K9YA Telegraph

Robert F. Heytow Memorial Radio Club

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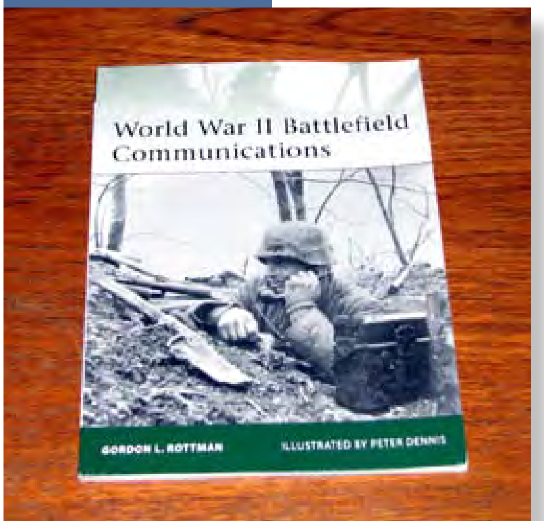

Philip Cala-Lazar, K9PL
Editor

Mike Dinelli, N9BOR
Layout

Dick Sylvan, W9CBT
Staff Cartoonist

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

"WWII Battlefield Communications"

Book Review and Remembrance

Philip Cala-Lazar, K9PL

Gauged by the number of its pages, 64, Gordon L. Rottman's *World War II Battlefield Communications* is not a very big book, but it contains a wealth of information. Though not encyclopedic in its coverage, it offers readers an overview of Allies and Axis communications equipment and deployment that belie its page count.

World War II Battlefield Communications is profusely illustrated with wartime black & white photographs and richly detailed full color illustrations by Peter Dennis. The author surveys much subject matter so the reader acquires some insight into the enormous effort put forth by the belligerents. Not limited to radio, the book depicts a wide swath of communications tools: field telephones; visual signals including flare pistols and smoke projectiles; smoke grenades and candles; signal flags; marker panels; signal lights; arm and hand signals; messengers; and audible signals, e.g., whistles, sirens, horns, bugles, rifle shots and the human voice.

"Did you know?"

Scattered through the book are supplemental text boxes containing background material: definitions, techniques and protocols. They include the kind of tidbits expressed during many ham radio roundhouse discussions, "Did you know…?"

The book's five chapters discuss *Means of Tactical Communications*, *Unit Communications Equipment*, *Communications Procedures*, *Signal Units* and *Unit Communications Systems*.

Amateur radio operators will especially appreciate the COMMUNICATIONS PROCEDURES chapter. Here are revealed the U.S. (A-ABLE), British & Commonwealth (A-ACK), German (A-ANTON) and Russian (A-ANNA) code alphabets and the Japanese *katakana* syllabary characters that "…allowed use of a Morse-type code system."

The Morse code section includes a description of radio intercepts' ability to discern individual operators by their fist (the author uses the term "hand"). Also mentioned is CW's ability to "…usually be more 'readable' (understandable)" than a voice transmission given the same conditions and that Morse code "…was a basic requirement for radio operators in all armies." Morse acquisition is cited doable "in about three weeks" plus "…at least six to eight additional weeks…" to add "…speed and proficiency…."

A couple of nits in the text:

Page 21: SCR-511 "pogo stick radio" is depicted on Plate B, page 22, not Plate C as stated in the text.

Page 44: Noted above, discussing telegraphy, the author uses the term "hand" rather than "fist" to describe a telegrapher's unique keying technique.

World War II Battlefield Communications provides a great kick-start to learning about WWII communica-

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Inside This Issue…

Robert F. Heytow
Memorial Radio Club

www.k9ya.org
telegraph@k9ya.org

The Ubiquitous MP

Hal Mandel, W4HBM

Yaesu FT-1000MP MARK-V

In the past forty years Yaesu made some astoundingly bad decisions and some really great ones. There was a time when Yaesu was seen on an endless downward spiral, and if allowed to continue, the brand name would have long ago disappeared like so many others. However, there was a man in the company, Managing Director Sako Hasegawa, JA1MP, who had a vision that Yaesu would again be great. The idea was to make a top performing radio and subsidize its emergence. The FT-1000 was born.

