Across the Ocean on the NC-4

The Personal Narrative of the Wireless Operator on the Naval Seaplane Which First Spanned the Atlantic in an Historical Air Flight

By Ensign Herbert C. Rodd

I EXPECT that it is up to me to tell, as best I can, just what happened in wireless when the NC-4 made the historic flight across the Atlantic.

The explanation of how the radio equipment was used, and the very great assistance it afforded us, presents no difficulty; but the thing which I find very hard to reconcile with this workaday job is bathing the task in the floodlight of an heroic action. I simply cannot view it that way. The wireless operation of the NC-4's equipment was carefully planned and easily executed; I must say at the start it required no special effort of the superhuman order, as many of the descriptive writers have pictured it. My principal impression of the part I played in the history-making episode is a sense of gratification that the selection of this task happened to fall on me.

The flight in itself was extremely interesting, and I can truthfully say that the success of the wireless communication exceeded all my fondest expectations. If I can convey in this article and its successors, exactly what was accomplished in radio communication during the flight, tell the tale without any embellishments and make the reader understand by inference, more than by power of descriptive writing, how fascinating the manipulation of the apparatus became, then I will feel that the purpose of these articles has been achieved.

Ensign Rodd

Let me first briefly describe the apparatus. The NC-4 had a 500-watt propeller-driven spark transmitter, a 5-watt battery-driven telephone transmitter, an aircraft type receiver and a radio compass equipment consisting of a revolving set of coils operating in conjunction with a compass control panel and an amplifier. Transmission and reception was arranged for either on an antenna stretched between the skid fins on the upper plane, or on a single-wire trailing antenna. The apparatus was located in the aft portion of the boat and was arranged as shown in one of the photographs accompanying this article.

In this photograph the reel of the trailing antenna may be seen to the extreme right. Alongside is the variometer assembly for the spark transmitter. A large special send-receive switch was mounted against the side of the boat; below this on the table may be seen the telephone transmitter and the switch by means of which the amplifier could be used in conjunction with the compass equipment or with the standard receiver. The wave length of 1,500 meters was the one arranged for most efficient operation of the compass. The inter-communicating telephone system was arranged so that the radiophone could be used by either Commander Read, located forward in the craft, or by myself as operator.

During the trans-Atlantic flight I kept a very complete log and this enables me to describe nearly everything that happened, right from the beginning. I am unable to give the exact wave length on which each communication was copied, but it may be generally understood in all that follows that 1,500 meters was used by the destroyers, except when I requested them to transmit on 1,200, 952 or 756 in order to eliminate interference. Communications from the NC-4 were transmitted on a wave length of 425 meters. As we passed each destroyer the time by the clock was immediately broadcasted on 756 meters and this information was then broadcasted by me on 425 meters.

Dispensing now with the earlier preparations preliminary to the actual attempt to fly across the ocean, it may be said that it was on May 6th at 3:30 in the morning when the radio installation on the NC-4 was completed. Within an hour we were expected to make ready for the start, but an unfavorable weather report came in and the flight was delayed, giving me the opportunity to spend most of the day in the boat selecting vacuum tubes for both the amplifier and continuous wave transmitter.

When Norfolk station began on the afternoon schedule, I took bearings, to make sure that the fixed condensers in the radio control panel were adjusted to 1,500 meters. A wavemeter had verified the adjustment, but no tests had been made with the station actually working. The variable condenser in the control panel had a capacity of but .0005; because of the extra weight of larger condensers a fixed capacity was shunted across each variable.

There had been no opportunity to test the radio apparatus in flight, and it looked very much as if the NC-4 would leave Rockaway without knowing whether things would function when the plane took the air. On the following day, however, the weather cleared and at 5 in the afternoon we had everything in readiness to make a test flight. The boat was taken out on the runway and just as we were about to slip down into the water the engineer officer put his foot through the generator's propeller, breaking both blades. This accident was due to the fact that the center engine was running and its tractor propeller had caused the air screw of the small generator to run at such high speed that it was not seen.

A most unfortunate accident also occurred at this time. Chief Special Mechanic E. Harry Howard caught his hand in the propeller, severing the member completely at the wrist. He showed a great amount of grit by refusing to be helped down from the plane, and so challenged our admiration that had it not been our last chance for the test flight, we certainly would have given it up for the day. It was rather rough on Howard to be eliminated from the flight at this late date and we all extended our deepest sympathy to him.

There was no time to be lost, however, as it was

growing dark, and when I told the Navigator that it would probably take fifteen minutes to change the generator air screw, it was decided that we would leave without effecting repairs.

This flight gave me an opportunity to test the continuous wave transmitter with the station at Rockaway. The skid-fin antenna was used and the buzzer signals were easily readable in the air. I found, however, that the telephone did not work to full satisfaction, except when the plane had come to rest on the water with the motors stopped. This was the first time I had tried out the trailing antenna arrangements and the ease of operation of the metal reel surprised me. We remained in the air about two hours, which gave me the opportunity to hear a sufficient number of distant stations with the amplifier and warranted no worry on that score.

The following morning at 4:30 the eventful moment of the start arrived, for it was then that we were awakened and told to make our final preparations for the departure. At 8 o'clock everything was ready; all mechanical and electrical needs had been provided for and food and coffee in Thermos bottles had been put aboard. Especially thorough was the preparation for personal solace in the form of nicotine. Each man had been allowed five pounds for personal effects, exclusive of his flying equipment. Kit bags made of light balloon fabric were provided, and I feel quite certain that had these been weighed after they had been put aboard, they would have found that the limit was well exceeded on account of the generous stock of cigarettes supplied for each man. As a final touch, Captain Irwin presented members of the crew with four-leaf clovers.

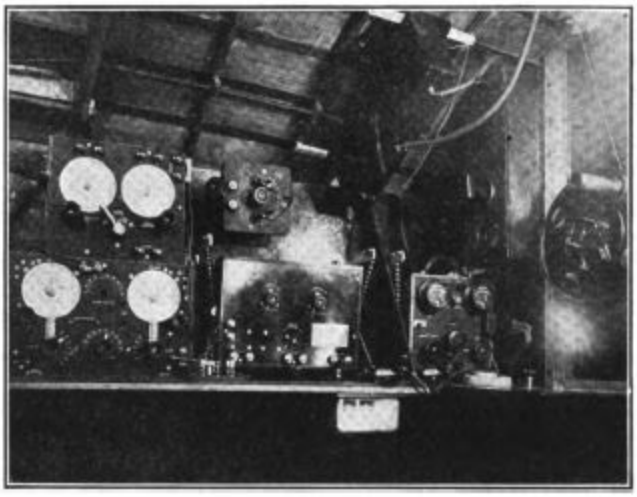
We left Rockaway at 10 in the morning of the 8th of May, my seaplane getting off just after the NC-3 and just before the NC-1. Several other planes accompanied us for a distance of perhaps 25 miles; these were equipped with moving picture cameras and recorded the early stages of the eventful trip.

It did not take me long to get down to business. The immediate result was nearly fatal, for I was ready to jump out of the cockpit with joy when, upon throwing in the field switch and depressing the key, a beautiful spark note greeted my ears through the head phones.

It was a great relief to know that everything was hooked up properly, for I had feared that in the rush, and because of the necessity of working outside of the hangars at night with a poor light, we might have mixed up our power leads. When I adjusted the variometer it showed a radiation of 3 amperes on the skid-fin antenna, and the NC-1 came back immediately, saying that my spark was good. A little personal touch was added then by a good-luck message which came to me through the ether signed by Wise, Jones, Parks and all the rest—radio electricians who had worked to get us in shape.

Twenty-seven minutes after we hopped off, all three of the NC craft had adjusted things and we were in communication with each other. Three minutes later New York and Boston broadcasted that the NC boats had started the trip to Halifax. It was then that I let out my trailing wire.

There seemed to be something doing every minute. Less than three-quarters of an hour after we had started there came a congratulatory and goodluck message from Admiral Coffman, Commandant of the Third Naval District. Within five minutes I received a long message via Rockaway which had come from Admiral Knapp in London, stating that the British Air Ministry had made arrangements to extend every facility and convenience to the NC flying boats at Plymouth when the trans-Atlantic flight had been completed. We were offered the Air Station in the Scilly Islands as a temporary repair or refueling point. I recall that at the time this message seemed a little far fetched, but with it came a feeling of appreciation of the undeniable cordiality of the British and their interest in our success.



The wireless apparatus located in the aft part of the NC-4. To the right may be seen the reel of the trailing antenna, alongside is the variometer; the send-receive switch is attached to side of boat; below that the telephone transmitter and switch for amplifier to be used in conjunction with compass equipment or standard receiver

Fire Island called a few minutes later and wished us good luck. We had then been in the air less than an hour and a half, and I told Rockaway "Everything O. K. 2,000 feet altitude." As I completed this message, I heard Norfolk transmitting on 952 meters, 400 miles distant.

About this time my deep cupped receiving helmet had become uncomfortable and I changed to one which employed ordinary bath sponges, a helmet which had been made at Hampton Roads by Lieutenant-Commander Taylor—one which I had used with great comfort and success during flights totaling several hundred hours. It might be of interest to note here that Commander Read wore the helmet which had been supplied throughout the entire flight, a very creditable performance because pilots have always worn this type of helmet with reluctance, showing a decided preference for the ordinary type which is much lighter.

We passed Montauk after one hour and fifty minutes of flying. It was here that I got a bearing on Philadelphia on the 1,500 meter wave length. It checked up roughly and the signals came in loud on the radio compass. This early indication that the direction finding apparatus was O. K. was very reassuring.

During the next hour I heard the NC-3 working with destroyers No. 1 and No. 2 which lay off Boston and were sending weather reports. New York also asked us to listen for his telephone at 1,200 meters, but it was not audible. Then I heard the operator at Siasconset station asking if we had anything for him. A message from Assistant Secretary of the Navy Roosevelt arrived a minute later.

The next use of the apparatus was of a practical order, demonstrating its value in navigation. The 1 o'clock time tick from the high power station at Arlington came in strongly, and I switched on to the Navigator's phones so that he could check his chronometers. Immediately afterward the air station at Chatham requested our position, and relayed a message from the "Baltimore" at Halifax,

giving weather conditions at that point. This report contained the disturbing information that an hour earlier the northwest wind had a velocity of 37 miles per hour. As this was an important matter for the information of the Navigator, I immediately sent it forward to him.

