Earhart's Final Hours: Life, Disappearance, and Legacy

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Introduction

On July 2, 1937, Earhart took off in her Lockheed Electra for the last time from Lae, New Guinea, leaving for the last leg of her circumnavigation of the globe. Her navigator, Fred Noonan, was tasked with ensuring that they made it to their next destination, Howland Island.[1] It would be dark at their expected arrival time, so, it was imperative that their calculated route flew them close enough to the island to see the lights of the U.S. Coast Guard cutter, the *Itasca*, which would be awaiting their arrival to guide them in and ensure a safe landing on the small, uninhabited island.[2] In an unexpected turn of events, Earhart and Noonan would never arrive at Howland, prompting a massive search-and-rescue mission for the missing persons. Eventually, the U.S Navy released a report stating that the aviators' cause of death was drowning, after assuming that they ran out of fuel and subsequently crashed into the ocean.[3] Since the release of the report, there has been mass speculation and debate regarding Earhart and Noonan's true cause of death. The looming question is: what really happened to Amelia Earhart? One argument states that Earhart and Noonan crashed into a remote, nearby island called Nikumaroro (Gardner Island at the time) where they lived out their final days. These theorists cite

[1] "US Navy Report of the Search for Amelia Earhart, July 2-18, 1937," Records of the Office of the Chief of Naval Operations, 1875-2006 in *World War II Action and Operational Reports, December 7, 1941-1946*, Record Group 38, National Archives at College Park, MD, https://catalog.archives.gov/id/305240.
[2] Randall Brink, *Lost Star: The Search for Amelia Earhart* (New York: W.W. Norton, 1994).
[3] "US Navy Report of the Search for Amelia Earhart, July 2-18, 1937," 1-2.

decades of accumulated archeological and analytical evidence.[4] The other side argues in favor of the contents of the initial Navy report: Earhart and Noonan crashed into the Pacific Ocean and drowned, and any argument to the contrary is nothing more than a baseless conspiracy. This paper will examine each side of this historical debate, and ultimately determine which thesis holds more merit based on their claims, evidence, and logic.

Ocean Crash Theory

The original, most commonly accepted theory is that Noonan and Earhart crash-landed into the Pacific Ocean after failing to find Howland Island and running out of fuel, as was reported by the United States Navy and Coast Guard. This theory revolves around one central concept: the other side simply does not have evidence to prove that their theory is true, so this one must be true. For example, the radio transmissions, said to have been broadcast by Earhart after the estimated time of the crash cannot be traced back to her with complete certainty. In the days following the crash, reports of "carrier waves" (radio signals) in the vicinity of Howland island arose, as reported by the US Coast Guard. Additional SOS messages were picked up, centering around the Phoenix group of islands southeast of Howland, which is in the direction of Nikumaroro. This is also the direction that friends and colleagues of Noonan knew he would head in the event of an emergency. Despite how promising these leads were, by the time the search reached this area there was no evidence found of the Electra, Earhart, or Noonan being there.[5] According to Long:

[4] Thomas F. King, "The Archaeological Context of the 1940 Nikumaroro Bones Discovery." *TIGHAR*, November 2017: 1-4, https://tighar.org/Projects/Earhart/Archives/Documents/BonesForensicAnalysis/05ArchaeologicalContext.pdf.

[5] Carol A. Pearce, *Amelia Earhart* (New York: Facts On File Publications, 1988), 146-147.

> "...the incessant calls of the *Itasca*, calling KHAQQ and Earhart by name, were being broadcast indiscriminately to most of the Pacific and a good part of the world. Dozens of people, having just heard the name 'Earhart' or 'KHAQQ' over their receiver, sent reports of having heard her. Some even claimed to have messages sent in Morse code by Earhart or messages of her reported position where no land or island existed."[6]

According to supporters of this argument, it is impossible to know if a true radio broadcast from Earhart was heard, and the reports were likely just the result of frenzied aviation enthusiasts, no more than conspiracists. Further, when questioned by the crew of the Itasca, residents of two nearby islands, Arorai and Tamana, claimed that they neither heard nor saw the plane come down.[7] Therefore, it is not likely that Earhart and Noonan ended up on the islands in the direct vicinity of Howland.

A strong supporting factor of this argument is that government-reported strong headwinds, heavy weather, and low visibility would have made it extremely difficult for Earhart and Noonan to 1) make it to Howland Island without running out of fuel, which would be drained from fighting headwinds, and 2) spot the island when/if they finally did arrive. According to the US Navy's report, the most likely courses that Noonan would have taken in an event of predicted early-morning low visibility from the east were either overcorrecting southward running up a morning longitude through the target or overcorrecting northward to run down a morning longitude through Howland Island. Both of these options would have placed the aviators over the open ocean if they overshot their target, which would be catastrophic in the event of a premature gas shortage.

