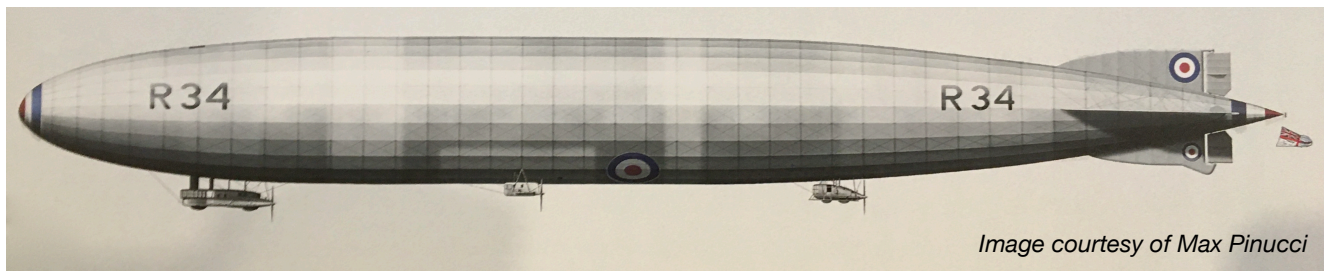


LESSONS FROM HISTORY...

By Alan Shrimpton, image credits shown individually



The story of the HMA R34's double crossing of the Atlantic ocean in July 1919 is well known and features in many books on the history of airships. Indeed, our title picture is taken from Max Pinucci's seminal work on the 25 most significant airships 'Designed for Greatness: The Illustrated History' (*reviewed last edition*). You can readily find details of the airship itself (643' long, 1,950,000 cu ft of hydrogen providing a disposable lift of around 26 tons) and the flight (108 hours in the air westbound but a much faster time of 75 hours on the return trip for a total distance of 7,420 miles) but I want to use this article to look at a particular aspect of the flight and see what lessons can be drawn.

The weather played a very significant role in the R34's journey into the record books, but to understand why we need to dip into the very detailed **Log of the R34** by **Brigadier-General Edward Maitland** who was onboard the R34. There is also much useful material in the Commanding Officer, **Major G H Scott's Report to Brig Gen Maitland**, made in August 1919, and the subsequent and initially secret **Report to the Chief of Staff** at the Air Ministry, also made by **Brig Gen Maitland**.

As noted in Scott's report, there were three objectives of the mission:

- to obtain information and data, both meteorological and pilotage, during an extended Atlantic patrol
- to demonstrate the possibility of large rigid airships in carrying out long over-sea voyages
- to land in the United States.

The first objective is the interesting one. At the start of the First World War, the Meteorological Office (which had been founded in 1854 as a small department within the Board of Trade) was undergoing a period of rapid development and it was quickly realised that good weather forecasts

were vital to all of Britain's armed forces. This led to the development of specialist departments to provide forecasts for airships, the Admiralty and the Royal Engineers, but this also resulted in serious overlapping and duplication of effort. To correct that, the whole Met Office was transferred to the Air Ministry in 1919 where it was to remain until 1990.

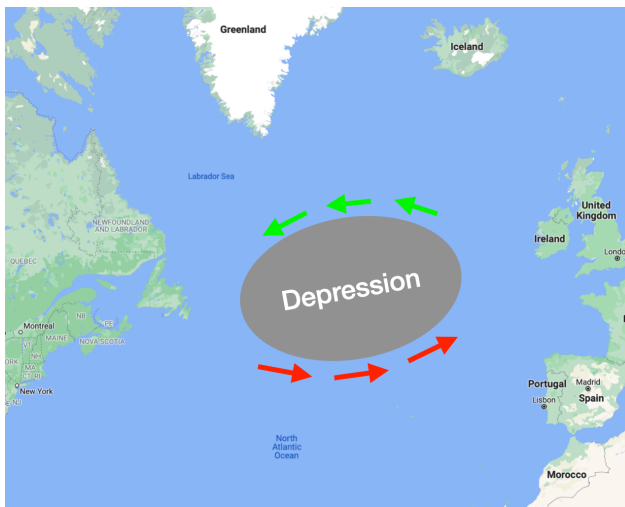
But the experience of operating airships throughout WWI had shown that weather forecasting was critical to airship operations, especially when engaged in long endurance missions. Knowing this, the people planning the transatlantic flight of the R34 made some special provisions in the form of the Royal Navy battleships *Renown* and *Tiger*.

The battleships were stationed in mid-Atlantic (HMS *Tiger* just south of Greenland and HMS *Renown* much further south) to render assistance, should it be needed, and to provide weather reports. They were not the only ships to provide weather information though. An analysis of the R34's radio log shows that she was in communication with 17 different vessels during her two-way trip, all of whom provided some surface weather information which allowed the navigator (Major G Cooke) and the Meteorological Officer (Lt Guy Harris) to more accurately predict the conditions the R34 was flying into, and take appropriate action.

In fact, Maitland identified '*the organisation for supplying accurate weather information to the aircraft engaged on the flight*' as '*being of supreme importance*' in his report to the Air Ministry. He also noted that the presence of the two battleships was '*useful but more for the confidence*' they imparted than their weather reports, whilst commending the U.S. Weather Bureau who provided them with '*valuable and accurate weather forecasts*'.

Accurate forecasts were important because of the direction of the winds around the all too common Atlantic depressions which, in the northern hemisphere, blow in an anti-clockwise direction. This means that the winds on the north side of the depression are easterlies (blowing from the East) while on the south side they are westerlies (blowing West to East).

So an airship flying from England to the USA would be well advised to take a more northerly route on the outbound leg, and pick-up any favourable tail winds, rather than taking a more direct route to the south and encountering headwinds.