When we had been in the air four hours and a half the Navigator instructed me to inform the NC-3, our flag-plane, that we had passed over destroyer No. 1 and that we were now running on three motors. In spite of the loss of part of our propelling power we had been keeping up with the other planes, but for some little time it had been noticed that something which looked like oil was streaming out of one of the center motors. Had it not been for the leak here which drained the oil from the forward center engine, we would have made Halifax all right; but when that motor went dead it immediately became evident that with our loss of altitude, which had been rapid, we would not be able to fly far with only two engines in operation. So both center motors were cut off and we glided for landing.

I tried to send during the glide, but could not get a spark, so the destroyers were not informed that we were coming down. The air screw of the generator was located in the propeller slip stream and it was afterward determined that the generator screw turned only when the center tractor was running, showing that the air speed of the NC-4 did not influence the speed of the generator.

The accident which brought us down was the breaking of a connecting rod in one of the motors. A big piece was knocked out of the crankcase and it is still a matter for wonder that no one was hurt and that the pusher propeller was not injured by the flying bits of aluminum.

Immediately after the landing I was given a message to send in the event that I could raise one of the stations. It gave our latitude and longitude and stated that we would probably not require assistance. I called destroyers

The NC-4 at Rockaway Point receiving the final inspection previous to the trans-Atlantic flight

No. 1 and No. 2 at Chatham, but they were busy on higher wave lengths and I received no reply. I was not surprised at this, because all continuous wave transmitters tune very sharply on the receiving end, especially on the shorter wave lengths. Still, I thought that within an hour or two sombody would happen on our tune. All night long, whenever I noticed an opening, I sent out SOS signals. We were not in any danger but I figured the ordinary call might not attract attention. I kept up the sending on the buzzer, modulated with radiation varying from .5 to .8 ampere, according to filament input. There was no response.

During the first five hours of the ensuing "taxi" in the light craft, there was a heavy sea running and it pitched the NC-4 about like a cockle-shell.

While we were on the water Bar Harbor and Cape Sable could be heard very plainly working the NC-1 and the NC-3. Communications from ships 300 miles at sea and the responses from stations at New York and Boston were also heard. The practicability of the radio compass was illustrated in one instance by an inquiry from a ship, supplemented by the statement that she had been without astronomical observations for thirty-six hours; New York replied that her signals were Q R Z, and Montauk could hear her on the radio compass.

Our first "casualty" then occurred, the engineer officer became slightly indisposed, necessitating his turning in. The "corpse" looked very comfortable as it lay stretched out on the grating with life preservers used as matresses.

We were able to make about eight knots running on the two outward motors, and although it would have been possible to shift the air driven generator to an outward strut in the slip stream of the propellers, the situation did not seem to warrant it. We were getting along nicely and in making this change I recognized the possibility of putting a foot through the wings or losing a set overboard.

Up to 10 o'clock that night the destroyers could be heard maintaining almost a continuous run of wireless conversation, inquiring whether the NC-4 had been seen and telling each other what course they were patrolling. Their signals came in so loud that they were heard by the Navigator in the cockpit forward, nearly fifty feet away. He suggested that I take bearings on them and determine which one was the nearest, but even though on the skid-fin antenna they could be heard strongly, the transmission was on 756 and 952 meters and the signals were inaudible on the compass coils. This was due to the fact that the range of the compass panel extended only about 200 meters above and below its wave length of 1,500 meters.

An hour after midnight we sighted a ship and signaled with the Aldis lamp, but received no answer. At another time we were within sight of a destroyer, but the operator was apparently not listening in on short wave lengths, for I signaled long and loud with a telephone set without any response. At two in the morning Siasconset's signals were coming in unusually strong, and for an hour I hailed the shore station continuously but could not get the operator's attention. Nor did anything happen when I called Chatham Air Station, but shortly after five in the morning we made the entrance of the channel at Chatham and it was only then that I heard the station there informing the destroyers that the Coast Guard Station had sighted the NC-4. We had established a long distance "taxying" record, having covered 125 miles in fifteen hours.

The boat from the air station came out to meet us and we reached the dock at Chatham two hours later. There we learned that two airplanes had been searching for us without success, probably because they were not carrying wireless operators.

A hearty reception awaited us at Chatham and the officers' mess turned out a breakfast that would be hard to beat. Having disposed of this welcome meal, we instructed the mechanics on the installation of a new motor and then turned in for a few hours needed sleep.

That evening Captain Eaton drove us to the village. It proved to be the town in which Commander Read had lived when a boy, and he pointed out the house occupied by his father, who had been pastor of the church, and he also recognized the school house which he had attended at the age of nine.

We stayed at Chatham for five days, experiencing a regular old Cape Cod Northeaster, with continuous rain and a wind that blew at the rate of 35 miles per hour. There was little to be done to the wireless equipment; in fact, the only attention required was charging the storage battery. This battery had run the 6-tube amplifier continuously for 22 hours, and the continuous wave set for 2 hours—approximately a discharge of 80 ampere hours—with no signs of deterioration. Visits to the plane and thorough inspections were daily occurrences, however, and everything was kept well covered with balloon fabric to protect it from the driving rain.

Although every assistance and encouragement was given by Lieut. (j. g.) T. A. Hoopes, radio officer at Chatham, I must confess that at the end of the fourth day I would have sold at a bargain price my chances of making a trans-Atlantic flight. NC-4 stock went up, however, when on May 13th we received a favorable weather report, supplemented by the information that the weather between Trepassey and the Azores was not favorable for starting. This relieved our anxiety that the other planes at Trepassey might get good weather and hop off without waiting for us.

The following morning, at ten minutes after 8 o'clock, we made a short flight to inspect the propellers and clear an oil line; during the eight minutes in the air I worked Chatham on the skid-fin antenna and was well satisfied that everything would function properly in the operation of the wireless equipment. At 9:07 a. m. we got away, and fifteen minutes later I heard in my head phones the news of our departure being broadcasted by wireless from Boston. A few minutes later the station at Fire Island called the C-5. This call came as a surprise to me, for though we had heard that the dirigible was contemplating a trip to Newfoundland, this was the first intimation that we had that she had started. Twenty minutes later we had passed over destroyer No. 1 and everything went along quietly for about an hour. Then Chatham inquired how much "gas" we had taken on and informed us that the C-5 had passed over that station at 10:10 a. m. A few minutes later I heard Bar Harbor call and tell me to stand by to receive a rush message from Washington, to be answered immediately and relayed to all parts of the world. It was a long weather report which he sent on 600 meters and afterward shifted to 1,400 meters.

This message was followed a half-hour later by a communication from Assistant Secretary of the Navy Roosevelt reading, "What is your position? All keenly interested in your progress. Good luck." In the short space of two minutes the following reply had been sent: "Thank you for good wishes. NC-4 is 20 miles southwest of Seal Island, making 85 miles per hour. Read"

Immediately afterward Chatham asked by wireless for a report for Commander Whiting, giving our total loading, amount of gasoline we were carrying and other details. Hardly had this communication been finished when Bar Harbor radioed a complimentary service message; it read: "Took three minutes for Roosevelt to send despatch to NC-4 and receive your reply. This beats all known records."

The next communication came about twenty minutes later; it was a weather report from Cape Sable. The operator at that station then told me informally by wireless that we looked fine as we flew over. I replied that his station had looked so good to me that I had taken a snap-shop of it, a detail apparently of great interest to him for he immediately requested me to mail him a print of the photograph if it was good. Unfortunately I had only an ordinary vest pocket Kodak with a lense not sufficiently fast, and the picture was a failure. Not knowing the operator's name, I take this opportunity of informing him of the reason why the souvenir has not arrived.

Shortly after noon I started working the Cruiser Baltimore at Halifax, telling them that we would land there for a few minutes, for at that time we expected to keep on to Trepassey. Within a half-hour we had flown over station No. 4 and received his position by wireless. The air then became very "bumpy" and as we were going into Halifax it became very difficult to remain sitting on the small stool with which I was provided; it was almost impossible to send decently. I had managed, however, to tell Bar Harbor that we would land soon and I must say that operator "DN" at that station was certainly a good man on the key; it was a pleasure to work fast with him.

We landed at Halifax without incident, having accomplished the run from Chatham in four hours. For this reason the storage battery still read high, but I observed the precaution of having it charged in the engine room of the "Baltimore." Our intention to remain at Halifax only a few minutes was set aside by the necessity for changing propellers. The type which had been used thus far on the trip was a new one, and the air screws already showed signs of weakening, so it was decided to make a change and to delay the flight to Trepassey until the next morning.

We made an auspicious start for Trepassey at eight minutes to 9 on the following morning, but lack of oil pressure in the center tractor motor forced a landing a half-hour later. It was then that I established communication with the "Baltimore" and the Camperdown station with the small battery set. This apparatus had failed to reach anybody at Chatham, but without any changes whatever in adjustment, it worked these stations very well at a distance which the Navigator told me was 18 miles. Camperdown station, however, could not hear the continuous wave telephone, probably because he had a non-oscillating circuit receiver.

After we had remained on the water for several hours I copied a message from Washington via Bar Harbor which reported that the weather over the European end of the trans-Atlantic course was unfavorable; this certainly encouraged us, for up to that time it did not appear that we would have a fair chance to take off with the NC-1 and NC-3.

We left the water at Story Head at 11:47 a. m., and for something over an hour Baltimore filled the air with message traffic with the station at Bar Harbor. When we were passing Cape Canso, about an hour and a half after our departure from Story Head, the "Baltimore" inquired our position, which I gave him. Immediately, the Canadian stations began to send out broadcasts, requesting all ships to restrict the use of their radio, and each in turn wishing the NC-4 the best of luck. Compass signals followed from destroyers No. 1, No. 2, No. 3 and No. 4, which were all audible and received without difficulty.

At two in the afternoon I sent instructions to destroyer No. 1, the Stephens, reading: "Request change in procedure as follows. As soon as seaplane is sighted, steam on course at full speed and continue course until next destroyer or station reports plane passing." Had this arrangement been in effect at Chatham, it would have solved our difficulties, for back there we had landed just between two ships.

A few minutes later I asked destroyer No. 3, the Robinson, for a weather report and received it in six minutes. Within a half-hour the same message had been sent to destroyer No. 2 and his reply was also received in six minutes.

