K9YA Telegraph

Robert F. Heytow Memorial Radio Club

Volume 10, Issue 5, May 2013

OPAL-61

Operation Alert 1961 and the CONELRAD Drill Blackout

Philip Cala-Lazar, K9PL

Late last year on the Ham Radio History forum a discussion arose over whether an early 1960s Conelrad national practice drill required a period of radio silence for amateur radio operations like that imposed on their commercial brethren.

There was much back and forth, pro and con, discussion on the topic that enticed me into researching this dimly remembered blackout. What I found was an interesting and mostly forgotten bit of ham history down the memory hole.

Operation Alert 1954-1961

Throughout their history, America's amateur radio operators have served their country in times of war and peace. Participation post-WWII, in the Cold War, was no different as hams volunteered to staff the Radio Amateur Civil Emergency System and the Amateur Radio Emergency Corps.

In 1952 the FCC and the Office of Civil and Defense Mobilization (OCDM), in collaboration with the ARRL, conceived the Radio Amateur Civil Emergency System. RACES stations would serve as a communications arm of CD and operate during any national emergency including war. RACES was an entity distinct from the ARRL's Amateur Radio Emergency Corps (AREC).

Beginning in 1954 and ending in 1961 the OCDM implemented an annual Operation Alert (OPAL). Concurrent with these OPAL events in 1959, 1960 and 1961 were Conelrad drills. The 1959 and 1960 drills did not apply to the amateur radio service. Amateurs were requested, however, to keep clear of declared RACES operations on specified frequencies.

The OPAL exercises were conceived to test the efficacy of the nation's civil defense system during a simulated nuclear attack on the U.S. homeland. In 1960, for example, a rather sanguine scenario for Chicago posited an enemy bomber first identified over Canada and heading toward its target at 400 mph. This aircraft overshot and dropped its payload on Peru, Indiana, 116 miles southeast of its intended destination. Two and one-half hours later a second enemy bomber wound up short of ground zero and dropped its single nuclear bomb on the town of North Chicago, 33 miles to the north. The resulting blast "supposedly rattled windows in the Loop."

> *"…a rather sanguine scenario…"*

During these alerts the city's mayor, fire commissioner and county sheriff were helicoptered to emergency command posts located in towns north and west of the metropolis.

Starting with OPAL-59, April 17-18, for the first time, a Conelrad drill was held in conjunction with the exercise. The OCDM asked the ARRL

Continued - OPAL-61 on Page 6

Inside This Issue...

