 40 and 15 meter CW privileges in addition to their 80 meter segment and 11 meters was removed. Technicians got six meters in 1955 and the 145-147 Mc segment of two meters in 1959. Technicians could also hold a Novice class license simultaneously.

Many amateurs were unhappy with this structure. Extras complained that they had to go through a two year waiting period as a General or Advanced, had to pass a difficult test, and yet received no exclusive frequencies for their efforts. Advanced class amateurs were upset with the "limbo" status of their licenses, the fact that they no longer held the highest class license, and the fact that they no longer had exclusive use of 75 and 20 meter phone. General, Advanced and Extra class amateurs complained that Novices should not have been given 15 meter CW. The General, Advanced and Extra class hams were also opposed to increasing Technician class privileges, for reasons we will see in our next installment.

In summary, although the vast number of hams were satisfied, a small minority had complaints. And the ARRL listened. In 1963, acting on complaints they claim they received from members and operators in other countries, the ARRL proposed "Incentive Licensing." In an editorial, the ARRL implied that perhaps it was a mistake when the Class B and Generals were given the 75 and 20 meter phone segments. The ARRL's stand was now clear. Exclusive frequencies must be restored to the Advanced and Extra class amateurs in order to give the Generals an "incentive" to upgrade. Of course, what was left unsaid was that in order to do so, frequencies would have to be taken away from the General class

hams.

What was the ARRL's original proposal? How did hams react to it? What was the controversy about the Technician class license that was dragged to the forefront in this battle? Be on board "The Wayback Machine" next time for the answers!

The History Of Amateur Radio Chapter 14

In our last installment, we reviewed the events that took place between 1951 and 1953. In that two year period, the Class A, B, and C licenses had been renamed the Advanced, General and Conditional class respectively. Three new licenses had been created--the Extra, Technician and Novice class. Also during that period, 40 meters was finally opened to phone operation, after being a CW only band for years, we lost the top 50 kc of 20 meters, but gained our new 15 meter band, the Advanced class was closed to new applicants (although those holding this license could still renew), and, in a surprising decision, the FCC opened all phone bands to the General and Conditional class operators. Previously, holders of Class B and C licenses could only operate HF phone on 10 meters. Now all amateurs, Conditional to Extra class, had the same on-the-air operating privileges.

Many amateurs resented the fact that the Advanced and Extra class operators had no exclusive frequencies and that there was no incentive for a General or Conditional class licensee to upgrade. Some of these complaints filtered their way to the ARRL. And so, in the February 1963 issue of "QST," an editorial appeared in which the ARRL expressed regret over the abandonment of the incentive license structure, called the 1952 decision a step backward, and proposed a new incentive licensing system be implemented.

The idea of exclusive frequencies for Advanced and Extra class hams--at the

expense of the Generals and Conditionals--drew volumes of mail in response. Some of the comments printed in "QST" included: "...absolutely outrageous...", "...ridiculous...", "Your editorial hits the nail on the head", "...thought provoking...", "Congratulations to the ARRL" and "To Hell with the ARRL." The responses in "QST" were about evenly split for and against. There were a few letters from Generals and Conditionals who supported the idea of incentive licensing, even though they would clearly lose under the proposal.

On May 3, 1963, the ARRL Board of Directors adopted their official position on incentive licensing. Their proposal would completely take away all General and Conditional class phone privileges on 75, 40, 20, and 15 meters in a two-year phase-in period. In other words, the ARRL's incentive licensing would only allow HF phone operation for Generals and Conditionals on 10 meters and on the small sliver of 160 meters that was available in the days of LORAN Radionavigation. The ARRL also suggested reopening the Advanced class license again to those who held a General or Conditional license for one year. Strangely, the ARRL did not suggest that Extras be given exclusive frequencies, nor did they propose exclusive CW frequencies. Rather, they just wanted exclusive access to the 75 through 15-meter phone segments for the Advanced and Extra class licenses.

Again, the mail poured in, pro and con. Many hams felt betrayed for, at this time, the ARRL was running a building fund drive to raise \$250,000 to construct the headquarters that now stands at 225 Main Street in Newington, Connecticut. In effect, they believed that the ARRL was saying "Thanks for your donation, now say goodbye to your HF phone privileges." They were not happy.

On April 1, 1965, the FCC, in response to the ARRL proposal and proposals submitted by others, released their own version of incentive licensing. For Generals and Conditionals, the FCC proposal was not as bad as the League's--the FCC would take away about 50% of their phone frequencies on 75-15 meters, but they would still have access to half of each phone band. For the Advanced Class licensees (formerly Class A), it was a disaster. The FCC, instead of reopening the Advanced class, proposed creating a new "Amateur First Class License." This license would have a code speed of 16 WPM. Worse, the FCC would "bump" the present Advanced class operators down to General upon renewal.

Now it was the Advanced class licensees who were outraged. Prior to 1952, they had held the top license. Now, in effect, they would be demoted two grades and lose 50% of the 75-15 meter phone bands. The FCC also proposed extensive 50 kc CW subbands for Extra class licensees on 80-15 meters, small exclusive phone segments for Extras, and incentive restrictions on six and two meters. For the next two years, 1965-1967, the battle raged on. Hundreds of proposals and counter proposals were made. The ARRL opposed any incentive subbands on six and two, and worked to retain the Advanced class in lieu of the proposed

"Amateur First Class License."

On August 24, 1967, the FCC announced its decision. There would not be a new "Amateur First Class" ticket, or a 16 WPM requirement. The Advanced class would not be demoted to General, but rather would be reopened as the intermediate step between general and Extra. In summary, the FCC rules established a three-step phase-in of incentive licensing, to begin on November 22, 1967. On that day, the Advanced class was reopened to new applicants after a 15 year freeze and Novices were given a two- year, non-renewal license, instead of the previous one-year, non- renewable term.

On November 22, 1968, Novices lost their 2-meter voice privileges. Generals, Conditionals and Technicians lost the first 100 kc of 6 meters. The first 25 kc of the 80-15 meter CW bands became Extra only and Generals and Conditionals lost about 25% of the 75-15 meter phone bands, which were given to the Advanced and Extra class hams. Comments and opinions still poured into the FCC and the ARRL, requesting anything from total abandonment of incentive licensing to even more restrictive allocations. Most of the comments suggested that the third phase, scheduled for implementation on November 22, 1969, was too severe. Upon review, the Commission agreed in part. Thus, on September 24, 1969, the FCC scaled back the scheduled changes. As a result, Technicians, Conditionals, and Generals did not lose the 50.1 through 50.25 Mc segment of six meters (where most of the sideband activity was) and the Extra class CW subbands were kept at 25 kc. After November 22, 1969, Generals and Conditionals had only 50% of the 75-15 meter phone bands, Advanced about 90%, and Extra class licensees retained 100% of their previous allocations.

On a final note, the FCC, in its Report & Order adopting incentive licensing, had refused to increase VHF operating privileges for Technicians and had taken away Novice voice operations on 2 meters. There was a reason for this. The FCC wanted Novices to bypass the Technician class license and go right to General. Why?

In our next installment, "The Wayback Machine" will journey back to the amateur world in the 1950s, '60s and early '70s to take a closer look at the Technician class license and the unique position it held. I hope you will be aboard.

The History Of Amateur Radio

Chapter 15

The Technician license is, by far, the most popular class of license now held in the amateur community. Most new hams start at the Technician level, to the extent that proposals have been made to eliminate the Novice license as unnecessary. The amateur community accepts the Technician, especially the Technician Plus, as an acceptable mainstream license, either as a steppingstone to a higher class license, or as an end in itself. But it wasn't always like this. For the first 25 years of the Technician class license's existence, it was an official outcast, set apart by the FCC as separate and distinct from the other amateur classes. Why were Technicians considered second class? To answer this question, we must go back to 1951.

On July 1, 1951, the FCC replaced the class A, B, and C licenses with the Advanced, General and Conditional classes and created three new licenses--the Extra, Technician, and Novice. The FCC was specific about the purpose of the Technician class license, as shown in the following quote: "This class was established expressly for serious minded experimenters who need spectrum space in which to air test their equipment. It was not established as a communications service and should not be regarded as a stepping stone between the Novice and General operator classes. The Technician class of amateur license has as its purpose the provision for serious amateur experimenters to explore the higher frequencies and otherwise contribute to the art".

Thus, the Technician was an experimenter, not a communicator. For this reason, the FCC initially allowed Technicians privileges only on frequencies above 220 Mc. The FCC did not intend for the Technician to engage in casual conversations on the air. Other than allowing a Technician to simultaneously hold a Novice license (which at that time was valid for only one year and non-renewable), it was expected that the Technician operator would stick to experimentation, not communication.

Although many of the early Technicians were indeed pure experimenters, many others obtained the license as a means to communicate without having to pass the 13 WPM code test. These "Technician communicators" became restless with the limited frequencies available above 220 Mc., and wanted access to the more mainstream VHF bands at six and two meters. They were joined by a small number of "Technician experimenters" who also wished access to 50 and 144 Mc., for the purpose of studying Sporadic E skip, building equipment for these bands, or even using their license for radio control.

Thus, in early 1955, a proposal was submitted to the FCC to allow Technicians access to six and two meters. Knowing that the FCC regarded the license as an experimental one, these proposals avoided mentioning "communication"--rather phrases such as "greater experimentation" were used. The ARRL supported Technician access to six, but not two meters. In announcing their decision, the ARRL stated that six meters was far less occupied than two meters, and could use the influx of Technicians to study the band, and thus contribute to greater understanding of the unique characteristics of 50 Mc. The ARRL went on to say that permitting Technicians on two meters would appear to make the Technician license too attractive. Many amateurs also wrote the FCC on this--some said that Technicians should have full access to all frequencies above 50 Mc., while others opposed the move, citing the FCC's original intent for this license, and expressing fears that by allowing Technicians to use six and two meters, they would become mere communicators.

On April 12, 1955, the FCC amended Part 12 of the rules and regulations to give the Technician class operator six but not two meters.

The fears of those opposed to Technician communicators were amplified in 1958 when, at the peak of the sunspot cycle, thousands of Technicians used F layer skip on 50 Mc. to work vast amounts of DX--with some earning the W.A.S. award. Nevertheless, allowing Technicians on six meters had a beneficial effect--it helped populate a band that was underutilized, and it allowed a greater study of E and F layer skip. For this reason, early in 1959 another proposal was submitted to the FCC to allow Technicians full access to the 144 Mc. band. This time the ARRL agreed. They stated that things had changed since 1955 and Technicians on two meters would benefit not only the advancement of the radio art, but would also allow all classes of amateur licenses to share at least one voice band in common, as Novices had access to the 145-147 Mc. segment of two meters.

Despite the ARRL's support of Technicians on two meters, there was opposition. Again, the argument as to the purpose of the license was brought up. Many amateurs wrote to the FCC stating that a Technician was an experimenter, not a communicator, and that the license should not be used for the routine exchange of communications. One ham complained that Technicians were rag chewing and not experimenting. A few amateurs not only wanted Technicians kept off of

144 Mc., but asked the FCC to incorporate their statement as to the purpose of the license into Part 12, presumably so that Technicians caught "communicating" rather than "experimenting" could be fined or have their licenses suspended. Others, including the ARRL, did bring in valid "experimental" reasons to allow Technicians on two meters. Once again, the FCC compromised. They restated their official position that a Technician was an experimenter, not a communicator. However, they acknowledged that VHF studies could be made on two meters, and that it was beneficial to have one common meeting ground for all classes of license. Thus, on August 21, 1959, Part 12 was amended to allow Technicians access to the 145-147 Mc. segment of two meters--the same subband that Novices had.

And so Technicians entered the 1960s as a distinctly second class license. They were not eligible for RACES station authorizations. They could not hold many ARRL appointments. And, despite the ARRL support of full Technician access to all frequencies above 50 Mc., the FCC's official position had not changed. Although no Technician was ever actually fined or suffered a license suspension for the "crime" of communicating, many hams felt that Technicians were merely "glorified CBers" who were violating the spirit, if not the letter of the law.

In our next installment, we will see how a new, short lived VHF magazine, and an official change in the ARRL's viewpoint, helped bring about a gradual acceptance of Technicians as "real" amateurs. I hope to see you then.

The History Of Amateur Radio Chapter 16

In our last installment, we saw how, when the FCC created the Technician class license back in 1951, their intention was to give it a separate and unique purpose. The Commission stated that the Technician class license was

established expressly for serious minded experimenters who needed spectrum space in which to conduct their tests. It was not established as a communicators' service and was not to be a stepping stone between the Novice and General class licenses. The original Technician class operator only had privileges above 220 Mc. In 1955, they were given six meters and in 1959, the 145-147 Mc. segment of two meters. Getting additional frequencies for Technicians was difficult--the petitions could not mention "communications" as a reason, but rather had to show that there was a need for additional experimentation on the six and two meter bands. Because of the "experimental" nature of the license, Technicians were not allowed to become RACES stations. They also faced some discrimination by a few higher class amateurs--in fact, several proposals were made to the FCC to "punish" Technicians who used the airwaves to communicate, rather than to experiment.