It was ten minutes to 3 o'clock when we flew over destroyer No. 1 and at that time I was working with the Baltimore at Halifax. Captains Simpson and Lee both sent messages to Commander Read, who replied that he hoped that he had not kept them waiting too long. Im-

mediately the response came back they were not the least bit tired.

At 3:25 in the afternoon we passed over destroyer No. 2, and twenty minutes later had left No. 3 behind. It was about this time that I saw my first iceberg. From a distance the bergs looked like sailing ships, an impression which was also held by Lieutenant Hinton until we had quickly covered the distance to them. I find in my radio log the entry "temperature getting low"—an observation which was made as we passed over the ice floes.

The multiplicity of interesting occurrences during this flight was again emphasized within an hour, when I copied the following message "Navy dirigible C-5 broke adrift from mooring at Pleasantville. Rip cord broke. No one on board. No casualties. Edwards proceeding in a northeasterly direction. Ten persons with instructions to attempt bring down with anti-aircraft fire." It was just about this time the pilots sighted her, but the fact was not communicated to me, so no report was sent by radio.

At 5 o'clock in the afternoon I intercepted a message which was a bit of a shock. We had just passed station No. 4 when I heard No. 3 on the Azores leg tell No. 8 that she could not arrive at the station until 1 a. m., that she was taking No. 3 position. This was our first intimation that the other planes were about to start on the overseas flight.

Ten minutes later our motive power again came into prominence and I sent a message to Commander Towers of the NC-3 at Trepassey requesting that arrangements be made to change our forward center motor. This engine was the one which was installed at Chatham and was of a low compression type. It was just as powerful as the high compression motor which we now asked for, but it was slightly less economical in fuel consumption, and a change seemed advisable.

Within half an hour we made our landing at Trepassey Bay. As we approached the harbor the Aroostook sent me a wireless message to be on the lookout for the NC-1 and NC-3 as we came in. As we had surmised, they had made their start overseas! But our great disappointment was somewhat mitigated when we sighted them, for we then saw that their noses were turned back to Trepassey.

As we glided down to the water with the center motor running I sent a message on the skid-fin antenna, punctuated by the mental hope that the mechanics would be ready and able to give us quick service so that the NC-4 would be ready to start for the Azores with the others.

Good service was forthcoming.

We landed at 5:39 in the afternoon. Immediately mechanics clambered aboard and worked like demons all through the night.

Little was needed in the way of attention to the wireless equipment. The battery was charged aboard the Aroostook, new brushes were put in the spark transmitter, and for rubber gaskets under the cover which had pulled out rubber tape was substituted. There was nothing else required but the elimination of many spare parts which we were carrying and wiping up the apparatus with 3-in-1 oil. Every pound of superfluous weight was removed; bulkhead doors were taken off, and we dispensed with heavy tools and an extra fresh water tank, for favorable weather reports over the entire course were received the following morning, and the start that night became certain.

At 6 in the evening of May 15th we left the water at Trepassey, making a landing a few minutes later to wait for the NC-3. The flag-plane came along within ten minutes took off on the great hop across the Atlantic.

The Aroostook was immediately heard broadcasting the time of our departure and requesting that it be passed down the line to all the destroyers.

(To be continued)

Wireless as an Aid to Aerial Navigation

By Roy A. Weagant

Chief Engineer, Marconi Wireless Telegraph Co. of America

ONE question which has been developed by the remarkable trans-Atlantic flights by aircraft is the great advantages to be secured by utilizing wireless equipment for purposes of air navigation. It is reported that Captain Alcock and Lieutenant Brown employed astronomical observation for obtaining bearings, but I think the flight itself illustrates how unwise it is to depend upon this means of navigating aircraft. It is reported that for hours the moon or stars could not be seen, owing to the dense fog and drizzle. Similar handicaps must be regularly expected, and it is therefore obvious that any consideration of the possibilities of cross-ocean flight on a commercial scale must make provision for navigating instruments that function without visual aid.

There are wireless instruments now available which provide for taking bearings under any weather conditions, and for their universal application it merely remains for the radio and aircraft engineers to get together and work out the details of design within the weight and space limitations imposed by heavier-than-air craft. The layman hardly appreciates that present day airplane wireless equipment was developed under pressure of a supreme emergency and that the apparatus has been adapted to the aircraft which existed, whereas under normal development airplane designers would have made provision for taking care of the wireless equipment features. We can expect normal development now, and there can be no question that under proper supervision air navigation will be greatly simplified and made exact by utilizing wireless aid.

The particular apparatus which makes this possible is the Bellini-Tosi directive system, otherwise known as the goniometer, direction finder or radio compass. The operation of this device is very simple. It comprises essentially two coils fixed at right angles and another coil which is rotated within the fixed coils. This exploring coil is connected to the wireless receiver and is moved through the arc of a graduated scale; when the signals are heard strongest in the operator's head telephone, the movable pointer indicates the direction of the incoming signal. The geographical direction is then secured by a glance at the compass. It may readily be seen, therefore, that if signals can be heard from two wireless stations offering a wide angle, say, Clifden, Ireland, and Lyons, France, the aircraft operator flying across the ocean has merely to make a simple triangulation to get his exact bearings.

The densest fog is no obstacle to the receipt of these wireless signals and it remains but to equip aircraft with long distance receiving apparatus to take full advantage of the aid of wireless in trans-ocean navigation.

In the two epochal airplane flights made thus far there has been no opportunity to determine the full value of the directive system of wireless. The American NC flying boats employed the device, but only with short

Across the Ocean on the NC-4

The Personal Narrative of the Wireless Operator on the Naval Seaplane Which First Spanned the Atlantic in an Historical Air Flight

By Ensign Herbert C. Rodd

PART II

(*Continued from August* WIRELESS AGE)

SEVERAL minutes elapsed before I had any true realization that we were actually on our way overseas. Then the steady thrumming of the motors and a sight of the gradually fading shore line served to awaken in me a quiet sort of exultation in the fact that with good luck this enterprise might go down to posterity as an event in history.

More practical things, however, almost immediately engaged my attention. In the first transmission of wireless signals, using the skidfin antenna, I noted that the lead-out to this aerial leaked slightly, undoubtedly due to the fact that considerable water had been shipped in the take-off. These first communications were with the NC-1, and when we had been in the air for about three-quarters of an hour I let out the trailing wire antenna, from which all radio messages were thereafter sent and received until we neared the Azores on the following day.

The flag plane, the NC-3, soon after inquired for our position, asking if we were just astern of her; I sent a reply requesting that she turn on her running lights.

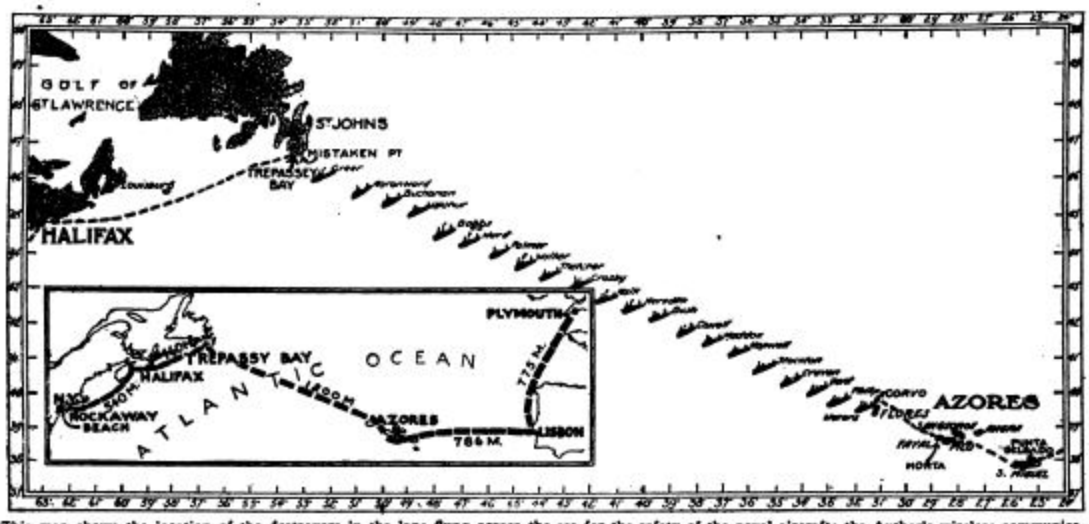
About a half hour later, while I was communicating with Cape Race station and with the other two planes, we passed over the second destroyer, and then twenty minutes later, I heard the wireless signals from the NC-3 requesting destroyer No. 3 to cease firing star shells, as they had sighted her. Compass signals were then given and these were heard all the way to destroyer No. 10, more than 350 miles distant.

There were all sorts of interesting wireless communications registering in my head phones along about this time, one of which I recall came from the "Maumee" in the following fragmentary form:

"Maumee will not be able to move for three days comma that heavy. . . ."

Afterward I heard that she had broken down while plying back and forth through heavy seas to refuel the destroyers which were waiting for us. At the time the message was received she was in the vicinity of the Azores.

Within a half hour all three planes had passed station



This map shows the location of the destroyers in the lane flung across the sea for the safety of the naval aircraft; the Author's wireless communications with these vessels and the shore stations is a feature of the article

No. 4 and Cape Race reported by wireless, "signals good," which message was clearly received. Boston—then a thousand miles distant—came in, and I clearly heard her call the Acushnet.

