

Pacific Ocean

Finding Amelia

RADIO LOG

USCG ITASCA

Date

1 JULY 1937

Log Jam

L.G. BELLARTS CRM ON WATCH ENTRIES TIME

WATCH STARTED AT// SIGNALS HEARD LOGGED ONLY// 1900
VERY NO SIGS ON DURING PERIOD 1917
WATCH 0200 Drifting to westward of Howland Island... Wind: East, Force 2 (light breeze)... Temperature; 1945/48

NO SIG ON 81° F... Sky Condition; clear... Sea Condition; 1 (moderate swell, calm sea) 2015-18
KHAQQ DE NRUI A A A A A NRUI HOWLAND ISLAND A A A A A 2030-35

UNREADABLE FONE SIGS ON OR ABT 3105 35-40
SENT WEA TO KHAQQ ON 7500 255-58

KHAQQ DE NRUI A A A A A NRUI HOWLAND ISLAND A A A A A 2100-05

Itasca nodded gently in the tropical night, waiting, listening. Far to the west, the Lockheed Electra flown by Amelia Earhart and navigator Fred Noonan was inbound to Howland Island, its planned mid-Pacific refueling stop enroute to Hawaii and California and the completion of the first aerial circumnavigation of the globe by a woman. Everyone knew that Earhart's flight from Lae, New Guinea across more than 2,500 miles of trackless ocean would be the most challenging of her career and *Itasca's* job was to stand by off Howland to render navigational assistance. On shore, crewmen would chase the birds off the coral runway for her landing and mechanics would service the plane. Two wire service reporters stood ready to describe the landing and interview the fliers. It would be a memorable morning.

In fact, the events of July 2, 1937 would become the stuff of legend. Recorded in not only the ship's log but in three radio logs as well, the facts surrounding the flight's failure to arrive at Howland Island would be interpreted in several official reports and, over the years, speculated upon by countless searchers, researchers, authors, screen writers, and the public at large. Many solutions to the mystery have been offered, some apparently logical, others patently absurd, but none offering any semblance of proof. As with all legends, the story has become skewed and stylized through endless retellings from differing perspectives until, nearly sixty years later, the popular perception of what happened bears little resemblance to the picture painted by the original record.

Good conclusions can not be drawn from bad facts. A critical re-examination of the *Itasca's* logs and new information made available by the discovery of long-lost documents has enabled TIGHAR to piece together a more accurate account of the events of that morning. Especially helpful was an eight-page letter written days after the disappearance by Eric Chater, General Manager of Guinea Airways and Earhart's host in Lae. The letter, which describes in detail the preparations made and the difficulties experienced by Earhart and Noonan prior to departure, had been misfiled by the recipient and only surfaced in 1992. It answers many long-disputed questions about the airplane and its crew at the time of the final takeoff. Also of great help is the existence, in the U.S. National Archives, of the original sheets from the *Itasca's* primary radio log for that morning. Tradition-



Courtesy National Archives

ally, the logs are re-typed (the term is “smoothed”) to correct errors and overstrikes, but in this case the *Itasca’s* chief radioman, Leo G. Bellarts, had the foresight to save the original messy sheets. The log is an invaluable tool in reconstructing what happened in the *Itasca’s* radio room and aboard the aircraft.

Itasca Primary Radio Log entry for 11:55-58 p.m. July 1, 1937

KHAQQ DE NRUI (GAVE HER OUR WEA ON 7500) 2355-58

ABOARD *ITASCA*: KHAQQ is Earhart’s radio call sign, DE is Morse code shorthand for “from” and NRUI is *Itasca’s* call sign. *Itasca’s* transmitter can not send voice on 7500 Kilocycles. This message is sent in Morse code. The previous evening the ship received word that Earhart had departed Lae at 00:00 Greenwich time (10:00 a.m. in Lae and 11:30 a.m. at Howland) that morning and should be expected at Howland 18 hours later, or 05:30 a.m. on July 2nd. The sun will not rise at Howland until 06:15 a.m. but the officers aboard *Itasca* think the flight could easily take 20 hours.