If there truly were strong headwinds and heavy weather as the Navy reported, they would have few other pieces of land to retreat to if they could not find Howland. In fact, Navy Lt. Warren

[6] Elgen M. Long and Marie K. Long, *Amelia Earhart: The Mystery Solved*, (London: Simon & Schuster, 2009), 216.
[7] "US Navy Report of the Search for Amelia Earhart, July 2-18, 1937," 6.

W. Harvey stated that "If Miss Earhart entered the storm, she hadn't a chance."[8] The Navy's report claims that Earhart and Noonan experienced stronger headwinds than expected and estimated that the pair flew at an average of about 110 knots. The recommended speed for the flight was approximately 130 knots, which would have the pair arrive soon after the sun had come up but after the immediate daybreak to avoid visibility problems.[9] Earhart and Noonan were slightly behind schedule, but it is unlikely that this caused any major concerns regarding fuel, since they were just short of the recommended speed. However, if the pair spent too much time searching for the island, it is possible that fuel became a concern.

In fact, researchers know for certain that Earhart and Noonan were concerned about running out of fuel; she said so herself in her last hour of broadcasting.[10] According to Long and the Charter Report from Lae, New Guinea, Earhart's plane was filled with 1,100 US gallons the day before takeoff.[11] However, it was 88-degrees Fahrenheit and sunny in the daytime, which affected the 87-octane fuel's density and caused an estimated reduction by expansion and venting to an equivalent 1,092 standard 6-pound US gallons (fuel expands and weighs less per gallon at higher temperatures). So, the calculation of flight endurance based on a standard 6-pound gallon may have been skewed.[12]

An hour and a half after Earhart's correspondence with Captain Thompson regarding her concern over fuel, he sent a message to the San Francisco division saying, "EARHART CONTACT 0742 REPORTED ONE HALF HOUR FUEL AND NO LANDFALL . . ."[13] The *Itasca* departed to search to the northwest on line 157 337° a half hour later. Earhart's last transmission to the ship at 0843 had stated that they were traveling up and down line

[8] W.C. Jameson, *Amelia Earhart: Beyond the Grave* (Lanham: Taylor Trade Publishing, 2016), 78.
[9] "US Navy Report of the Search for Amelia Earhart, July 2-18, 1937," 7.
[10] Long and Long, 29.
[11] Ibid., 189.
[12] Ibid., 232.
[13] Ibid., 232.

157 337, which runs northwest to southeast through Howland Island, in an attempt to find land and the *Itasca*.[14] Nikumaroro (then called Gardner Island) also sits on this line. Not only does this mean that Earhart was very much still aloft a full hour after Thompson reported her claiming to only have a half hour of fuel left, but it also presents Nikumaroro as a very real possibility for an emergency landing site, lying directly on the path she and Noonan were traversing. This is cause for the suspicion leading to the second theory.

Nikumaroro Theory

The other, more hopeful side of the historical debate regarding Earhart and Noonan's ultimate whereabouts believes that the two landed on Nikumaroro, a small coral atoll southeast of Howland, rather than crashing into the sea. Earhart was not known to give up, and Fred Noonan's wife even stated that he would turn back if in doubt rather than ditch the Electra in the sea.[15] According to Earhart's close friends, she claimed that if she could not find Howland Island, then she would attempt to land on a nearby island with fresh water on it.[16] Subscribers to this theory argue that Earhart and Noonan were attempting to find Howland Island, but struggled due to early-morning visibility problems. So, they ultimately elected to land on another island along the line that they were traversing, 157 337.

As to the claim of adverse weather conditions, there is little-to-no evidence that there was any sort of storm or heavy weather upon Earhart's arrival to the area surrounding Howland Island, nor did she mention this in her transmissions.[17] Researcher Rollin Reineck even goes so far as to claim that the story of serious weather problems was completely fabricated by the navy to explain Earhart

[14] Jameson, 65.
[15] "US Navy Report of the Search for Amelia Earhart, July 2-18, 1937."
[16] Pearce, 143.
[17] Jameson, 78.

and Noonan's disappearance. Additionally, the University of Hawaii's meteorological reports near Howland Island at the time showed that conditions were suitable for flying, and Jameson even goes so far as to claim that "Harvey's descriptions of snow, sleet, and ice in the area were incorrect. He was either provided with this information to broadcast or ordered to manufacture it himself."[18] So, there is a great deal of doubt surrounding the argument of adverse weather conditions. While there is no evidence supporting why Lieutenant Harvey would fabricate weather data, there is also no other confirmation claiming that said extreme weather conditions indeed existed. As for visibility concerns, Leo G. Bellarts, chief radio broadcaster on the *Itasca,* said that no such problems existed, claiming, "As to the weather, there were puffy clouds to the northwest but plenty of blue in between them. Other than that, it was a very clear day."[19]