In 1962, two events occurred. First, the FCC denied petitions to give Technicians the 29.5-29.7 Mc. segment of ten meters as well as full two meter privileges. In rejecting these petitions, the FCC said there was "considerable misunderstanding" about the role of the Technician class, and restated the "experimenter" policy they had issued in 1951.

Also that year, a new amateur publication hit the market- "VHF Horizons." Concentrating on six meters and above, this magazine was full of technical articles, construction projects, contest information, and VHF news. But it was the editorial content of "VHF Horizons" that broke new ground. For the first time, an amateur magazine called for a rewrite of FCC policy. They wanted Technicians to be considered full-fledged amateurs and not just experimenters. Naturally, this caused controversy in the amateur community. Technicians who considered themselves communicators flocked to this new publication, while some higher class amateurs condemned it and restated their position that "communicating" Technicians were violating FCC policy. Unfortunately, "VHF Horizons" was not able to turn a profit, and expired after only two years.

In 1967, the FCC instituted "incentive licensing". While the actual frequency loss by Technicians was minimal--just the first 100 kc. CW segment of six meters--the FCC still struck a blow to those wishing to remove the "experimenter" status from this license. The FCC once again turned aside requests to expand Technician privileges to the full two meter band. In addition, the FCC also removed two meter voice privileges for Novices and took away the right for an amateur to simultaneously hold a Novice and Technician license. According to the Commission, too many Novices were operating two meter voice, were not increasing their code speed, and were upgrading only to Technician instead of General when their Novice license expired. Once again, the 1951 policy was restated.

However, despite the FCC's position, thousands of Technicians were on the VHF bands as communicators. With the rise of two meter FM, new Technicians were

taking to the airwaves every day, mostly with surplus wide-band commercial equipment. Recognizing that the role of this class of license had evolved, the ARRL Board of Directors met on November 1, 1969 and came to a decision. In an editorial in the December 1969 issue of "QST" entitled "Technicians as Communicators", the ARRL's new position was stated--Technicians were no longer just experimenters, but rather full fledged communicators. The ARRL proposed that they be given the full two meter band, the 29.5 to 29.7 Mc. segment of ten meters, and the ability to once again hold a Novice license simultaneously. The ARRL put these proposals before the FCC in a petition.

The FCC did not immediately respond to this petition, but rather, in 1971 issued an odd ruling in which they stated that a Technician class amateur could not use a repeater in which the input was in the Technician subband of 145-147 MHz, but the output was above 147. Nevertheless, since the repeater subband in the early 70's was 146-148 MHz and the Technician was not allowed above 147, the FCC was under pressure. On October 17, 1972, Technicians were given the 147-148 MHz segment of two meters. The FCC denied Technicians ten meters, Novices privileges, and the 144-145 MHz portion of two meters, but the door was opened.

With thousands of Technicians on two meter FM, the FCC then moved slowly towards full VHF privileges for them, realizing that the "experimenter" designation was obsolete. In 1975, Technicians were given Novice frequency privileges. When the new repeater subband was opened at 144.5-145.5 MHz, Technician privileges were expanded to 144.5-148. The FCC also realized that Technicians could no longer be excluded from RACES operation. In 1976, the FCC eliminated the "mail order" status of the Technician exam and required applicants to show up at an FCC examination point.

Finally, in 1978, Technicians received full two meter privileges. In the eyes of the FCC, they were full-fledged amateurs. In 1987, the exam was made easier by splitting element 3--the General written exam--into 3A for Technician and 3B for General. This is why those Technicians licensed before March 1987 only have to take the 13 WPM code test to upgrade to General. Also in 1987, Technicians received sideband privileges in the 28.3 to 28.5 MHz segment of ten meters. And, in a final act of "Technician Liberation" in 1991, 40 years after the license was established, the code-free Technician was created. So, if you meet a Technician who has been licensed since the 60's, treat him or her with dignity and respect, for they have suffered and endured years of being ostracized so that today's Technicians can enjoy full VHF/UHF privileges.

In our next installment, we will look at the development of repeaters and repeater regulations. I hope you will join me.

The History Of Amateur Radio Chapter 17

Repeaters...It seems they are everywhere, and they are. Several thousand amateur repeaters operate on our bands from 29.5 MHz all the way thru the microwave range. In fact, there are more amateur repeaters in the U.S. & Canada than there are AM Broadcast Stations. How and when did this evolve? Let's take a look at the development of repeaters in the Amateur Community.

If you had to guess when the first repeater came on the air, what would you say? 1970?, 1965?, 1955? Try 1932!!! It was in the early 30'S that the first "Duplex Phone Relay Stations", (as they were then called), came into existence. W1AWW & W1HMO set up a manned relay station in a 90 foot wooden lookout tower near Springfield Mass. They used a superregenerative receiver tuned to 60 MC (the top of the old 5 meter band), and a modulated oscillator transmitter on 56 MC, (the bottom of the band). Stations in Connecticut, Massachusetts or Rhode Island could transmit on 60 MC, and have their signals manually rebroadcast on 56 MC. This relay station, of course, was in operation only when amateurs were on duty at the lookout tower. Fully automatic repeater operation was still over 30 years away.

In the 1950'S and early 60'S, there were a few AM repeaters on the air in California. But for the most part, VHF operations in the 1940'S thru the late 60'S were on AM phone in the simplex mode, with a handful of sideband stations thrown in. Using crystal controlled transmitters with about 10 watts, and single conversion superhets, the typical VHF operator had a range of 10-15 miles, not counting any band openings.

There were a handful of FM stations of course, but the development of FM as a mainstream amateur mode of communication had been pushed aside by sideband. As early as 1940, QST had construction projects for a complete 112 MC FM station, but FM took a back seat in 1947 when sideband appeared. Now, however, thanks to an FCC edict, it was about to make a comeback.

In 1960, the FCC issued new requirements for the users of VHF commercial frequencies. Over the period from 1960 to 1970, commercial users gradually phased in narrow band (5 KC deviation) equipment to replace the wide band (15 KC) transceivers they had been using. Rather than revamp the older equipment to meet the new standards, they simply purchased new radios. The old units made their way to the surplus market, where they were quickly snapped up by amateurs. Converting this equipment to ham frequencies was relatively easy, and soon hundreds of stations were operating on 52.525 MC and 146.940. Why those frequencies? Well, 52.525 was the lowest 6 meter frequency on which wide band FM was allowed, and 146.94 was chosen to accommodate Technicians who weren't allowed above 147 MC. Thus, these became the first "calling Channels".

It wasn't long before some surplus commercial equipment was revamped into repeaters. Unlike the 1932 setup, these were fully automatic devices, with no need for a control operator to be present. This, however, presented problems. Part 97 at that time contained no provision for repeater operation, and it was unclear as to whether it was legal to operate a repeater without a control operator present. Many proposals were presented to the FCC to clarify the rules in regards to repeaters. FM and repeaters received considerable publicity in 1969 when Hurricane Camille caused widespread destruction in the Gulf Coast and Virginia. This was the first time mobile rigs, FM and repeaters were used extensively in an emergency. FM activity increased in late 1969 and early 1970 with the ARRL's announcement that it no longer considered Technicians to be just experimenters, but rather full fledged Communicators. Also adding to the popularity of FM was the introduction of the first commercial rigs for the amateur market, from manufacturers such as Galaxy, Clegg, and Drake. By 1970, it was clear that coordinated, legal growth of FM and repeaters was necessary.

In early 1970, the FCC proposed its first repeater rules. They were as follows:

On 6 meters, repeater inputs would be from 52.5 TO 52.7, with the outputs at 53.0 to 53.2 MHZ.. For 2 meters, repeater inputs would be authorized from 146.3 to 146.6, and the corresponding outputs would be from 146.9 TO 147.2. On our 220 band, the input/output subbands were 223.1--223.3 and 224.1--224.3, while on 440 repeaters would be authorized on 447.7--448.9 for inputs and 449.1--449.3 for outputs. (By the way, it looks like the 1970 FCC proposal contained a typo in the 440 MHZ segments). "Whistle on" or other coded access would be required--carrier activated repeaters would NOT be allowed. No cross band, linked or chain repeaters or multiple outputs would be allowed. The maximum power permitted was 600 watts input (about 400 watts output). And, finally, the FCC declined to allow fully automatic repeater operation, the proposed rules required the licensee of a repeater station to be in attendance at the transmitter or at an authorized fixed control point and to monitor all transmissions of the station.

The proposed repeater rules appeared unduly restrictive to many hams. Except for 2 meters, each band had only a 200 KHZ wide input/output window. On 2 meters the input/output subbands were 300 KHZ wide--but 2/3 of the repeater output subband was above 147 MHZ--where Technicians weren't allowed!! The FCC had still not acted on the ARRL's 1969 proposal to open all VHF frequencies to Technicians. When the FCC was questioned on the legality of a Technician using a repeater whose input was within the 145-147 subband, but whose output was above 147, they said the Technician operator **COULD NOT USE THE REPEATER**. The FCC went on to say "the licensee of such a repeater should sit there with the latest Callbook showing license class and keep his finger on the NO-NO button". (Yes, this is an actual quote). So much for liberal repeater rules.

Despite the FCC's rather restricted proposed rules, repeater operations flourished throughout 1970 & 1971. Over 200 repeaters were on the air by 1971, almost all of them in the 146--147 MHZ range so they could be used by Technicians. But, with the uncertain status of future FCC rules, the lack of national frequency standards, and the inability of Technicians to operate the full 2 meter band, a dark cloud hung over the FM world.

In our next installment, we will review the ARRL's national plan for 2 meter FM, as well as the revised FCC rules on repeater operation. I hope you will join me.

The History Of Amateur Radio Chapter 18

In our last installment, we traced the development of FM and repeaters from 1932 up to 1970. Since the FCC rules at that time had no provision for repeater

operation, stations in repeater service were operated under the Part 97 provisions covering remote control. The FCC, in February, 1970, came out with Docket #18803, which set forth the Commission's proposed repeater rules. These included small subbands set aside for repeater operation, a ban on linked, cross-band and multiband repeaters, a requirement for "whistle on" or other tone control, and a requirement that the licensee of a repeater station be in attendance at the transmitter or at an authorized fixed control point to monitor all transmissions of the station. In regards to the 2 meter band, the FCC set up the repeater subband in such a way that two thirds of it would not be accessible to Technicians.

Reaction was quick and negative. The ARRL and others felt that the proposed rules were so restrictive that they might be the end of amateur repeater operation as it existed at that time. Counter proposals, far less restrictive than the FCC's, were submitted to the Commission.

While amateurs waited for the revised FCC rules, another problem had to be solved. When two meter FM operation started in the 60's, 146.94 had been chosen as the national simplex frequency. This was the highest wide band FM frequency available to Technicians. After repeaters came along, amateurs discovered that the surplus commercial equipment in use had a maximum bandwidth of 600 kHz. Thus, 146.34 was chosen for the first repeater input. However, in areas where .94 was in heavy use by simplex stations, 146.76 was chosen as the output. This led to the problem of non-standard splits, and in some areas of the country, repeaters such as .34/76, .28/94, and .34/82 could be found. The frequency 146.94 was a battleground between the simplex vs. repeater groups.

Amateurs were also fighting a minor battle over 146.64 MHz, which, in some parts of the country, was a DX simplex frequency. To make matters worse, all transceivers back then were crystal controlled. With crystals at \$10 per pair, it cost \$120 (about \$350 today) to fill all 12 channels in a 2 meter radio. It was possible to equip your radio with the repeaters and simplex frequencies used in one area, then find all of your channels were useless 200 miles away.

A National Plan was needed. The Texas VHF-FM Society proposed such a plan, which was described in the May, 1972 issue of QST. In it, the repeater offset was standardized at 600 kHz, 146.94 and 146.64 became repeater outputs, 146.40 through 146.58 became simplex, and 146.52 was chosen as the national simplex frequency. In the 146-147 range, accessible to Technicians and above, there were 13 repeater and 7 simplex channels. The 147-148 range, available only to Generals and above, had 14 repeater and 6 simplex channels. Note that in the Texas plan, all repeater inputs were 600 kHz below the output--even in the 147-148 range. Except for changing the inputs to the high side above 147 MHz, the Texas Plan was adopted.

The gradual acceptance of a 2 meter band plan still did not resolve the FCC issue. The Texas Plan, as good as it was, violated the FCC's 1970 proposal. The Commission still had not issued any repeater rules, nor had they acted on the ARRL's 1969 request to give Technicians the full 2 meter band. Finally, in September 1972, the FCC issued new rules covering repeaters, logging and portable/mobile operations. Liberal repeater subbands were authorized at 52-54, 146-148, 222-225, and 442-450 MHz. Logging requirements, especially for repeater and mobile stations, was simplified: repeater operators no longer needed a tape recorder hooked up to their stations. The requirement for a portable or mobile station to notify the FCC of operation in a particular Radio District was also reduced--no longer would amateurs contemplating a cross country trip with their radios have to write to each District on their journey in order to inform the Engineer of the trip.