Philip Cala-Lazar, K9PL
Editor

Mike Dinelli, N9BOR
Layout

Dick Sylvan, W9CBT
Staff Cartoonist

Rod Newkirk, VA3ZBB (SK)
Contributing Editor
2004 - 2012

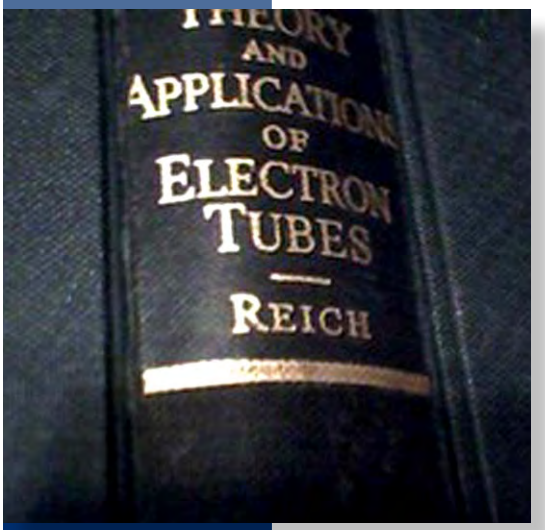
Robert F. Heytow
Memorial Radio Club

www.k9ya.org
telegraph@k9ya.org

621.384—An Appreciation

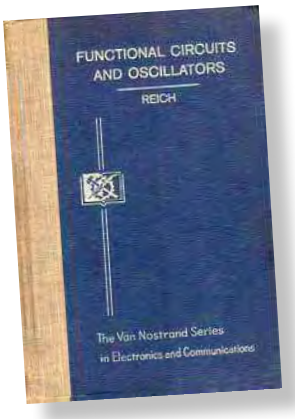
Herbert J. Reich

Paul W. Ross, W3FIS



Long ago, and far away (Niagara Falls, New York, to be exact), I was a constant denizen of the local public library. Long before the Internet we had to read real books. I now admit to owning three computers and two electronic book readers. Having developed an interest in electronics after my dad bought me an AM broadcast radio receiver kit using a 1D8GT (diode, triode, pentode), a 45-volt battery, and lots of little (for that era) parts. My dad helped me to put it together, and the rest is my history.

The Great Books



Of course, being the kind of kid I was, I headed off to the library for more information. If you haven't already figured it out, 621.384 is the Dewey Decimal System designator for radio and electronics. Among such great books as Alfred P. Morgan's books on electricity and radio, I stumbled onto a great set of books called the "MIT Radiation Laboratory" series edited by one H. J. Reich. Most of it was way above my head, but as I learned more, I delved into them, coming away with at least a working understanding of VHF technology, radar and associated topics.

Well, "fast forward" a few years to when I headed off to college, having pretty well decided to go into electrical engineering. Lo and behold, the advisor to whom I was assigned was Dr. Herbert Reich. I do remember saying something to him about having read some of the Radiation Laboratory series. He must have been impressed. I suspect few people had actually read them. If nothing else, they are great books to pile up for little kids to sit on at the Thanksgiving dinner table!

That incident was clearly the beginning of something. I took a couple of his courses, as well as having him continue as my advisor and mentor through graduate school. He was working on another book, *Functional Circuits and Oscillators*, which we suffered through in draft form in my senior year. I stuck around for graduate work, and we had another go at that book, but on a pretty profound level. Dr. Reich had by that point, gotten it into pre-publication, with galley proofs. Dr. Reich concluded that by the second time through the book that I might not be at attentive as the first time, so I was dragooned into reading galley proofs. I am now a compulsive "blue pencil" person. I also suspect Dr. Reich and I were the only people who ever read the whole book.

Dr. Reich's main claim to fame was an encyclopedic work known a *The Theory and Application of Electron Tubes*. Unfortunately, the book had been replaced by something else by the time I got around to taking the tubes course (remember, transistors were just starting to put in their appearance!). I picked up a copy anyway, as there were reams of useful stuff to be found between its covers.

I recall him giving some lectures before the student chapter of the Institute of Radio and Electrical Engineers (predecessor of the IEEE). He showed how a microwave magnetron could raise the temperature of a ball of steel wool enough to set it on fire. None of us had the slightest idea of what this might be useful for. Nobody even had the least idea of a microwave oven in the future. We even had an operational World War II radar system we could use to see airplane traffic in the New Haven area.

A Passing Fancy

In later years, Herb maintained that transistors were just a passing fancy. They lifted his private pilot's license at age 80, as they were concerned about his heart. He was not happy. He passed away at age 100. Not bad. Vacuum tubes must be good for you. ■

Robert F. Heytow
Memorial Radio Club

www.k9ya.org
telegraph@k9ya.org

That Defining Moment

Joe Malloy, W2RBA

When I was 10 or 11, or so, I got a Lafayette KT-135, a three-tube regenerative radio kit, and with my father looking over my shoulder, I slowly pieced it together. I hooked up an antenna and AC mains, and lo and behold, sounds emanated from the little box! I did a whole bunch of SWL'ing and happened across some hams using the very common AM mode. I became hooked instantly! The thought that individuals could have radio transmitters and talk with other folks was too much for an 11 year old to bear.