In his book, Maitland commented that he didn't think that this meteorological rule had been exploited by aircraft before but that *'we had the satisfaction of doing so on both the outward and homebound journeys.'*

But the weather is fickle and depressions may form in the wrong place (from the navigator's perspective), and they move. All this had to be factored into the R34's course.

An hour after the departure from East Fortune in Scotland on Wednesday 2nd July, the R34 reported an estimated speed over the ground of 66 mph, supported by a following wind of around 25 mph. Perfect flying weather in other words, and for the remainder of the day and into Thursday, the R34 enjoyed favourable South Easterly winds and only had to 'play' with her altitude to find the most favourable wind.

Weather observations played another role as well. In order to calculate your position in an airship, you need to know your height above the sea, and this can only be estimated when flying in or above cloud. But if you can get an accurate barometer reading from a ship in your vicinity, as

happened with the SS Canada on Thursday lunchtime, you can get an accurate altitude by comparing their surface barometer reading to the on board reading as air pressure falls by 1" for every 1,000 ft of height.

But the ability to *'deduce local conditions by observing cloud formations'* was flagged up in Scott's report as critical to being able to accurately predict the conditions the R34 was flying into, and take appropriate action. Indeed, Major Scott went so far as to cite an example where Lt Harris' cloud forecasting on 3rd July spotted a depression some 6 hours before its presence was felt by the ship.

By early evening, the R34 was flying more or less through the centre of a mild depression in order to get into the easterly winds and 'was doing well', sighting land at 12:50 the following day (Friday). At this point the R34 had burnt around 2,678 gallons of fuel and expected to arrive over New York with 1,100 gallons in reserve, but the weather had other ideas.

By 3:00 p.m. the fog had closed in but with no wind over the ground they were still making 38 knots. With 870 miles to go they expected to arrive in New York by early Sunday morning, but by 2:30 a.m. on Saturday morning they were flying into strong headwinds *'peculiar to the East coast of Nova Scotia'*. Maitland commented that *'if only we had sufficient petrol we could now change course to the westward, crossing the American coast, and so get round behind this barrage'* which, of course, is exactly what a modern airship would do. The Captain ordered the airship down to just 800' to avoid the worst of the winds but they were still burning fuel to make headway, and their speed over the ground dropped to just 27 knots. Maitland reported that *'the petrol supply is distinctly serious.'*

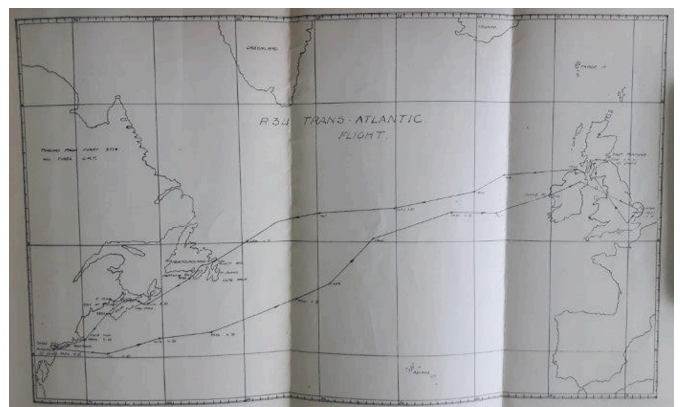


Image from Major Scott's declassified Report

HMA R34 Cont'd

Contingency plans were drawn up to drop to 300' and ride a sea anchor until they could be refuelled from a destroyer, or land in Boston and refuel there, before proceeding onto New York. And things got worse. A severe thunderstorm was spotted over New Brunswick moving rapidly down the coast towards them, and by 2:45 p.m. they were riding a violent squall on the outskirts of the storm with *'the ship very badly thrown about'*. Speed over the ground had dropped to just 15 knots and the need to avoid a second colossal thunderstorm in the early evening, and then violent temperature 'bumps' later on in the evening (which were only avoided by standing out to sea and running on all five engines), further depleted their dwindling petrol supply. By 11:30 p.m., Maitland commented that *'things don't look at all well for getting to New York'*.

And yet, despite what must have been a very rough night for all on board, by 7:20 on Sunday morning, the storm had cleared and the airship found itself with a *'nice following wind'*. They were going to make New York after all, but barely. They landed at 09:54 with 140 gallons of fuel left - about 2 hours flying time at full speed - so they had cut it really fine.

The return trip was much faster. Where the outbound trip had taken just over 108 hours due to the adverse weather right at the end, the return trip was accomplished in just 75 hours by taking advantage of separate depressions over the Atlantic and picking up tail winds of up to 35 knots in places.

This was, at its heart, a scientific voyage of exploration so what lessons did they learn:

- they confirmed their theories that trans-oceanic flights could actively use weather patterns to improve their journeys (a skill that Hugo Eckener had already developed, but later brought to a high art)
- they confirmed that they could only use weather patterns if those patterns were known in advance (in 1921 the head of the French Weather Bureau proposed Weather Ships in the Atlantic to aid Transatlantic Flights, among other objectives)
- they confirmed that there was insufficient information known about higher altitude weather (particularly how the winds vary)
- the flight showed that airships need to carry enough fuel to take the most 'beneficial route' to their destination, not the shortest.

The flight of HMA R34 met all of its objectives but that first objective *'to obtain information and data'* was the real success of the mission.

National Weather Ships were eventually established in the 1930s, with an international service being established in 1948.

And, as a direct result, modern airships have on-board weather radars and access to satellite weather forecasts, but Brig Gen Maitland nailed this idea with one of the closing comments in his book. *'Captains of future Airship Liners will become wily and cunning masters of the art of selecting the right wind and the right height and... and will save many hours upon long sea and land passages'*.



HMA R34 landing in New York, 6th July 1919



Image by Wikimedia Commons