JA1MP didn't stop with the FT1K. His dream was to build the next generation of radio and incorporate digital signal processing in the architecture. The radio was again subsidized, with a bet toward the future of Yaesu that would prove very successful. The FT-1000MP and its generation made the amateur world look twice at the new dynasty. Yaesu, who named entire "breeds" of radio models as "MP," would carry on Mr. Sako's influence.

"Sako Hasegawa, JA1MP"

The FT-1000MP, FT-5000MP and FT-9000MP are all widely known for their vast abilities. JA1MP ruled the Yaesu engineering department and the subsequent assembly areas, hands down. When the FT-1000MP Mark-V was shipped, every radio had a Yaesu World Map, a Yaesu decal sticker and a JA1MP QSL card. (Can't get any more personal than that. [ed: Those documents also included with the original FT-1000MP.])

Now it's 2013 and a new generation of radio gear is upon us. However, the amount of radio these days to cover the same levels of performance as the FT-1KMP dynasty is far more costly.

For the operator with a medium budget, the best bang-for-buck might be looking at a vintage MP. For less than two kilobucks and a tune up, there is little that can compete. After looking at the radio scene and what my money bought, the idea of a mint Mark-V started looking very appetizing. I found one, manufactured in 2001, complete with six INRAD crystal filters and the INRAD IF amplifier additions, right at one of the "big three," and the sales person said it was "pretty clean," and not too scratched. (For me, that means very little. The way my gear sits it accumulates scratches right and left.) So I took the chance and plunked my hard earned down. When the radio arrived it looked like it had sat in the box for ten years. If there were an elapsed-time meter I would wager less than one hundred hours. But who am I to determine viability?

The very day the radio came it was repacked better than OEM and immediately shipped off to Byron Campbell, WA4GEG, in Tennessee, for a complete diagnostic, complete modification, upgrade and try-out to make sure everything, every widget and every function and every menu item actually did something. Byron had it for a good two weeks and his report said "A-OK."

That's a good starting place. Me, I'm one to get as much radio as possible in a vintage rig, and that's why the INRAD and Collins crystal filters are important. The radio, as stated earlier, had five additional filters in the main receiver and one INRAD 250 Hertz CW filter added to the sub receiver. I remembered an article about the Mark-V sub- receiver SSB filter, so I found the paper on the INRAD Web site.

Robert F. Heytow
Memorial Radio Club

www.k9ya.org
telegraph@k9ya.org

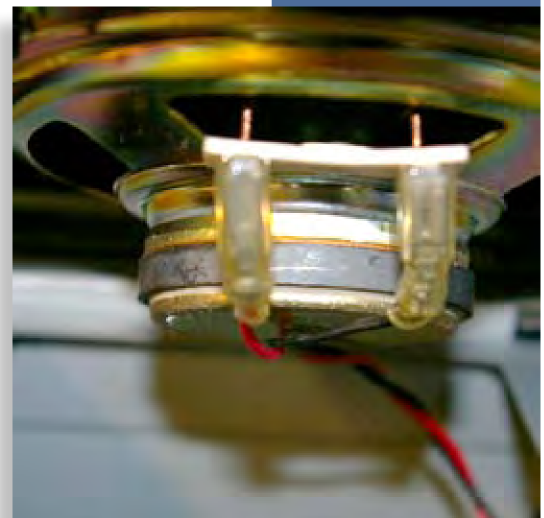
The gist of the INRAD article says the Murata CFJ455K13 filter used in the FT1KMP series could stand improvement. The article further states the wide skirts associated with the CFJ are so broad the filter will allow "a good portion" of the opposite sideband through, making noise and QRM.

