

Radio Central

By Chuck Meyers, Docent USS Hornet

Hornet had massive amounts of communication capability and some of that is obvious in Radio Central – also called the “radio shack”. In fact, there are at least 14 spaces devoted entirely to radio equipment.

In order to provide a buffer zone around secure spaces, the passageways in proximity to all these spaces was “controlled” – the spaces themselves were usually secure or restricted at a minimum. Adjacent spaces are also frequently controlled as well for the same reason.

There are many ways and means of communicating among units of the Navy. When in close proximity signal flags, semaphore or flashing light can be used. Flashing light employs Morse code, which can also be transmitted by radio. Radio signals can be transmitted by frequency bands, from low frequency (LF), high frequency (HF), very high frequency (VHF) or ultra-high frequency (UHF), and Hornet has equipment for all. In general, the lower the frequency the longer distance it can travel. For example, whales use low frequency tones to communicate over very long distances underwater. UHF radio was used in ship-to-ship communication in a formation because it didn’t travel far out of those distances and could not easily be intercepted.

In the admin area you will notice the door has a bank teller-like barred window in the main door with a combination lock. Also note that there is a curtain that restricts the view from outside the door to just that of the sailor responding to the door buzzer – just one impression of how the Navy deals with the security of information.

On the forward bulkhead just inside the door are a system of pipes and valves. Each of the pipes is labeled with a destination for that pipe – such as “Navigation”. This was the pneumatic tube system that moved paper messages from Radio Central to various parts of the ship using the shuttle in the clear plastic cylinder. Once the message was enclosed in the metal and acrylic cylinder, it was placed into the appropriate tube and fired off to its destination by a burst of air as the valve was opened. This same concept was used in banks and currently can be seen in Costco.

Note that only de-classified messages were sent using the pneumatic system. A secret or TS message was typically delivered by a messenger with a clip board and the receiving officer (for the most part) had to sign for receipt. Bridge watches would periodically see a messenger arrive at the captain’s chair with a clip board and a message to sign for. Some of those were quite log Secret messages that were summaries of the political or military situation in the area. OODs used to joke that those were the same reports we saw last week in the Far East edition of “Time”.

The two spaces to the left as you are facing the curtain hold patch panels and CW equipment. CW operators received Morse Code messages and typically typed as they listened. Note the CW keys and the typewriters.

The next room has a variety of comms equipment – and the Universal Time System broadcast can be heard as an example. UTS was an important factor in swapping codes, many of which only lasted for 24 hours and would

change in all commands at a specific UTC time, 0000 UTC, for example. The US has two stations broadcasting UTC time – one in Hawaii and one in Fort Collins, Colorado.

Note that much of the equipment, including the cables, is painted red. That denotes the fact that classified information is passing through that equipment. If maintenance, repair, or upgrade of that equipment was necessary it had to be done by someone with a high security clearance level. The patch panels seen here are nearly identical to those used in modern ships – if it ain't broke, don't fix it.

The next space on the way to the teletype room has more comms equipment. And there is a repair space as well.

The teletype room has several types of equipment – and a view of the guts of a teletype. Note that there are send and receive systems, receive only systems, and send and receive systems that also have a paper punch capability. The paper punch was particularly important for encrypted messages. The paper tape was cut and delivered to the next room where it was deciphered and processed further.

At this point you will have noticed that this was a paper intensive enterprise, with a lot of paper for burning or deep-sixing.

And about this time, you may get questions about how traffic was sent successfully over the long distances represented by the Pacific. The answer is somewhat complex but the simple answer is that there were stations across the globe that repeated the messages, in effect, like electronic repeaters / amplifiers / relays. They were in such tourist favorites as Adak, Alaska, Guam, Panama Canal, etc.

The door to the cipher room has another combination lock to secure it from entry by unauthorized personnel – it required Top Secret (or above) clearances for the occupants.

The crypto room does not have any of the devices that aided in the encryption or decryption of classified messages. For this purpose, you may want to refer to devices like the German Enigma machine, something most visitors have heard about (at least you will get nodding heads). The US had similar devices during WWII which were, for the most part, more sophisticated than Enigma but much less well known. (Likewise, many people have heard something about Bletchley Park and the code cracking of people like Alan Turing. The US was well ahead of the Brits in this area, including development of the so-called “U.S. Navy Cryptanalytic Bombe”, but it is much less romanticized by Hollywood. A good book and reference in this area is “Code Girls”.)