ABOARD NR16020: For Earhart and Noonan the time is 11:25 Greenwich. Their 00:00 takeoff means that they have been in the air 11 hours and 25 minutes. In a message sent from Lae and received by *Itasca* two days before, Earhart specifically said she would use Greenwich time during the flight. She does not know that *Itasca* is, nevertheless, using local time which, at Howland, is Greenwich plus 11 and 1/2 hours. Earhart also expects that the *Itasca* will follow her requested radio schedule in which she listens for messages on the hour and the half hour, and transmits messages at quarter to and quarter past the hour. As the *Itasca’s* code message is being sent on 7500, Earhart is tuning her receiver to 3105 to listen on the half hour. When the *Itasca’s* transmission ends at 23:58 (11:28 for Earhart) she probably doesn’t even have her headphones on, not that it would make any difference. Not only is the weather being sent on the wrong frequency but Earhart has repeatedly asked the Coast Guard to “report in English, not code, especially while (I am) flying.” Neither she nor Noonan can read Morse code.

Itasca Primary Radio Log entry for 02:45-48 a.m. July 2, 1937

HEARD EARHART PLANE / BUT UNREADABLE THRU STATIC 0245/48

ABOARD *ITASCA*: Although the words are unintelligible, the operator is confident the transmission is from Earhart. In a later report, the ship’s captain, Cmdr. Warner K. Thompson, explained that the wire service reporters recognized Earhart’s voice (they had covered her flight to Hawaii in March). In the same report, Thompson also alleged that the operator heard Earhart say “cloudy and overcast” at this time, but no such phrase appears in the log.

ABOARD NR16020: It is 14:15 Greenwich. Amelia’s transmission, whatever its content, is made exactly on schedule. At this point the flight is 14 hours and 15 minutes enroute and, according to the fuel management tables prepared for Earhart by Lockheed’s Kelly Johnson, has expended 724 of the 1,100 U.S. gallons of fuel aboard at takeoff. Johnson’s procedures (see below) provide just over 24 hours of endurance, leaving a 20% (5 hour) reserve which, according to Army Air Corps Lt. Daniel Cooper aboard the *Itasca*, was considered standard for long-distance flights.

Fuel Management Procedures prepared especially for Earhart by Lockheed engineer Clarence L. Kelly Johnson. These power settings yielded a cruising speed of 130 knots.

TIME	ALTITUDE	MANIFOLD PRESS.	R.P.M.	GAL./HR
1 hour	0-8,000 ft.	28.5 inches Hg	2,050	100
3 hours	8,000 ft.	28 inches Hg	1,900	60
3 hours	8,000 ft	26.5 inches Hg	1,800	51
3 hours	8,000 ft	25 inches Hg	1,700	43
Rest	10,000 ft	24 inches Hg	1,600	38

KHAQQ FM ITASCA PLS Y OUR SIGS ON KEY PLS UNANSWD 30
KHAQQ DE NRUI A-S 31-4
KHAQQ DE NRUI A-S 7500 KCS 35-40
KHAQQ DE NRUI A-S, 3105 KCS 41

ITASCA PRIMARY RADIO LOG ENTRY FOR 03:45-4? A.M. JULY 2, 1937

EARHART HEARD FONE/ WILL LISSEN ON HOUR AND HALF ON 3105-SEZ SHE 45/4--

KHAQQ CTRG ITASCA W/ 3105 KCS ON 7500 KCS BUT CANNOT HEAR IT ON 3105 KCS
RUNNING BEARING ON 3105 KCS FOR WIND SAMPLE TO HEAR JMWG CALL
1000
KHAQQ DE NRUI A-S, 3105 KCS 6
KHAQQ DE NRUI A-S, 3105 KCS 7-8
KHAQQ FM ITASCA PLS Y OUR SIGS ON KEY PLS UNANSWD 49-50-
57
KHAQQ CTRG ITASCA W/ 3105 KCS ON 7500 KCS BUT CANNOT HEAR IT ON 3105 KCS