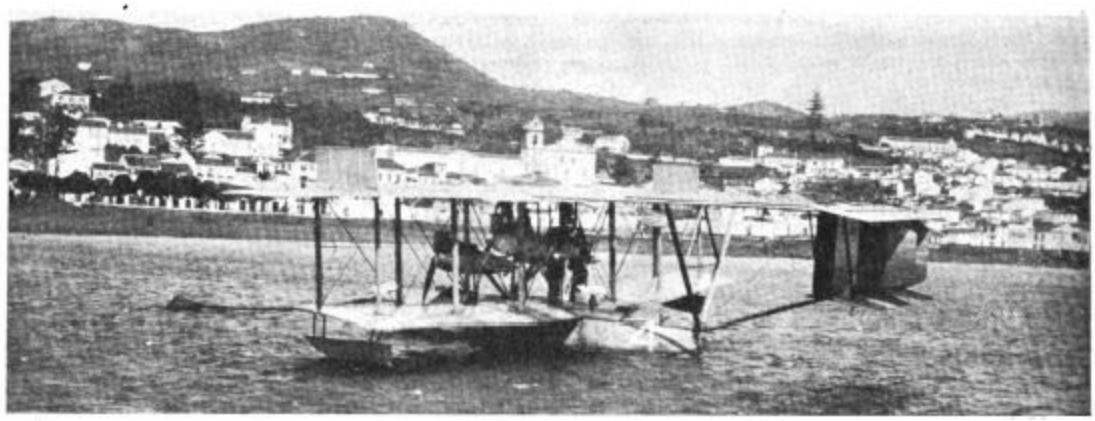
My next communication to the destroyers informed them that we were about to inspect the motors on the NC-4, and proposed to use the Aldis lamp for this purpose. This lamp was intended for signaling, but as a matter of fact, it was an ideal light for examining the motor, although the idea had not struck us until this time. Incidentally, I might mention here, that perhaps the most inspiring sight through the entire trip was that of the four Liberty motors, each spitting six tongues of blue flames from either side. This roaring, flashing fire symbolized a wonderful mechanical achievement, for the flames bore direct testimony to the fact that the entire forty-eight cylinders were hitting perfectly.

In contrast to the flashing of the power explosions from the motors and the vicious blue shafts that belched from their sides, was the placid disc of the moon rising slowly from the surface of the sea. Cold ladders of light led

out across the black waters below us, seeming to be harbingers of a guiding hand of Fate which would lead us safely to our island objective.

Any further philosophical thoughts which I might have entertained on the subject were interrupted when I happened on the tune of 1,200 meters and heard the station at Brest being called by one who signed himself NEC. I then copied the following message:

"S/S GEORGE WASHINGTON ne-1 Ck. 126. Confran. Position eight PM GMT May sixteenth. Lat. 47-05; Long. 23-00. Expect arrive Brest seven PM. GMT Sunday May eighteenth period. Please furnish five hundred tons fresh water comma eight hundred tons coal and stevedores upon arrival period carrying capacity three hundred fifty first class passengers six thousand three hundred thirty-five troops and one hundred forty stretcher cases subject to material reduction if president



The seaplane NC-4 at rest on the waters in the harbor of Horta, after completing the history-making flight across the Atlantic

and party . . . Swedish minister to United States and wife on board. Please reserve Paris train accommodations . . . (interference from UB2 calling CQ) . . . afternoon period Major General Squier and aide on board. Please reserve Paris train accommodations for . . . . eighty sacks navy mail."

A broadcast from destroyer No. 5, directly below us, interfered with the remainder of the message.

The George Washington was then 1,175 nautical miles or 1,325 statute miles away; I am certain that this distance was never before covered by wireless to an airplane in flight from a ship at sea.

Nothing of special consequence happened for about a half hour, then the station at Cape Race asked me to send a short story of the flight thus far, the distance which we had covered, and anything of special interest. A request was also appended for a report of the NC-3. I was not authorized to transmit messages of this charatcer so I merely replied that everything was going along O. K.

A few minutes after this message had been sent, the steamship Abercorn asked if she could help us in any way; and the next episode worthy of record was when destroyer No. 7 sent me compass signals which were audible 30 miles distant. I had regularly been reporting each time when we passed a destroyer, sending these messages clear to the Cape Race station at Newfoundland. Evidently they were being received, for the operator at Cape Race answered promptly each time.

We flew over destroyer No. 8 at 3:29 (Greenwich Meridian Time), and about twenty minutes later I sent out a 22 word message to my mother in Cleveland, Ohio, by wireless to Cape Race station. We were 425 miles away from the Newfoundland station at that time, and the operator at Cape Race marveled that I was able to hear his signals, when I told him that his signals were still good. He could not understand how it was possible to hear him through all the noise made by all four Liberty motors pegging away at full speed.

Lieutenant Harry Sadenwater, the operator on the NC-1, had kept in almost constant communication with me up to this point. We exchanged friendly messages between our work with the destroyers and felt highly elated at not being "called" by a shore station. It reminded us of the early days in wireless when chit-chat exchange between operators was tolerated to a great extent.

At 4:06 I asked destroyer No. 9 for a weather report and received his reply within four minutes. This illustrates the efficiency of our communication. I cannot say whether it was due to the electrical or mechanical design of our transmitter, or whether it should be credited to the excellent work of the operators on the destroyers; in any event, it seemed just as easy to call a destroyer 300 miles away and get a quick reply as it was to communicate with one which was directly under us as we passed by in our flight.

At 5:30 the naval men at Cape Race inquired as to the time when we had passed destroyer No. 10. I informed them that I had not picked up that vessel's broadcast, so did not know: the Cape Race operator responded with a lengthy message, asking that he be kept advised as to our position. He added the final comment: "Signals great."

A half-hour later I heard at one time six destroyers sending out their compass signals, these vessels were respectively numbers 12, 13, 14, 15, 16 and 17. No. 16, the Hopewell, more than 200 miles distant came in exceptionally loud.

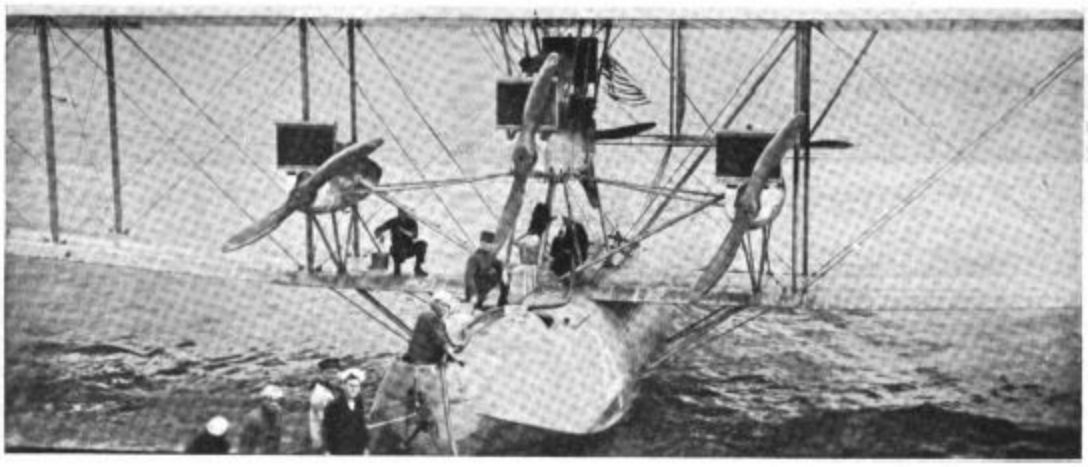
Soon afterward we passed over destroyer No. 13, which information I imparted to Cape Race. Immediately afterward I heard, clear as a bell, a 14-word message sent to the Aroostook, stating that the signals from the plane were "great."

The NC-1 then inquired whether I had heard any wireless communications of the NC-3. I listened and found that the flag-plane was communicating with destroyer No. 13, and at the conclusion of these communications I heard her ask destroyer No. 16 for a weather report.

It was about 7 o'clock when I heard the station at Bar Harbor very faintly. The messages were being communicated to two of the naval vessels, probably off the coast of Maine, Bar Harbor being almost 1,100 miles away.

A half-hour later I sent the position of the NC-4 to Cape Race, but I did not hear this station answer. This was not surprising for the last communication I had sent had spanned a distance of 650 nautical miles.

I became a bit sleepy at this time and sought the open hatchway for a few breaths of fresh air. Chief Machinist Mate "Smoke" Rhodes had slept peacefully all night covered with life preservers, the only visible part of his anatomy being two feet set at a spread eagle angle. As the cobwebs were cleared from my brain by the rush of air, I began to speculate on the reasons why there was no noticeable change in temperature, for I had fully expected it to become warm as we approahced the Azores. Then I recalled how at Rockaway I had counted on writing some letters during the long flight. I had often done this before, and in the rush of things preceding our departure I had made a mental reservation that



The epochal flight had just ended when this photograph was taken, but to the Author this seemed relatively unimportant; he was far more concerned with securing the soothing solace of a cigarette

I would catch up with several weeks correspondence; but nothing had been done on the flight; I never had a spare minute, it seemed.

When I returned to the instruments I picked up Lieutenant Sadenwater of the NC-3 and remarked that the thought of sleep had never occurred to me. He replied that perhaps, too, I had not thought of food, adding that he had a sandwich in his hand at the moment. He was right; I had given no thought to the supplies we had taken aboard at Trepassey. "Smoke" was awake by this time and I scribbled off a note asking him to go back and get a sandwich. When it came, I seemed to have no taste for anything but the buttered bread. I got away with this, but passed up the coffee, for the Thermos bottle in which it was contained, was faulty and the contents were cold.

We crossed the steamer lane soon afterward and there was considerable interference on the 600 meter wave length. I heard the NC-3 calling destroyer No. 17 and by the strength of his signals I figured that the craft was a good distance ahead; the NC-1 then came in loud, and I noted that this vessel was just one station behind.

The hour between 8 and 9 was a busy one. The steamship Imperoyal wished us good luck and stated that she was bound from New York to Spain with gasoline. A few minutes later I heard two vessels calling Cape Race; one sent a message and the other reported to some station that he had met two planes and had a good time communicating with them. I found it was possible to hear two destroyers at once with the amplifier entirely disconnected from the receiver, antenna and counterpoise. A remarkable record was made, too, in this hour, when the NC-1 asked the destroyer No. 16 for a weather report and received a reply in one minute.

Destroyer No. 17 notified me at 9.31 that the NC-3 had just called with a rush message but that the operator could barely hear it. This was the last heard of the NC-3. Fifteen minutes later we struck a heavy fog and from then on I adjusted to the 1,500 meter wave length so as to get all the compass bearings possible.

The hour from 10 to 11 brought some anxiety. At 10:30 I established communication with destroyer 19 and asked if he heard our motors, explaining that we were flying between the fog and the clouds. The reply came back that the destroyer had not sighted us, but that the operator on board thought we were off her port bow. I was just about to ask for compass signals when the navigator came aft and requested me to inquire about the fog conditions close to the water in the vicinity of destroyers 19 and 20. I received an immediate reply from 19, stating that the fog was very thick near the water; destroyer 20 then wirelessed the information to me that it was misty in her vicinity. The operator on this vessel asked whether we were flying high or low and I told him: "high, but we want to come down if it is clear at the surface."