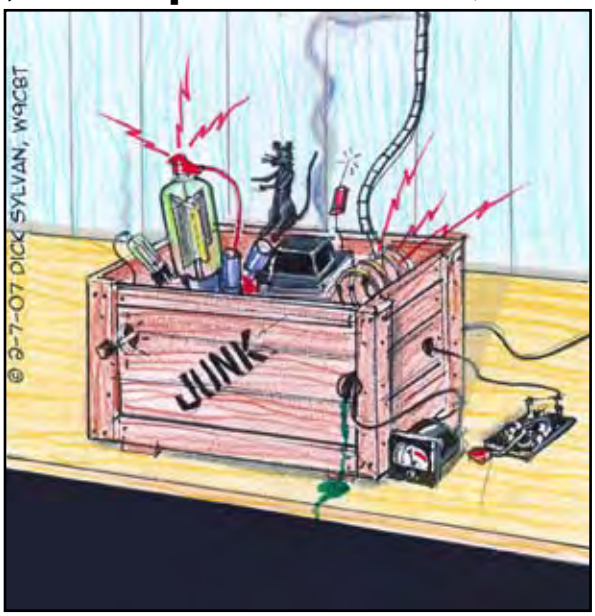
I don't know how I figured out they were "hams," but I began to learn all I could. It was about 1962, so I googled (uh, no, forget that!), I learned about the ARRL and sent off for information. I soon learned what was expected of a "Novice" class licensee and the written test seemed pretty easy, but the Morse code? I shuddered at the thought of having to memorize something on the order of 40 or so separate letters, numbers, and prosigns (which I really didn't know about at the time), but I was determined. I did as best I could without an Elmer, but I had virtually no experience in copying Morse. Then I hit upon an idea: My Boy Scout troop was having a contest to sell candy and thereby raise money for the group; first prize was $25. I figured I would outsell everybody else, get the prize (which I won), buy a portable tape recorder, record code on it, put the tape away for a week or two, and then use the oldest tape as a source of Morse. Not only did it work, I even had the original books and magazines to check my work!

Finally, in 1964, I got to take the exam from a friend of my father's (I don't recall him, really, much to my chagrin) and passed. I received the call from the newly computerized FCC in Gettysburg of WN-2QTQ and was delighted.

I immediately ordered my very own QSL cards from the Little Print Shop somewhere in Texas. What's that? Oh, yeah, the FCC wrote me a letter about two weeks later apologizing for the mix-up, but they had forgotten to program the computer to eliminate suffixes that duplicated Q-signals (although I always thought QTQ a highly superfluous one) and subsequently issued me WN2RBA. Frantic phone call to the Little Print Shop later and things were set aright. I was a ham. ■

Ham Quips

DICK SYLVAN, W9CBT



"JUNK BOX" TRANSMITTER

Dr. Robert "Smitty" Smithwick, W6CS (SK)

We regret to note the passing of Dr. Robert "Smitty" Smithwick, W6CS/W6JZU. Dr. Smithwick became a silent key at the age of 92 on March 22, 2013. Among his many lifetime achievements, Smitty was instrumental in the success of Capt. Marion Boling's 1958 Beechcraft Bonanza flight from the U.S. to Manila and back (*K9YA Telegraph*, February 2011). Dr. Smithwick graciously assisted in the creation of that article.

The Moment You Knew…

Of course you remember that defining moment when you had to get your ham ticket. Your eyes opened wide and you couldn't soak it in fast enough. Tell us about it—your Elmer—your first contact—your first rig, etc.

Send us an e-mail at: telegraph@k9ya.org

Robert F. Heytow
Memorial Radio Club

www.k9ya.org
telegraph@k9ya.org

Titanic Calling

Wireless Communications During the Great Disaster

John Swartz, WA9AQN

The centennial anniversary of the sinking of the *Titanic* occurred in 2012. The occasion was marked with memorial commemorations around the world, cruises to the site of the sinking, films chronicling the people and activities surrounding the event, renewed sales of books and articles and lavish dinners recreating the White Star Line menus of the period.

Titanic remains a captivating subject for many people. The literature ranges from official reports of the inquiries held in the United States and England following the tragedy, to fictionally enhanced renditions of the people and events in books and films. These efforts go to great lengths to convey the personal and emotional effects of the sinking and its aftermath. And, often, these efforts are quite dramatic, bringing us to the brink of identification with the individuals whose lives were lost, or those whose lives were permanently altered by the events of that night in April 1912. But for all the drama and effort put into these interpretations of the tragedy, few of us can genuinely identify with the depth of emotional outpouring following the sinking.