Another point on the position of an emergency landing on Nikumaroro is that there was simply no evidence pointing toward the theory that the plane crashed into the water surrounding Howland Island. Further, Nikumaroro was not searched because it was not in the radius of the Navy and Coast Guard's search and rescue. The search team focused their efforts toward the southwest of Howland based on wind and sea current directions since they assumed the aviators would be in the water, but Nikumaroro is southeast of Howland.[20] This search turned up no evidence of a downed plane, oil slick, crash debris, etc. According to Jameson, "there exists no evidence that points to the notion that Earhart and Noonan were anywhere near Howland Island when they came down."[21] If the plane had come down in the open water as the first theory suggests, it would have remained largely undamaged. The fuel tanks were purposefully engineered as a flotation device to keep

[18] Ibid., 78.
[19] Ibid., 78.
[20] "US Navy Report of the Search for Amelia Earhart, July 2-18, 1937," 7.
[21] Jameson, 78.

the plane afloat in the event of a water landing.[22] So, it is likely that the plane would still be visible and spotted by searchers in the hours and days following the crash. However, in the instance of a crash landing on an Island such as Nikumaroro, the Electra likely would have taken substantial damage, causing the fuel tanks to be punctured and allowing for the plane to sink if carried out to sea.[23] Just offshore of Nikumaroro are massive underwater cliffs, which, if the plane was carried out by the coral atoll's dramatic tide changes, could allow for the plane to be swept away deep and far out into the ocean. So, this could be an explanation for the disappearance of the plane, which the Navy was searching for. If they didn't spot a plane, they would likely rule the area out as a crash site and fail to search the land for castaways. Further, if Noonan and Earhart did in fact find land, it is unlikely that they abandoned this position to make themselves more visible to search parties; this would make them more vulnerable and they may have not been able to find their way back to the island and the Electra. Rather, they more likely sought shelter and waited to be rescued.

Additionally, the Navy reported that "the plane's radio power supply was so located that it could not have been used with [the] plane on the water."[24] So, considering the numerous reports of transmissions and carrier waves from Earhart after her disappearance, it is unlikely that she was broadcasting from the water. If Earhart and Noonan had crash landed into the ocean as the original theory suggests, it would not have been possible for her to continue broadcasting on her radio, and it is proven that she did just that. On the other hand, if the plane, which stood at 3.0734 meters tall, landed in the atoll of Nikumaroro Island, it would remain perched above the water even at the maximum predicted tide of 1.934 meters.[25] In this case, it would be possible that the radio

[22] "US Navy Report of the Search for Amelia Earhart, July 2-18, 1937," 10.
[23] Ibid, 10.
[24] Ibid, 4.
[25] "L-10 Electra, " National Naval Aviation Museum, Naval History and

remained usable to Earhart (especially accessible at low tide, when almost all of the transmissions were recorded) until the Electra was ultimately swept out to sea.

Another compelling set of evidence supporting the Nikumaroro theory is the archaeological excavation conducted by TIGHAR (The International Group for Historic Aircraft Recovery). They found a great number of artifacts on Nikumaroro Island strongly implying that "a woman from the United States lived and died [there] in the late 1930s."[26] The artifacts found included, but were not limited to, a compact mirror with early 20th-century rouge consistent with one Earhart is shown holding in photographs, a small jar containing mercury-based freckle fading cream (Earhart was known for her freckles), and a snap fastener consistent with those which would have been part of a Tabloid first aid kit, which was documented to have been aboard the Electra. Additionally, a US zipper pull was found, and after examination it was determined that it was made between 1933 and 1936. This put to rest claims that the belongings were those of a victim of the SS Norwich City shipwreck, which crashed into Nikumaroro in 1929. Also among the findings was a heel from a woman's shoe which Earhart was known to wear, along with a "tiny piece of aluminum foil with lettering on it that, while sparse, is consistent with that of an American signal torch."[27] Lastly, a wooden, dovetailed sextant box was found. According to King, Noonan used a nautical sextant similar to the one found as a backup instrument when navigating Pan American or Pacific routes. A photo of the navigation room in a Pan Am Clipper

Heritage Command, accessed May 16, 2023, https://www.history.navy.mil/content/history/museums/nnam/explore/collections/aircraft/l/l-10-electra.html; Randy Jacobson, "Recorded Tide Data for Nikumaroro," TIGHAR: The Earhart Project, March 11, 1999.

[26] King, "The Archaeological Context of the 1940 Nikumaroro Bones Discovery," 4.

[27] Ibid., 4.

