

TOP SECRET

(IN WWII)

HUFF DUFF

German Submarine Locator

Radio Direction Finders have been in use for many years in aircraft and on board ships, but they were very slow to use because careful adjustment of a loop antenna was required, then even further measurements comparing the magnetic loop signal with an electrostatic signal to determine which of the two directions was the correct direction. Submarines could avoid detection by radio direction finders, simply by keeping the messages short enough.

The invention of the HUFF DUFF high frequency direction finder process in England and further development by the Naval Research Laboratories early in WWII enabled much faster detection of transmitter direction than had ever been done before. Basically the new HUFF DUFF radio direction finder was "instantaneous" and a transmitter direction could be determined with the transmission of a single dot from the Submarine.

Fortunately the Germans did not catch onto this new process right away, and we were able to manufacture a number of HUFF DUFF receivers and install them in many shore locations as well as in quite a few ship- board locations including the USS SLATER, the ship you are standing in right now. This enabled the allies to get "Cross Bearings" on many Submarines before they could shut off the transmitters.

There was actually a case where HUFF DUFF operators were able to get a radio - location on a Submarine and radio an aircraft that was in the general area in time to sink the Submarine before the Submarine could crash dive out of sight.

The HUFF DUFF GAVE THE ALLIES AN ADVANTAGE IN THE WAR OF THE ATLANTIC that the Germans were never able to overcome. The Germans referred the early days of WWII where they were sinking thousands of our ships in the Atlantic as "THE HAPPY DAYS". It could easily be said that the HUFF DUFF gave us the advantage that enabled the Allies to win the war against the Germans because we were then able to transport men and war material to England without getting sunk first!

Nine out of ten of the German Submarine sailors that went to sea during WWII died in their Submarines. This is probably the highest death rate of any large military group in recent history. While they were suffering these losses, they were also sinking more than 2800 ships and killing more than 42,000 Merchant Seamen, Army, Navy and Marines. These were men that were lost even before they could engage the enemy. No wonder that the Germans referred to that time as "THE HAPPY DAYS".

The "BATTLE OF THE ATLANTIC" WAS THE LONGEST SUSTAINED BATTLE OF WORLD WAR II.

I note in the latest SLATER SIGNALS magazine that readers are asking about radio silence at sea on HUFF DUFF ships. Radio silence was carefully maintained at sea at all times, except on very high frequency transmissions of the TBS radio, which generally did not reach beyond the horizon.. In general, the probability of receiving a transmission from a submarine was very remote, because they would change operating frequency according to a secret German frequency plan for each day and hour. The German receiving stations simply kept changing frequency according to plan and thus could receive all transmissions, but the chances of any one American ship stumbling onto such a transmission would be very rare indeed. The transmissions of weather information from the North Atlantic (vital information to predict European weather several days later) was quite short, only a matter of a few seconds per message. In practice this meant that it would take quite a few men to be monitoring swept-frequency receivers at a shore station, either in England or the United States or Canada. Speed was of the essence because the messages were so short, so, when a man saw a new signal show up on his swept-frequency receiver. he simply turned on a shore based transmitter and shouted out the frequency that he observed. All HUFF DUFF equipped ships at sea would then tune to that frequency in the hope that then they would be able to obtain a cross bearing to the beam angle received on the shore, which the shore station would subsequently transmit in code. Note that only a shore station would actually transmit on the air. The transmission from the submarine would not have wide crossing angles (necessary for accurate location) when received by two locations on opposite sides of the Atlantic, so a cross bearing from mid-Atlantic is highly desirable for accuracy. If more than one HUFF DUFF receiver at sea is available, and they are close enough together to be able to use the TBS radio transmissions. The problem then is that the ships will probably not be far enough apart to get a wide open crossing angle for accuracy unless the Submarine is also very close

HUFF DUFF locations can be obtained without breaking radio silence, using a ship-based receiver, or even two ship bases receivers, if they were close enough together to use the TBS frequencies.

The real problem with shore based HUFF DUFF, is that most submarines are quite far away, and thus require that their received signals be "SKY-WAVES" reflected multiple times from the Ionosphere (and earth) sequentially and thus be a much less accurate angle than from a nearby-sourced Ground Wave.

SEQUENCE OF EVENT DIALOG FOR THE HUFF-DUFF DEMONSTRATION

Introduce your group to the demonstrator.

I am going to demonstrate a TOP SECRET device that was used on the SLATER during the BATTLE IN THE ATLANTIC. During WWII, the war with Nazi Germany would be won or lost in the Atlantic, because we could not even reach Nazi Germany without first crossing the Atlantic Ocean. Remember, WWII was before the advent of trans-oceanic aircraft!

The only way to get across the Atlantic Ocean was by ship! In fact the BATTLE IN THE ATLANTIC actually started in 1939, long before the United States went to war! The United States did not go to war until Pearl Harbor was attacked by Japan on December 7 1942. On that date, Hitler declared war upon the United States, so the war in Europe became a full blown World War.

WWII battles raged over many continents, but the longest battle of all was the BATTLE OF THE ATLANTIC, which went on continuously for six years, from 1939 to 1945, when the war finally ended. More than 100 thousand men died in this battle, and the SLATER, that you are standing on today actually took part in this battle!

The German Submarines in the Atlantic were sinking Supply ships going to England as fast as they could. Nazi Germany was trying to conquer England, and they had to stop all food, fuel, and military supplies from reaching England at all costs. There was an ALL-OUT war going on in the Atlantic starting in 1939. The United States was trying to protect our ships from the Submarines, starting in 1942, by sinking German Submarines that were endangering our supply ships. Of course, on December 7, 1942, when Hitler declared war upon the United States, we turned on the submarines as fast as we could, but not very fast, we did not have the ships needed. The ships that finally did the job were the DESTROYER ESCORTS, one of which you are standing on today.

Obviously, in order to sink a submarine, you must first LOCATE IT! Early in the war it was very difficult to detect the location of a Submarine, so we simply had to stumble about the ocean trying to get close enough to locate it with sound detection systems, which were very short range and didn't work very well either. England actually invented the HUFF-DUFF, and a very elaborate system was set up that spanned several continents to receive the signals from the submarines that were sent in every day to report in their activities to Germany.

The HUFF-DUFF radio location system that I am going to demonstrate to you was TOP SECRET in its day. Before HUFF-DUFF of course we could locate the direction that a radio signal was coming from, but the process was slow and cumbersome and usually required about several minutes to accomplish. The Germans knew this, so they kept the messages short, no longer than 20 or 30 seconds. This effectively prevented us from locating the Submarines in the early stages of the war. The HUFF-DUFF, when fully deployed, could locate the source of a radio transmission in seconds, and with a large network of receiving stations on ships at sea as well as numerous shore stations, it was often possible to get a very good idea of where the Submarine was located.

The Germans never did really catch onto what we were doing. They suspected that we could speed up the location process, but did not realize how fast we could locate a Submarine. Later in the war they started using mechanical transmitters (the forerunners of today's Data Transmitters), but it was already too late to change the outcome of the war.