INRAD kind of says it's the last major improvement to be made on the MP, so what the heck, let's try it.

The new filter is an INRAD 702, 8-pole, 455kHz SSB filter, and unlike most Yaesu-directed filters it comes without a PCB to simply slide into the radio. The old filter needs to be levered out and coax cables need to be soldered in, as the new filter is roughly six times the size of the Murata. This means the entire sub receiver board needs to come out and go on the bench. Marking the various connector sockets for orientation sure helps, and marking the one screw hole in the BPF housing that takes a pillar is important, too.

Levering out the Murata CFJ requires desoldering four contact pins and one case ground mount in the middle. There are surface mount chips very near the pins, so no blowtorch, and no railroad soldering iron. I ended up deciding to sacrifice the Murata because the filter was not being cooperative, and I didn't want too much time on the junction with the iron. After the filter was levered off, removing the four pins from the board became a piece of cake. In order to fit the tiny coax cables that came with the new INRAD 702, it was necessary to ream out the holes in the Sub RX board with a pin vise and a number 62 drill. Carefully twirled, the bit ate up the residual solder in the through holes and allowed the coax jumpers to be fed in from the front of the board and soldered on the back with no difficulty.

Just cutting the supplied coax in two equal pieces allowed the new INRAD to be mounted with the supplied double-sided tape to a ledge in front of the BPF can. (There was absolutely no room on the side of the radio: All the room was taken up by the RX2 board and the TCXO in front of the chassis.)



Internal Speaker

All the internal hardware went right back in. No jockeying, no tantrums, no destroyed ribbon cables. By the way, the backup CR2032 coin cell is right near the ribbon cable for the RX2 on the bottom of the radio, so this is a perfect time to slide a new one in the holder. Why take a chance?

The covers and hardware for them require separation and counting. Both the top and bottom cover sets need to come off for the RX2 filter upgrade. This means there are twenty-one screws divided into three distinct sizes. The very top of the radio near the speaker, but in the middle of the cover are the smallest, and they should come off first.

> *"Why take a chance?"*

(Make sure to pull the internal speaker terminals off the speaker before yanking off the top front cover and flinging it over to the spare parts pile.) Use a number one Phillips screwdriver only for these two. The rest all use a number two Phillips.

Next are the screws fastening the heat sink. There are four. These are hidden in the folds of the heat sink on one side, and down on the lower surface of the heat sink level on the other side. These four screws are different than any of the others, so pay attention to them. The rest of the screws are all the same size–machine threads–not self-tapping. There are seven on the bottom. Don't remove the screws holding the feet; they are not cabinet screws. The bottom cover will need to be spread apart a small amount towards the back to get the cover to fit over the radio's innards. Just a wee bit–no tools required.

Getting the covers back together is easier if you use a little bit of thick grease on the Phillips screwdriver

Continued - The Ubiquitous MP on Page 8

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www.k9ya.org
telegraph@k9ya.org

Some Thoughts About SSB

Part I

Paul W. Ross, W3FIS

KN-Q7A SSB Transceiver

First, some background, and why I decided to write an article about single sideband. Single Sideband transmission–SSB, is pretty much the norm in ham voice communications on HF. My desire for a more in-depth understanding was motivated by the recent construction of a single band, SSB transceiver. More about that later. All of us tend to take SSB for granted without necessarily having a comprehensive understanding of how it works.

When I first got into ham radio in the 1950s, AM, or amplitude modulation, was about the only game in town other than CW. I remember visiting some friends of my father's during high school, and hearing them discuss single sideband transmission techniques, which were then just starting to make an impact on the ham radio community. The seed was planted.