Repeaters would have to be licensed: call signs beginning with the prefix "WR" would be issued. The repeater license application was complex--each applicant for a repeater license had to submit certain data to the FCC regarding the technical, operational, and effective radiated power of the proposed station. "Whistle on" or tone control was no longer required, two repeaters could be linked, but multi-linked or crossband repeaters were prohibited. Repeater monitoring and control requirements were made more flexible. And finally, the FCC acted in part on the ARRL's 1969 proposal. Although they did not give Technicians full 2 meter privileges, they did grant them the 147-148 segment. Technicians could now operate all 2 meter repeaters without violating FCC rules. The new FCC repeater rules, coupled with the Texas Plan, caused a surge in 2 meter FM activity. It also was the shot in the arm the hobby needed to fully recover from the decrease in growth caused by Incentive Licensing.

Manufacturers such as Drake, Standard, Regency, Tempo, Genave, Clegg and Midland poured rigs onto the amateur market. Heathkit had the very successful HW-202 followed by the even more popular HW-2036. The increase in the number of Technicians on 2 meter FM finally killed the "Technicians are experimenters, not communicators" theory. And finally, thanks to 2 meter FM, amateur radio grew by over 33% in the 1970's. In 1975, due to increased demand, the FCC authorized the use of 144.5-145.5 MHz for repeater operation. Technicians were given access to this subband. In 1978, the FCC relaxed the rules, eliminated the separate repeater licenses and the "WR" prefix, and gave Technicians the full 2 meter band.

From 1978--1981, the synthesized revolution took place, as affordable PLL and microprocessor rigs drove the last of the crystal controlled radios off the market. Today, a name brand, 2 meter HT costs about \$175. With it, you can access over 4000 repeaters, or scan the VHF Hi band. Compare that to 1972, when a crystal controlled radio, equipped with 12 channels, cost \$300--or about \$800 in today's dollars. We truly have come a long way.

In our next installment, we will look at a couple of license proposals in the mid 70's and the controversy they caused. I hope you will join me.

The History Of Amateur Radio Chapter 19

In 1974, the amateur radio population was on the increase again, thanks to the popularity of 2 meter FM. Incentive Licensing had been in place for 5 years, and the anger and resentment over losing HF frequencies was beginning to fade.

However, trouble was brewing. The FCC had several petitions on their agenda, most from hams, and one from the Electronics Industry Association. In late 1974, two bombshells were dropped.

The first surprise was Docket #20282--the FCC's restructuring plan for amateur radio. Apparently oblivious to the upheaval that was caused in the 1960's with Incentive Licensing, the FCC was now proposing rules that would take away major privileges from Generals, eliminate the ability of 90% of Technicians to renew their license, and, horror of horrors, create a new "No Code" license. The proposal was somewhat complicated, so grab a pencil and some paper, and follow along.

The FCC, in essence, wanted to create a "dual ladder" incentive licensing system, with two routes available. The first, named Series A, covered the shortwave frequencies, while Series B encompassed the VHF-UHF allocations. The dividing line between Series A and Series B was not 50 MHz, as one would expect, but rather 29 MHz, or roughly the middle of the 10 meter band.

Series A contained familiar amateur classes--Novice, General, Advanced and

Extra. Novices would get a power increase from 75 to 250 watts input, and would also gain a 5 year renewable license to replace the 2 year non-renewable one now in existence. Generals would lose big--the 29.0 to 29.7 MHz segment of 10 meters would be taken away; they would be limited to A1 (cw), A3 (AM & SSB), and F3 (FM) emissions only (in other words no more slow scan TV, RTTY, or radio control); power output would be reduced to 500 watts PEP; and they could no longer supervise mail examinations. Furthermore, they could no longer be the trustee of a club station or repeater. Generals who were already licensed if or when this proposal was adopted would also be "Grandfathered" into the Series B Technician Class license.

The Advanced class gained under Series A. They kept all of their privileges below 29 MHz, received a power increase to 2 kw PEP output, gained access to the Extra Class phone segments, and would be "Grandfathered" into the new "Experimenter" Class in Series B.

The Extra Class lost their exclusive phone bands, which would be shared with the Advanced license. However, they kept their CW subbands, and gained the 2 kw PEP output, as well as a lifetime operator license. Note that the Conditional Class license is not mentioned. That's because the FCC incorporated it into the General license. Conditionals would have the letter "C" after the word General, and their license would not be renewable.

On the Series B, or VHF-UHF side, the proposed changes were even more drastic.

The FCC, for the entry level license, would create a new "No Code" "Communicator" Class, which would allow operations above 144 MHz using F3 (FM) emissions only

Technicians would gain some frequencies--the 50.0-50.1 and 144-145 MHz segments--but otherwise, like the Generals, would lose big. They could only use A1, A3 and F3 emissions with 500 watts PEP output, and could not be the trustee of a club station or repeater. However, the worst news for Technicians was that those who had taken their exam via mail (about 90%) would not be allowed to renew. They, like the Conditionals, would have to pass the test again before their license expired.

One step above the Technician Class was another new license proposed by the FCC--the Experimenter Class. "Experimenters" would have all amateur privileges above 29 MHz, with 2 kw PEP output.

Above the Experimenter license was the Extra Class, which held the distinction of being at the top of the ladder for both Series A and B.

The FCC proposed adjusting the written exams to accommodate the different

requirements of Series A and Series B. Element 2 (the old Novice written exam) would be rewritten into 2A (Novice) and 2B (Communicator). Novices would have to pass the 5 wpm code, as well as 2A, while Communicators only had to pass 2B. Likewise, the General Element 3 would be divided into 3A (General) and 3B (Technician). Generals and Technicians would still have to pass the 13 and 5 wpm code tests respectively. Advanced Class operators needed 13 wpm and the Element 4A written exam, while Experimenters had to pass a 5 wpm code test along with Element 4B. For the Advanced and Experimenter Classes, only the 20 wpm code test was needed to upgrade to Extra.

Since, except for the Extra, the Series A and Series B licenses did not overlap, the FCC would allow amateurs to hold one license in each Series. This created some interesting possibilities. As previously noted, a General could also hold a Technician, and an Advanced the Experimenter. Both Technicians and Experimenters could obtain a Novice, if they passed Element 2A. The "No Code" Communicator could also hold a Novice, if Element 2A and the 5 wpm tests were passed.

The FCC set a June 1975 deadline for comments on the restructuring proposal. The ARRL, still smarting from the Incentive Licensing conflicts, wasn't going to comment until they had taken the pulse of their members. What was the ARRL's response? And just what was "Class E CB", the other FCC proposal? How did it affect Amateur radio? In our next installment, the "Wayback Machine" will have the answers.

The History Of Amateur Radio Chapter 20

In our last installment, we took a look at the new "dual ladder" licensing system proposed by the FCC late in 1974. In effect, there would be 2 parallel series of

Amateur Radio Licenses, with 29 MHz as the Line of Demarcation. Series A covered the frequencies below 29 MHz, and included the Novice, General, Advanced and Extra Classes. The Conditional Class would be abolished, Extra and Advanced Classes received a power increase, the Advanced License would get access to the Extra phone bands, and Generals would lose power, frequencies, certain modes of operation, and the ability to be a Trustee of a Club station or a Repeater. Series B covered the frequencies above 29 MHz, and included 2 new license classes--the "Communicator", which would be FM only above 144 MHz, and the "Experimenter", which would offer all Amateur privileges above 29 MHz. Like Generals, Technicians would lose big. In fact, those who took their exam by mail (over 90%) would NOT be allowed to renew.

Reaction to the proposal was strong, but somewhat puzzling. Instead of a vehement output of negative comments from the 180,000 General, Conditional, and Technician Class Amateurs, (who stood to lose substantial privileges, and, in many cases, their very licenses), instead, comments concentrated on the "no code" Communicator Class. Amateurs were overwhelmingly against it. In fact, the Communicator License received the same amount of contempt and disdain that the "Hobby Class" proposal had received a few years back. However, while amateurs were debating the FCC Restructuring proposal on the air, and in letters to QST, the ARRL was unusually quiet. Why weren't they coming out with a position?

The answer, in a word, was "Incentive"--as in Incentive Licensing. The ARRL had learned its lesson back in the '60's, when it had submitted its proposal for restrictive phone bands. Now, before any response was made, the ARRL wanted to know exactly what the members wanted.

Thus, the League sent out a comprehensive survey to all 100,000 members. Fifty six percent, or 56,000 (myself included) returned the questionnaires. The ARRL tabulated the results, printed them in a multi page report in QST, and then, in the Summer of 1975, submitted their own proposal to the FCC.

The ARRL's plan kept the basic amateur structure that was in existence--but with a few changes. The League suggested a "Basic Amateur" License, which would provide limited VHF operating privileges. The "Basic Amateur" would not actually have to pass a code exam, but would have to be familiar with CW characters. The trick here, of course, is that once someone has memorized the letters, numbers and basic punctuation marks, they are at 5 wpm already. So, this wasn't really a "no code" license, but it did eliminate formal CW testing.

As for Technicians, the League once again asked that they no longer be burdened with the "experimenter" designation, that they receive Novice HF subbands, and that they receive full VHF privileges.

Generals would see their code requirement drop to 10 wpm, while the Advanced

Class would be bumped up to 15 wpm. No major changes were proposed for the Extra Class.

Unlike the '60's, when the ARRL was blasted for shoving Incentive Licensing at the members, this proposal was met with overall approval and appreciation from amateurs.

In the end, although the FCC dropped the "dual ladder" idea, they did incorporate many of the ARRL's ideas into future rule changes. Technicians were mainstreamed into the amateur license structure, Novices received expanded privileges, to eventually include hf & vhf phone, and the FCC, after years of restrictive proposals, finally chose the path of gradual deregulation.

But the "dual ladder" story was not the only event of 1975. When amateurs weren't arguing over the evils of the "Communicator" Class, they were blasting the idea of Class E CB. What was it? In summary, the Electronic Industry Association, or EIA, proposed taking away up to 2 MHz of our 220 band, and turning it over to a new CB service. With 25 khz spacing between channels, the new EIA Class E CB could have as many as 80 channels. The EIA claimed that the 23 channel CB Band at 27 MHz was impossibly crowded, and worthless for local communication among legitimate users. Remember, this was at the time of the gas crisis and the "CB Boom". The EIA argued that a skip free area was needed for CB, and that the 220 band was underutilized by hams. The EIA's proposals, in fact were quite stringent and, had it not been for their unfortunate choice of frequencies, they may have received the support of the ARRL.

But, the EIA was trying to mix matter and anti-matter--in this case, amateur frequencies and CB. This had happened once before, in 1958, when Class D CB was created out of "our" 11 meter band. "Never Again" was the cry from hams. The explosion of protest from the amateur community was palatable. Amateurs pointed out that CB wouldn't be such a mess if everyone obeyed the Part 95 rules, and the FCC took some enforcement action. The ARRL stated that CB'ers themselves were opposed to 220 MHz CB--which was only partly true. The only CB operators surveyed were those who read hobby type magazines, such as S-9. They were opposed to anything that would take them away from the skip and DX zone into a tightly regulated land of local communications. Lost in the emotional shuffle was the logical point that CB did not belong in the HF spectrum.

In the end, with the strong opposition of the ARRL, and the indifferent support of CB'ers who really wanted to stay on HF, the FCC dropped the idea. Instead, in late 1976, the FCC expanded the CB band from 23 to 40 channels, and prohibited the sale of the older 23 channel units. This created a mini bonanza for hams, who snapped up the "obsolete" 23 channel units at fire sale prices, and converted them to 10 meters.

As a postscript, amateurs did lose 2 MHz of our 220 band in the early 90's. These frequencies are now in a no man's land, unused. Which is better--to lose 2 MHz to a service that hams and their families could use productively, or to lose it to something that is inaccessible--and doesn't even exist yet?

In our next installment, we will look at the war protest movement in 1970, and how it affected amateur radio. I hope you will join me.

The History Of Amateur Radio Chapter 21

In May of 1970, with the Vietnam War in full swing, the United States invaded Cambodia for the purpose of rooting out the Communists using that country as a base of operations. This led to protests at College campuses across the nation, and the deaths of four students at Kent State University in Ohio. At this point, the demonstrations exploded on virtually every major campus nationwide.

One problem facing the leaders of these protests was how to exchange news and information with their collegiate brothers and sisters on other campuses. The internet was in it's embryonic stage, and available to only the military and a few select universities; network news and wire services were not to be trusted (after all, they were run by people over the age of 30); the mail was too slow, and in a shambles after the recent postal strike; and long distance telephone calls were too expensive for students surviving on part time jobs and Care Packages from their parents. Thus, they turned to an institution that was prevalent at that time on almost every college campus--Amateur Radio. The Student Information Net was born.

The net appeared on 7260 khz and 14.294 MHz in the 40 and 20 meter bands. Net Controls included K1WGM, at Brandeis University in Waltham, MA, and W2UC, at Union College in Schenectady, NY. At first, the net was used solely for

the purpose of gathering and exchanging information as to what was happening on the various campuses nationwide. The net was so good at this, as a matter of fact, that they began to feed news to the wire services and the major networks.

However, the net soon expanded in scope, and that's where the trouble began. Dialog was encouraged among the various participants on the merits of the war, and what type of protests should be used. News bulletins were passed as traffic, to be rebroadcast on the college radio stations. Funds were solicited for the continuation of the student strike activities. Traffic was passed encouraging students to send their draft cards to Washington D.C. for a massive bonfire. A boycott of Coca Cola was discussed, as well as a demonstration to be held at Fort Dix on May 16. W2UC and W3EAX exchanged information on the demonstration at the University of Maryland and the attempt to block U.S. Route 1. W2UC claimed that they were forwarding all information received to a "clearing center", the location of which was not specified.