> *"…the special role radio played…"*

For those of us born post World War II and later, the *Titanic*'s loss is an historical event, we are largely removed from its profundity. Its sinking may be one of the most dramatic events of our grandparents' generation. If our parents were alive at the time, they were probably infants. But for our grandparents, the events surrounding the *Titanic* are what the assassination of John Kennedy was to baby boomers, the loss of the Space Shuttles to our children, and the terrorist attacks of September 11, 2001 to the current generation. These events marked generations; virtually everyone remembers where they were when they learned of these tragedies. However, the further removed in time from an event, the more difficult to identify with it.

Depictions of such tragedies evoke kindred responses in select populations. For years, we, as amateur radio operators, have known of the special role radio played and thereafter assumed. The publication of *Titanic Calling: Wireless Communications During the Great Disaster*, brings us closer to the event.

We who entered the hobby during the years when the ability to send and receive Morse code was a requirement for a license, and when the government demanded we keep detailed logs of our operations, are linked through time and space to the ship and shore stations that witnessed the sinking. We can envision that long distant event even as we recall the days of our introduction to radio, when we used receivers that depended on our brains to filter out QRM and QRN, and when our logbooks, by regulation, documented our successful *and* unsuccessful efforts to find contacts by calling CQ.

Titanic Calling draws extensively on the *proces verbaux* maintained by the radio operators within range of the *Titanic* on its fatal maiden voyage. *Proces Verbaux* is French for what we know as logbooks. But, shipboard operators kept logs not only of contacts made, but also of contacts heard around them. The editors of *Titanic Calling* extracted extensively from the logbooks of the shore stations and vessels that heard *Titanic*, and provide insight into the radio traffic during the days leading up to, the night of, and the aftermath of the tragedy.

Those logbooks detail the ice warnings ships traversing the North Atlantic broadcast to other vessels; *Titanic*'s specific transmissions and each vessel responding to or relaying the messages; calls for help and news of the tragedy; and, in its aftermath, document the efforts to gather and disseminate news of the event.

Continued - Titanic Calling on Page 8

Robert F. Heytow
Memorial Radio Club

www.k9ya.org
telegraph@k9ya.org

Conan Wyatt Burtram Barger, W3CVE

Part XI

Scott B. Laughlin, N7NET

At the conclusion of World War II the activities of the FCC, RID and FBIS were not as intense. However, world radiotelephone and A1 transmissions were still monitored on the bands. There is always rebellion and discord throughout the world and it is important that Uncle Sam keeps his ears open. It was realized that the efficient worldwide intelligence gathering done by the RID, FCC and FBIS must not be abolished. Therefore, President Truman made possible the formation of the CIA. We were reassigned to duty under the CIA.

Shortly after the conclusion of World War II radio amateurs and many commercial stations were permitted to resume their activities. Whenever there is a war or national emergency radio amateurs and some commercial stations must cease to transmit, not because of suspicion, but to keep the frequencies clear so that more efficient work can be done, monitoring for clandestine transmitters.

My duties within the CIA were similar to those of the RID, FCC and FBIS. However, a new worldwide picture of rebellion was beginning to unfold. General Douglas MacArthur predicted that communist North Korea would endeavor to overthrow the republican government of South Korea. On June 25, 1950 communist North Korea invaded South Korea. President Truman ordered troops to aid South Korea. General MacArthur was appointed as the Supreme Commander. The Korean conflict, one of the bloodiest, lasted 37 months. A truce agreement was not signed until July 27, 1953.

CIA intelligence pointed to the fact that communist activity in SE Asia was threatening South Vietnam and another battle would soon rage.

A new CIA building was constructed for our monitoring staff. It was located some distance from any commercial or residential establishments that might cause any severe "manmade" interference. In this building everything was centrally located, making it possible to carry out our duties more effectively. We had several rhombic antennas pointing to all parts of the world. Those and sensitive receivers brought signals from all over the world. Uncle Sam had his ears on.