Now a choice should be made. If you want to end with a “bang”, it will be timely to talk about the burn bags and “deep six” bags that are scattered around. Be sure to warn folks about the weight of the canvas bags. Note the port in the aft area of the room. At one point there was an incinerator on the hangar deck pretty much directly below that port – burn bags were tossed through the port to the incinerator.

For your tour finale, , push the tiny white button on the shelf to the right – it activates a machine. Once the message has been typed ask someone to read it.

Background:

Prior to the battle of Leyte Gulf Halsey was aware of the Japanese carrier force headed South towards the landing sites and prepared to meet it and destroy it. This was a decoy and Halsey took the bait – the carriers

had very few aircraft and almost no experienced pilots – the IJN was sacrificing the carriers to get other forces to the beaches to destroy the invading force. Halsey's actions were ultimately controversial, but he was well within his orders to finally destroy the IJN carriers. One of his orders was for the battleships to remain in the area of the beachhead to fight off any IJN forces that were NOT the carriers. That message went out to Jesse Oldendorf, commander of the battleships and cruisers on a high frequency circuit and was received at Pearl Harbor as a result. Halsey later countermanded that order and had TF 34 come along to destroy the IJN carriers. That message was sent UHF and did not reach "PH". Nimitz got reports that the transports were essentially unprotected and was concerned about the beachheads once the whole tactical picture came into some focus and the other IJN forces approaching the beachhead were seen. Nimitz sent a message asking Halsey where the battleships were.

It reads: TURKEY TROTS TO WATER GG FROM CINCPAC ACTION COM THIRD FLEET INFO COMINCH CTF SEVENTY-SEVEN X WHERE IS RPT WHERE IS TASK FORCE THIRTY FOUR RR THE WORLD WONDERS

This was a message, as dictated on October 25, 1945, and began with the addressing to Halsey (COM Third Fleet) as the action addressee, with copies to King and Oldendorf. The "TURKEY TROTS TO WATER GG" before the addressing is what is called "padding" – it is meaningless text added to make the message more difficult to decipher by the enemy and is somewhat arbitrary text to complicate the job. The same is true of "RR THE WORLD WONDERS". The "GG" and the "RR" are keys to that, denoting the end of the front-end padding and the beginning of the back-end padding.

Someone on the battleship, New Jersey, missed a beat and what Halsey got was this:

"FROM CINCPAC ACTION COM THIRD FLEET INFO COMINCH CTF SEVENTY-SEVEN X WHERE IS RPT WHERE IS TASK FORCE THIRTY FOUR X THE WORLD WONDERS".

Halsey was convinced his boss was trashing him when it was really a basic mistake made in decrypting the message. Halsey slammed his hat down on the deck and went into a rage until finally calmed down by his chief of staff.

Ask one person in the tour group to tear off the message and read it. The tearing off will generally be poorly done and humorous, so you may have to practice doing it yourself. It is also an opportunity (depending on the paper stock in the machine, to explain what "cc" really means to those whose only use has been on emails.

This may be a good opportunity to discuss encryption at a basic level. Simple letter substitution – moving down alphabet by 3 letters - gives this result for the message:

QROHBV QOLQP QL TXQBO DD COLJ ZFKZMXZ XZQFLK ZLJ

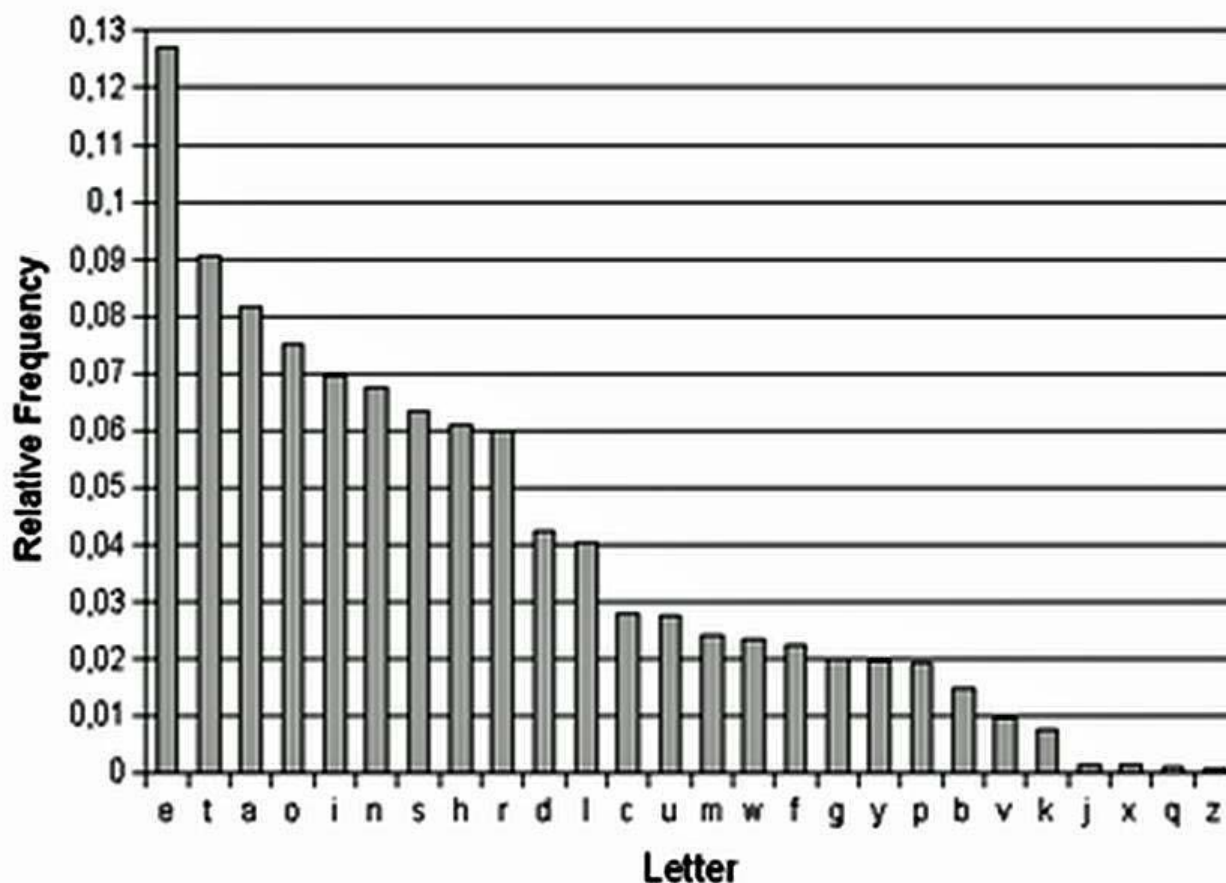
QEFOA CIBBQ FKCL ZLJFKZE ZQC PBSBKQV8PBSBK U

SEBOE OMQ SEBOE FP QXPH CLOZB QEFOQV CLRQ OO

QEB SLOIA SLKABOP

Decryption of the message by an enemy might well start with an analysis of the most common letters in English and doing re-substitution, using this kind of chart, recognizing that "Navy speak" is different from

“Hemmingway speak” or “F. Scott Fitzgerald speak” and having an alphabetical incidence chart that accounts for that.:



But the chart turns out not to be very useful in this case – there are 14 Q’s (T), 13 B’s (E), and 10 L’s (O), but only 3 X’s (A), which should be the 3rd most frequent letter. A starting assumption might be that Q = E, B = T and L = A, but rendering no joy with this message.

More analysis of U.S. Navy messages will be necessary. Just a quick review of the original message with “Turkey TroTs to WaTer” suggests that this meaningless phrase also makes the frequency table misleading for this message.

For fun, substitute “Golden geese give golden eggs” for the turkey phrase, encrypt it [DLIABK DBBPB DFSB DLIAKB BDDP] and the distribution becomes quite different, with lots more Ds and Bs. Using alliteration in padding could be very effective in frustrating decryption.

Finally, you will likely get some questions about how things are encrypted in today’s military. If you know something about it, tell that which isn’t classified. If you don’t, you might simply say it is likely more complex than the 256-bit encryption that is common for the Internet and that padding is likely more prevalent than what was standard in 1944.