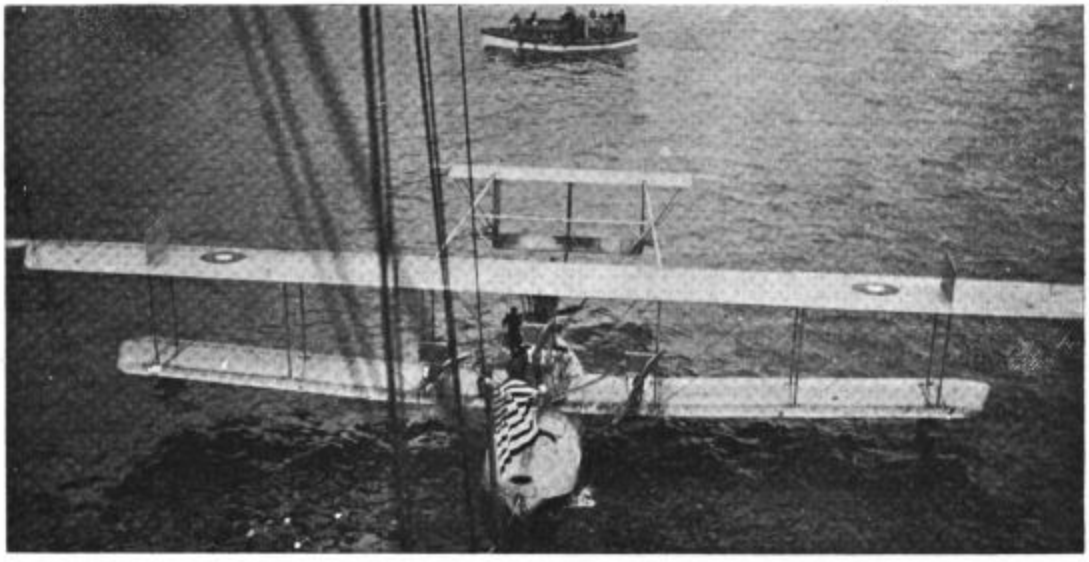
At 11:13 destroyer No. 21 replied to my inquiry that the visibility at the surface was 10 miles and that the wind was blowing at the rate of 20 miles an hour.

Then, at 11:30, we sighted Flores—the most welcome sight that had ever greeted our anxious eyes.

We came down near the surface so I reeled in the trailing wire aerial and in subsequent communications used the skid-fin antenna. We were concerned about the NC-1 and the NC-3. I inquired of destroyer No. 23 whether the other planes had been heard. A reply stated that the NC-1 had passed two hours earlier and that a message had been intercepted stating that the NC-3 was off her course between destroyers 17 and 18. The information immediately followed that the NC-3 had just been heard, asking for bearings.

Forty minutes later we picked up land again, sighting rocks that were so close on our bow that the craft had to be raised instantly to avoid striking them. As we came down to the surface of the water, I worked with the Cruiser Columbia lying in the Bay of Horta.

Hardly had we brought the craft to a standstill when the captain's gig of this vessel came to meet us. The doctor on the Columbia evidently expected to find us all



The NC-4, just after the craft had been brought to a standstill on the conclusion of the cross-ocean flight to the Azores, a dramatic moment in the annals of aviation

in, for he was perched on the bow and loaded down with Thermos bottles full of beef bouillon and stimulants.

We were by no means exhausted, but the hot beverages looked good and no member of the crew refused them. Welcome as this attention was, however, the important thing to me was the opportunity at last to get a smoke. All night I had been tantalized by the fragrance of cigarette smoke wafted through the passageways of the plane. Commander Read had permitted smoking in the forward compartments of the plane, but aft of the gas tanks it was considered dangerous and there was nothing doing for me.

As I looked back at it now it seemed relatively unimportant that our landing at Horta meant the accomplishment of the first successful air flight across the ocean. I was far more concerned with the relaxation of restrictions and the soothing solace of a cigarette.

(To be Continued.)

A Summer on the Great Lakes

(Continued from page 24)

decks but there was little to prevent the firemen from coming up on top after the blacks. If ever a time comes when the two gangs of men decide to have it out—and such a time must surely come—there won't be any Juniata left. Of the total crew of a hundred and thirty, at least sixty were black, so one could expect a pretty good battle—and an even one too.

Below us was the berth deck, so called because most of the staterooms were here. Here, too, was the barber-shop, more bunks for the engineers, barber, bellhops and some of the colored fellows who could not be accommodated on top; also the "fantail." This was the extreme after end of the ship where the huge coils of rope—the breast and stern lines—a steam capstan for making fast the line, and a shower bath for the crew were conveniently located. The shower consisted of a hose placed in the center of the space and hooked to the ceiling or deck above, so that it could be moved about by the recipient of the water. As the fantail was decidedly open to the public, shower baths were prohibited during the day time and when near port. Only when the ship was on the "high seas" could the affair be used; even then I doubt if it was ever used, for the officers had a shower of their own, less public by far; and the crew—well I am not sure that they thought an occasional shower necessary.

One man always went swimming in the third engineers trousers when we docked at Mackinac, but the rest of the crew must have been cleansed by liquid fire and suggestion rather than by the use of water. So the fantail was used not for a bathhouse, but for the customary shipboard poker and crap games. Here the members of the crew made and lost their money, several hundred dollars often changing hands in a single day. The rail and the capstans were filled with shouting followers of the game who tossed their quarters and halves into the ring with the utmost abandon. Only when the steamer docked did the dice game stop, and then only because the players were afraid of police, or because they needed their money for refreshments.

Still another deck was below the berth deck, this one being used for most of the freight which could not be stored in the hold. Here was the passenger gangway with the offices of the Purser and Steward on opposite sides of the stairs leading to the upper decks and the social hall. The engine room was also on this deck, although the engines proper were still further down, and there usually was a pile of coal which was carried on deck and not placed in the bunkers. This was used in cases of emergency when the coal below was gone or on fire and could not be used. On this deck was stored the copper and zinc ingots which usually comprised part of our freight. The flour and dry goods cases and such stuff were swung into the hold by steam winches which kept up their terrible squeak for a day and a night while we were in Buffalo and Duluth.

Across the Ocean on the NC-4

The Personal Narrative of the Wireless Operator on the Naval Seaplane Which First Spanned the Atlantic in an Historical Air Flight

By Ensign Herbert C. Rodd

PART III

(Continued from September Wireless Age.)

THE villagers of Horta, mostly Portuguese peasants, showered flowers and souvenirs upon the crew of the NC-4 when we came ashore; our reception lost nothing in enthusiasm from the fact that ours was the first airship they had ever seen.

But the call of normal things prevailed, and after an appetizing meal served in the captain's cabin aboard the Columbia, we indulged ourselves with about two hours' sleep, to counteract the effects of about thirty-four hours' constant activity from the time we had reached Trepassey. Later, we paid a visit to the village and, as special guests, saw the only "movie" in town.

On the terrace of the House of Commons after the luncheon given to the American aviators by the Prince of Wales. The author is in the left center of the picture with fingers locked. Among the notables to be seen are: the Prince of Wales, Lord Reading, Admiral Wemyss, General Seeley and Winston Churchill

When we entered our box the orchestra greeted us with "The Star Spangled Banner," and I nearly made a bad bull. Deafness, caused by the constant roar of motors for sixteen hours and signals received through a six-step amplifier, prevented me from recognizing it and I nearly sat down. Then, too, none of the NC-4 crew recognized the Portuguese national air played immediately afterward and the officers of the Columbia had to signal us to rise. After that we jumped whenever the fiddler made a move, during a reception which continued until nearly 2 o'clock the next morning.

Although our craft was ready to leave for Ponta Delgada the next day we waited to get word from our Division Commander aboard the NC-3. This was necessary, since the three NC boats had been commissioned regular ships of the Navy before the start at Rockaway.

On Sunday morning the crew of the NC-1 was brought in by the steamer, Ionia. Standing on the unsteady deck of the Columbia we watched this Greek tramp put in, land the men she had rescued, and then proceed on her way to Gibraltar. She seemed to toss about like a cork in the heavy seas and made us realize what the NC-1 crew had gone through while battling the storm, with their plane going to pieces. The men, glad to be alive, were keenly disappointed over the loss of their plane and the termination of their cherished hope of completing the trans-Atlantic flight.

The welfare of the remaining plane, the NC-3, gave us deep concern at this time and we wondered if she could weather the seas that were running. Even the destroyers were having a rough time of it in their search for her. As the hours slipped by, so did our trust that she would live through it. When Monday morning came, and still no news, we concluded that our brother naval adventurers were lost.

That evening, however, we were overjoyed by a report that the NC-3 had arrived at Ponta Delgada under her own power with the entire crew safe. The dispatch did not state that she was damaged so we expected that the NC-3 and the NC-4 would continue the trans-Atlantic flight together. News that Hawker and Grieve had started from Newfoundland in the Sopwith plane also reached us.

On Tuesday morning, May 20, we made ready to leave Horta for Ponta Delgada. There was nothing to do to the wireless apparatus except to charge the storage battery. The high voltage batteries read 69 volts, the same as at Rockaway. The spark transmitter was in fine condition though the sparking disc and stationary electrode insulator were slightly coated with oxide. This was removed with an oily cloth.

All morning we waited to make the hop. Finally, after five rain squalls had blown over we got started. It was 12:35 o'clock when the NC-4 jumped from the water 20 seconds after the motors were given full throttle. We shipped a little water in the take-off and that caused a leak in the skid-fin antenna insulator, so I could not send until we were high enough to use the trailing antenna. At 1,300 feet I sent a broadcast.

Leaving Horta, after five rain squalls had blown over

Mt. Pico—Taken from the plane as the storm clouds rolled away

In the harbor at Lisbon where the Order of Tower and Sword was conferred on the crew

Flying high we watched Mt. Pico, the crest of which is 7,000 feet above the sea, and, as though especially for our benefit, the surrounding clouds lifted and we saw for the first time the snow-capped peaks glistening in the sunlight.

A half-hour after the start destroyer No. 24 informed us that she was making heavy black smoke and the Columbia wirelessed that weather conditions were improving along our route. Communication with the Melville at Ponta Delgada was also established a little later and at 1:22 we passed beyond the smoke screen created by destroyer No. 24. A radio compass bearing on destroyer No. 25, fifty miles distant, showed 351 degrees at this time.