President Harry S. Truman

In December 1950 I organized a Trans Continental Relay Net (TCRN). Only proficient CW operators who could copy at least 30 wpm using a typewriter were included as members: W2BO, W3CUL, W6KYV, W7CLL, W9JUJ, W6MBW, W5OSZ, WØKA, W4WBK, W4LM, KL7ATO/9, W3WV, W3PZW, W6BAM, W4UWE, KG6FAA, W4PL, W4EMC, W9NUJ, W9NQW, WØJAD, KL7AFC, W4TR, W5BRS, W9KRH, W8DNU and W2OE were some of the topnotch operators. With such proficient operators it didn't take long to clear traffic. During some net sessions we cleared 100 to 150 messages. I made arrangements with the Armed Forces Hospitality Committee in Washington, D.C. to relay traffic to our armed forces. About a week before the holidays it was published in newspapers that "Ham-grams" would be sent free of charge via amateur radio. With operators who could copy 30 wpm traffic went like water down a rat hole.

"Ham-grams"

Our main outlets for APO SF traffic were W6KYV, KG6FCC and W6BAM. I made schedules with K4AF and K4USA at the Pentagon to clear my APO NY traffic. During those days the Pentagon stations, K4AF and K4USA, had some crackerjack operators who could copy CW at a rapid clip. Red Callihan was the best and I could flip the bug at him at 40 wpm and he always copied letter perfect. TCRN was strictly a CW net. It is the only mode to use when handling heavy traffic–no question about it.

Col. Richard Dugan, KG6FAA, USAF commanding officer, sent many messages originating from

CONTINUED - CONAN BARGER ON PAGE 8

Robert F. Heytow
Memorial Radio Club

www.k9ya.org
telegraph@k9ya.org

CONTINUED - OPAL-61 FROM PAGE 1

to publicize the drill and solicit signal reports from amateurs.

OPAL-60, May 2-4, another Conelrad drill. However, that year hams were not asked to turn in signal reports. *QST* noted: "This year only broadcast stations are required to observe the alert." Considering the amateur radio service was not included in the 1959 drill did the League know something was afoot for OPAL-61?

OPAL-61, April 28, marked a big, if short-lived, change in FCC directives to hams as they were asked to voluntarily observe 30 minutes of radio silence.

QST, April 1961
FLASH–CONELRAD DRILL

Notice of FCC request for voluntary amateur radio participation in the upcoming Conelrad drill. The drill commences at "2100 GMT (4 P.M. EST) Friday, April 28, 1961. ARRL urges full cooperation by all amateurs in maintaining complete radio silence during the drill." RACES stations will participate "with plans and rules for that service during an alert."

"Hang a notice on your rig…"

QST, May 1961
NOTICE: CONELRAD DRILL

League's second notice of the 30-minute drill: news item offers suggestion to "Hang a notice on your rig concerning the date and time…." Amateurs' full participation in the drill will serve to reinforce their image as a self-policing radio service.

Happenings of the Month

A longer article in the same issue stresses the League's position on the FCC's request: *For the first time, amateurs have been requested to take part in the exercise, along with most commercial radio services. Though the participation of amateurs has been labeled "voluntary" for technical reasons, the FCC and OCDM desire a full-dress test of the Conelrad system.*

The ARRL viewed this first-time government agency request as an important public relations opening providing an "excellent opportunity for all American amateurs to prove once again that their operations meet the public interest, and that the amateur service can be trusted to police itself."

Some RACES stations operating during this drill were permitted to pass specific types of messages using their assigned tactical calls, not their amateur radio callsigns.

QST, July 1961
Operating News

The League chided hams for less than 100% participation, "…this can hardly be called a surprise drill. And still it fell short of 100% radio silence." The ARRL received many "unsolicited comments" about activity heard on the bands. Earning much contempt were those amateurs who got on the air to berate others for being on the air.

Novice class operators bore most of the abuse heaped on those who didn't maintain the 30-minute radio silence. One commenter's opinion that, "Novices should be done away with," was perhaps a bit over the top, but "[A] look at each band showed observance generally quite good, with the possible exception of the Novice segments." Two-thirds of the Official Observer notices issued were addressed to Novices.