After I had gotten my ticket, and worked through some simple CW rigs, I moved on to VHF–first 6-meters, then 2-meters, as I had only a Technician Class license, and was not particularly excited about CW or HF. The first 6-meter transmitter I built used a 2E26, and then upgraded to a 6146. For modulation, I used plate-modulated AM, with a push-pull pair of 6AQ5s running class B. I was not a popular person in the neighborhood, as the 6-meter band is right below channel 2 television! Talk about QRM!

As an electrical engineering student, we learned about AM modulation, and went through the trigonometric exercise showing that for 100% AM modulation, a carrier and two sidebands would be generated, effectively doubling the bandwidth of the signal over the modulating frequency, as one sideband lay below the carrier, and the other above. Thus, a 2 kHz audio signal would end up producing an RF signal output 4 kHz wide. Into the bargain, it was quite clear that all the required information was really only in *one* sideband; the carrier and other sideband (it doesn't really matter which one) were redundant. Half the energy was in the carrier, and the other equally distributed between the two sidebands.

However, the nice thing about AM for ham radio is that it is easy to do. There are a variety of ways to modulate that nice CW rig you built by just the proper connection of a suitable audio frequency amplifier to the output stage of the transmitter. Simple is good. Cheap is better.

Obviously, I was not the first person to come to this conclusion that the carrier and one sideband were just "going along for the ride." If we go back into the early days of radio, there were some fierce arguments about even the existence of sidebands. Some very early experiments with resonant antennas, acting as a filter to eliminate one sideband, indicated that sidebands were real. For a variety of reasons, the single sideband concept never took hold in the amateur community, but was used in a variety of commercial applications, such as transoceanic radiotelephone systems, and various landline telephone environments.

> *"Get rid of the carrier"*

After the Second World War, with increased HF band congestion, the concept of SSB transmission took on a new life. Band congestion on HF for all users was becoming a serious issue. The question, of course, is how to economically generate a single sideband signal.

So, how do we go about creating a SSB signal? There are four design issues to address:

- Get rid of the carrier. We can easily do this with a balanced modulator. A diode ring or unbalancing a push-pull amplifier feeding both inputs the same signal does the trick. The carrier cancels out, and only both sidebands are produced.
- Now, we have to get rid of one sideband. The early approach was to use filters. However, they are hard to design and build with simple inductors and ca-

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Ham Archaeology

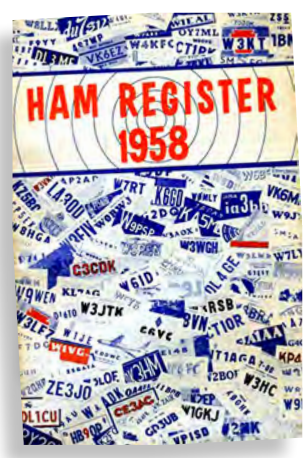
Bob Ballantine, W8SU

Who were the wireless pioneers in your community and what became of them? Inquisitive minds will find some outstanding information about our ham radio heritage.

I will explain how I wrote a book about very early wireless heritage in my hometown—my gift to the local library. My book was almost ten years in the making, has over 200 pages and is registered with the Library of Congress. It is hardbound and printed on 100 lb. paper to last a long time.

The Research Begins

My research started with Bob Arrowsmith, an old call book collector. Ronald Allen, W3OR, was a great help and he eventually purchased Bob's material. I then located and interviewed a handful of local amateurs who knew the old timers. My best contact was living in Texas. My Texas contact, Dick, W5OUN (SK), could remember dates, names and call signs; he was truly a walking encyclopedia.



The book, *Ham Register 1958*, by Arthur Lewis, W3VKD, was a keeper. Lewis hit the nail on the head. Unfortunately, Mr. Lewis didn't continue his project.

Now it is much easier to find our pioneers because call books from the teens through the mid-twenties are available on the 'Net, these include the old WAA call books starting in 1909 by Electro Importing and famed Hugo Gernsback Publications.