Lieutenant Breese created a diversion on the leg to destroyer No. 25 by getting out his shaving kit and shaving himself. The water that he used was badly discolored and I assumed it was hot coffee from a Thermos bottle, and so informed several of the de-

Waiting for high-tide at Figueira, Portugal, where we were forced to land for repairs and got stuck on a sand bar

stroyers that were communicating with me. It developed later that the murky mess was hot radiator water.

When we had been in the air one hour the operator aboard the destroyer Wilkes, which held station No. 4 on the Lisbon leg, informed me that our signals had been fine ever since we left Horta. We passed over station No. 25 soon after this and the station ship Melville at Ponta Delgada came in to inquire what time we expected to arrive. "About 2:20," said our navigator. We were off the harbor at 2:20 and landed at 2:24. As we nosed down, steam could be seen issuing from the whistles of the ships in the harbor, but we could not hear the din until we had landed. It sounded like the celebration of Armistice Day back in the States.

Commander Towers came out in a small boat to greet us and then we learned, for the first time, that the NC-3 was damaged to such an extent that she could not continue the flight. The power plant of the NC-3 was as good as ever. The four Liberty motors operated without any trouble despite the abuse that they had undergone, but the lower wings of the plane had been battered to pieces by the heavy seas when the NC-3 was compelled to descend on account of the fog, and this prevented a continuation of the flight. We learned that these same heavy seas had prevented the plane from rising again and forced them to resort to taxying until they reached Ponta Delgada. It had been no failure of personnel or material, for everything had proceeded according to plan until the fog was encountered. The NC-3 crew looked very haggard and worn, as well they might after their harrowing experience, and we felt a very genuine regret that their misfortune had put them out of the running.

Nearly endless greetings and equally endless photographings awaited us ashore. Admiral Jackson finally came to our rescue and secluded us in his home. We had a week of rain and windy weather at Ponta Delgada but the time passed by rapidly, for the surrounding country was of the greatest interest and there were many receptions and festivities to attend. One very large reception was held at the Governor's Palace, where we met the Mayor, the military authorities and the leading citizens. So generously were the attentions and souvenirs showered upon us that we left there with feelings of awe.

We made a trip of inspection to the plane each morning. Since we were not quartered aboard the station ship Melville I could not supervise the recharging of the batteries for the wireless set, so I sent a message from shore to have it done. When at 5 o'clock the next morning we went aboard the plane I found a new battery which showed a specific gravity of only 1100. A boat was immediately despatched for a new battery which read 1250. Later on I was able to get the old battery back. It registered 1290!

The shelter of the harbor being none too good, we feared some damage to the plane might be caused by a slight change of weather conditions and this gave us so much concern that we had almost decided to attempt to leap the sea wall in order to take off in smooth water in the harbor beyond, when at last a favorable day arrived and we got away in spite of very rough water. The start had been planned for 6 A. M. but because of dirt in the gasoline and carburetor we were delayed about four hours. But as we rose in the air I felt that our troubles were over and the impatience of the past week disappeared.

It was 10:17, Greenwich Mean Time, May 27, when we left Ponta Delgada, on the leg to Lisbon, 786 miles away. The favoring wind was about 23 knots and visibility was good with clouds covering the mountains. Immediately after the start, I inadvertently caused what might have proved a catastrophe to the wireless set, when I made the mistake of plugging in the six-step amplifier tubes on 12 volts and burned them for about a half-hour before discovering it. I felt sure that I had injured them, but upon plugging in 6 volts —the correct voltage—destroyers five stations away were heard loudly. It was evident that the tubes were in good working order so I dispatched some traffic to the destroyer Wilkes for relay to the Melville. A half-hour afterward I sent a message to Admiral Jackson at Ponta Delgada thanking him for his hospitality and stating that we seemed to be on our way. During the next three minutes I requested weather reports and received replies that favorable weather conditions existed along our entire route. Wishes for good luck were extended to us, too, as we passed over No. 1 destroyer on the Lisbon leg. Within the next quarter-hour we passed No. 2 destroyer 10 miles to the southward, sending her a message to that effect, as those on board the vessel did not see us. At this time Destroyer Gamble, No. 6, seemed exceptionally loud for the 200-mile distance between us; destroyer No. 7, 250 miles distant, also called us and advised us that our signals were strong.

We missed station No. 3, the wireless equipment of which did not seem to radiate well on 1,500 meters, so I requested several compass signals from No. 4. At 12:20 he was hearing slightly to the left, ten minutes later he was 20 degrees to the left, and at 12:35, 45 degrees to the left. Commander Read could not figure out what the trouble was, but headed back to our course with the aid of the radio compass, and we passed over Destroyer No. 4 at 12:50, much to the relief of the pilots and the rest of the crew. Later

our Navigator discovered that the gimbal rings of our magnetic compass had jumped out of the pivots, probably at the time of our take-off at Ponta Delgada when we bounced on top of several waves. With this trouble rectified the compass functioned properly for the rest of the trip.

At the rate we were flying it appears that radio compass signals were audible at 50 miles, which was the best distance spanned during the trip.

About this time I told Chief Wiseman on the destroyer Wilkes about having worked Cape Race 650 miles. He replied if Cape Race could do it, he could also do it, so we arranged to see how far we could work each other. Since the optimum wave of destroyers is 756 meters, we agreed to use that wave when the 1,500 meter signals became weak. At this time we were flying at an altitude of 1,000 feet and our speed, aided by a westerly wind, was about 88 knots.

At 1:10 Destroyer No. 7 advised that he had heard us when we left Ponta Delgada—a distance of 350 miles. A bearing on No. 6 about this time showed 15 degrees to the left and we passed her at 2:05. Destroyer No. 11 was coming in loud at 300 miles on the run to No. 7, whose radio compass was weak, though we got a bearing from her. It showed 8 degrees to the right, and we passed her at 2:40.

Requests for weather reports were sent to No. 8 and No. 9, to which they replied promptly and at 3 o'clock I exchanged messages between our captain and Captain Simpson of the destroyer Robinson. We passed destroyer No. 8 a little later and I worked No. 4 to test her signals in compliance with Chief Wiseman's wishes.

At 3:30 a weather report was secured from No. 11 in 5 minutes; this time was approximated 15 minutes later when No. 12 replied to a request for a report in 7 minutes. Shortly afterward, 4:18 to be exact, we passed destroyer No. 9. She had been moved 17 miles to the eastward and No. 11 had taken a position 17 miles to the westward of the scheduled points, because destroyer No. 10 was missing, for some unknown reason. At 4:46 I got a weather report from No. 14 and I also worked No. 4 again, both stating that my signals were loud. I called the station ship Shawmut at Lisbon at 5 o'clock, but she did not answer.

Destroyer No. 11 had been audible for 25 minutes on the radio compass, a distance of 40 miles, when we passed her at 5:05. About 15 minutes later I carried out another test with No. 4. She stated she had left her station for Ponta Delgada at 2 o'clock. Her signals were good on 756 meters, but quite weak on 1,500 meters. The Rochester at Lisbon was the next ship to call me with a message from Admiral Plunkett, which read: "Fine work. Come along." Immediately afterward I managed to get a reply from the Shawmut at Lisbon and we exchanged messages. At 6:05 we passed Destroyer No. 12.

The test with Wiseman on the Destroyer Wilkes, No. 4, having lapsed for a time, I worked him again. He said he was only using .4 kw. and that they expected to reach Ponta Delgada about 10 P. M. This indicated that the Wilkes was approximately at station No. 2, making the distance covered by our signals around 520 miles. I promised to call him at 6:30, but being busy with the Rochester for about a half-hour I forgot about the Wilkes and later when I called at 6:47 I heard no reply. I have since learned that Lieut. Sadenwater, using a 950 receiver aboard the Columbia in Horta, copied my messages all the way to Lisbon, and that the chief on Destroyer No. 23, stationed near the Azores, copied us from Trepassey on the Trepassey-Azores leg and also on this leg, Bar Harbor station turned in messages copied from the NC-4 at a distance of 1,400 miles.

The flight thus far exceeded our expectations and now a message came in from the Rochester inquiring as to the time we expected to arrive, to which our navigator answered: "Expect to arrive about 8 o'clock. Please have search-light on water trained into the wind. Shall I land to north or south of Shawmut?" We had passed No. 13 at 6:35 and because No. 14 was bearing to the left about 32 degrees we passed her to the right at about 7:16, shortly afterward sighting the rocky coast of Portugal. Many Portuguese stations were heard, as we approached the coast. Cadiz (EBY) near Gibraltar, especially was very loud and clear.

We approached the Tagus River just as the sun was getting low, and after circling a bit we landed astern

Just after landing at Plymouth. The entire crew at the finish of the epochal flight

of the station ship Shawmut at Lisbon. The time was 8:01 P. M. While landing, I communicated with the Rochester and the Shawmut on the skid-fin antenna without any difficulty. The time for the trip was 9 hours and 42 minutes and the average speed was a little more than 81 knots.

We were taken from the NC-4 immediately and put aboard the Rochester, the flagship of the destroyer force, where we were received by Admiral Plunkett, his officers and men, as well as the American Minister and officials of the Portuguese Government. The Order of the Tower and Sword was conferred upon us on this occasion and we had to pose for "movies" that were taken by searchlight.

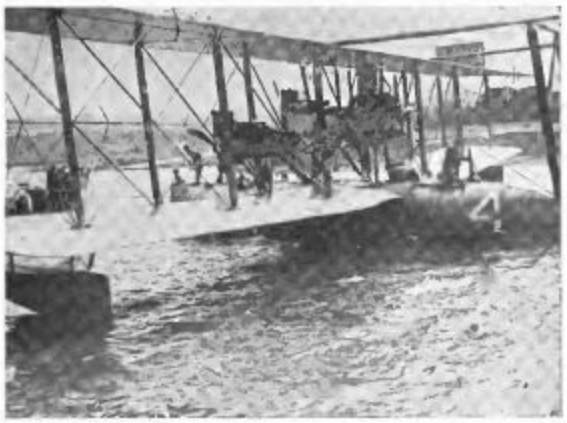
At length we were allowed to remove our warm flying clothes and permitted to sit down to a meal. Having taken practically no food since 4 o'clock that morning this part of the reception appealed to us immensely. The crew, a little tired, but in excellent condition, were interested in all the festivities and some went ashore to see the town that night for fear that it would be the only chance, as the NC-4 was in perfect running order and might start the next day. We found Lisbon to be a good-sized city, with many buildings constructed of red and white tile located on an expansive hillside that inspired one with its beauty. If this were not strictly a radio story I might relate many amusing incidents that occurred during our stay. However, it was all very enjoyable and interesting.