QST, August 1961

Reiterating that in 1961, unlike other years' Conelrad drills, the "…FCC requested a *voluntary* observance by amateurs…" and further, the League thoroughly disseminated that request "via *QST*, an Official Bulletin through the OBS system and the CD bulletin."

Official Observers "were requested to monitor, send OO cards to amateurs heard on the air during the alert, and report to headquarters the calls of such stations." The resulting tally: "...91 OOs reported 355 'violators' of the conelrad alert on 12 amateur bands (phone and c.w. segments of the same bands counted as separate bands for this purpose)." Most violators of the FCC's voluntary request: "166 different calls," were found on 40-meter CW. Of that number "93 of them Novices." Some ops who received OO notices objected strenuously to their citation stating in their comments that it was a *voluntary* request.

QST, March 1962
Operating News
Your Conelrad Provisions?

Conelrad was about to end its run, but as long as it was in force hams were urged to comply. Operators were referred to articles in *QST* issues published in

Robert F. Heytow
Memorial Radio Club

www.k9ya.org
telegraph@k9ya.org

1957 that explained the rules and offered construction plans for monitors.

CONELRAD'S END

Hams Signed Off Early

In 1961, 10 years after Conelrad's implementation, the National Industry Advisory Committee (NIAC), a group that "advises the FCC on a wide range of questions," asked the FCC to reexamine the program. The FCC responded by requesting the Joint Chiefs of Staff to reevaluate Conelrad's practicality in light of political realities and advancements in military technology. The navigational aid premise for Conelrad, i.e., enemy aircraft fine-tuning their direction finding on radio signals, had greatly diminished with the introduction of inertial guidance systems-based intercontinental ballistic missiles carrying megaton warheads. Nor did our geographic neighbors, Canada and Mexico, have their own Conelrad-type programs.

NIAC included on its board some very influential hams including Southwestern Division Director Ray Meyers, W6MLZ; ARRL General Manager John Huntoon, W1LVQ; and ARRL Communications Manager F.E. Handy, W1BDI. Ray Meyers led a very adventuresome life with amateur radio at its heart. One of his adventures is described in the March 2010 issue of the *K9YA Telegraph*, "Nautilus to the Pole."

A July 1959 Johns Hopkins University study concluded that "The idea that fm and tv broadcast stations must cease during an enemy attack is erroneous." The reason being that "for an enemy to utilize fm or tv signals for homing purposes, he would have to use antennas and equipment utterly unmanageable aboard a missile or an airplane." Also from the study, "…enemy agents could, with impunity, plant automatic, unattended homing beacon transmitters anywhere they desired, set to begin operating on 'X' day and which could run for hours before they could be located and shut down."

"…amateur radio at its heart."

QST, September 1962

CONELRAD ENDS FOR HAMS

The Department of Defense in response to a request from the FCC notified that agency "that, with few exceptions, the navigational provisions of Conelrad are no longer required." Thus amateur radio and some other radio services were awarded their reprieve July 13, 1962 as sections *12.190–12-196* of the amateur regulations were canceled. Other radio services had to wait until August 5, 1963 to end their compliance with Conelrad rules and regulations.

For more about Conelrad for hams see the August 2009 *K9YA Telegraph*.

Excerpt from OPAL-61 Conelrad broadcast:
http://www.youtube.com/watch?v=z3Vq847ZnFo

References

Chicago Daily Tribune

73, September 1962

Broadcasting, April 25, 1960

QST, June, December 1954; June, September 1955; July 1956; January, July, November 1957; May, October 1958; September 1959; May, October 1960; April, May, July, August 1961; March 1962

"Little Holes to Hide In": Civil Defense and the Public Backlash Against Home Fallout Shelters, 1957-1963, John Whitehurst, Student Thesis, Georgia State University, 2012

The radio amateur's handbook, Headquarters Staff, The American Radio Relay League, West Hartford, Conn., 1961

The Public Responds

Letters to the editor about the 1960 Conelrad drill in the Chicago Daily Tribune.

May 12

Earle A. Mann writes: "I tried to listen to Conelrad between 1 and 1:30 [CST] yesterday, but all I got was static." Moreover, he was able to hear other stations clearly from the same location and concludes, "the static is caused at the Conelrad station."

