
Royal Canadian Navy Radio Operations During World War II

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During the Second World War, Canada played a vital role in radio operations by providing both technical expertise and manpower to support Allied radio communications. The Royal Canadian Navy (RCN), the Royal Canadian Army (RC Sigs), and the Royal Canadian Air Force (RCAF) all relied heavily on radio for navigation, coordination, and intelligence gathering. Canadian operators maintained ship-to-ship and ship-to-shore contact across the North Atlantic, enabling effective convoy protection against German U-boats. At the same time, Canadian radio intelligence units intercepted and analyzed enemy transmissions, contributing significantly to codebreaking and signals intelligence. These efforts not only safeguarded vital supply routes but also cemented Canada's reputation as a key contributor to Allied communications warfare. The purpose of this story is to summarize various aspects of Canadian naval radio operations

Introduction

Allan Riley enlisted in the RCN in 1939, immediately after WWII broke out, and served as a radio operator until 1945. Radio operators were called “Sparks” or sometimes “Sparkers” in that era. During his service, he maintained a diary of his observations as a radio operator. In wartime, keeping a diary or any photography of a ship’s radio room was expressly prohibited. However, some official photographs were taken (see Fig. 1). Much of his material has been incorporated into the story which follows. Thank goodness that Allan kept such a diary.¹

By 1941, low-powered, medium- and high-frequency radios were widely used for communications within task groups and convoys.² VHF voice radio was slowly being adopted thanks to developments in the Royal Canadian Air

Force (RCAF). During the period 1943 to 1945, the most important advance in wireless communications was the tactical use of voice radio. This explosion of voice radio communications reduced the role of flag or light signals and reduced the workload of operators using Morse code (CW). Note: In other contexts, voice and also radioteletype allowed communications to be used by virtually anyone, thus freeing up the skilled radio operator to focus on telegraph operations.

Direction Finding

High-Frequency Direction Finding

Most ships of the period between WWI and WWII were fitted with direction finders whose antennas consisted of a pair of crossed loops. They were generally described as navigational in nature, but they could have been conceived as a

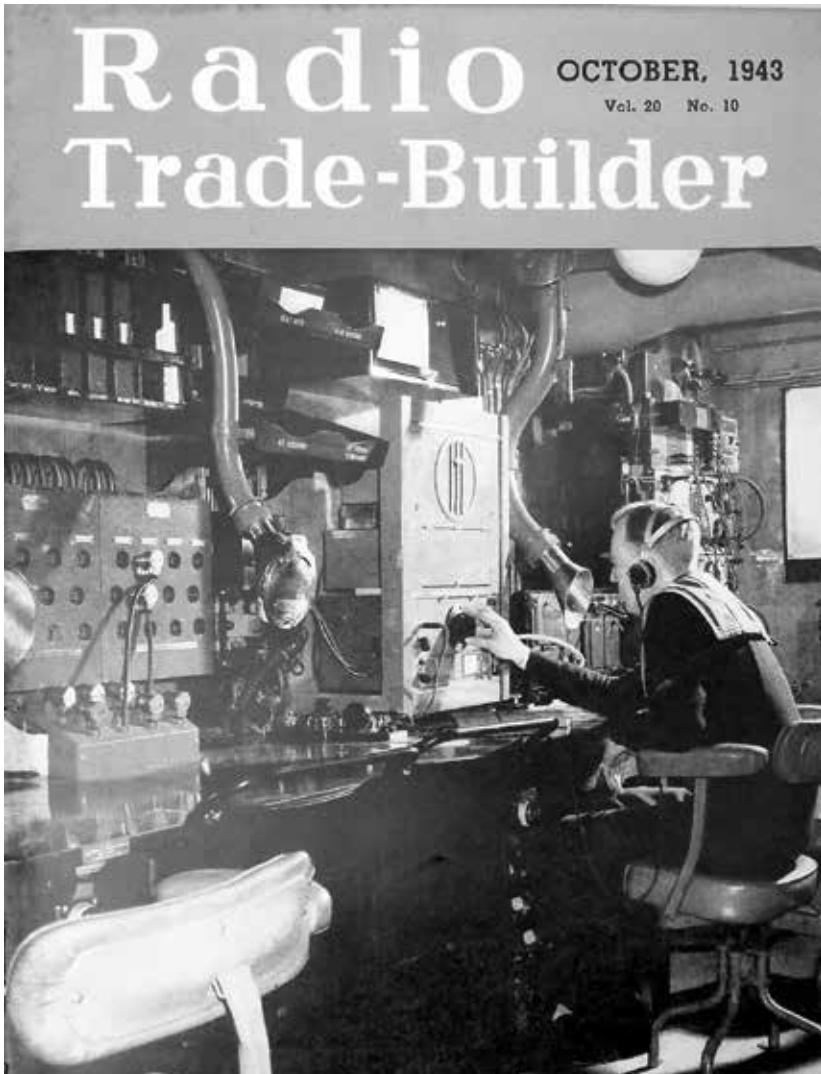


Fig. 1. This is a photograph of the radio office aboard HMCS *Iroquois* taken in 1943; it was one example of the period. (*Radio Trade Builder*, Oct. 1943)

means of detecting enemy transmitters just beyond the horizon. High-frequency direction finding (HF/DF), also known by the sobriquet Huff Duff, was a relatively new development at the outbreak of hostilities. Production was slow, and experience in correct operating

techniques had to be learned step by painful step. By the end of 1942, HF/DF was accepted as an essential part of the equipment that vessels had to carry. Later in the war, convoy rescue ships and some merchant ships were fitted with HF/DF sets. In retrospect, Huff Duff played an

extremely important part in the Battle of the Atlantic along with the emerging technologies of ASDIC (Allied Submarine Detection Investigation Committee, called sonar in the United States) and radar.

Because Canada did not have an electronics industry when WWII started, there was a dependency on having Canadian ships fitted with British electronics, much of which was designed to British Admiralty specifications. The FH-3 and FH-4 direction finding sets serve as examples of British designs (see Fig. 2, Fig. 3, and Fig. 4).