ABOARD *ITASCA*: “Fone” refers to radiotelephone as opposed to Morse code. Earhart reaffirms her schedule for receiving transmissions and that she will remain on 3105 Kilocycles. Although very faint (Strength 1), this is the first intelligible message received by *Itasca* and the operator attempts to clarify the log entry by adding a dash and “sez she” at the end. For some reason, the termination time for the message is not completed. In later reports, Cmdr. Thompson inserted the word “overcast” into this message. The word does not appear in any of the original logs nor in the report filed by Lt. Cooper who was present in the radio room at this time. In short, the notion that the Earhart flight encountered overcast weather during the night (which would have thwarted celestial navigation) is not supported by the original logs.

KHAQQ CTRG ITASCA W/ 3105 KCS ON 7500 KCS BUT CANNOT HEAR IT ON 3105 KCS
LNG COMMUNICATIONS ON 3105 KCS
KHAQQ DE NRUI A-S, 3105 KCS 58
KHAQQ CTRG ITASCA W/ 3105 KCS ON 7500 KCS BUT CANNOT HEAR IT ON 3105 KCS
TAKE BEARING ON US AND ANS 3105 WID VOICE / NRUI DE KHAQQ LNG DASHES
ON 3105 -/ NRUI2 DE NRUI PA AR 0800-3

ABOARD NR16020: The time is 15:15. Once more, Earhart’s transmission is on schedule. If on course, the flight should be roughly 500 nautical miles out and have recently passed over the island of Tabiteuea in the Gilberts. (Islanders later reported that an aircraft was heard to pass high overhead that night.) If Earhart has followed Johnson’s tables, her situation looks like this: Fuel remaining: 338 gals. Hours of fuel remaining (at 38 gph): 8.9 hrs. Estimated time to Howland: 3.8 hours.

SENT WEATHER /CODE/FONE/ 3105 KCS- (HEARD EARHART -~~(PART-CLDY)~~- 0453
- - - - - 0500

NRUI2 GIVING TO DPE TT NO SIGS ON 3105 ES IMPOSSIBLE TO WRK ITA / R 04
KHAQQ FM ITASCA PLS Y OUR SIGS ON KEY PLS UNANSWD
BEARING ON 3105 KCS FOR WIND SAMPLE TO HEAR JMWG CALL

ITASCA PRIMARY RADIO LOG ENTRY FOR 04:53 A.M. JULY 2, 1937

KHAQQ DE NRUI A-S, 3105 KCS 5
KHAQQ DE NRUI A-S, 3105 KCS 5-8
KHAQQ FM ITASCA PLS Y OUR SIGS ON KEY PLS UNANSWD
TT WE
RING ON 3105 KCS FOR WIND SAMPLE TO HEAR JMWG CALL

ABOARD *ITASCA*: Close examination of this puzzling entry reveals that it is actually made up of three separate notations. The first entry states that *Itasca* sent the weather by both code and voice on 3105 (the correct frequency) at 53 minutes past the hour (the wrong time—again). The operator then went back and added (note the platen misalignment between the first two dashes) a parenthetical notation that Earhart had been heard and had apparently said something about “partly cloudy.” In a third action, the reference to “partly cloudy” was typed over with a series of dashes which was continued on the next line. The impression created by the log, and expressed in Cmdr. Thompson’s later reports, is that Earhart broke in off schedule.

KHAQQ DE NRUI A-S, 3105 KCS 11
KHAQQ DE NRUI A-S, 3105 KCS 11-14
KHAQQ FM ITASCA PLS Y OUR SIGS ON KEY PLS UNANSWD
WID RE

ABOARD NR16020: The time is 16:23. At this point in the flight, transmitting off schedule would be very uncharacteristic for Earhart. It would appear more likely that *Itasca* heard the tail end of her scheduled 16:15 transmission. Her report of partly cloudy conditions agrees with the *Itasca*’s Deck Log for this time period which describes “clear skies with detached clouds.” 15