Then it started--the jamming, the deliberate interference, and the name calling by several unidentified stations. The net continued through the jamming, and operated for about a month- -long enough for the U.S. to withdraw from Cambodia, and for the summer break to arrive. But the controversy was just beginning.

The July, 1970 issue of QST contained an editorial in which the ARRL stated that the use of the amateur bands for heated political discussion was a self imposed taboo in amateur radio. They said that because of amateur radio's international status, what goes out over the air can have negative political consequences for us at future radio conferences. As a result, according to the ARRL, there was no place on the amateur bands for arguing about the Vietnam War, advocating resistance to the draft, and talking about the new and permissive morality. The ARRL also condemned the jammers, stating that "Frontier Justice", vigilantes, and "Joe McCarthyism" had even less place than politics in amateur radio.

The letters from hams poured into QST. By a 2 to 1 ratio, they opposed the use of amateur radio for political purposes. One writer stated the net was a violation of national security and notified his local FBI office. Another stated that the net advocated mass disobedience to the laws of the land. One amateur stated "We must keep politics and jammers off the amateur bands. A political discussion on the amateur frequencies is as inappropriate as a political speech on an air traffic control channel". The ARRL's reference to "McCarthyism" brought a rebuke from an amateur who said that Joe McCarthy was a "great American", who was proven correct in every case. And finally, one letter called the net participants "creeps", and sympathized with those who caused the QRM.

On the other side, supporters of the net were appalled at the deliberate jamming and claimed that the net was non-political, provided accurate information, facilitated good will, and prevented false rumors. Members of the Student

Information net claimed that the traffic passed was legal and was eventually carried by the UPI & AP wire services.

Several writers brought up constitutional issues, claiming that the First Amendment gave the net operators the right to do what they did, as well as the right for every amateur to discuss anything, including unpopular causes, on the air. One ham, ex-W6SDW, condemned the anti civil libertarian attitude of the ARRL & a majority of hams, and gave up his license as a protest.

The Student Information Net lasted only one month, but it opened the door to the concept that amateur radio did not exist in a technical vacuum, and that discussions of current political and social events were allowable on the amateur bands. Have we gone too far in the "anything goes" direction? That's up to you to decide. As a postscript, W2UC has recently been reactivated at Union College. If you ever hear it on the air, remember the role it played in amateur radio history 28 years ago.

In our next installment, we are going to jump back in time to the depths of the Great Depression, the early 30's. I hope to see you then.

The History Of Amateur Radio Chapter 22

On March 4, 1929, Herbert Hoover, the former Secretary of Commerce who had helped Amateur Radio during it's embryonic years, became President of the United States. Less than 8 months later, the Nation was thrown into the Great Depression. Stock prices fell 80%, the Gross National Product fell 50%, and unemployment was at 25%. It did not sound like a good time to waste money on a frivolous hobby such as amateur radio. And yet, the early 1930's was the

period of the greatest growth in our history. From 1929's census of 16,829, amateur radio expanded 276% in 5 years, to a total of 46,390 in 1934. What was life like in our hobby 65 years ago?

QST was 25 cents per issue. One of the interesting columns in it was entitled "Calls Heard", which simply listed page after page of call signs heard by various stations reporting in. Each month hams would scan the hundreds of calls listed, to see if their signals had been noticed. One of the call signs listed was W2XAF, which was not an amateur station, but rather the shortwave relay of WGY, Schenectady. In fact, in the 1930's, there were so many broadcast stations with SW relays, that the Callbook listed them in addition to amateur call signs.

Most of the ads in QST at that time were for components to construct your own station. Tubes, resistors and condensers (not capacitors), were displayed in full page ads. RCA and deForest were the dominant entities in the tube field. If you needed "A", "B" and "C" batteries, the Burgess Battery Company in Madison, Wis. could supply them. As the 1930's progressed, more companies appeared with kits or even assembled units. Hammarlund, then known as Hammarlund-Roberts Inc, made it's debut with the "AC PRO", an 8 tube superhet receiver. National's new receiver was the SW-3. Radio Engineering Labs, known as REL, of Long Island City, supplied low cost transmitter and receiver kits. In 1931, one of these kits was at the center of a legal battle that went all the way to the Supreme Court. RCA, which held the deForest patents on the regenerative circuit, sued REL. Edwin Armstrong, who actually invented regeneration, but lost a controversial court battle with deForest, saw this as an opportunity to win back his patent. He purchased 51% of REL's stock, and proceeded to fight the grand battle once more. Unfortunately, in 1934, the Supreme Court ruled that deForest, not Armstrong, was the inventor of regeneration.

Armstrong could take some small consolation that another of his inventions was finally put to good use in the amateur world -- superregeneration. Invented in the early 1920's, superregeneration provides very high sensitivity on AM signals. However, it has almost no selectivity, a very high noise level in the absence of stations, and radiated a broad interfering signal to nearby receivers. It was useless on MW or SW, but was perfect for the 5 meter band at 56 mc. During the early 1930's, Ross Hull, QST's Associate Editor, wrote many articles about 5 meters and the surprising propagation there. Many 'phone stations appeared on 56 mc, almost all used "supergenny" receivers, and some even operated full duplex.

If "UHF" 'phone doesn't interest you, how about amateur television? In 1931 you ask??? Unbelievably, the answer is yes!. In 1931 an article appeared in QST describing the "spinning disc" mechanical television system that had been around since the 20's. It was clumsy and crude, but it worked. The Jenkins Television Corp of Passaic, NJ, offered a "spinning disc" kit in QST. Within 9 years however, the mechanical system was rendered obsolete by RCA's all

electronic system.

The Madrid Conference was held in 1932. Unlike the 1927 Washington Conference, amateur radio was not in danger, and no frequencies were lost. 1932 also saw the expansion of the 'phone bands, but a special endorsement was needed to operate them.

The "Old Man" was still around, with his letters in QST about "rotten" operators, "rotten" band conditions, "rotten" stations, etc.. In fact, everything that didn't meet the Old Man's standards was "rotten". For the past 15 years he had been writing- no one knew who he was. Finally, when Hiram Percy Maxim died in 1936, the ARRL revealed that Maxim was indeed the Old Man. By the way, since H.P. Maxim, W1AW, was still alive in the early 30's, the ARRL Station Call was W1MK.

Dealers included "Uncle" Dave Marks, whose first store was located at 115 North Pearl St in Albany, NY. This address is significant to me because the building I now work in stands on that site.

By 1934, the Federal Radio Commission was superseded by the FCC, and a new license structure, with Class A, Class B, and Class C licenses, was in place. What goes around, comes around.

In our next installment, we will take a look at the late 1930's, particularly some events in 1938. I hope you can join me.

The History Of Amateur Radio Chapter 23

Cairo, Egypt, 1938. In the pre war time of Colonial Empires, this conjures up an

image of Europeans in white linen suits sitting on the veranda of a luxuriously decadent Colonial Hotel, oppressive ceiling fans, dark, mysterious strangers, Peter Lorie & Sidney Greenstreet. However, for amateurs, Cairo in 1938 meant a setback.

The first International Radiotelegraph Conference was held in Washington D.C. in 1927. Although amateurs lost almost 40% of their allocations, the concept of amateur radio as a legal, international hobby was established. The second Conference was held in Madrid in 1932, and produced no changes in ham radio. Now the third Conference was at hand, but times had changed. Italy, Germany, and Spain were under Fascist Dictatorships, Stalin was directing a ruthless purge in the Soviet Union, and Japan was at war with China. The shortwaves were filled with propaganda broadcasts and military communications. Under this cloud of uncertainty, delegates from 71 countries assembled in Cairo on February 1, 1938. How would amateur radio be treated under these circumstances?

Actually, American hams came out of the battle with no major losses. Despite the number of Dictatorships at the Conference, there was no attempt to destroy amateur radio, which, after all, allowed individual citizens access to receivers and transmitters. The most serious threat came from Japan, which proposed that amateurs be limited to 50 watts input. The Japanese Plan was easily defeated. The ARRL had pushed for expanded HF bands, but the American Delegation, mindful of the potential hostility at the Conference, did not propose it.

The headlines in the July 1938 issue of QST summed up Cairo: "American Amateurs retain all frequencies after a terrific fight", "USA puts up splendid defense", "European Hams short changed by Greedy Governments", and, "European Broadcasting to invade 7 mc Band in late 1939". In Europe, the 7200-7300 kc segment of the 40 meter band would be shared with Broadcasters, starting September 1, 1939. They also lost half of the 80 meter band to broadcasting and other services, and the European 5 meter band was scaled back to make way for television. However, it could have been a lot worse. The next International Conference was set for Rome in 1942. It never took place.

In other 1938 news, the amateur population was stabilized at 50,000, after years of growth. This was partly due to the increase in the code speed, from 10 to 13 wpm in 1937. With regenerative receivers and crystal controlled transmitters (which meant that two stations having a QSO would probably be on two separate frequencies), many hams felt that 50,000 was the saturation point for our bands.

On October 4, 1938, the FCC issued complete new amateur regulations. Included in the package were two new ham bands at 112 and 224 mc. What could hams do up there? Try amateur television. An all electronic form of television was replacing the mechanical "spinning disc", and QST carried several articles discussing the theory and construction of an amateur TV station. W6XAO was an experimental TV station in LA, which would soon be followed by other TV

pioneers such as W2XBS. (Where have I heard that call before?).

On September 2, 1938, the new Maxim Memorial Station, W1AW, was dedicated at 225 Main Street in Newington, Ct.. The Station was in memory of Hiram Percy Maxim, the Founder and first President of the ARRL, who died in February 1936. Less than one month after Maxim's death, floods roared through the Connecticut River valley, and destroyed W1MK, which had been the League's Station. Later in 1936, the ARRL Board of Directors allocated \$18,000 to build a Memorial Station to honor W1AW, as well as to replace W1MK. The station would stand alone on Main St., in Newington, until joined in 1963 by the ARRL/QST Offices, which moved from West Hartford.

On September 13, 1938, Ross Hull, Editor of QST, died after being electrocuted in his home. He had been working on a homebrew TV receiver. Ross was a native of Australia and held the call 3JU while living "down under". He did not hold a U.S. license because his citizenship application was not finalized. Despite his lack of American Amateur privileges, Ross Hull was instrumental in early VHF/UHF developments. He designed practical and inexpensive 5 meter stations, and greatly contributed to the knowledge of VHF/UHF propagation. His death dramatically pointed out the dangers of working on live circuits and, for months thereafter, QST ran articles on how to "switch to safety".

No discussion of 1938 would be complete without including the Great Hurricane. In the fourth week of September, New England and Long Island, already soaked by previous rainstorms, were pounded by the unnamed Hurricane, which was completely unexpected. Over 600 people died, and damage was \$500 million in 1938 dollars. The new W1AW Memorial Station, just 3 weeks old, survived without any damage, although power was lost for 36 hours. Hundreds of amateurs grabbed whatever generators and batteries they could find, and set up emergency stations on 5 meters AM, and 160, 80 and 40 cw. Amateurs were the only source of communication for dozens of communities and handled everything from health and welfare traffic to police communications. It was a superb demonstration of public service at its best.

In our next installment, we will look at amateur radio in WWII. Yes, amateurs were off the air. But what did they do, if they weren't in uniform? What filled the pages of QST? And what was this "WERS"? Join me as the "Wayback Machine"

seeks the truth .

The History Of Amateur Radio Chapter 24

World War II started on September 1, 1939, when Germany invaded Poland. By May, 1940, Germany had conquered much of Europe, and had her sights on Britain. Although the United States was officially neutral, it was obvious that our sympathies were with the Allies. In addition, it was clear to a few perceptive Americans that we would be drawn into the conflict.

Amateur Radio Operators, like most Americans, began to gear up for War. On June 4, 1940, the FCC issued Order #72, which prohibited amateurs from engaging in foreign communications, or from establishing contact with any or all points outside the continental U.S. and its possessions. The FCC was quite serious about this--they revoked the licenses of several hams who had contact with foreign stations. The "How's DX" column was jokingly referred to as "Where's DX"--so many foreign hams, including our neighbors in Canada, had been off the air since September, 1939.

Throughout 1940 and 1941, the face of amateur radio changed with the darkening war cloud. The War Department sent out a questionnaire to all hams to obtain data on equipment, experience, physical fitness, and availability for service. Columns devoted to the military began to appear, such as "Army-Amateur Radio System Activities", which included the schedule of station WAR on 4025 and 6990 kc. Other columns were "Naval Communication Reserve Notes"; "In the Services", which listed amateurs now in military service; and "USA Calling", which published requests from the Navy, Marines, Army, Army Air Corps, Signal Corps, Merchant Marine, and even the FBI for amateurs proficient as radio operators, electronic specialists, electrical engineers and Communications Officers. In the summer of 1940, the British used the "USA Calling" column to issue an urgent appeal for radio servicemen and amateurs for their Civilian Technical Corps. Up to 25,000 Americans were requested by the British.