From the beginning of World War II, a shore-based Huff Duff organization was in existence. The network of stations in the British Isles gradually grew to include shore stations in Africa, Iceland, Greenland, Bermuda, and North America. In Canada, there were stations located at Cap d'Espoir, Quebec;

Coverdale, New Brunswick; Fort Chimo, Quebec;³ and Hartlen Point, Nova Scotia. In Newfoundland, there were facilities at Harbour Grace and Gander. A very active station was also located in Winter Harbour, Maine. Cross bearings could be taken by means of all these stations, and fixes were plotted by special tracking centers. Escorts would then be alerted and the courses of convoys altered, if necessary. Alternatively, aircraft or hunter-killer groups could be dispatched to the area of a Huff Duff fix.

In the summer of 1942, three British HF/DF sets were given to the U.S. Naval Research Laboratory for study and evaluation. By the fall of that year, sets were being installed in American ships because the Americans succeeded in developing their own Huff Duff, and called it Direction and Audio Quality (DAQ). In Canada, in September of 1942, the Canadian Naval Staff approved

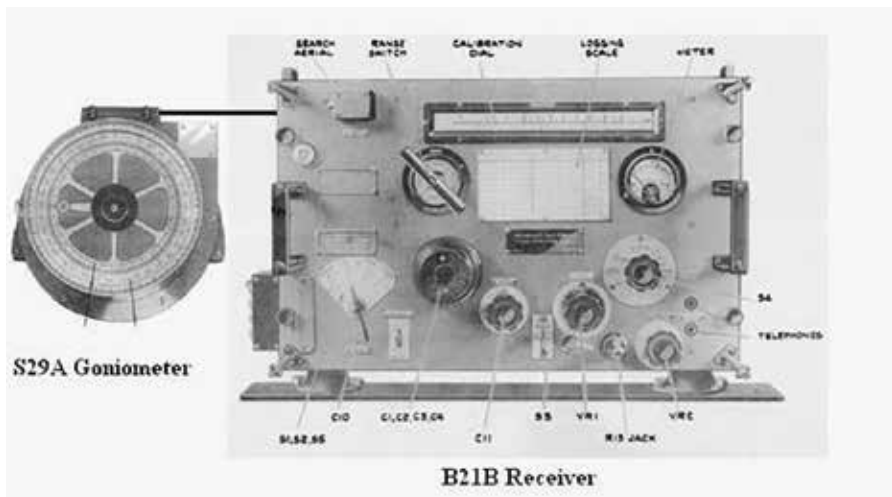


Fig. 2. The FH-3 HF/DF set used the B21 receiver which could tune the range of 670 kHz to 20 MHz. The goniometer determines the direction of the transmitter using a small search coil that is rotated. (British Admiralty photo.)



Fig. 3. The FH-4 HF/DF could tune the range of 1 to 25 MHz. (Photo by Øyvind Garvik)

in principle the fitting of the HF/DF set Type FH-3 in each Canadian destroyer of an escort group.⁴

However, RCN records indicate that the Canadian destroyer HMCS *Restigouche* had her Huff Duff set fitted earlier

when she was undergoing repairs in Londonderry, Northern Ireland, during the period December 1941 to March 1942. The ship's captain, Lt. Cdr. D. W. Piers, acting on his own initiative and against headquarters policy, convinced a British

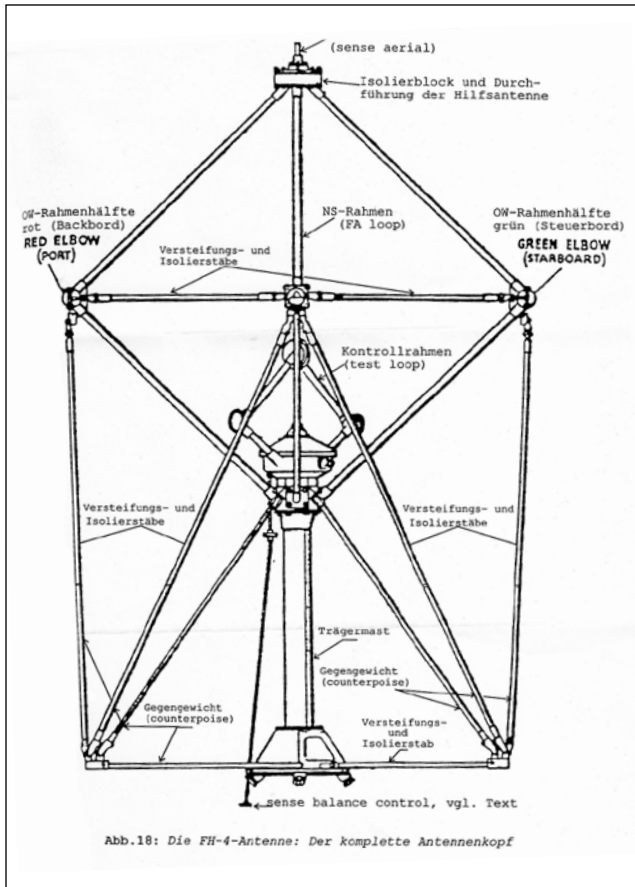


Fig. 4. The FH-4 used the birdcage antenna which was usually mounted on the highest mast of the ship. Due to the prevailing level of secrecy surrounding direction finding operations, the bird cage antenna was airbrushed from photos. This is an interesting drawing in that it has both German and English words. One might wonder if the antenna, when covered in arctic ice, caused difficulties in navigating the ship. Large antennas on Canadian ships in the Arctic in the old spark-gap days had such difficulties. (Image source unknown)

officer to fit the FH-3 set into *Restigouche*. Fittings in other ships occurred during the winter of 1942–43 with the installation of the new model FH-4 Huff Duff. When FH-4s were not available, FH-3s were installed in their place.

The problem of retrofitting a Huff Duff cabin into Canadian ships was solved in various ways. In the destroyer *Restigouche*, it was built on the upper deck amidships directly aft of the 3-inch gun platform, while the HF/DF mast and antenna were fitted to the forward end of the after superstructure. On Tribal

Class destroyers, the Huff Duff cabin was generally fitted over the crew's galley.