WANTS BEARING ON 3105 KCS// ON HOUR// WILL WHISTLE IN MIC 14//
ABOUT TWO HUNDRED MILES OUT// APPX// WHISTLING// NW 15

KHAQQ DE NRUI REPTED ABOVE DPE ON 7500 GA 3105 A3 AR / UNANSWD 16-17
KHAQQ FM ITASCA PLS Y OUR SIGS ON KEY PLS UNANSWD
KHAQQ UNANSWD
KHAQQ DE NRUI A-S, 3105 KCS 18
KHAQQ DE NRUI A-S, 3105 KCS 19

ITASCA PRIMARY RADIO LOG ENTRY FOR 06:14-15 A.M. JULY 2, 1937

KHAQQ DE NRUI A-S, 3105 KCS 16-17
KHAQQ FM ITASCA PLS Y OUR SIGS ON KEY PLS UNANSWD
KHAQQ UNANSWD
KHAQQ DE NRUI A-S, 3105 KCS 18
KHAQQ DE NRUI A-S, 3105 KCS 19

ABOARD *ITASCA*: The signal is now stronger (Strength 3) and consistent with the estimate of “two hundred miles out” but Earhart’s request for a bearing comes as a surprise. The Coast Guard expected to provide signals upon which Earhart would take bearings, not the other way ’round. Besides, the *Itasca*’s direction finder can not respond to a relatively high frequency such as 3105. Also puzzling is Earhart’s apparent willingness to wait 45 minutes for a bearing which would, by then, be meaningless.

ABOARD NR16020: The time is 17:44. So far, the flight has been guided by dead reckoning and celestial navigation but now Noonan's calculations place the aircraft approximately 200 miles from Howland and within range of assistance from radio direction finding. However, in a test flight the day before, Earhart had been unable to take a bearing on the station at Lae, attributing the problem to the closeness of the station. In fact, at no time during the world flight is Earhart known to have successfully used her direction finder. Clearly, her confidence in the technology, and in her own ability to use it, was not high. It is hardly surprising that she would prefer to simply provide a signal and have someone else tell her what direction to fly. She wants the information at her next scheduled receiving time: "on the hour" Greenwich time, not in 45 minutes.

PSE TAKE BEARING ON US AND REPORT IN HALF HOUR--	0645
I NILL MAKE MOISE IN MIC-ABT 100 MILES OUT	0646

ITASCA PRIMARY RADIO LOG ENTRY FOR 06:45-6 A.M. JULY 2, 1937

ABOARD *ITASCA*: Frustration is mounting. Repeated attempts to establish contact and explain that Earhart's unanticipated request is also unreasonable have received no reply. Now she is once again asking for a bearing but, inexplicably, she is willing to wait half an hour for the information. The sun is up and her arrival should be imminent. Her transmission is received at Strength 4, indicating that the flight is drawing closer. However, although generally ascribed to Earhart, the words "about 100 miles out" appear to be the operator's. The notation was added sometime after the original entry (note the platen misalignment) and is similar to the —SEZ SHE comment in the 0345 entry. It's an important point because, at 130 knots, the airplane cannot be 200 miles out at 06:15 and 100 miles out half an hour later.

ABOARD NR16020: The time is 18:15. The requested bearing was not received at 18:00 nor has anything at all been heard from the *Itasca*. Earhart tries again, sticking to the schedule and asking for a bearing "on half hour" (not "in half hour"). Meanwhile Noonan has taken a celestial observation of the rising sun and has plotted a line of position (LOP) which runs 337° to the northwest and 157° to the southeast. He can place this line very accurately on the surface of the earth and, through dead reckoning, theoretically advance the line until it falls through the intended destination. When the calculated time has elapsed he will know that he is on a 337/157 line that passes through Howland Island. The trouble is, he can't be sure just where on the line they are, so if they don't hit Howland on the nose he will not know whether to turn left or right on the line. That's why the radio bearing is so important. Fuel remaining should be 224 gals. or 5.9 hours. If his "two hundred miles out" estimate at 17:44 was accurate and they don't have a significant headwind (*Itasca* was reporting easterly winds at 7 knots), they should reach the advanced line of position and, ideally, Howland Island in about an hour. At this point the lack of response on the radio is disturbing, but if they can see Howland when they reach the advanced LOP it won't matter.