May 13

Robert M. Woodward, Illinois Director of Civil Defense, replies, "We learned he had a good portable receiver" and was located in a large steel-framed building in downtown Chicago. "Even in ordinary broadcasts there is considerable static in such structures–more so with Conelrad, because of reduction in transmission power." Further, of "3,000 reports on Conelrad reception to date, more than 70 per cent indicate clear on both frequencies." And, "we hope to correct difficulties in reception. The weakness in this system is a matter of concern and study by this office."

Robert F. Heytow Memorial Radio Club

www.k9ya.org

telegraph@k9ya.org

Continued - Conan Barger from Page 5

Guam stating that during the month of December 1954 their traffic count totaled 12,156 messages.

TCRN used two main frequencies, 7042 Mc and 3521 Mc. The times for the 7042 were 0212, 0615, and 1600 GMT. When band conditions were normal we could clear our APO SF traffic direct with W6KYV in LA and KG6FAA in Guam. NCS duties were given to various members. I recall receiving 30 messages bound for APO SF and being unable to check in at 0315 GMT on the TCRN 7032 frequency. I gave the traffic to W2BO on the 1600 net so he could pass it to W6KYV on the 0215 net. Also, I would give Mac, W3CUL, a batch of traffic and she would pass it directly to KG6FAA.

TCRN attracted a great deal of attention during emergencies. Our net was instrumental in providing vital assistance to the Red Cross and Weather Bureau during floods and hurricanes. Many times we gave the Weather Bureau information regarding the position and devastation of hurricanes when communications were disrupted.

One morning at 0300 in 1956, Mr. Matson, the chief at the Washington office, called with information that Hurricane Carol was pounding Cape Hatteras. They'd lost all communications with the Cape and asked if we could provide directions, wind speed, and flooding conditions. TCRN was active and I was soon able to get one of our stations operated by a retired weatherman located at Morehead City. He quickly provided a full report that Mr. Matson was able to analyze.

Whenever hurricanes start blowing and threaten the mainland TCRN goes to full alert. Efforts are made to have multiple stations operating in the area where the storm may strike.

TCRN was active after the earthquakes in Alaska and Managua, Guatemala as well as the Jamestown flood. Television station WTTG interviewed our operators during emergency conditions. TCRN earned many public service awards and commendations. ■

Continued - Titanic Calling from Page 4

Unlike films and books of the event targeting the general public, *Titanic Calling* holds a special fascination for radio amateurs. It is difficult for most of us to identify fully with the circumstances of *Titanic*'s Marconi operators Jack Phillips and Harold Bride. Most of us will hopefully never have to transmit distress signals seeking aid as icy waters lap at our vessel or rise relentlessly toward our operating positions. But, we can imagine ourselves seated before early radio sets, radios with front ends as broad or broader than the receivers we ourselves first used, headphones clamped to our ears and straining our brains to filter out unwanted signals and noise, while creating logbooks that would become a permanent record of an incredible tragedy and disaster.

Those long-ago operators had only raspy, spark-generated Morse to tell them of the disaster's progress and only their imaginations to draw conclusions about it, measuring the immediacy of impending doom from the quality of the operator's fist, the quality of the signal and its strength.

The book's editors provide photographic copies of the actual logs in some instances and printed log extracts in others. Chatter between stations, afloat and ashore, seeking clarification and information, is detailed. We who now use the operating protocols and practices adopted after the hard lessons learned in the wake of the sinking can understand and appreciate those operators' motivations. Their frustrations, third parties' demand for news from their employers and business associates; and reassurances and condolences to the families, friends and loved ones of all aboard.

Other sources told us in great detail about the ship, its designers, builders, crew and passengers. In recent years researchers have uncovered more of the *Titanic* saga. This compilation, focusing on communications during the disaster, provides a new dimension, personalizing the radio side of the story in a way amateur radio operators will appreciate from their special perspective. ■

Titanic Calling: Wireless Communications During the Great Disaster

Edited by Michael Hughes and Katherine Bosworth, Bodleian Library, 2012

ISBN 978-1-85124-377-8