Initially, each Huff Duff-equipped ship was required to carry three additional wireless telegraphy (W/T) operators, and Canadian ratings for the Huff Duff branch had to come from the fleet. Telegraphists drafted for the special Huff Duff course had to obtain a Morse accuracy rate of 85% at eighteen words per minute in tests carried out by the Signal Training Centres. Special training consisted of a course in enemy W/T procedure, enemy W/T organization, and an

operations/maintenance course on the HF/DF equipment.

In the early part of the war, the limitations of the HF/DF system precluded accurate position finding of U-boats in the Atlantic. The gradual addition of more shore stations and the installation and improvement of Huff Duff eventually produced an amazingly accurate system. Naval Service Headquarters in Ottawa promptly received all U-boat bearings taken by the British. Ottawa was able to obtain fixes of enemy units in the area east of 30 degrees west longitude with equal efficiency and in approximately the same time as was done in the Plotting Centre at the Admiralty. The positions obtained by Huff Duff were then broadcast to the escorts at sea.

Occasionally, small problems arose. For example, during late 1943, the comparison of HF/DF bearing reports taken at sea with those of shore stations showed a constant reversal of sense (reciprocal bearing) when receiving U-boat transmissions on 4,000 kHz. Ships exhibiting this problem were HMS *Hotspur*, *Dundee*, *Berry*, and HMCS *Ottawa*. The discovery of this problem led to the requirement for frequent calibration of HF/DF equipment. When steaming close to shore, the direction finding came in handy in fog or when the “old man” was off course.

HF/DF was only part of the full communications equipment on board a ship. John Powroz of Bedford, Nova Scotia, describes some radio fittings on his ship when he joined the RCN:⁵

“At the time that war broke out in 1939, all RCN destroyers were fitted

with Royal Navy radio gear. When I joined His Majesty’s Canadian Ship (HMCS)⁶ *Restigouche* in 1940, she had, in the main radio office, a single tube, Model NT1, Admiralty Pattern transmitter with a spark gap transmitter as an emergency backup. All receivers were battery-operated. A secondary office next to the radio room now contained a low-power transmitter and receiver, and the space was also shared as a Fire Control office. During a refit, the radio office was altered. Now, a second low-power transmitter, namely the Admiralty Pattern Model 60, was added. Now, the ship had radiotelephone capability, but early in the game, only the captain was allowed to use it. In addition to the Model 60, we also had a Hallicrafters Model HT-4 transceiver, which was used as a voice intercom between ships. Voice communications took place on 2,410 kHz. The radio office was encased in copper mesh and covered by mahogany paneling. All wiring was lead sheathed, and the Morse keys were bolted to the edge of the desk. To this day, I still have and still use my Admiralty Pattern AP7681 key.”

Huff Duff Calibration

From time to time, Huff Duff required calibration. This involved taking simultaneous visual and radio bearings of a distant transmitting station on relative bearings around the compass at intervals not exceeding five degrees. To accomplish this, a ship would generally be anchored in open water, and simultaneous visual and radio observations would

be made on a transmitting station. This station was located on a small auxiliary vessel chugging slowly around the ship. Conversely, the calibration could also be accomplished with the ship being swung relative to a fixed radio station.

For HF/DF calibration, special auxiliary vessels were available on both the east and west coasts of Canada, including Newfoundland.⁷ Two of these were HMCS *Seretha* at St. John's, Newfoundland, and HMCS *Merry Chase* on the west coast. There were many different wireless exercises carried out during patrols. One such exercise took place with an aircraft. First, the aircraft was located using direction finding, and the bearing was then passed on to the aircraft using W/T. Then the aircraft would home in on the ship. The usual routine was for the aircraft to transmit its call sign along with five-second dashes on 375 kHz. The ship would take the bearing. The bearing and the time were passed to the aircraft on 3,925 kHz.

Tracking Down U-Boats

There was a more urgent need for HF/DF operators on Canada's east coast rather than the west coast. Normally, an operator would listen on an assigned frequency made known by the British Admiralty. These frequencies were listed in numbered sets called a Series. Two examples of these frequencies were 10,525 and 12,215 kHz. The regular and constant relay of information on convoy position, course, and speed back to German shore authorities on HF formed the basis of wolf pack operations.⁸ Once a member of the pack sighted the convoy, it was

usually tasked as a "contact keeper" until the pack was drawn in. This "shadower" made brief radio transmissions at regular intervals, followed by a short MF homing beacon transmission. The MF homing beacon was the only direct communication permitted between the U-boats, thus allowing the other members of the wolf pack to locate the convoy. As each U-boat gained contact with the convoy, it too made an HF report and continued to do so periodically until the action was over. Fig. 5 shows the radio room of a typical German U-boat.⁹

On hearing a U-boat transmission, the intercepting operator aboard an Allied escort ship would press a foot pedal, which activated a microphone. He would then shout a coded warning to other Huff Duff-equipped ships to tune the intercepted frequency. After the other escorts and the convoy rescue ships obtained bearings, the results would be passed to the senior officer (SO) of the escort group, and a fix would be obtained. If it were a 15-to-20-mile ground wave bearing, the senior officer would send an escort chasing down the bearing. The SO would also have a message transmitted notifying shore authorities of the U-boat's bearing or position.

Ashore, operators would listen and search on high-frequency intercept receivers. When a U-boat's transmission was picked up, the operator on watch would immediately warn another operator at a remote site where the actual work of taking another bearing would be performed. All Huff Duff operators knew how to recognize German transmissions, and there was no dearth of

signals. In the absence of HF/DF, the RCN also attempted to use the U-boat's own MF homing beacon, which could be received on the commercial MF/DF set that was fitted on many Canadian ships. Unfortunately, the MF signal diffused rapidly, and while it was sufficient to draw U-boats into the general area of a convoy, it was not sharp enough to permit an escort to locate a small and elusive U-boat.

The initial first sighting report by a U-boat invariably commenced with a recognizable symbol, namely, the B-Bar, followed by four letter cypher groups. The following is an example of a first sighting report: BB CLC WOND ETHG ISYO VNOC, etc.