Foreign espionage invaded the ham bands in 1940. The FBI, in a successful bid to capture several foreign agents in the U.S., operated a counter-espionage station in the 20 meter band. Using a phony amateur call, the FBI passed over 500 messages to various spies before arresting them.

Amateurs were members of the Defense Communication Board, which met every week to prepare for a military emergency.

Amateurs also made their own preparations for a national emergency. QST ran several editorials urging hams to improve their CW skills. Many articles appeared on "emergency" equipment, such as vibrator power supplies (to supply the B+ voltage for tubes), battery operated radios, and mobile stations. The 2 1/2 meter band (112-116 mc) was chosen as the primary "Civil Defense" band, and every issue of QST had another 2 1/2 meter construction project, including a few "Walkie-Talkies". Civil Defense coordination and participation was urged.

On July 22, 1941 the FCC, in response to the National Emergency, announced that the 3650 to 3950 kc portion of 80 meters would be withdrawn from amateur use and reassigned to the military for use in an Aircraft Pilot Training program. Amateurs were given a few months to vacate the band, and preparations were made to move popular 80 meter nets to 160. But before the reassignment was completed in December 1941, Pearl Harbor was attacked.

On December 8, 1941, the FCC issued Order Number 87, which read in part:

Whereas a state of War exists between the United States and the Imperial Japanese government, and the withdrawal from private use of all amateur frequencies is required for the purpose of National Defense; IT IS ORDERED, that except as may hereafter be specifically authorized by the Commission, no person shall engage in any amateur radio operation...and all frequencies heretofore allocated to amateur radio stations under Part 12 of the Rules and Regulations ARE HEREBY WITHDRAWN. All amateur licensees are hereby notified that the Commission has ordered the immediate suspension of all amateur radio operation in the continental U.S., its territories and possessions.

However, the FCC left a small loophole for amateur operation during the war. Amateurs would be allowed to operate for the purpose of National Defense, upon application of a Federal, State, or local official.

In our next installment, we will look at some amateur operations during WWII. Some will surprise you.

The History Of Amateur Radio Chapter 25

On December 7, 1941, the Japanese attacked Pearl Harbor. Less than 24 hours later, the United States was officially at War, and the FCC had issued Order Number 87, which suspended all amateur radio operation in the U.S., and withdrew "our" frequencies from the amateur service. However, the FCC did recognize that limited amateur operation would be required in connection with domestic Civil Defense work.

Thus, in June, 1942, the FCC issued regulations which created the War Emergency Radio Service, or W.E.R.S. for short. This was not an amateur operation, even though the frequencies used were our former bands at 112-116, 224-230, and 400-401 Mc. Note that the 5 meter band, 56-60 Mc., was not included. The FCC apparently sought to limit operations to the "UHF" frequencies, where long distance skip was impossible. A WERS License was not given to an individual, but rather to a municipality or other local government entity, to cover the operation of all such stations engaged in emergency civilian defense communications. Operations could only be conducted upon authorization of the local Civil Defense Corps.

Operators in W.E.R.S. had to be loyal U.S. citizens, with fingerprints and proof of U.S. Citizenship on file with the FCC. They also needed to have an FCC commercial or amateur license, or an FCC 3rd class operating certificate. Thus, although most operators were hams, many non-amateurs were active in this service also.

Authorized operations in the War Emergency Radio Service were limited to emergencies relating to enemy activity. There was no provision for operations in natural disasters. Practice and training sessions were allowed, and local governments may have used these "practice" activities to provide needed communications during natural disasters.

Technical standards were strict for 1942. The carrier frequency could not deviate

more than 0.1% in the lower half of each band, and 0.3% in the upper half. In the 2 1/2 meter band, this meant that the signal could not vary more than 112 kc at the lower end, and 340 kc at the upper end. While this sounds incredibly wide today, remember that in the 30's and 40's, almost all "UHF" transmitters used the "modulated oscillator"--cheap to build, but not very stable. The only receiver useful with this type of signal was the superregenerative. Power was limited to 25 watts input, which is about 10-15 watts output.

By default, 2 1/2 meters became the band of choice for W.E.R.S. operations. In fact, it came to be known as "The Civil Defense Band". The most popular radio in W.E.R.S. operation was the TR-4, by Abbott Instruments of New York City. The unit measured only 9" x 8" x 4.5", ran on 6 volts DC or 110 volts AC, had a range up to 75 miles, and cost less than \$40.

Although W.E.R.S. served a valuable purpose, it did not satisfy the needs of an active amateur suffering under the wartime radio silence. Fortunately, the WWII amateur had it far better than his WWI predecessor. For one thing, amateurs did not have to disassemble their stations and take down their antennas. Contrary to popular belief, the FCC did not ban shortwave listening. AM broadcasting was still allowed, W1AW was authorized to remain on the air. QST was still published. But, even with all this, the restless amateur wanted more. And, believe it or not, some hams legally got on the air and had QSO's. How?

"Wired Wireless". Have you ever heard of it? In summary, "wired wireless" was a Carrier Current type of operation. A transmitter, usually running 10-25 watts output, was inductively coupled to the AC power line. The signal would follow the power lines throughout the city, up to a maximum of about 5 miles. Anyone within 300 feet or so of the AC power line would be able to copy the signal. Even though the range was a 5 mile radius from the transmitter, the actual radiation distance was only 300 feet, thus it was legal. Amateurs found that carrier current operations worked best in the longwave spectrum, and set up hundreds of stations in the 160-200 kc range. Ironically, the 160-190 kc segment survives to this day as a legal, unlicensed low power band, with one watt and 50 foot antennas permitted.

Some amateurs experimented with Audio Frequency Induction Field Communications. This involved no RF--an audio oscillator was coupled to a large inductor. At distances of 2000-3000 feet away, an audio amp coupled to a similar inductor received the signal.

QST was active during the War years, running articles on secret communications and ciphers, the latest 112 Mc W.E.R.S. equipment, visual signaling (including the semaphore alphabet), a course in radio fundamentals, a multi part series in Cryptanalysis, and the Japanese Morse Telegraph Code, with notes on the Japanese language. Towards the end of the War, QST ran several articles on the postwar amateur allocations. Two columns focused on amateurs serving in the

Armed Forces; "In the Services", and "Hams in Combat". And, as a grim reminder of the horrors of War, the column "Gold Stars" listed those amateurs who made the ultimate sacrifice.

In our next installment, we will look at amateur life in the postwar world.

As a postscript, the ARRL has asked that the 160-190 khz band be reallocated to amateur use. Will the ghosts of the WWII operators be listening as we once again activate that band with CQ's? You decide.

The History Of Amateur Radio Chapter 26

What was the post-war world of amateur radio like? Let's take a look at our hobby as it existed in the late 1940's.

In November 1945, amateurs were allowed back on the air on the 10 meter, 5 meter, and the new 2 meter band. The 5 meter band from 56-60 mc was temporary--by March 1946 we were moved in the great post war frequency shuffle to our new 6 meter home from 50-54 mc. As for the new 2 meter band, it replaced our old 2 1/2 meter allocation which ran from 112-116 mc. Throughout 1946, the military gradually vacated the 80, 75, 40, and 20 meter bands, turning them back over to amateur operations. We lost a few frequencies--the 160 meter band was staying in the hands of the military for LORAN Radionavigation, and we lost the top 300 kc of 10 meters, from 29.7 to 30 mc. To compensate us for this loss, the FCC, in 1946, gave hams an allocation at 27 mc to be shared on a secondary basis with industrial, scientific and medical devices. Dubbed the "11 meter band", it was unique as the only HF allocation where A0 and A2 emissions were allowed.

The amateur population was pushing 60,000, and the FCC was running out of "W" call signs in the 9 call areas. So, the FCC created the 10th call district in 1946, and redrew the district boundaries. The license structure was the same as before the war. Class A hams had all amateur privileges, including exclusive use of the 75 and 20 meter phone bands. Class B had all CW privileges, and phone operation on 10 meters and above. Note that at the time, 40 meters was CW only, and 15 meters didn't exist yet. Class C had the same frequencies as Class B, but it was a mail order license for those in remote areas. The only change the FCC made to the license structure in the 1940's was to allow applicants to copy the code either by printing, or by longhand. Prior to the war, the code test had to be copied in longhand only.

Most hams used cw or AM phone, but there were 2 new modes on the horizon. Narrow band fm enjoyed a brief surge in popularity. QST had several articles on VHF and even HF fm operation. Phase modulation, a variation on fm, made its first appearance in 1947. But the big news was something called "SSSC", or Single Sideband Suppressed Carrier". SSB, as it would eventually be called, appeared on the ham bands late in 1947. Throughout 1948, QST was full of articles on this new mode. And, how do you get your fm or SSB signal to the antenna?? Try an item developed during the war--coaxial cable. And, with coax, came a new concern over reflected power. Thus, the first SWR meters were described in QST.

So, what rig do you want to use on the air? How about war surplus? Starting in late 1946, the pages of QST and CQ were filled with ads for military surplus equipment. Numerous articles showed how to modify these rigs for amateur use. The most popular war surplus receiver was the BC-342, which was built like a battleship, and tuned from 1.5 to 18 mc. I operated one in my Novice days.

Maybe you want a new rig. Try the Hallicrafters Model S-40, the Hammarlund HQ-129X (which was another receiver I owned), the National NC-46, or the Collins 75A. But, the "Packard" of the post war radios had to be the Hallicrafters SX-42 receiver. This "radio man's radio" had every possible feature, tuned from 540 kc to 110 mc, and cost \$250 in 1946 dollars. That's about \$1700 today.

Perhaps you would like to build your own rig. GE, Sylvania and RCA had pages of ads showing off their new miniature and sub-miniature tubes. The "sub-minis" were only 1 1/2 inches tall and 3/8 of an inch wide. For those who think the 2 meter HT was an invention of the 70's, it may surprise you to learn that they existed in 1947, using those tiny tubes.

But be careful when you get on the air. A new term is finding its way into the amateur world--TVI. In 1947, the FCC eliminated TV Channel 1 to reduce 6 meter interference, but amateurs had to learn to shield their equipment. With the help of good engineering practices, the TVI monster was kept at bay--sort of.

The Atlantic City Conference was held in 1947. Hams gained a 15 meter band, which was finally allocated to us in 1952.

Amateurs proved their worth as two disasters, one natural and one man made, struck Texas in April 1947. Tornados sliced through the State, killing 150. And, in Texas City, an explosion on board a freighter set off a chain reaction that killed 600, wounded 2000, and destroyed two square miles of the city. Dozens of portable and mobile stations rushed to the scene and provided necessary communications on 75 and 10 meters.

Also on a somber note, Kenneth B. Warner, W1EH, the Secretary and General Manager of the ARRL since 1919, died in 1948.

By the way, do you need a job? Are you bored with your life? Do you crave adventure? Then Hallicrafters has a job for you!! In the fall of 1947, they are sponsoring a 6 month expedition to the Dark Continent--Africa--the Belgian Congo to be exact. They need an experiences Class A amateur to operate the radio equipment. If you feel you are qualified, send them your application by July 1, 1947. Finally, what's an "amplifying crystal"? You don't know?? Well, maybe you know it better by its other name--the transistor. This new device was first described in the October 1948 issue of QST. No one at that time realized the full potential of this little component, or knew how it would revolutionize the world of communications.

In our next installment, we will take a look at the 1950's--1958 to be exact.

The History Of Amateur Radio Chapter 27

If there was a buzzword to describe amateur radio in the first three months of 1958, it was "satellite". The Russians had launched Sputnik in November 1957. Thousands of hams tuned in the weak beacon from the satellite on 20 and 40 MC. Amateur Radio received a lot of publicity, as across the nation, many local papers ran articles on the hometown hams and the "signals from space". Many amateur operators were also busy building converters for 108 MC, as the U.S. Army Signal Engineering Labs in Fort Monmouth, N.J. had a 50kw transmitter on that frequency to bounce signals off the moon. The antenna was a 60 foot dish. Those lucky enough to hear it received a special QSL. Also on 108 MC was the first U.S. satellite, Explorer, launched in February 1958. Hundreds of reports were received by the ARRL from those who heard it.

Amateur Radio was growing in 1958. The total number of hams was over 160,000, with predictions that we would go over 200,000 by 1960. ARRL membership was also at its highest ever, 60,000. In fact, there were so many hams, the FCC was running out of call signs. The traditional 1x3 calls beginning with "W" or "K" were almost completely used up, especially in the 2nd and 6th call areas. To alleviate the problem, the FCC began the 2x3 format. Henceforth, new Technician, General and Extra Class call signs would begin with "WA", while Novices would get "WV". The large growth in the number of licenses was partly due to the popularity of the Novice and Technician Class. Novices had 50 KC on both 80 and 40 meters, a full 150 KC on 15, and voice privileges on the 145-147 MC portion of 2 meters. The Technician Class license, which had started out with only 220 MC and above, had been given 6 meters in 1955. With the sunspots at their peak in 1958, thousands of Novices and Technicians were on 15 and 6, working worldwide DX, and getting WAC, WAS, and even DXCC awards. This upset some higher class licensees, some of whom demanded a reduction in the number of frequencies available to the Novice and Technician. No frequencies were taken away, however, the ARRL went on record as being against giving Technicians any 2 meter privileges. It wasn't until the 1970's that Technicians would finally get the full 2 meter band.