Tricks of the Trade

Local libraries have material to greatly assist including microfilmed local newspapers, heritage and ancestry material. There are photos from high school year books; just add 18 years to the person's date of birth and check the year books for their senior photo. City directories are very helpful with family information and occupations. If you only have a dozen pioneer hams you have it made. I gathered approximately 50-plus souls and it was a ten-year chore.

Sometimes just bits and pieces gathered slowly, then a QSL card and it eventually built into a nice file. You might obtain some difficult to understand material, such as that of a young couple married only several weeks and on a trip to Detroit when one of our pioneering hams lost his wife in a car crash returning home on a Memorial Day weekend.

Get Started

I challenge you to get on with the job at hand; it is a rewarding and pleasant hobby that grants old-timer status! If the subject is deceased, the obituary will garner far more information than needed. We had Ph.D.s, inventors, nuclear physicists, Bell System employees, and the founder of the IRC, broadcasters, physicians, two college professors and every walk of life in between.

Some radio club archivists have files on their old members. This material is a start, making it much easier to get into ham radio archaeology!

What to do with the material? Simply make it available: W8JYZ and K8CX tributes, the World Wide Web, radio club anniversaries, club radio history publications and local newspapers enjoy printing the wireless material in their weekend additions. They find it as fascinating as some of us do. Who knows, maybe one day Arthur Lewis's ham register idea could catch fire once again.

As one of the Radio Boys used to say, "Be Safe, Be Happy!" ■

Robert F. Heytow
Memorial Radio Club

www.k9ya.org
telegraph@k9ya.org

Hedwig Eva Maria Kiesler

Famous Personalities

Tony Thorrold, VK4KKY

Hedy Lamar

Hedwig Eva Maria Kiesler (1914-2000) was born in Vienna, Austria. In the early 1930s she went to acting school in Berlin and in 1933 she starred completely nude in the film *Ekstase*, a shocking scandal in those days. That year she married Fritz Mandl, an armaments manufacturer and in their home in Vienna they lavishly entertained many important industrialists and world leaders, including Hitler and Mussolini.

Mandl was very interested in radio control systems for his weapons and Hedy would listen in on the conversations around the dinner table. She once said, "Any girl can be glamorous, all she has to do is stand still and look stupid." Far from being stupid, she was fascinated hearing about problems with radio-controlled missiles and how the control signal could easily be blocked. Mandl became deeply involved with the Nazis and in 1937 Hedy divorced him because of this and moved to London, then to Hollywood. Rated by many as the most beautiful woman in the world, she was hired by MGM and given the stage name of Hedy Lamarr.

A New Friend

In Hollywood she became friends with George Antheil who was born in New Jersey, USA in 1900, son of Prussian immigrants. He had studied music in Philadelphia then went to Berlin and later to Paris as a concert pianist. In Paris he became a leading composer and one of his works, *Ballet Mécanique*, used sixteen simultaneous Pianolas (player pianos). In 1933 he returned to the USA and became a film music composer in Hollywood where he and the exquisite Hedy Lamarr met.

They discussed a wide range of topics, one of which was Hedy's interest in radio control. Thinking about the problem of blocking, she had come up with the idea of 'frequency hopping', but was not sure how this could be accomplished. She had realised that by quickly jumping from one frequency to another at both the transmitter and the receiver, the signal could never be blocked by someone who didn't know the sequence.

Antheil had the answer—he had invented a system to co-ordinate the sixteen Pianolas in *Ballet Mécanique.* The two of them worked on the invention, which used slotted paper rolls to synchronise the frequency changes at the transmitter in a high-flying plane and the receiver in a torpedo. It used 88 different frequencies, the number of keys on a piano. With the help of an electrical engineering professor from the California Institute of Technology, they miniaturised and debugged the system and patented their "Secret Communication System" on 11 August 1942, at the height of her Hollywood film career.