When German headquarters needed to communicate with U-boats, they repeated all broadcasts at one-half to

one-hour intervals in case the transmissions were garbled. There was no need for the U-boat to signal receipt of a message. To the advantage of the Allies, the Germans' liberal use of radio made it possible for the British Admiralty in London to realistically make hour-to-hour tactical decisions, then transmit those decisions to commanders at sea. This information could be used to prevent the assembly of a U-boat formation or, in the worst case, reduce the number of U-boats to be dealt with when the attack finally came.¹⁰

Headache

Of interest was the function known as "Headache." This codename was applied to the shipborne sections of "Y" intelligence who were charged with the task of intercepting and reading German low-grade radiotelephone traffic, which had



Fig. 5. This is the very cramped radio room of the German submarine U-995. What is missing is the famous Enigma machine. (Photo courtesy Uboataces.com)

been steadily introduced since 1941.¹¹ Generally speaking, Headache operators came from a special branch of the Royal Navy and were fluent in German. Monitoring was performed using the Hallicrafters S-27 receiver (which received 27 to 143 MHz).

Every important warship in the D-Day armada and the bombing force was provided with a Headache unit for the interception and interpretation of enemy air and naval radiotelephone traffic on VHF. Fifty ships in all were fitted with Headache units in preparation for the D-Day invasion (see Fig. 6).

Lawson Gregory of Woking, England, relates his experiences as a Headache operator:¹²

“Having knowledge of German, I volunteered for any job where I could be of more use. When my ship, HMS *Zulu*, was sunk during the raid on Tobruk in September 1942, I was initiated into Headache. Once I was drafted to a ship, I was accompanied with a special VHF radio set, plus aerial, and of course a copy of the codes used by

the enemy. The presence of a Headache operator usually meant the ship would probably be very close to the German forces. On HMCS *HAIDA*, my action station was in a small office just below and aft of the bridge. Communication with the bridge was through voice pipe.

“Even when not at action stations, I would listen in. On one occasion, enemy aircraft were giving a sighting report on *HAIDA*’s position while she was in Plymouth! Overall, it was a fascinating job, almost guaranteeing action. On *HAIDA*, one of the tags on a telephone junction box in the Fire Control Room makes reference to the Headache Office. The receiver was given the Admiralty pattern designation RL85. Together with the aerial, it was referred to as Outfit QD.”

Decca Navigator and LORAN 'A'

During the war, the Decca navigation system was developed and installed in the United Kingdom. To ensure its secrecy, it was turned on the day before D-Day, then shut off on D-Day+1. It was a highly successful and secret system that enabled



Fig. 6. German VHF aeronautical frequencies were monitored using receivers like this Hallicrafters S-27 ultra high frequency communications receiver. (Photo courtesy UK Vintage Radio web page)

Allied minesweepers to clear naval minefields. Its existence was unknown to the Germans at the time. Decca's normal accuracy was about ± 200 meters or 218 yards. Accuracy and reliability were best within about 50–100 nautical miles. Typical results of a minesweeping operation are shown in Fig. 7.

The Canadian LORAN 'A' stations were critical navigational links in the North Atlantic LORAN 'A' system. With equipment installed in a Quonset hut, station Baker (Baccaro, Nova Scotia) transmitted signals to station Dog (located on Deming Island, Nova Scotia) and to one U.S. station on the east coast. The job of the WREN (Women's Royal Naval Service (WRNS) also known as WREN) operators at Baccaro was to keep the signals synchronized twenty-four hours a day. They worked regular four watches broken by the Dog watches (1600–1800 and 1800–2000 hours) for nine days on and three days off. During each watch, they spent roughly forty minutes on each transmitter to synchronize the signals. By the end of WWII, there were approximately 70–75 LORAN 'A' stations operating globally.¹³

Communications Security

Initially, a great problem presented itself with Allied communications. German shore stations, ships, and U-boats were always prepared to take advantage of any Allied radio indiscretion. One example of this was the excessive chatter that took place on the 600 meter band after the United States entered the war.¹⁴ In this, the Germans found the Americans sadly lacking in security as coastal defense

stations broadcast a veritable bonanza of intelligence. Incredible as it sounds, these stations actually transmitted anti-submarine schedules for ships, aircraft patrol times, and positions of ships at sea. Escort groups of the Newfoundland Escort Force were not above reproach. Regulations strictly prohibited breaking radio silence 48 hours before sailing. Ships, as a group, had the habit of tuning and testing their convoy escort frequency about an hour prior to leaving harbor. This always heralded within a matter of hours, the rendezvous with a convoy at WESTOMP (Western Ocean Meeting Point) off the Newfoundland Grand Bank. It was almost like sending the German U-boats an invitation on a silver platter. This practice of tuning and testing continued right into the 1960s despite the fact that operators were constantly reminded that this security violation would not be tolerated. After the 1960s, with the advent of secure voice and teletype circuits, radio silence was still practiced; however, with the proliferation of satellites, that silence was not very meaningful.

To ensure the authenticity of received messages, a procedure based on using special code words came into vogue. Usually, there were twelve code words allotted for a voyage. For example, the code word in force at the beginning of the voyage was "Flag." If this word were used, the number two word, "Purchase," would automatically come into force, and so on. This was a weak system, but it was better than having nothing.