KHAQQ CLNG ITASCA WE MUST KN ON YOU BUT CANNOT SEE U BUT GAS IS RUNNING LOW BEEN UNABLE TO REACH YOU BY RADIO WE ARE FLYING AT A 1000 FEET	42
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ITASCA PRIMARY RADIO LOG ENTRY FOR 07:42 A.M. JULY 2, 1937

ABOARD *ITASCA*: The situation is growing more tense. It is clear that Earhart has not heard *Itasca*'s transmissions although they are now receiving her at maximum strength (S5) indicating that she is within at least one hundred miles and possibly much closer. A second, less detailed, radio log kept by the ship records this message as "EARHART ON NW SEZ RUNNING OUT OF GAS ONLY HALF HOUR LEFT CANT HEAR US AT ALL." Lt. Cooper's report and the ship's Deck Log, however, both agree with the primary radio log that the phrase is GAS IS RUNNING LOW.

Cmdr. Thompson knows that the flight should have enough fuel to stay aloft until noon.

ABOARD NR16020: The time is 19:12 and Howland has not appeared as hoped. Earhart has dropped down to 1,000 feet so as to get under the scattered deck of clouds. She and Noonan believe they are very close to their destination but really need to know which way to turn on the line to find Howland. With 188 gals. remaining, enough for just 4.95 more hours, they are now burning their reserve. Gas is running low. There is, however, a contingency plan that will guarantee landfall before the fuel is exhausted. By turning right (157°) and running down the advanced line of position, one of four islands is bound to appear. If they are now too far north they will come to Howland. If they are already south of Howland then Baker, Mckean, or Gardner Island will eventually appear, provided they begin running southeast on the line when they have roughly three and a half hours of fuel remaining. Their situation at this point is serious but not desperate.

KHAQQ CLNG ITASCA WE ARE CIRCLING BUT CANNOT HR U GA ON 7500 WID A
LNG COUNT EITHER NW OR ON THE SKD TIME ON $\frac{1}{2}$ HOUR (KHAQQ S5 A3) 0758

Courtesy Purdue University Library Special Collections



ITASCA PRIMARY RADIO LOG ENTRY FOR
07:58 A.M. JULY 2, 1937

ABOARD ITASCA: Apparently Earhart's transmissions are coming in so loud that the speakers are distorting her words. At first the operator thinks he hears "WE ARE DRIFTING BUT CANNOT HEAR YOU" but that can't be right so he goes back, partially erases DRIFTING and types in CIRCLING, which seems more reasonable to him. There is also confusion about how much fuel she has left. If Earhart is really expecting to run out of gas at 08:12 (HALF HOUR LEFT at 07:42) why is she asking Itasca to "GO AHEAD ON 7500 KILOCYCLES WITH A LONG COUNT EITHER NOW OR ON THE SCHEDULED TIME ON THE HALF HOUR" by which time she will already be in the water?

ABOARD NR16020: The time is 19:28 and the situation is now serious enough that Earhart, for the first time, departs from her regular transmission schedule. She probably says, "WE ARE LISTENING BUT CANNOT HEAR YOU..." then asks for a long count on 7500 either now or in two minutes. Having failed in repeated attempts to get the ship to take a bearing on her, she

will try to use her direction finder to take a bearing on the ship.

KHAQQ CLNG ITASCA WE RECD ~~XX~~ UR SIGS BUT UNABLE TO GET A MINIMUM PSE
TAKE BEARING ON US AND ANS 3105 WID VOICE / NRUI DE KHAQQ LNG DASHES
ON 3105 -/ NRUI2 DE NRUI P AR 0800-3

ITASCA PRIMARY RADIO LOG ENTRY FOR 08:00-03 A.M. JULY 2, 1937

ABOARD ITASCA: The ship can not give Earhart a "long count" on 7500 Kilocycles because its transmitter is incapable of sending voice on that frequency, but it does repeat the letter A in Morse

code (dit dah, dit dah, dit dah), the prearranged signal for homing transmissions from *Itasca*. Earhart reports hearing the signal but is “unable to get a minimum” and again asks *Itasca* to take a bearing on her. She sends long dashes on 3105.