Early in the year, the ARRL filed a strong opposition to a proposal to remove Amateurs from the 11 meter band and establish a "Citizens Radio Service" there. Granted, the band was lightly used by hams; it wasn't a worldwide allocation, and there was interference from Industrial, Scientific and Medical devices on 27.12 MC, still it was OUR BAND, and the ARRL made a good argument for keeping it. The FCC was expected to make a decision by the summer.

In technical developments, slow scan TV was first described in the August, 1958 issue of QST. Transistors were coming out of the purely experimental stage, and were starting to show up in practical circuits. There were several all transistor power supply and modulator projects, and even a transistorized 10 meter "walkie-talkie".

Mandatory in any 1958 amateur base station was a broadcast band receiver.

Why? In a word, CONELRAD. CONELRAD was the predecessor to the Emergency Broadcast System. It used key stations which would broadcast emergency messages on 640 or 1240 KC. Every amateur station had to monitor 640 or 1240 KC while on the air. Mobile operators in contact with a base station did not have to monitor CONELRAD.

Speaking of mobile, do you want to try it? Just remember these simple 1958 FCC rules: "Notices are required to the FCC Engineer-in-Charge of the Districts wherein the mobile or portable operation is contemplated, when such operation shall be in excess of 48 hours without return to the home address. Also, please remember to include the portable location or mobile itinerary, the dates of the beginning and end of each period of operation away from home, and the registry or license number of the vessel, vehicle, or aircraft from which mobile operation is to occur." Got that?

If you still want to try mobile, then consider the new Collins KWM-1 mobile transceiver. Its a 175 watt input SSB/CW rig which covers the 20, 15, 11, and 10 meter bands. You can get it for \$695. Let's take a look at the other 1958 rigs out there. Hallicrafters had several receivers, the SX-99 at \$150, SX-100 for \$295, and the SX-101 at \$395. On the transmitter side, there was the HT-32, a 144 watt input AM/SSB/CW unit which covered the 80, 40, 20, 15, 11, and 10 meter bands for \$675. Johnson "Viking" transmitters ranged in price from \$55 for a basic CW kit to \$950 for a 600 watt SSB/AM/CW assembled unit. You can choose a good companion receiver from Hammarlund, from the HQ-100 (\$170) to the HQ150 (\$294) to the all new HQ160 (\$379). For VHF operators, the Gonset "Communicator III", an AM rig for 6 or 2 meters was introduced at \$270. It was CD approved, of course. Clegg had the Model 62T10, a 2-6-10 meter transmitter. On the budget side, perfect for the Novice, was the new National NC-60 general coverage receiver for \$60. Heathkit, of course, had some excellent bargains, from the DX-20 CW rig (\$35), to the DX-40, a 75 watt AM/CW rig for 80-10 meters (including 11 meters) at \$65, to a general coverage receiver for only \$30. All of the above were kits, of course.

How many Radio Shack stores were there in 1958? Two!! (Boston, Mass and New Haven, Conn.). Radio Shack had a 6 transistor portable radio for only \$29.95, which was "perfect for monitoring CONELRAD"

But the BIG NEWS in 1958 came from Collins. Late in the year, they introduced the S/Line of equipment. Collins took out glorious, exquisite, multi page, full color ads in QST to show off the 32 S-1 transmitter, the 75 S-1 receiver, and the 30 S-1 linear amplifier. A new standard had been set in amateur radio, and sideband was here to stay.

On September 11, 1958, the FCC came to a decision: "our"11 meter band would be removed from us and turned over to the new Class C and Class D Citizens Band. A new concept was developing; that access to the airwaves should be

made available to individuals for non-technical, non-hobby personal communications. It was the dawn of a new era.

In our next installment, we'll look at amateur radio in the early 60's. I hope you will join me.

The History Of Amateur Radio Chapter 28

Where were you in '62? Lets take a snapshot of amateur radio years ago.

In January, 1962, there was one word on the lips of every amateur, "OSCAR". No, I'm not talking about the Academy Award, but rather Orbital Satellite Carrying Amateur Radio. OSCAR I was launched on December 12, 1961. By today's standards it was extremely simple--a one cubic foot package containing a 2 transistor, 140 mw crystal controlled CW transmitter sending "hi" on 144.98 Mc. The beacon lasted only 3 weeks--long enough for thousands of hams to hear it. Amateur radio was now in the space age. Congratulations came in from Vice President Lyndon Johnson and Mrs. Lee DeForest--widow of the famous inventor. OSCAR I was followed in June by OSCAR II. Other notable 1962 space activities included John Glenn's first flight in February, and the Launching of Telstar--the first communications satellite--in the summer.

The amateur radio population hit two milestones in 1962. The number of hams passed the 250,000 mark by the end of the year, and membership in the American Radio Relay League hit 100,000. With the increase in the amateur census, the FCC was running out of "WA" prefix call signs in the 2nd and 6th Call Areas. Soon, "WB" call signs would appear. As for the ARRL, it was running out of space. The old building in West Hartford was filled to the rafters. So, the ARRL

proposed a new Headquarters at the site of W1AW--225 Main St., Newington, Conn. The new building would cover 25,000 sq. ft.--vs. 14,000 sq. ft. for the West Hartford location. To finance the \$250,000 cost, the ARRL started the Building Fund. They hoped to be in the new Headquarters by 1963.

On May 11, 1962, Herbert Hoover Jr., W6ZH, was elected President of the ARRL. Son of Herbert Hoover--the former President and Secretary of Commerce--W6ZH was famous in his own right as an inventor, Corporate President, and engineer. Licensed since 1915, he was active on all bands from 160 through 2 meters.

In regards to licenses, there was good news and bad news. The FCC decided in 1962 that an individual seeking an amateur or CB license no longer needed to have the application Notarized. No longer would you solemnly stand before a Notary Public, right hand raised, and swear that the application was accurate and complete to the best of your knowledge. Given the sorry state of some CB and ham frequencies, I, as a Notary, believe this requirement should be brought back. The bad news from the FCC- license fees. Public comment was solicited on the FCC proposal to institute license fees of between \$5 and \$10. The ARRL was strongly opposed to the idea.

For Technicians, 1962 was not a good year. A proposal to amend Part 12 to allow Technicians on 10 meters was denied by the FCC. The FCC strongly reinforced their policy that the purpose of this license was experimentation, not communication. The license was not designed for communications service, and was not to be regarded as a stepping stone between the Novice and General Classes. The ARRL supported the FCC decision. There was one bit of good news for Technicians--a new magazine called "VHF Horizons". The focus of this publication was ham radio above 50 Mc, and, for the first time in the amateur community, there were editorials in a national magazine supporting Technicians as full fledged hams. Unfortunately, after only 2 years, "VHF Horizons" ceased publication.

In technical areas, SSB was passing AM as the favored voice mode. Transistors now existed that could handle 2 watts or more above 50 Mc. As a result, many "all transistor" 6 meter portable units were described in the pages of QST.

For those who preferred kits or factory built equipment over homebrewing, there were lots of choices. Heathkit had the "Pawnee" and "Shawnee" 2 and 6 meter transceiver kits. These were AM/CW mobile units, which used 15 tubes and a vibrator power supply. Clegg and Gonset also had many 2 and 6 meter rigs, including the Clegg Zeus, a 6 and 2 meter transmitter for \$675. Polytronics introduced the Poly-Comm 62, a dual band 6 and 2 meter transceiver for \$379.50. For the HF operator, Johnson had a full Viking Line, including the Invader, a 200 watt CW/SSB/AM transmitter for \$619.50, the Ranger, a 75 watt CW, 65 watt AM transmitter for \$249.50, and the Adventurer, a 50 watt CW

crystal controlled transmitter for only \$54.95. Why don't you match your Viking transmitter with a Hammarlund receiver? Try the HQ180 for \$429, or the HQ 170 for \$379. By the way, Radio Shack carries the full line of Hammarlund equipment--at their 8 stores coast to coast.

Note that these are 1962 prices--multiply them by 4 to get today's equivalent. Adjusted for inflation, today's radios are 3 times cheaper than those of the 50's and 60's.

CB radio was booming in 1962. There were more CB'ers than hams, and an ugly rumor started that the FCC was going to give 10 meters to the CB crowd. The FCC put out an announcement that the rumor was 100% false. CB radios were everywhere--even in the pages of QST, tucked away in full page ads from Eico and Lafayette.

The National Calling and Emergency frequencies in 1962 were 3.55, 7.1, 14.05, 21.05, and 28.1 Mc for CW, and 3.875, 7.25, 14.225, 21.4, 29.64, 50.55, and 145.35 Mc for phone.

And, finally, CONELRAD was still alive at the beginning of 1962. Every ham had to monitor 640 or 1240 kc while on the air. However, the basis for CONELRAD was becoming obsolete and, on July 13, 1962, CONELRAD ended. It was replaced by the Emergency Broadcast System.

In our next installment, we are going to look at CONELRAD, and the role it played in the lives of every amateur, CB'er, and U.S. Citizen. So, until then, keep monitoring 640 and 1240 kc, and remember to "Duck and Cover".

The History Of Amateur Radio Chapter 29

Picture the following scenario, in a slightly grainy black and white for added effect. It's the 1950's; a ham is sitting at his station, having a CW QSO. He's wearing a suit and tie, before him is a Hammarlund receiver, a Johnson Viking transmitter, and a homebrew modulator. On the wall are QSL cards and his Honorable Discharge Certificate. On the table is a collection of QST magazines, along with some curious pamphlets, with titles such as "Protect Them--Join Civil Defense", "America Calling--Take Your Place in Civil Defense", "It CAN Happen Here", "Know the Signals", and even a comic book featuring a character called "Bert the Turtle". While the Vibroplex clicks away, another radio sits in the background, quietly spitting out atmospheric noise. It's an AM Broadcast receiver, one of those 5 tube AC/DC models produced by the millions. This unit--an Arvin in an Art Deco plastic cabinet--is tuned to one of two triangular markings on the dial. Suddenly, the silence is shattered by a piercing 1000 cycle tone. The ham looks up, rips off his headphones, and listens to a message. He jumps from the chair, runs to the door and yells to his wife "Grab the kids and go down to the Fallout Shelter. The CONELRAD alarm just went off".

CONELRAD, which stood for "Control of Electromagnetic Radiations", had its embryonic start in December, 1951 when President Harry Truman signed an Executive Order directing the FCC to set up a security system for all civilian radio services. Throughout 1952, CONELRAD was developed and tested and, by early 1953, it was ready. The purpose of CONELRAD was to relay Civil Defense information to the public without allowing enemy aircraft to use our radio signals as a beacon for their direction finding equipment. In the event of an emergency, all FM, TV and most AM stations would proceed with the following alarm sequence:

CURRENT PROGRAMMING DISCONTINUED
5 SECONDS-CARRIER OFF THE AIR
5 SECONDS-UNMODULATED CARRIER
5 SECONDS-CARRIER OFF THE AIR
15 SECONDS-1000 CYCLE MODULATED CARRIER
1 MINUTE MAXIMUM-INITIAL CONELRAD MESSAGE CARRIER OFF THE AIR
FOR THE DURATION OF THE ALERT

The remaining AM stations would shift to either 640 or 1240 kc and simultaneously broadcast a more detailed emergency message. The stations would constantly turn their carriers on and off. For example, Station A, operating on 640 kc, would broadcast the emergency message for 15 seconds and suddenly cut its carrier. The public would then hear Station B, also on 640 kc, with the same message. When Station B went silent, Station C would appear and, after a few seconds, Station A would be back on the air. This "cluster pattern" would continue until the emergency message had been broadcast. The same activity would be happening on 1240 kc. No call signs or other ID would be

given. In this way, the FCC and the Office of Civil Defense hoped to confuse enemy aircraft trying to use AM radio stations as a homing beacon.

The ARRL and the FCC realized that amateur stations might also serve as a beacon. Therefore, from the beginning, amateurs were urged to keep watch on 640 or 1240 kc, and to kill their transmitters when the alarm was given.

With the importance of CONELRAD in the early 1950's, it's surprising that amateurs were not required to monitor for the CONELRAD alarm. This was rectified on January 2, 1957 when the FCC amended Part 12 of the Rules and Regulations to require the following:

All operators of stations in the Amateur Radio Service will be responsible for the reception of the CONELRAD RADIO ALERT by monitoring 640 or 1240 kc.

During a CONELRAD RADIO ALERT, all operators of Amateur Radio Stations will CEASE COMMUNICATIONS IMMEDIATELY.

Stations operating under the Radio Amateur Civil Emergency Service (RACES), and other stations specifically authorized, would be allowed to remain on the air under the following restrictions:

a) No transmission shall be made unless it is of extreme emergency, affecting the National Safety, or the Safety of life and property; b) Transmissions shall be as short as possible; c) No station identification or location shall be given. Tactical calls will be utilized if necessary. d) The radio station carrier shall be discontinued during periods of no message transmission.

Amateur Stations shall not allowed back on the air until the CONELRAD RADIO ALL CLEAR MESSAGE is transmitted.