When the TBS transmitter/receiver was introduced into service, it

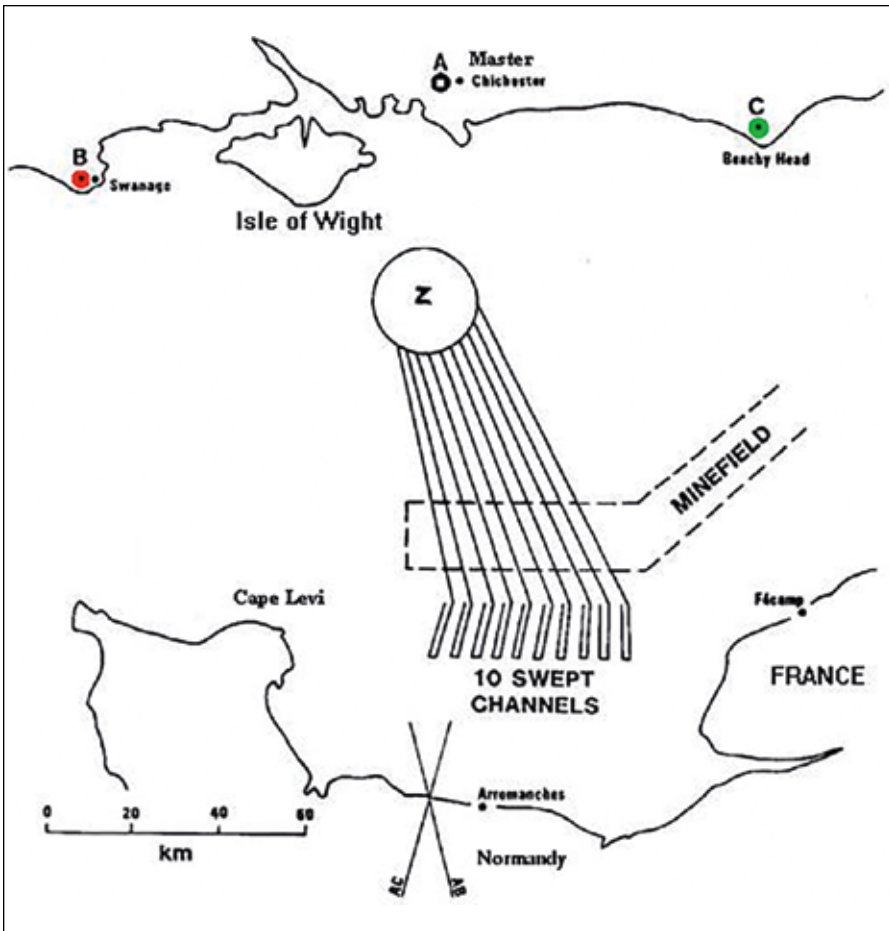


Fig. 7. This sketched map shows the swept channels made by the minesweepers. The circle with the letter Z was the rendezvous area for the minesweepers and was known as Piccadilly Circus. The Decca navigation system was instrumental in providing the necessary navigational information. (From the collection of Walter Blanchard)

undoubtedly initiated an era of indiscreet conversation between Escort Commanders, in the blissful belief that their very high-frequency TBS set was secure in line-of-sight communication. It later became known that radio waves, regardless of the frequency of emission, are at times propagated over distances beyond the normal usable ranges.

In the United States Navy (USN), the TBS was used primarily for maneuvering signals, which replaced flag hoisting. When a task group of over 25 ships is spread over 10 miles or more, flag hoists for maneuvering are not practical. At the time, it was the Navy's communications doctrine that any frequency above 30 MHz was considered line of sight

and secure. On occasion, the TBS could be heard at distances of 1,000 miles. So much for doctrine!

Early in World War II, the German Navy had been highly successful in pinpointing convoy locations. Their radio intelligence service, *Beobachtungsdienst* (B-Dienst), used sensitive direction finders by which they could reportedly detect radiation from regenerative receivers on board a ship up to distances of 100 miles away, but there is no evidence to actually support this claim.

If there was a likely source of radiation, it would have come from regenerative receivers fitted aboard many pre-war merchantmen. They were still there because ship owners had suffered through the Depression years with limited capital for radio modernization. Simple regenerative designs without RF amplifiers are famous for radiating, even to the point of being usable as transmitters at very short ranges. In time, this was suspected by the Allies as a source of radiation (real or imagined), so merchantmen in convoys came under strict radio silence for both receivers and transmitters through much of their voyages. Under these conditions, the only means of communication between ships was by flags or flashing lights. It must also be noted that there was not a single documented case of any German submarine ever locating an Allied convoy ship by the detection of radiation from a regenerative receiver. A U-boat could acquire more useful information by listening for propeller sounds rather than wasting time on the surface searching for weak radio signals.

Frank Dukat of Los Altos, California, was an Anti-Submarine Warfare Officer with the U.S. Navy during World War II. He gives a glimpse into the methods used to report the vicinity of U-boats.¹⁵

“During World War II, the North Atlantic was ringed with a network of radio-direction finding stations. Using Adcock direction finding antennas, they monitored the U-boat “reporting” frequencies. The operators copied exactly what they heard and immediately relayed that information along with date, time, frequency, and bearing to a central collection point. This data was compared and analyzed, and an approximate position of the transmission was determined. Once a day, a report was broadcast giving the estimated time and position of the U-boat which had made an identifiable transmission.

“The system worked very well and was aided by the fact that the U-boats never changed frequency in the early days of the war. Admiral Doenitz’s communicators felt that the resultant confusion caused by numerous frequency changes was not worth the risk. It would also be noteworthy to mention that the system of direction finding from ships was not introduced until later in the war.”

Jamming

Sometimes it is asked if the RCN jammed enemy radio transmissions during WWII. No evidence of that has ever surfaced, but the RCN definitely tried to jam the German radio-controlled

glider bomb. This excerpt from *Radar Development in Canada* expands on that point.¹⁶

“The war was marked by a large number of uses of physics, and especially of radio, both offensive and defensive, by both sides. In the fall of 1943, a new German offensive weapon became unpleasantly effective in the Mediterranean. This was the radio-controlled glider bomb, launched from high-flying aircraft and controlled by radio signals. But there was a defense. It was found possible to make the enemy lose control of the bomb by jamming the control frequencies with a high-power frequency-modulated transmitter.

“The procurement of such transmitters was the object of a crash program started at the request of the Royal Canadian Navy in February 1944. Five transmitters were requested, and also parts for twenty more to be assembled by the RCN at St. Hyacinthe, Quebec. It is difficult to believe that the first equipment, complete with spares, was shipped to Halifax on March 28, and the other four in April.

“The transmitter provided an output of 1 kW, frequency-modulated, and was scanned over a 4 MHz bandwidth in the region between 42 and 75 MHz. The output was also amplitude modulated at 60 cycles. This may or may not have made it more effective, but it certainly made the apparatus simpler by doing without a rectifier in the high-voltage supply. The frequency modulation was performed by a variable condenser rotating at high speed.”