"Ballet Mécanique"

Pianos Not Allowed

The U.S. Navy refused to consider the system, scathingly remarking that there was no space for a piano in a torpedo. They were unwilling to consider the idea that music technology could play a role in a weapon of war. Immediately the patent expired, engineers at the Sylvania Electronic Systems Division took up the idea, but implemented it in an electronic rather than a mechanical manner. It became widely adopted by the military and is used today by the U.S. government's Milstar defense communication satellite system and is also the basis of all modern cellular phone technology. Lamarr and Antheil never received credit or royalty payments for their idea—it was an invention 20 years ahead of its time. However, before her death in January 2000, Hedy was honoured with an industry award for "blazing new trails on the electronic frontier." ■

Robert F. Heytow Memorial Radio Club

www.k9ya.org
telegraph@k9ya.org

CONTINUED - SOME THOUGHTS ABOUT SSB FROM PAGE 4

pacitors. Clearly there is a problem here. In more recent years, with the availability of inexpensive crystal filters, this problem is easily overcome. We will invoke a little mathematics and magic and show that a "phasing" system can be created, not requiring any fancy RF filters.

- Move the remaining sideband to the desired output frequency. Tuning a bunch of filters is not going to be practical. A heterodyne technique is used. Simply add or subtract a signal from the generated SSB to put it where we want it.
- Amplify the resulting sideband to the desired level. We need a linear amplifier here, as we have to preserve the output from the SSB generator undistorted.

First, let's consider the phasing technique. There are two parts to the problem. We need to first generate two RF signals 90° out of phase. We then modulate both of these signals separately with two derived audio signals, also 90° out of phase as well. Generating two RF signals (historically done at 9 MHz) can be done with what is known as a "quadrature coupler."

The audio phase shift of 90° is done with a multistage phase shift network. Each leg of the network is a cascaded RC or active filter that tracks the 90° phase shift over the audio frequency range of interest.

This sounds simple–create the desired signals, and combine them, and the undesired sideband is phased out by simple 180° cancellation. The fly in the ointment is the audio phase shift filter. It requires a carefully matched set of components, and only works correctly over a restricted frequency band. Thus, for proper operation without introducing additional complexity, you must usually band limit the audio signal to something perhaps like 400 Hz to 2.8 kHz. Frankly, this whole scheme is a bit of a "house of cards," but once properly adjusted, will perform nicely. Commercial audio phase shift networks were available to ease the construction process, and was in fact, the major motivation for me to built a SSB exciter many years ago.

KN-Q7A SSB Transceiver

Now, what about that 9 MHz issue? Above 9 MHz, we use USB, and below that, LSB. The value of 9 MHz is a very convenient frequency. Remember that we need to heterodyne our signal to the desired output frequency? The sum of 9 and 5 is 14–the 20-meter band. The difference between 9 and 5 is 4–the 80-meter band. One VFO will produce output for either 20- or 80-meters. The *lower* sideband is produced for 80-meters, and the *upper* sideband for 20-meters–the usual USB/LSB convention for SSB voice. You had to know.

The second article will address the use of multi-pole crystal filters, and describe a rather interesting single-band SSB transceiver kit that not only works nicely, but also can give you a really good understanding of how it all works. ■

Ham Lingo

DICK SYLVAN, W9CBT

D-104 "LOLLYPOP" — A REALLY SWEET MIC

The Rest of the Story…

Like what you're reading in this month's *K9YA Telegraph*? If so, you're in good company, as amateur radio operators in more than 100 countries agree with you. Know what else? Hams just like you write the *K9YA Telegraph*.

These operators want to read your story. Evidenced by your feedback and our expanding worldwide subscriber base we know we've hit on a winning formula:

YOU + *K9YA Telegraph* = A Great Read

Without your side of the equation, it just doesn't add up.

Not sure of your writing skills? No problem, the *Telegraph's* staff will edit your manuscript. The important thing is to share your story. Remember: "A good story is a terrible thing to go untold."

http://www.k9ya.org/write_for_us.htm

Robert F. Heytow
Memorial Radio Club

www.k9ya.org
telegraph@k9ya.org

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tangs. That way they hang onto those pesky screws going down into the heat sink fins.