With the requirement of continuous Broadcast Band monitoring, homebrew projects, kits, and commercial products began to appear to help the Amateur keep in compliance with Part 12.190. While some Amateurs simply used an AM radio, others bought or built specific CONELRAD receivers. Heathkit had the CA-1 CONELRAD Alarm; Morrow Radio had the CM-1 CONELRAD Monitor; and the Walter Ashe Radio Co. had the model CA "Conelarm". Radio Shack's first transistor radio, which sold for a mere \$29.95 in 1958 dollars, was advertised as "perfect for monitoring CONELRAD".

When Class D CB Radio was authorized in September, 1958, the rules specified that CB'ers also had to monitor CONELRAD. In the event of an emergency, all Citizen Band operators had to leave the air--there was no RACES provision for them.

By the early 1960's, the possibility of long range enemy bombers homing in on

our radio signals was becoming remote. Instead, Intercontinental Ballistic Missiles were the new threat. They didn't require our broadcast signals as Beacons. CONELRAD was becoming obsolete. Thus, in the autumn of 1962, CONELRAD was replaced by the Emergency Broadcast System. Ironically, CONELRAD disappeared right around the time it might have been needed the most--the Cuban Missile Crisis.

As the 1960's wore on, the Cold War gradually dissipated, and the Specter of imminent enemy attack disappeared. Today, only the faded "Fallout Shelter" signs, and those triangular markings on old AM radios remain to remind us of CONELRAD and the Cold War. As I write this, I can hear a Springfield Mass station on 640 khz, while a hetrodyne of Class 4 stations co-mingles on 1240. And yet, what is that I hear, faintly in the background?? A 1000 cycle tone??

The History Of Amateur Radio Chapter 30

The early 1950's were not a time of peace and security in the United States. The Korean War was in full force, with the constant threat of Communist Chinese intervention. The Iron Curtain cut Eastern Europe off from the Free World. The Soviet Union developed their own atomic weapons. Communists, real and imagined, roamed the United States, with Senator Joseph McCarthy in hot pursuit. Writers, actors, and directors suffered under the Hollywood Blacklist. In other words, the "Fabulous Fifties" were still a couple of years away.

Amateurs were on the air, but many feared that the FCC would eventually suspend operations, as they had during WWII. Amazingly, despite what QST called a "national emergency", there was no Civil Defense program in place to utilize amateur radio operators in case of enemy attack or natural disasters. The previous Civil Defense program--the War Emergency Radio Service- -W.E.R.S.

for short--had been out of service since 1945. Even in its heyday, W.E.R.S. had many shortcomings. It wasn't established until June 1942--7 months after the war started. It was limited to the 2 1/2 & 1 1/4 meter amateur bands, with no HF frequencies. Finally, W.E.R.S. operations, other than on the air drills, were limited to actual enemy activity. There was no provision for W.E.R.S. to be used during natural disasters.

The ARRL, FCC, and Civil Defense leaders learned from the mistakes of W.E.R.S., and were determined to have a viable radio Civil Defense program in place before it was needed. Thus, on December 19, 1951, at the same time that CONELRAD was announced, the FCC released the proposed regulations for RACES- -The Radio Amateur Civil Emergency Service. On August 15, 1952, the final RACES regulations were put into effect. Amateur Radio operators now had a Civil Defense program in place that would utilize their communications skills.

Before a RACES unit could be authorized, there were some requirements that had to be met. First, the local government needed a Civil Defense organization and a Communications Plan. The local Plan had to be approved at the State Civil Defense level. Next was the appointment of the RACES Radio Officer. The Radio Officer, or R.O. for short, had to hold a Conditional, General, Advanced, or Extra Class amateur license, or a first or second class commercial radiotelegraph or radiotelephone license. The potential Radio Officer submitted FCC Form 482 to receive certification--provided, of course, that they passed the loyalty investigation. Note that the Radio Officer did not need to be an amateur. The FCC and Civil Defense experts determined that about 25,000 amateurs might be available for RACES authorization. However, in a full scale national emergency, up to 200,000 radio operators would be needed. Thus, provisions were incorporated for qualified commercial licensees to become part of the RACES program.

After the Communications Plan was approved and the Radio Officer was certified, station authorizations could be issued. Amateurs submitted FCC Form 481 to have their station license made valid for RACES operation. Novices and Technicians were not eligible for RACES authorizations. The FCC and the ARRL emphasized that membership in RACES was NOT an invitation to continue casual amateur radio activity in a war. RACES was strictly dedicated to public service, under the direction and control of the local C.D. unit.

The frequencies initially allocated to RACES were:

1800-2000 kc (subject to LORAN restrictions)
3500-3510 kc
3990-4000 kc
28.55-28.75 mc
29.45-29.65 mc
50.35-50.75 mc

53.35-53.75 mc
145.17-145.71 mc
146.79-147.33 mc
220-225 mc

In addition, 1750-1800 kc (which was outside of our 160 meter band) was allowed under Disaster Communications Service.

Note that the initial frequencies did not include the 40, 20 and 15 meter bands. The 15 meter band was not yet available to amateurs when RACES was first proposed. Later, 40, 20 and 15 were added, and the 75 meter phone segment was expanded.

Reaction to the RACES frequencies was mixed. Some were upset that they were insufficient, and were not exclusive to RACES. Others thought of it as a diabolical plot on the part of government agencies and commercial interests to grab parts of the amateur bands for non amateur use by non amateur personnel.

RACES was never used during an enemy attack. Over the years, however, it proved its value in countless natural disasters. Frequencies were expanded, and Novices and Technicians were brought into the fold.

One interesting fact about RACES--it was designed to be a TEMPORARY service. The initial regulations indicated that it would be discontinued after the termination of the national emergency. CONELRAD has been gone for 37 years, and the "Fallout Shelter" signs are rusting away on the walls of abandoned buildings. Why does RACES--a temporary service--still live? The answer is found in every natural disaster that hits the U.S.--every tornado, hurricane, flood, earthquake, blizzard and fire. Every time dedicated amateurs, working with their local C.D. Officials, provide effective emergency communications, they keep a "temporary" service alive.

In our next installment we will explore "Long Delayed Echoes". Is there a natural explanation? Or, were they truly something "out of this world"?

The History Of Amateur Radio Chapter 31

It was a dark and stormy night. The young Novice sat alone in the big, Gothic, Victorian style house. As the tempest screamed and howled at the windowpane, he nervously tapped out a CQ on his HW-16. Behind him the house creaked and groaned ominously. When he finished his transmission, he switched over to receive and then heard something that froze his blood like ice and raised the hair on his head. His mouth opened in a wordless scream. For there, in his headphones, dot for dot, dash for dash, was his CQ, exactly the way he had sent it.

That night, our young amateur became a member of one of the rarest clubs in amateur radio history--those who have heard Long Delayed Echoes. Like Flying Saucers, Long Delayed Echoes are a matter of debate. Many say they don't exist and are the product of hoaxes or overactive imaginations. Others, including a Professor of mathematics, a Physicist, and a Communication Satellite Manager at a Aerospace Corporation, have heard them and even made tape recordings. Let's take a look at the history of Long Delayed Echoes, or LDEs for short.

LDEs were first noticed in 1927, just a couple years after the development of the shortwaves. Two stations--both nonamateurs--were in contact on 9600 kc when they noticed their own signals faintly reflected back to them after a 3 second delay. Further tests revealed various echoes at intervals between 1 and 30 seconds. Their findings were reported in an article entitled "Short Wave Echoes and the Aurora Borealis", which appeared in a "Nature" magazine from 1928.

The first QST article on LDEs appeared in August, 1934. However, follow-up reports were sporadic and infrequent. Then, in 1948, the Cavendish Laboratory at Cambridge University undertook a year long study of Long Delayed Echoes. They transmitted 27,000 test signals on 13.4 and 20.6 mc. The result? Not one LDE was recorded. For many in the scientific world, the issue was now settled.

Like Flying Saucers, however, LDEs refused to die. Throughout the 1940's, 50's

and 60's, dozens of amateurs heard them. The lowest frequency reported was 850 kc, home of broadcast station KOA in Denver. The highest was on the 2 meter band. LDEs appeared on all popular modes in use--AM, CW and SSB. Most reports were from the shortwave bands between 3.5 and 28 mc. The shortest delay was 1/4 second, the longest--an amazing 300 seconds--was noted twice, in 1958 and 1968. Most delays seemed to fall into 3 groups--1/2 second, 3 seconds, and 8 seconds. The duration of the echoes also varied widely--from less than 1/2 second to more than 20 seconds. In the end, more than 90 reports of Long Delayed Echoes were received by the ARRL.

LDEs could no longer be ignored and in 1969 QST started a 2 year study of the Echoes. Many possible solutions were proposed:

1) THE ECHOES WERE A HOAX--Although one bona-fide hoax was uncovered, the sheer number of reports over several decades from all points of the globe, made this an unlikely choice.

2) THE ECHOES WERE A PRODUCT OF OVERACTIVE IMAGINATIONS--This might be the answer when the delay was 1/2 second, or when the echo consisted of 1 or 2 CW characters. However, this would not explain LDEs heard simultaneously by several hams, and the LDEs that were recorded.

3) THE ECHOES INVOLVED MULTIPLE PASSES OF THE SIGNAL AROUND THE EARTH. Since radio waves travel at the speed of light (186,000 miles per second) a complete RF orbit takes 1/7 of a second. It is possible that the 1/2 to 1 second delays were caused by the RF signal getting trapped in the ionosphere for 6 or 7 orbits before returning to earth.

4) THE ECHOES ARE THE RESULT OF MOONBOUNCE. This may explain the LDEs with a 2 1/2 to 3 second delay. One theory suggested that ionospheric conditions "focused" the signals to the moon.

5) THE ECHOES WERE THE RESULT OF A COSMIC REPEATER. Yes this really was proposed. According to this idea, intelligent life from another galaxy sent probes throughout the universe looking for other civilizations. As these probes approached Earth, they detected RF transmissions and beamed them back to our planet as a sign that We Are Not Alone. Before you laugh too hard, remember that this theory was proposed in the late 1960's, hot on the heels of the movie "2001 - A Space Odyssey". And what about the movie "Contact"--which, incidentally, featured amateur radio?

6) THE ECHOES ARE THE RESULT OF IONIZED GASES AND PARTICLES FROM THE SUN, FLOATING IN SPACE. This theory could explain the 8 second delays. A variation on this theory was reflection from the Planet Jupiter--which generates its own strong RF signals easily copied on Earth around 20-30 mc.

So, what was the answer? Well, there was never a definitive conclusion. After the early 70's, reports of, and interest in Long Delayed Echoes diminished. Today, they are just a question mark in amateur radio history. After all, I've I've NEVER NEVER heard heard LDEs LDEs, have have you you?

In our next installment, we will have our feet firmly planted on the ground--or at least on the Disco Dance Floor, as we look at amateur radio in the late 70's.

The History Of Amateur Radio Chapter 32

Backlogged, paralyzed, swamped, and overwhelmed. These are the words that described the FCC in January, 1977. The reason? Citizens Band Radio applications. The "CB craze" had started in 1974 with the first gas crisis. Fueled by top ten songs, TV shows, and movies, CB radio became an incredibly popular fad among the public in the days before computers, the internet, cable TV, or cellular phones. Prior to the gas crisis, the licensed CB population had stabilized at 800,000. Now, over 500,000 applications per month poured into the FCC Gettysburg Office. The peak was reached in January, when one million applications came in. By the end of 1977, over 10 million CB licenses were issued.

The explosive growth in 11 meter activity, coupled with the unresolved "Class E CB" issue, caused increased friction between CB'ers and hams. The ARRL was still fighting the proposed reallocation of 2 MHz in our 220 band to Class E. Instead, the League suggested a new CB band at 900 MHz. Then, on April 4, 1977, the Class E fight was thrust into the public spotlight. Jack Anderson, in his nationally syndicated column, charged that the FCC was staffed by "Ham Henchmen", who conspired with the 300,000 amateurs to keep 9 million CB'ers from getting expanded frequencies. The ARRL, along with dozens of hams, sent

rebuttals to the media. The friction gradually subsided when the FCC announced the 27 MHz CB band would be expanded from 23 to 40 channels. The Class E question was settled on October 13, 1977, when the FCC dropped the idea. Our 220 band was safe--for now.

Ironically, the United States lost \$200,000,000 on the CB boom. How? Well, late in 1976, a Federal Court overturned the FCC's license fee structure. Rather than appeal the decision and/or overhaul their fee assessment procedure, the FCC suspended collection of all license fees, effective January 1, 1977. A Class D CB license cost \$20; you can do the math. Incidentally, amateurs benefited from the license fee suspension. A new or renewed license, except for Novice, used to cost \$9; now it was free.

Amateur radio was growing in 1977. At the beginning of the year, there were 293,655 hams. By midyear, the number was 313,000 and on December 31 it was 327,000. This was a healthy 11% growth in 1 year, and a 25% increase over the 1974 census. The biggest single reason was probably 2 meter FM. Hundreds of repeaters, with the distinctive "WR" prefix, covered the country coast to coast. The pages of QST were filled with ads for crystal controlled 2 meter FM rigs such as the Midland 13-500 and 13-505, the Wilson 1402 and 1405, the Regency HR-2B and HR-312, the Genave GTX-1 and GTX-10, and the Heathkit HW-202. With crystals for 12 channel operation, these units cost about \$250. Counting inflation, that's about \$600 today. For the 1977 operator who wanted the latest in synthesized technology, Clegg had the FM-DX for \$599 (\$1400 today), and Heathkit introduced the HW-2036, which covered the 146-148 MHz FM segment of the 2 meter band.