Cryptography

Another notable development during WWII was the German Naval Enigma machine, which was a cipher machine utilizing a typewriter-style keyboard and a selection of internally mounted rotors which produced millions of different coding combinations. Although the people at sea were not aware of it, the British were having some success in breaking the Enigma cipher.

After the war, there was an astonishing discovery which showed that the Germans had great success with breaking British naval ciphers and those of Canadian ships as well. The German wireless observation service, known as B-Dienst, was of particularly great assistance to Admiral Doenitz during the crucial early months of 1943. At this time, the monitoring service frequently provided him with deciphered convoy details. This recovery of information was not a decisive advantage for the Germans. It was more than offset by the Allies' coordinated use of Huff Duff, radar, and ASDIC in tracking and destroying U-boats.

At the beginning of World War II, ships in the Royal Canadian Navy were not equipped with any machines for coding or decoding messages. All decoded messages were logged in a book. Encrypted traffic was received in four-letter groups and decoded using codebooks. The first several characters of a message indicated which book and page to use for the message decode. When the code books were not in use, they were placed into special canvas bags equipped with lead weights. There were standing orders

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to throw the bags overboard in the event that the coding books might be captured by the enemy. Additional security for the coding books was afforded by their placement in a locked storage area. On some ships, this could mean anywhere. On HMCS *Niagara*, the coding books were stored in a converted refrigerator.

By April 1944, the CCM (Combined Coding Machine) adapter was fitted aboard numerous RCN ships. This was a common cipher machine system for securing Allied communications during World War II and for a few years afterwards amongst NATO member countries. The British Typex machine and the U.S. ECM Mark II were both modified so that they were interoperable

using the CCM adapter. CCM was initially used on a small scale for naval use from November 1, 1943, becoming operational on all United States, Canadian, and United Kingdom armed services in April 1944. Some of the machines used are shown in Fig. 8, Fig. 9, and Fig. 10.

Morse Code Messages and Fleet Broadcasts

Incredible as it sounds, the opportunity to transmit in Morse code was well appreciated at times because radio telephony or flashing light was the predominant form of communication when ships were in convoy. Ken Hedley, a former HMCS *HAIDA* telegraphist, expands on this statement.¹⁷



Fig. 8. Typex Mk 22 cipher machine. It employed five rotors and one reflector plus plugboards. A good operator could key the machine at 40 wpm. (Bletchley Park photo via Wikipedia)



Fig. 9. The CSP 1600 (CCM) was the stepping unit to adapt the Typex to the ECM Mark II. Sadly, this example is missing its rotors. Out of the 400 ships on strength with the RCN at the peak of WWII, 200 of them were fitted with Typex/CCM. (Photo via Crypto Museum)

“During the war, W/T silence prevailed. When a communique was to be sent by key, every operator clamoured to transmit the message. During my six years of service in the Navy, I didn’t get to send one message by key. On the mine sweeper HMCS *Gaspé* and the patrol vessel *French*, the radio office was staffed with two operators. One of the ops said, “We never got a chance to transmit anything, and the only message that we ever received after two or three days at sea was RETURN TO HARBOUR.”

Ships at sea would maintain radio-telephone watch on 2,410 kHz when in

convoy and standing a VHF watch using TBS equipment (60 to 80 MHz) while still copying the broadcast. Anytime that a U-boat was spotted, out went the alarm to the escorts on 2,410 kHz. On many occasions, the sighting would also be reported to other ships by flashing light. The frequency of 2,844 kHz was used for secondary ship-to-shore communications.

When west of 32 degrees west longitude, escort ships listened to the “L” broadcast from Halifax sent on 105 kHz. When east of this line, ships listened on 107 kHz to the “BN” Whitehall broadcast from the UK. The 32 degrees west longitude line is shown in Fig. 11.



Fig. 10. The American ECM Mk II cipher machine was also known as SIGABA. (Photo by Ralph Simpson)

When the changeover time came, two ships were always detailed to guard the overlap period, so no messages would be missed. For example, during a west-bound trip, after the changeover to the Halifax broadcast, one corvette was detailed to guard the Whitehall broadcast from 30 West to 37 West. Before the changeover, another corvette would have been detailed to guard the Halifax broadcast from 23 West. Since the broadcasts were simulcast on high frequency, there was not much chance of messages being missed.

Using a pencil, the operator would copy broadcast messages from shore authorities onto a naval message form, which, in the short form, consisted of 50 blocks, or 100 blocks in the longer form. At the top of the form, the operator entered the coded, lettered address delivery groups, while into the blocks went four-figure cipher groups. At the bottom were spaces for logging the time of receipt, the operator's name, the frequency, and other particulars. Without a doubt, the broadcast operator was kept fairly busy filling in these forms,

especially with long messages pertaining to convoy positions and U-boat situation reports.

Straight keys were used to transmit Morse code. When close to shore, a 'Local Port Wave' was available for calling shore stations. One notable difference in operating technique was to depart from international procedure and use the letter V instead of DE to denote the word 'from.' The three-letter Q signals that most amateur radio operators are familiar with were not used. Instead, the RCN used X signals.¹⁸ Here is a sample of a message: JVD V RZY X257.

This message means: "Ship with call sign JVD from ship with call sign RZY. I have nothing for you."

Off duty and at sea, telegraphists took turns scrubbing the mess deck and the W/T office deck. In a harbor, a telephone link could not be established if the ship was anchored in open water.¹⁹

Wireless Training

Signal Schools

The Signal School at St. Hyacinthe, Quebec, was very instrumental in training thousands of wireless operators during World War II. It had moved from Halifax to St. Hyacinthe in the summer of 1941. Modern buildings, numbering about 73, were spread over a 25-acre site. This facility housed almost 3,200 officers, ratings, and WRENS, involved in all phases of communications training. (Note: A naval enlisted man is known as a "rating." A naval enlisted woman is known as a "WREN," Women's Royal Canadian Naval Service, abbreviated as WRCNS or WRENS, and both are pronounced as WRENS.)