No repairs were necessary at Lisbon and on May 30 at 5:29 in the morning we departed. After circling over the harbor we cleared the mainland at 5:55, at

which time I let out the trailing antenna. The Shawmut was busy broadcasting until 6:12 when we sent the following message to her: "For American Minister. Request you express to all heartfelt appreciation of Commanding Officer and crew of NC-4 for wonderful welcome (signed) Read."

The destroyers Connor, Rathburne, Woolsey, Yarnell and Tarbell were stationed between Lisbon and Cape Finisterre, using the call letters A, B, C, D and E respectively.

At 6:25, CTV (Monsanto, Portugal) sent this broadcast: "Trans-Atlantic seaplane flight now in progress. Ships are requested to restrict use of radio apparatus to avoid interference with seaplanes." This message did not have the desired effect, for Spanish and Portuguese ships interfered considerably with "QRU?" signals.



NC-4 at Plymouth, showing after cock-pit containing radio equipment. Rodd is hoisting the colors

Weather reports were secured from A, B and C with difficulty and I despatched a message to the Shawmut to request destroyers to listen on 425 meters. Station A was passed at 6:33. Then I was told that a water leak had been discovered in the port motor and it seemed necessary to land for repairs. Shortly afterward I sent B the following: "We may have to land. Stick close on 425 meters for my buzzer modulated set if I send the word 'landing.'" At 7:12 I sent: "We have gas leak on port motor and may land soon." B acknowledged promptly. At 7:15 I reeled in the trailing wire and sent: "Landing, landing, sending on emergency antenna." The NC-4 was headed for the shore near Figueira, Portugal, to find smooth water for the landing, which was made in the Mondego River.

The repairs were quickly made, but in the meantime the tide fell rapidly and small islands appeared here and there, making it unsafe to "take off" until the tide was high again. We went aground on a sand-bar and I called B with the battery set. Hearing no reply I shifted to 756 meters and copied the following, although I missed the call letters: "NC-4 passed station A, but Rathburne (B) has not sighted yet. Sea smooth."

There was nothing to do but wait. Lieut. Stone and Chief Rhoades slept peacefully in the sun on the hull of the plane, while the rest went ashore.

The Shawmut on 756 meters at 8:30 sent the following: "To NC-4. What is your situation? Where are you? Answer via destroyers. Shawmut." Then the following: "Destroyers please listen on 425 meters for message from NC-4." I then called B, but found her sending this message to the Shawmut: "NC-4 not sighted. Am searching to southward of position. Sea smooth, visibility very good." I called B again at the first opening only to hear a destroyer on 756 meters reply: "Proceeding to assistance of NC-4." This reminded me of Chatham when destroyers worked on high wave-lengths and did not listen on 425 meters. The signals were so loud that Commander Read, sitting on a bank 100 feet away, heard them. Ensign Dowd, an aircraft radio officer, divining our situation, sent the following from the Shawmut: "Destroyers please listen on 425 meters for message from NC-4." Destroyer C acknowledged this message, but instead of heeding it called ISW (general call) about two minutes and then sent the Shawmut's message repeating each word and sending very slowly. His intentions were good, but we might have sunk several times during the five minutes he took to do this.

When C finally finished, B called me and asked: "Have you landed?" I answered quickly giving our position, but when I listened A and C were working. Destroyer A said, "NC-4 last seen full speed." B's signals were audible over 100 feet away. He then sent the following to the Shawmut at 9:04: "NC-4 reported leak in gas tank. Would probably land. Am searching to southward of position now. Last signals transmitted by NC-4 were on emergency radio set." This showed that B had heard my message and that the ensuing two hours' delay in rendering assistance could have been avoided if all had been listening instead of sending.

Finally, when things quieted down, I called B again on the battery set and sent: "In Mondego River. Must wait high tide at 2 o'clock. Seaplane O. K. Cannot make Plymouth tonight. Request destroyers keep station. What is best port to north to land within 300 miles? Request report situation Comfran and Plymouth. (signed) Read." B replied that our signals were faint but readable.

It might be noted that the skid-fin antenna was only 70 feet long and stretched about two feet above the top wing. Considering that the telephone set was rated at 5 watts, the distance which this message traveled—about 25 miles—is quite remarkable.

At 10:30 two destroyers arrived, anchoring off the mouth of the Mondego River, and Lieut. Commander Geer phoned that Commander Symington was on his way to us in a boat. When he arrived the details for the remainder of the trip were arranged. It was decided to stop at Ferrol Harbor, Spain, before dark and continue the flight to Plymouth the next day. At 2:14 the following by Commander Read was sent from B to C, having been semaphored to the Rathburne, anchored off the mouth of the river: "To Comfran, Brest and Simsadus, London, from NC-4. Request destroyer of coast division nearest Ferrol Harbor proceed there immediately anchor in position when seaplane can secure astern and act as tender for NC-4. Expect leave Figueira one thirty GMT and stay Ferrol tonight leaving for Plymouth tomorrow morning at eight weather permitting. Read." "Comfran" is the code word for Commander of Naval Forces in France and "Simsadus" stands for Admiral Sims.

We left the water at Figueira at 1:38, getting off very easily and with a slight favoring wind and fine weather set out for Ferrol. A few rain squalls were dodged by hugging the coast where the air was clear and the scenery more enjoyable. The Liberty motors were turning over so good that the estimated time for the trip was beaten by 15 minutes. The wireless apparatus was working fine, as usual, and my head phones were buzzing continually from the increased air talk.

At 2:51 I received the following from station E: "Tarbell will arrive Ferroll Bay 4:30 P. M." Immediately after that a delayed message from station D, relayed from the Rochester, came in. It read: "Best place north Mondego River is Ferrol, and second, Vigo."

Passing station D at 3:10 we told the Tarbell that we would arrive at Ferrol about 5 o'clock. Greetings were exchanged with Spanish stations at Oporto and Cape Finisterre about 4:15 and we also received the following from station No. 1: "Harding will act as mooring ship at Ferrol. Will anchor in inner harbor on arrival unless you wish me to meet you outside." The operator added that he had heard us 450 miles. Station E sent: "Will be outside making big smoke." As we came within range the Spanish station at Ferrol inquired: "Hydroaeroplaniz Norte Americano," to which I replied that we were.

At 4:45 the outskirts of Ferrol were reached and the NC-4 began to spiral to the landing, so I reeled in the trailing wire. The landing was made two minutes later. People flocked by the thousands to the docks and sea-walls to view us.

Immediate attention was required by the many small sail boats that swarmed out; these gave us much concern because of the danger of tearing the fabric of the ailerons, as they insisted on sailing underneath them. We endeavored to wave them off, but it was futile. At last, much to our relief, a Spanish admiral appeared on the scene and, uttering a few excited phrases, got them to disperse a reasonable distance.

The harbor afforded excellent shelter for the plane. The Harding came in from sea about 15 minutes later to act as a mooring ship, but the NC-4 required very little attention. I did not even charge the battery, though it had been used considerably at Figueira. Ferrol boasts of the largest navy yard in Spain and the friendly and courteous welcome by the naval officers was on a scale to comport with it.

We left this Spanish port on the following morning, May 31, at 6:27 o'clock. The NC-4 climbed so rapidly that I was working on the trailing wire within six minutes and heard the Harding sending our time of departure to station No. 2 for relay to Comfran, Brest, and Admiral Plunkett at Plymouth. At 6:37 I heard No. 4 sending the message to the Rochester. Stations Nos. 2, 3 and 4 replied to my requests for weather reports, stating that visibility was very good at No. 2, good at No. 3 and fair at No. 4. Station No. 5 (the Biddle) came in loud on his compass schedule, but was two minutes ahead of time, so I called him and corrected his time. At this stage of the flight rain was encountered and the weather became thick, causing reduced visibility and requiring frequent changes of course.

I asked No. 3 for compass signals. The reply gave a bearing 35 degrees to the left and 17 minutes later it was 49 degrees to the right. Thus it was apparent that we had passed No. 3 without seeing her and that the bearing was reciprocal. We were uncertain as to our course so the Navigator steered from bearings obtained by the radio compass. At 8:30 No. 3 was 45 degrees to the right and getting fainter. No. 4 was 20 degrees to the left, changing to 40 degrees left 18 minutes later. This proved that we were too far to the East for the bearings, or that No. 3 was a stern bearing.

At 9:03 No. 4 said she had sighted us and we flew over her three minutes later, somewhat to the relief of our navigator who was having difficulty in keeping to our course. Up to this time I had heard nothing from Destroyer No. 6, the Stockton, stationed near Plymouth; so I asked No. 5 about her. He had no definite answer, but No. 4 volunteered the information that the Stockton was at her station although possibly she was not sending. The Rochester, 300 miles away, surprised me with her signal intensity from Plymouth. A message from her read: "Desirable NC-4 land inside breakwater near Rochester, then taxi to mooring in Cattewater west of Mount Batten. British plane will probably lead you to mooring. Aroostook boat at mooring." She also sent this weather report: "Weather in Plymouth fine. Light northeasterly breezes, clear overhead, but slightly hazy around horizon. Apparently splendid flying weather. Stockton is in position."

We missed No. 5 station entirely and No. 6 asked

A part of the reception in England which the author terms "a fitting climax to the whole trip"

for the time of arrival at her station. I replied that we had probably passed No. 5 about 10 A. M. and that we were going to fly over Brest. An attempt to get a time tick from the Eiffel Tower failed, because I just missed the schedule and Nauen, sending at noon on 4,000 meters, was beyond the range of my receiver.

The George Washington at Brest called us about 10:50 and I received on the skid-fin antenna because we were flying low. I surprised the operator by telling him that I had copied his messages when leaving Newfoundland and only convinced him that it was true when I repeated the text.

Brest station came in with a "Bon voyage bon jour." Not knowing much French I had to limit my reply to: "Merci."