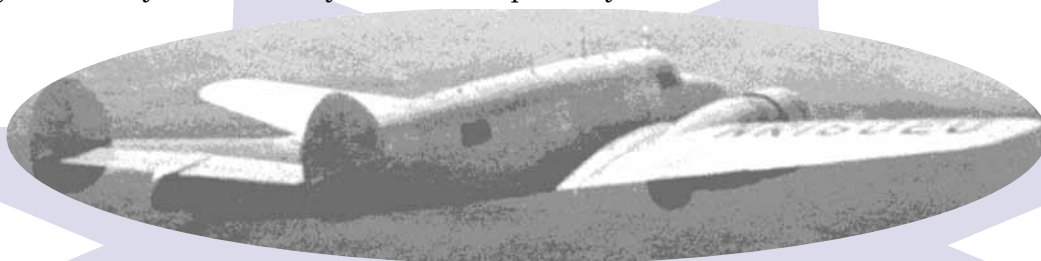
ABOARD NR16020: The time is 19:30. Earhart switches to her loop antenna and, for the first time, hears radio signals. It is not the human voice she hoped to hear but at least the repeated letter A indicates that *Itasca* has heard her. Turning the loop antenna mounted over her head, she attempts to get the signal to fade away (“get a minimum”) which will enable her to take a bearing, but her direction finder cannot respond to such a high frequency. She reverts to her previous attempts to get them to take a bearing on her.

KHAQQ TO ITASCA WE ARE ON THE LINE 157 337 ~~XX~~ WL REPT MSG WE WL REPT N ES S
THIS ON 6210KCS WAIT, 3105/A3 S5 (?/KHAQQ XMISION WE ARE RUNNING ON~~XX~~ LINE₄₃

ITASCA PRIMARY RADIO LOG ENTRY FOR 08:43 A.M. JULY 2, 1937

ABOARD *ITASCA*: Nothing has been heard from Earhart for nearly three quarters of an hour during which time *Itasca* has been trying to reach her almost constantly. The HALF HOUR GAS LEFT deadline is long since past when suddenly Earhart is back, very loud. The operator, apparently caught off guard, has already logged in other traffic at 08:44 and 08:45 which he strikes over and alters to 08:42 and 08:43 so that the new Earhart message will appear in sequence. She reports that she is on the line 157/337 and will repeat the message on her other frequency, 6210 Kilocycles. Then she says, “wait.” The operator has just typed in the end notations 3105 (the frequency), A3 (voice), S5 (Strength 5) when, quite unexpectedly, Earhart says something about running on the line. The resulting log entry is so jumbled as to be impossible to reliably decipher, but has been traditionally represented as “We are running north and south.” Whatever the words were, they were the last *Itasca* would hear from Earhart.

ABOARD NR16020: The time is 20:13 and, in spite of everything, Earhart is still sticking very close to her radio schedule. She may also have made her scheduled 19:45 (08:15 local time) transmission to *Itasca* but it wasn’t heard because, as the log shows, *Itasca* was trying to call her at just that time. For the past hour she and Noonan have been running back and forth on and near the line of position hoping to spot the island. Noonan can, of course, take additional sun shots but it will be another two hours or so before the sun will have changed enough to give him a reliable “cut” across his original 337/157 line. There are now 150 gals, just under 4 hours, of fuel remaining aboard the aircraft. They will soon have no choice but to begin running southeast on the line of position. Due to the skip characteristics of 6210 Kilocycles, Earhart’s decision to switch to that frequency effectively shuts off any further reception by *Itasca*.



Conclusion:

The Coast Guard’s official position that the Earhart flight ran out of fuel and crashed at sea shortly after the final transmission heard by the *Itasca* is not supported by the facts.