This was a sharp contrast to earlier complements, when, for example, in December 1942, the complement stood at 921, of which 40 were officers. It had become relatively easy for St. Hyacinthe

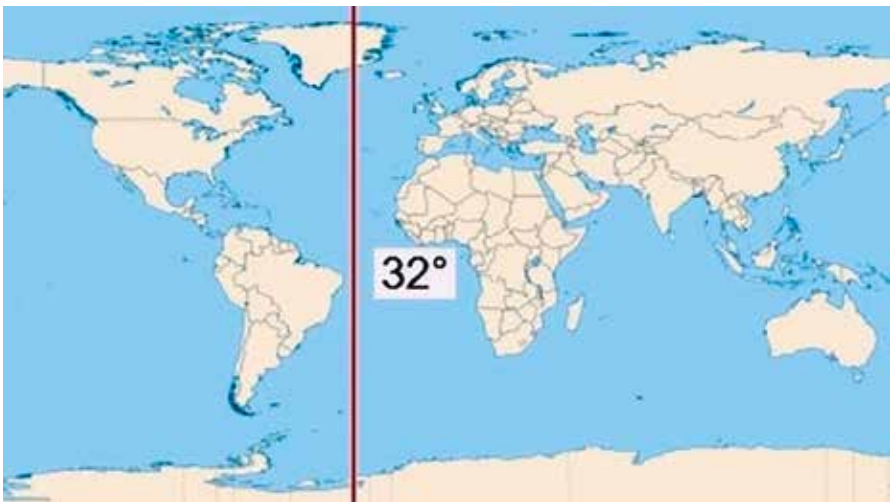


Fig. 11. The location of 32 west longitude (a.k.a., 32 West) is roughly in the middle of the North Atlantic Ocean. (Author)

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to produce good communicators, but it was not always the case. Since the beginning of the war, effective training in the signals branch had been made difficult by the poor selection of recruits. In December 1940, an educational standard for visual signalman (V/S) and wireless telegraphists (W/T) had been established, namely that ratings should have at least two years of high school.

In the years before WWII, training for telegraphists took about a year. After the war started, that period was reduced to approximately three months with intensive work. The Morse code test given at the end of the course varied between thirty and thirty-five words per minute (wpm), and one's marks were usually commensurate with ability. If a student failed his exam after six weeks, he was either assigned as a stoker or a seaman until the summer of 1941. After that, the RCN decided that they would start a coders course, and those who failed as signalmen or W/T operators would become coders after taking a six-week course.

As the need for more coders rose, the RCN recruited men just for the coding branch. Coders took a plain text message and encoded it before transmission over the radio. They also decoded incoming messages into plain text.

By 1944, major improvements in training had been made, and despite any earlier apprehensions, St. Hyacinthe was able to turn out a proficient and worthwhile product for the ships and establishments of the navy. Communications training at St. Hyacinthe now consisted of courses for visual signalmen, wireless

telegraphists, coders, radar operators, and radio artificers.

The oldest method of communication taught at St. Hyacinthe was visual signaling. This subject covered flag hoisting, which entailed memorizing the colors and meanings of more than 80 signal flags, and how to prepare and hoist the many various flag signals quickly and correctly. Signaling by semaphore and directional signaling by flashing light were of paramount importance because of the exceptional need for this type of signaling in wartime.

A small number of ratings were specially trained as convoy signalmen. Their duty, essential during wireless silence, was to serve in merchant ships so that these ships could maintain proper contact with the warships forming the escort.

Telegraphists began their studies by entering the 'Morse Pool,' also known as the 'Buzzer Pool.' In 1941, ratings could not join a regular class until they could read Morse at 12 wpm. The Morse Pool provided the opportunity to gain this speed, with the average length of time spent there being five and a half weeks. The regular course of twenty-one weeks duration covered a general knowledge of receivers and transmitters, wireless organization, direction finding, radio telephone procedure, along with transmitting and receiving Morse code at 22 wpm.

Typewriters did not come into general usage until late in the war, so any Morse code messages (CW) had to be copied with pencil and paper. Telegraphic typewriters were first issued to His Majesty's Canadian Ships starting around mid-1945.

The longest course given was one for radio artificers. New students for this course were required to have an education equivalent to grade 12 standing and manual skills. These manual skills included welding, lathe work, soldering, metal casting, and other high-precision work. During the second half of the course, they applied their knowledge to wireless and radar equipment. On graduation, they were qualified as Radio Artificer Fifth Class, just below the rating of a Petty Officer. Once aboard the ship, the radio artificers seemed more involved with radar repairs and spent very little time on W/T maintenance. The W/T operators usually completed their own technical work or waited for the ship to return to port. Either way, artificers were not available in any great quantity until the latter half of the war.

At peak strength, the communications branch of the Royal Canadian Navy contained about 9,300 ratings. Of these, 3,200 were telegraphists, 2,338 were signalmen, about 1,000 coders, 2,200 radar operators, and 399 were radio artificers. It is significant to note that the bulk of these were trained at St. Hyacinthe.

Pay Scales

Although not directly related to radio, it is interesting to note what the RCN paid their radio personnel. The RCN pay scale for a leading telegraphist in 1944 was approximately C\$72 per month or C\$2.40 per day. The variance between a leading telegraphist and that of a telegraphist was not that great. The telegraphist received C\$2 per day, while a telegraphist

trained operator (Tel/TO) was only 5 cents more a day. One had to pass the trained operator exams to receive five cents more per day. Of course, the Tel/TO rating was necessary before going on to further training as a leading telegraphist. By comparison, the starting pay for a rating was C\$1.10 per day, and an extra 25 cents per day was paid for Corvette duty. This was called hard layer's pay.

Another rating in the radio department was known as the telegraphist special operator (Tel/SO). This function monitored German naval traffic and took bearings on their submarine transmissions in the HF bands. A Tel/SO progressed through the ranks just like the other operators, but there were no badges to distinguish a special operator due to the prevailing level of security.