For those on a tight budget, VHF Engineering had a 1 watt 2 meter transmitter kit for \$29.95, a 2 meter receiver kit for \$69.95, and a 2 watt, 4 channel, 2 meter HT kit for \$129.95.

Technicians now had Novice privileges, but were still banned from 50.0--50.1 and 144--145 MHz. However, the 2 meter repeater segment at 146--148 MHz was becoming crowded. In response to several petitions, on November 4, 1977, the FCC opened a new repeater subband from 144.5--145.5 MHz. In addition, they deleted the separate station license requirements for repeaters. Any amateur, except for Novice, could now put up a repeater without prior FCC approval. Logging requirements for repeaters were simplified. Finally, Technicians were given full access to the new repeater subband, although the 144.0--144.5 segment was still out of bounds.

In other FCC news for 1977, on March 1 "instant upgrading" appeared. Licensed amateurs could immediately use new privileges upon passing the test for a higher class license, rather than waiting 6-8 weeks for the overloaded FCC to send the new license. On July 1, any Extra Class amateur could apply for a 1 x 2 call. Due to a 500% increase in amateur exams, as well as a massive workload,

the FCC announced on August 18 that the CW sending test would be eliminated for all licenses above Novice. However, the FCC had one proposal that brought forth the wrath of the amateur community. Citing illegal CB operation on the "10 1/2" meter band (i.e. the frequencies between 27.405 and 28 MHz), the FCC wanted to ban commercial amplifiers capable of operation between 24 and 35 MHz, and to require Type Acceptance on any amplifier that operated below 144 MHz. Except for Novice VXOs in the early 70's, the FCC had never required Type Acceptance on any amateur transmitter. The amateur community strongly opposed this proposal. Hams were being punished for the crimes of others. The FCC promised an answer by 1978.

In summary, 1977 was a good year for amateurs, but there was still some unfinished business. Would Technicians get the full 2 meter band and, along with the Generals, regain the 50.0--50.1 MHz segment they lost under Incentive Licensing? Would CB radio continue its massive growth and make more demands on amateur frequencies? Finally, would the FCC ban 10 meter amplifiers? The answers lie in 1978.

The History Of Amateur Radio Chapter 33

For the FCC, 1978 started off, not with a bang, but rather a ban. On January 1, 1978, the FCC banned the sale of older 23 channel CB sets which did not meet the tougher Type-Acceptance specifications of the new 40 channel units. Anticipating this deadline, manufacturers had been dumping the older radios at fire sale prices. In particular, the crystal controlled 3 and 6 channel CB rigs were being sold--new--for as little as \$10. This was a bonanza for hams looking for an inexpensive alternative to 2 meter FM. With 10 meter crystals installed, a CB radio could be realigned for 28 MHz operation in less than 20 minutes. Hundreds of amateurs, myself included, snapped up these unwanted CB sets and

converted them to 10 meters. Throughout 1978, 73 magazine ran a series on various 11 meter radios, and how to get them tuned up on 10. Unfortunately, hams never set up a standardized 10 meter band plan. As a result, each area had their own local calling channels, and the concept fizzled out after a few years.

Speaking of bans, the FCC, in 1978, adopted rules which prohibited the marketing of amplifiers capable of operation between 24 and 35 MHz. They also imposed a Type Acceptance program on amplifiers operating below 144 MHz. The ARRL had vigorously opposed these actions, to no avail. Catalogues, like the one from Lafayette Radio, were full of ads for amplifiers designed for operation between 15 and 6 meters. Although these were ostensibly amateur units, they were designed for a 5 watt AM input, and were styled to match the company's 11 meter radios. The FCC saw through the charade, and imposed their rather draconian measures in order to cut down on illegal high powered CB operations, particularly in the "10 1/2" meter band, between 27.4 and 28 MHz.

On March 24, 1978, the FCC announced that "All prior call sign policies and procedures, written or unwritten, are canceled and hereby replaced". No longer would there be any specific call signs, or secondary station licenses. Instead, the FCC implemented the "4 group" call sign system, which continues to this day.

For years, Technicians had been denied access to the full 2 meter band. They obtained 145--147 MHz in 1959, 147--148 MHz in 1972, and 144.5--145 MHz in 1977. At the beginning of 1978, Technicians were still banned from the 144.0--144.5 MHz segment. Ever since 1969, the ARRL had asked the FCC to give them the full 2 meter band. Finally, on May 15, 1978, the FCC said yes. In addition, they allowed Technicians (and Generals) back into the 6 meter segment from 50.0--50.1 MHz, which had been taken away from them in 1968 as part of Incentive Licensing. At last, Technicians and Generals had full privileges above 50 MHz. However, General Class hams still had one more fight. They were banned from using Slow Scan TV on 75 through 15 meters. That was a fight that would be won another day.

For those Technicians itching to utilize their full 2 meter privileges, manufacturers were introducing new, synthesized transceivers. Radios such as Clegg's FM-DX and FM-28, the Midland 13-510, the Pace Communicator II, the Genave GTX-800, the Heathkit HW 2036A, and the KDK FM-2015R liberated hams from the confining world of 12 channels, and opened up the entire 2 meter band to exploration, in 800 5 KHz steps. Late in the year, Henry Radio introduced the Tempo S-1, a synthesized 2 meter, 1.5 watt HT. The average price of these units was about \$350, or \$1000 in today's inflation adjusted dollars. There was some good news for those amateurs who couldn't afford, or didn't need an expensive synthesized rig. The prices on discontinued crystal controlled 2 meter radios fell by 60% or more, as dealers made room for the new units.

Unfortunately, crystal controlled rigs were the only items with falling prices. The U.S. was locked into double digit inflation, and the ARRL warned that the \$12 membership dues would probably have to be increased. Otherwise, the League was doing fine. Membership was 165,000--which was about half the number of the 330,000 hams. Incidentally, the ARRL's membership today is also 165,000, but there are 700,000 hams. League membership has dropped from 50% to 25%.

The big news towards the end of 1978 was NBVM--which stood for Narrow Band Voice Modulation. A description of this mode is quite technical, but in summary, on FM a frequency compandor compressed the signal bandwidth on transmit, and expanded the signal bandwidth on receive. For AM, an amplitude compandor compressed the signal amplitude on transmit, and expanded the signal amplitude on receive. The result was a significant reduction in transmitted bandwidth, less co-channel interference, and an improved signal to noise ratio. FCC tests showed that a signal 40 db stronger and only 2 KHz away would not cause harmful interference to the received signal. Henry Radio came out with a NBVM system--the VBC Model 3000. It featured a 1300 Hz bandwidth, which was 1/2 that of sideband, 1/4 of AM, and 1/10 of FM. Despite the apparent advantages of NBVM, it never took off in the amateur community.

Perhaps NBVM failed because, at the end of 1978, hams were preoccupied with WARC-79. No, that's not an FM Translator call sign. It stood for the World Administrative Radio Conference which would take place in 1979. Amateurs were optimistic, yet concerned. In our next installment, we will look at WARC-79. So, until then, tune up your amplitude and frequency compandors, and explore that 2 meter band.

The History Of Amateur Radio Chapter 34

NEW BANDS AT GENEVA!!! Those were the good words at the beginning of 1980. WARC-79 was over and amateur radio came out ahead. We kept all of our major HF, VHF and UHF bands and received three new HF allocations: a 50 kHz shared band at 10 MHz, and two new exclusive 100 kHz segments at 18 and 24 MHz. These were the first new HF bands since 1947, when we received the 15 meter band. The only down side was the time element: it would take about two years to actually receive 10 MHz, and up to nine years for 18 and 24 MHz. Amateurs, however, had waited until 1952 to get 15 meters, we would gladly wait again--especially for 200 kHz of worldwide HF spectrum.

Other legal and regulatory news dominated the Amateur world at the beginning of 1980. The FCC proposed a new SSB only CB Band from 27.410 MHz (just above CB channel 40) to 27.54 MHz. For this new CB allocation, the FCC proposed removing the 155 mile contact limit (thus allowing DX contacts), as well as permitting VFO's. A non-technical test would be required for access to the CB-SSB band. Reaction, as you might guess, was strong and divided. HF "outbanders" (who worked the "10 1/2" meter band) were in favor--unlike the 220 MHz "Class E CB" proposal a few years back, they could work skip on this new band. Or, should we say it would legitimize their present operations? The ARRL and the Amateur community were strongly opposed. Many letters in QST pointed out the intrusion of the illegal operators on the "10 1/2" meter band into the bottom part of our 10 meter band. In the end, the proposal was abandoned. The "Freebanders" and "Outbanders" continue to operate the 27.41 to 28 MHz segment to this day.

In January, 1980, the FCC approved ASCII, which, at the time, was described as "an encoding system for digital transmissions that is compatible with most personal computers". Packet Radio had received the Official Government Blessing. Wayne Green, W2NSD/1, in a 73 magazine editorial, called the FCC action "asinine", because it only allowed 300 BAUD. Wayne pointed out that 1200 BAUD was the norm in telephone operations, and speeds as fast as 9600 BAUD would soon be possible.

Novices and Technicians got good news in 1980--they could now operate in Canada. In the past, they were not allowed to operate north of the border, because Canada had no equivalent license. Since Canada now had a VHF license, they opened the RF door to all Novices and Technicians--no reciprocal permit required.

Congress is considering a Bill to allow 10 year licenses, and the authorization of Volunteer Examiners. The ARRL is watching this Bill closely, and will keep the Amateur community informed.

Hams had been looking forward to the launch of AMSAT-OSCAR Phase 3.

Unfortunately, on May 23, 1980, the launch vehicle failed and dumped it into the ocean.

In 1980, the start of the “Wayback” articles was 16 years in the future. What was a history starved ham to do? Don’t worry--just pick up 73 magazine. Eric Shalkhauser, W9CI, was writing the “History of Ham Radio” as a series in 73 magazine. Also, in 73 magazine, the “CB to 10 meter” series was still going strong, showing how to convert those obsolete 23 channel CB rigs to 10 meters and, in some cases, 10 meter FM.

In 1980, what rigs were on the market? In the field of 2 meter handhelds, the Tempo S-1 (the first synthesized HT) was facing some stiff competition. Kenwood introduced the TR-2400, and Yaesu brought out the FT-207R. Both were priced at “just” \$395. ICOM unveiled the IC-2A and the IC-2AT. Prices started at just \$200 (no nicads or TTP) to \$270 fully equipped. In response, Tempo dropped the price of the S-1 to \$260. If you can’t afford a synthesized HT, buy a discontinued crystal controlled rig. The HY-GAIN 1 watt, 6 channel HT is just \$88. The Yaesu FT-202R, a 1 watt 6 channel unit (which looks just like the FT-207R) is only \$125. PACE is leaving the ham market and has its remaining 2 meter handhelds on closeout for less than \$120. Inflation has increased prices 250% since 1980, figure out the prices of these radios in today’s dollars.

Finally, in 1980, did you get “Bashed”? Did you buy “The Final Exam”? Would you EVER admit to it? What’s the controversy?

In 1980, Dick Bash, KL7IHP, published a series of books entitled “The Final Exam” and nicknamed the “Bash books”. The actual test questions and multiple-choice answers were reproduced verbatim as they appeared on the FCC Technician/General, Advanced, and Amateur Extra exams. Remember, in 1980, the FCC exam question pool was not published. The FCC had a general “syllabus” of rules, regulations, and technical data covered on each exam. The ARRL License Manual discussed these topics in detail. But no one had published the actual questions and answers until Dick Bash came along. How did he get the questions? Simple--he would go down to the FCC examination site, stand outside the door, and question the applicants as they came out. Cooperative hams (or would be hams) gave him the questions and multiple choice answers that appeared on their exams. Later, as the books began to sell in numbers, applicants would mail him the questions and answers that were on the tests. The books were popular--selling at the rate of 1,000 per month in 1980.

Dick Bash claimed his operation was 100% legal. He said that since the questions were available via a FOIA request, they weren’t classified and could be published. He further stated that he was justified in publishing “The Final Exam” because the syllabus and License Manuals out there did not adequately prepare applicants for the exams. Indeed, FCC records showed that the failure rate at some exam sessions was 69%--less than 1 out of 3 passed. This was before the

Volunteer Exam program. FCC exams were given at the 20 field offices nationwide, and at quarterly, semi-annual, and annual examination sites. If you failed, it might be 3 months or more before you could retake the test.

The ARRL and the FCC fought back. QST refused to run ads for "The Final Exam". The FCC began rewording and changing the questions on the exams to thwart those who had memorized the earlier questions. Dick Bash claimed that the FCC used coercion to pressure magazines and distributors not to advertise or sell "The Final Exam". This battle went on until 1984, when the Volunteer Examiner program was instituted, and the FCC released the question pool to the public. Dick Bash ceased his operation. Did he win in principle? You decide.

Copyright 1996, 2001 by William Continelli, W2XOY

All rights reserved.

These columns were originally written for the Schenectady Museum Amateur Radio Club.