When, at 11:15, we sighted a point south of Brest and turned off our course to get a look at the harbor, I sent the following: "To Comfran-Brest: Greetings from NC-4. I am sorry we cannot stop. (signed) Read." Brest replied: "To NC-4: Congratulations on your magnificent feats. Sorry you cannot stop and let us entertain you. Good luck. (signed) Halstead." Brest harbor seemed just full of American ships and was the most typical American sight on our trip. It seemed quite like a port of our own.

Passing over Brest we flew very low to secure better visibility, and leaving France behind, ran into an increasing head wind and thick haze. This cleared slightly when we reached the middle of the Channel but not until we had sighted Plymouth, about an hour later, were we high enough at any time to let out the trailing wire, so communication was maintained through the U. S. S. Hannibal at anchor in Brest Harbor.

About 12 o'clock destroyer No. 6 sent weather reports, saying the sun was shining and visibility was

seven miles. I told her that, flying low in fog, we were using the small antenna; she replied that our signals, though faint, were getting louder. A little later No. 6 added that our signals were good and that she was making heavy black smoke so that we could locate her. Her bearing then was 50 degrees to the

The NC-4 beginning the spiral to the waters of Plymouth harbor and the end of the first trans-Atlantic flight

right and three minutes later it was 55 degrees to the right, or reciprocal. Upon inquiring if our signals were louder she replied: "You seem about the same."

I don't know how the Navigator felt at this time but I doubted the correctness of our course to Plymouth and therefore took every opportunity of locating our position by radio. At 12:41 No. 6 transmitted the information that visibility was eight miles and our signals were weaker. I replied that I thought we had passed to the eastward of her. Then, looking out of the hatch, I saw a merchant ship and I hoped we could get our position through her, so I sent the International Abbreviation for "What ship is that?" and "What is your position?" Probably the operator was out on deck watching us, for no answer was received on 600 meters. Destroyer No. 6, however, came in with: "There are two sailing vessels about four miles apart, bearing 150 degrees true, eight miles from Stockton." But we did not see them.

Having visions of missing Plymouth I asked the navigator if it was possible to climb to 400 feet so that I could call Plymouth station for compass signals on the trailing antenna. I thought that shore station bearings, being more accurate, would help us to find the harbor. We began to climb, but had to come down again because of very thick weather at 300 feet. The Rochester at Plymouth then called and said that our signals were getting louder. Her signals were good, but reception on the skid-fin antenna was not as good as on the trailing antenna four hours before, when we were only half way across the Bay of Biscay. Plymouth seemed to be further away than it really was. After being accustomed to the signal strength obtained from the trailing antenna the decrease of signal intensity on the skid-fin antenna was very confusing.

The Aroostook now came in with best wishes and while I was listening in the NC-4 began to climb. This permitted the use of the trailing wire again.

Land was sighted at 1:15.

Destroyer No. 6 called and said that the visibility was ten miles and the sky was clear, to which I replied that we had sighted land and were all right.

We found ourselves headed directly for Plymouth harbor. This was very good navigation on the part of Lieut. Commander Read, for the wind had shifted several times during the flight across the Channel and the pilots, who had frequently been ordered to change the course, did not think that we would land exactly at Plymouth.

We climbed to 3,500 feet and circling for position landed inside the Cattewater at Plymouth at 1:26, thus ending the first trans-Atlantic flight and achieving the hitherto impossible in human endeavor.

Two British planes sent out to meet us came in about ten minutes after we landed, having missed us on account of the fog. They were equipped with 1,600 meter continuous wave transmitters, but since I knew nothing about it at the time I did not tune to receive that wave-length.

The reception by the officials made a fitting climax to the entire trip.

We were again taken aboard the Rochester, where the usual motion pictures were taken, but, unlike our experienc at Lisbon, we were promptly fed, being cautioned to allow for the public banquet to be given at the Grand Hotel by the Royal Air Force. Our stay on shore lasted eight days.

In London we were received splendidly everywhere, one occasion which stands out being a luncheon given by the Prince of Wales at the House of Commons. I sat next to Commander Grieve, the companion of Hawker in his attempted trans-Atlantic flight, and upon inquiry learned that their Sopwith plane had been equipped with a radio set, but the apparatus had failed to work satisfactorily. Admiral Wemyss was intensely interested and questioned me closely on the NC-4's installation. He seemed to have an excellent knowledge of radio. While in London I called at the Marconi House just in time to verify a communication that General Manager Bradfield had received from the Cape Race station concerning the distance the NC-4 had worked.

Paris and the famous Eiffel Tower then received our attention, and shortly before we prepared to leave for the good old U. S. A. we were permitted to visit the Battle-Front in France, spending much time at Chateau Thierry and Belleau Woods. Those two places seem very close to Americans.

Summarizing my observations made during the entire flight the things worthy of note are about as follows:

The health of the crew was better at the finish than at the start of the flight. The performance of the Liberty motors, especially the motor installed at Trepassey without a test, was marvelous. In fact the whole plane was in excellent condition upon our arrival at Plymouth and we regretted to see her torn down for shipment to the United States. We preferred flying to London and Paris instead of traveling by rail and steamer.

The radiation on the skid-fin antenna changed slightly during the flight across the Channel, but it was kept to 3 amperes by adjusting the variometer from time to time. This variation was no doubt caused by the varying quantity of moisture in the air at different times and at different altitudes. Radiation on the

trailing wire averaged 3.3 amperes throughout the flight and the transmitter, running 54 hours without oiling, functioned perfectly. Judging by ear, the frequency of the generator was never quite up to 500 cycles, due no doubt to being mounted too near the deck, which prevented the proper rush of air from reaching it except when the center tractor engine was running. An improvement would be to mount the generator on an upper wing, out of the slip stream of the propellers, so that in a glide with dead motors signals could be sent. The present position of the generator propeller is in the path of all traffic over the hull when the plane is at rest, and in flight the propeller is apt to be damaged by things blown against it while traveling at 5,000 revolutions per minute.

No adjustments or repairs of any kind were required on the oil field-switch, sending key and antenna switch. The 6-tube amplifier also worked perfectly. Four extra tubes were never used and the six used were never transposed to secure a better combination even after 12 volts had been applied to the filaments for a half-hour by mistake. The only tendency of the amplifier to oscillate was at slightly above 1,500 meters.

A voltmeter was carried on the flight and readings at Plymouth showed the plate battery up to 68½ volts after nearly 100 hours' usage—a loss of only ½ volt since leaving Rockaway. The value of immersing the cells in paraffine is very evident, for ordinary batteries would not have stood up through the rain and fog encountered during the flight. The cut-down SE-950 receiver gave no trouble. Tight coupling was generally used because interference was seldom experienced. I noticed that maximum inductance and minimum capacity gave the sharpest tuning possible, and also the best audibilities.

It might be stated that the amount of amplification necessary to overcome the mechanical noise of the engines has been reached with the 6-valve amplifier, and although the signal audibility is increased by increasing the pressure of the phones no better readability is obtained.

The induction was much worse when using the compass coils than on the antenna. This, coupled with the fact that the signal intensity without any induction interference is much less than on an antenna, explains why the ratio of audibility on the same destroyer was about one to eight. Many readings were taken on the "A" coil only, because of the great increase in induction experienced when the "B" coil was thrown in. With the single coil it is possible to read within 5 to 10 degrees using the maximum method and taking the mean of the points when signals fade out, after rotating the coil either way from the maximum point.

A remarkable feature was that not a trailing wire or "fish" was lost and the tension of the skid-fin antenna developed no sag during the trip from Rockaway to Plymouth. All the insulators were leak proof except the lead-in from the skid-fin antenna, which, after having all the exposed surfaces rubber-taped at Ponta Delgada, functioned properly when the power transmitter was used.

Mention may be made of the desirability of having the wireless operator located so as to secure outside visibility with relation to the plane or else placed in close proximity to the navigator. It is hoped that the design of future flying boats will include this improvement.

The flight demonstrated the urgent necessity of developing the use of the radio compass to a much higher degree of efficiency and also made apparent the need of an emergency set employing a broad wave in place of the very sharp wave emitted by the continuous wave transmitter.

The use of a telautograph is contemplated for standard equipment in large seaplanes. It has the advantage of being both a communicating and recording device and requires a radio helmet only for the wireless operator instead of one for each of the entire crew.

In conclusion, I want to thank all the destroyer operators who stuck to the job so faithfully and gave us such excellent service. Since our flight, nearly every day has brought information that some ship or station heard us at greater distances than has been recorded in this story.

Weagant "Group Frequency" Circuit

ANOTHER circuit devised by Mr. R. A. Weagant for the detection and amplification of continuous and damped oscillations is shown in figure 1.

The aerial is earthed in the usual manner. Coupled to the aerial either directly or inductively is a secondary circuit which includes an inductance being in series with it, a variable condenser which is connected to the grid of a three-element valve. The plate of the valve is connected to a local circuit, which includes a telephone shunted around which is a variable condenser. In series with the telephone is placed a relatively large resistance shunted by a condenser in series in an inductance. The resistance is connected in series with the high potential battery, which in turn is connected to the negative side of the filament. The filament may or may not be connected to the earth. Connected across the local circuit from the plate to the filament is a second condenser in series with an inductance. Both the condenser and the inductance are adjustable so that they may be varied to secure the best effects. The last mentioned inductance is used when receiving continuous oscillations. It is not essential for damped wave reception except when the damped wave signals are very weak.

The condenser and inductance in shunt to the resistance permit of tuning the telephone circuit, which includes the telephone itself, to the group frequency of the incoming signal so that in the event of the apparatus being used to receive damped oscillations the effects produced by the groups of oscillations are very much magnified.

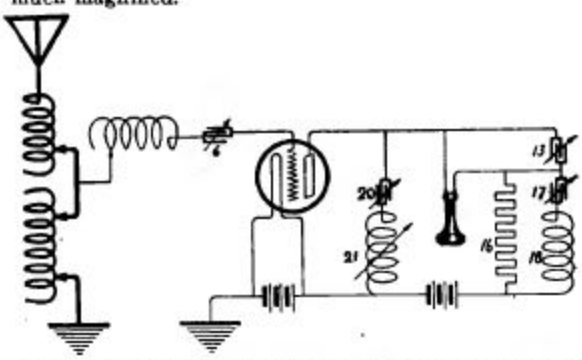


Figure 1—Circuit for detection and amplification of continuous and damped oscillations

In using the apparatus to receive continuous oscillations the inductance in the telephone circuit may be dispensed with.