During WWII, the Naval Service headquarters in Ottawa made a decision, based on security considerations, to discontinue the wearing of cap tallies²⁰ bearing the actual names of HMC vessels. For the duration of hostilities, all sailors would wear HMCS only. However, many of the crews took it upon themselves to individualize, or "tiddley," this item of uniform dress by adding such designators as DESTROYER, CORVETTE, MINESWEEPER, etc. This departure from naval procedure was soon banned by another directive, which stated that only HMCS shall be worn as a cap tally.

Comedy in Signaling

During World War II, much of the signaling at sea was done with light, and secondarily with radio. As a result, the sender would tend to be as brief as

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possible. The same would apply to messages sent by CW. Some of this brevity can be best expressed in the sample stories which follow.

A little armed coal-burning trawler, the smallest ship in a convoy escort off the coast of Scotland, was investigating an underwater contact. The large flag fluttering from her foremast attested to this fact. This small ship was hardly moving through the water while probing the depths with her primitive ASDIC. Then her hoist went close up to the yardarm, indicating that she was attacking with depth charges. On the bridge of another ship, someone gasped, "My God, at that speed she will blow herself out of the water." Suddenly, the ocean around the little ship erupted in towering fountains of water, which hid her from sight. After what seemed an eternity, the little ship came into view. Her stern staff had disappeared—blown clean off; she had a list to port, and her steering gear was damaged. Finally, she came to a stop with clouds of steam pouring out of the engine room skylight. Immediately, her signal lamp began to chatter, and everyone read the simple message as it spelled out: "I HAVE BUSTED MYSELF."

What could be shorter than the greeting flashed by the destroyer HMCS *Restigouche*, whose pennant number was HOO to the auxiliary vessel bearing the identifying number of YOO:

From HOO to YOO: "YOO HOO"

In another example of brevity, a number of senior escort officers, particularly those of the Royal Navy, developed the

habit of sending signals which merely contained a biblical reference of chapter and verse. The recipient would have to reference his own Bible to clue into the message. This business of biblical signals became a great cult, and it became necessary to keep a copy of the Bible (King James Version, of course) on the bridge. A treasured example was this signal sent by the Commander-in-Chief, Plymouth, England, to a corvette towing a damaged merchantman:

"ROMAN EMPEROR IN TOW,
BADLY DAMAGED, PLEASE SEND
TUGS."

From C-in-C, Plymouth: "REVELATIONS CHAPTER 3 VERSE 11."
(Translated—Behold, I come quickly; hold that fast which thou hast, that no man take thy crown).

Sometimes the shore authorities were out of touch with reality, as evidenced by this message:

From Admiralty to destroyer: "PROCEED WITH ALL DESPATCH."

From destroyer to Admiralty: "REQUEST DESTINATION."

From Admiralty to destroyer: "ADEN, REPEAT, ADEN."

From destroyer to Admiralty: "AM AT ADEN."

Later on:

From Port Authority to Corvette: "WHAT IS ALL THAT LAUNDRY HANGING UP FOR?"

Reply from Corvette: "SUBMIT, TO DRY."

In closing, it is hoped that this glimpse into RCN naval radio operations has been covered sufficiently. Flag, light, and semaphore signaling are also part of naval signaling; however, those are topics for another day.

Endnotes

1. Allan Riley, *A Sparker's War*, self-published book, 2005.
2. A task group is an armed force organized for a special operation. A convoy (here) is a group of ships traveling together.
3. At this time, it is not known what role Ft. Chimo played in WWII HF/DF activities since the U.S. military set up a base there called Crystal 1 in 1942. Chimo was activated as a direction finding station in the 1948–49 timeframe when it became part of the Atlantic HF/DF network.
4. A destroyer in an escort group was designed for anti-submarine warfare, radar picket, and convoy protection. They were usually slower than fleet destroyers, but carried additional sonar, radar, and depth charges.
5. John Powroz conversations.
6. As a general note, the prefix HMCS can have one of two meanings depending on the gender of the reigning British monarch. It can be either His Majesty's Canadian Ship or Her Majesty's Canadian Ship. Since King George VI was the reigning monarch during all of WWII, the word "His" will apply to HMCS.
7. Newfoundland joined Canada in 1949.
8. Wolf pack operations refer to coordinated group-based tactical strikes, historically used by German U-boats to overwhelm shipping convoys.
9. <http://uboataces.com/>.
10. I have previously written about the monitoring of German submarines from stations in Ottawa in previous editions of the *AWA Review*. Also see Ernie Brown <https://va3oeb.wordpress.com/va3oeb-merchant-navy-sparks-part-2/>.
11. "Y" service was a critical network of British signals intelligence collection stations designed to intercept enemy radio traffic for analysis. For further information, see *The Secret Listeners: How the Y Service Intercepted the German Codes for Bletchley Park* by Sinclair McKay, which details the vital role of these global listening stations in providing intercepts for Bletchley Park codebreakers, featuring personal stories from veterans. Another book is *The Enemy is Listening: The Story of the Y Service* by Aileen Clayton, focusing on the human experiences within these secret intelligence operations.
12. Lawson Gregory conversations.
13. E-mail correspondence with Walter Blanchard, past president of the Royal Institute of Navigation.
14. The 600 meter band (frequencies around 500 kHz) was used for international calling and distress, not chit-chat.
15. Frank Dukat conversations.
16. W. E. Knowles Middleton, *Radar Development in Canada: The Radio Branch of the National Research Council of Canada 1939–1946* (Wilfred Laurier University Press, Waterloo, Ontario, 1981).
17. Ken Hedley conversations.
18. E-mail correspondence with Ray White, RCN radio operator. Email correspondence with Spud Roscoe, former RCN radio operator. E-mail correspondence with Jim Sylvester.
19. E-mail correspondence with Allan Riley, RCN radio operator, 1939–1945.
20. A cap tally is that band of material which encircles a sailor's cap and indicates the name of the ship.

About the Author

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Canada. Later, he obtained an Advanced Networking Certificate through the Continuing Education Studies program at Humber College, Etobicoke, Ontario. Jerry has served in both a technical and managerial capacity in the mainframe computer and data communications field since 1970 and is currently retired from Bell Canada, where he was employed as a network support specialist. Jerry Proc can be reached at: jerry.proc@sympatico.ca



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