Oh, while you're in the radio, treat yourself to a can of computer keyboard lint spray-air and blow the dust out of the fins of the blower, etc. Just remember to be static-aware when touching the innards of the radio and you should do just fine.

Testing the radio to verify the filters went in okay is real easy for the main receiver (Rx1). Tune in a sideband station with the radio in LSB or USB and hit the NAR1 button. The audio should change between the NOR setting and NAR1. Set the radio up for tuning CW and hit NAR1 then NAR2. The audio should change with the filter settings.

Testing the sub receiver (Rx2) is going to require first activating the sub receiver by either pushing the DUAL button or by pushing the RX button—LED above the sub receiver tuning knob.

With the main AF knob turned down, turn up the SUB AF knob on the bottom row of controls and then first push the SUB button, then push the LSB or USB button. The little decal under the sub receiver frequency display will light up with a telltale LSB or USB. Find a convenient sideband QSO and then first push the SUB button and then the NAR1 button. The audio will change right away. Giving the NOR/NAR buttons a push without a first push of the SUB button will affect the main receiver, not the sub receiver.

If you decided to fit the CW filter on the sub receiver board, then tuning in a CW signal with the sub receiver will give you the choice of NOR/NAR1/NAR2, but only after pushing the SUB button first.

The FT-1000MP series really shines with a full boat of INRAD filters. The radios have excellent audio characteristics just by themselves. Adding digital signal processing and added crystal filters provide a wide range of listening choices. In fact, the replaced CFJ Murata filter can be a 2.1kHz, a 2.4kHz or even a 2.8kHz—if HiFi sideband is your kick. My pleasure is diversity receive with Rx1 set to LSB and Rx2 set to USB and both audio channels blasting away. Now setting the radio filters for CW and using both receivers puts a whole new light on pulling that Morse signal out of the mud. ■

Continued - Battlefield Comms from Page 1

tions gear. The author's authoritative and clear writing style transforms what could have merely been a dry cataloging of equipment and applications into a very informative and enjoyable read and a worthy addition to any inquisitive ham's bookshelf.

World War II Battlefield Communications, Gordon L. Rottman, illustrated by Peter Dennis, Osprey, Oxford, U.K., 2010 ISBN: 978 184603 847

Afterword

My personal memory of the iconic Signal Corps Radio-536 "Handie-Talkie" cum "Walkie-Talkie" designed in 1940 and built by Galvin Manufacturing (Motorola) for use by paratroopers and later seeing "…widespread use in the infantry."

In my twelfth summer, a boyhood friend received a pair of SCR-536s (purchased from a pawn shop) as a birthday present. His father, a WWII USAAF veteran stationed near war's end on Tinian Island, was a very thoughtful, understanding and generous man. His son, thanks to his father's largesse, was the recipient of some great gifts including, but not limited to, the aforementioned SCR-536s, a number of vintage and modern long guns, a model railroad, a shortwave receiver, and a bit later, a Vespa scooter.

We were prohibited, frustratingly, not to transmit with the Walkie-Talkies. How was that even remotely possible for two adventurous lads already into shortwave, home-made rockets and many things wondrous and hazardous?

Surreptitiously, out of parental view and earshot, we experienced firsthand the HTs' very short range and brief battery life. Their 360-milliwatt AM signal pumped through a 39-inch telescoping antenna meant no FCC monitor was going to hear us on 3885 kc unless driving very slowly past. Even in those days of yore the rig's two batteries (1.5 volt, BA-35 and 103.5 volt, BA-38) were prohibitively expensive. The SCR-536s were eventually traded for a Model 1873 "Trapdoor" Springfield rifle, which when not hanging over the fireplace, was to be found and heard at a local range. ■

Robert F. Heytow Memorial Radio Club

www.k9ya.org

telegraph@k9ya.org