Noonan served on shows a Brandis sextant box, the same kind that was found on Nikumaroro.[28]

Arguably the most supportive piece of evidence toward the Nikumaroro theory is the set of bones found on the island. In 1940, a set of skeletal remains were found on Nikumaroro Island under a "Ren" tree.[29] Seventy-seven years later, forensic dogs part of a 2017 expedition "alerted on the ground under a fallen Ren tree and nowhere else in the vicinity," indicating that this could well have been the initial discovery site of the bones.[30] After their discovery in 1940, the bones were immediately sent to and examined by Dr. D. W. Hoodless in Fiji and determined to be those of a stocky male, initially ruling out the possibility that they belonged to Amelia Earhart. The remains were subsequently lost during World War II; Fiji was a British colony at the time and under severe threat of Japanese invasion, most of the island's attention was focused toward militarization.[31] In the decades following, people have questioned Hoodless' arguably outdated methods of determining the sex of the remains. At the time of the analysis, "forensic osteology was not yet a well-developed discipline," and more modern analyses of his recordings have shone further doubt upon Hoodless' original assessment. In 2018, Richard Jantz conducted a statistical study using the measurements taken by Hoodless of the bones and compared them to Earhart's measurements. He then cross-referenced these with the average measurements of other possible individuals that could have stumbled upon Nikumaroro Island. Of the sample population, Jantz found that "2,758 (99.28%) individuals have a greater distance from the Nikumaroro bones than Earhart, but

[28] Ibid., 2.
[29] Richard L. Jantz, "Amelia Earhart and the Nikumaroro Bones: A 1941 Analysis versus Modern Quantitative Techniques," *Forensic Anthropology*, 1, no. 2 (2018): 83–98.
[30] King, "The Archaeological Context of the 1940 Nikumaroro Bones Discovery," 1.
[31] Ibid., 1.

only 18 (0.65%) have a smaller distance."[32] So, he concluded that "the Nikumaroro bones are at least 84 times more likely to belong to Amelia Earhart than to a random individual who ended up on the island."[33] Earhart was more similar to the bones than the majority of random individuals. It is possible that Hoodless mistook the robust tibia and narrow hips he was presented with as those of a stocky male without considering that they might have belonged to a tall, narrow-bodied female such as Earhart.[34] The bones may have truly appeared male to Hoodless, but he simply did not have the technology to analyze it correctly. Jantz concurs:

> "From a forensic perspective the most parsimonious scenario is that the bones are those of Amelia Earhart. She was known to have been in the area of Nikumaroro Island, she went missing, and human remains were discovered which are entirely consistent with her and inconsistent with most other people. Furthermore, it is impossible to test any other hypothesis, because except for the victims of the *Norwich City* wreck, about whom we have no data, no other specific missing persons have been reported."[35]

If the bones did not belong to Amelia Earhart, they belonged to someone very similar to her; Jantz's analysis "reveal[ed] that Earhart is more similar to the Nikumaroro bones than 99% of individuals in a large reference sample."[36] Despite the fact that the bones were lost, the fact that they once existed and were scientifically evaluated is a very strong piece of evidence supporting the theory that Earhart landed on Nikumaroro Island and lived out their final days there. Though Jantz's study involved assumptions

[32] Jantz, 13.
[33] Ibid., 13.
[34] Ibid., 1-2.
[35] Ibid., 14.
[36] Ibid., 1.

made about Earhart's measurements, they are still extremely promising. Jantz used a variety of credible methods to make his estimates, including photographs, the sizing of her clothing, Mahalanobis distance, et cetera, so his estimates were at least very close to her true measurements. As for Noonan's whereabouts, no evidence has been found beyond the discovery of a navigational sextant similar to the one that he would have carried. However, there are many possible explanations for the absence of his remains, including his body simply washing out to sea like hypothesized of the Electra.

Evaluation

The original theory that Earhart and Noonan crashed into the Pacific after running out of fuel searching for Howland Island mostly argues that the converse side simply does not have enough evidence to be true. However, it is clear from the findings of this paper that the Nikumaroro theory actually has more tangible evidence than previously thought and claimed by opposers. The strongest piece of evidence toward the ocean-crash argument involves using the radius in which the crew of the *Itasca* would be able to clearly hear Earhart's transmissions and comparing this with the estimated amount of remaining fuel the Electra would have had. This would give them an idea of how far she could have gotten from Howland Island before having to make a crash landing nearby or ditching the plane into the ocean. This was used to create a search radius for Noonan and Earhart after their appearance. However, the only other island within this radius was Baker Island, which was searched but contained no evidence of a crash. So, the search team continued hunting the ocean in the opposite direction of Nikumaroro Island, which was outside of their search radius (400 miles away from Howland). However, there is no way of knowing for certain how much gas was left in the Electra, as shown by Earhart transmitting on her radio a full hour after Captain Thompson reported that she

had only a half hour of fuel remaining. Additionally, uncertainty regarding the amount of fuel remaining in the Electra has arisen from weather-related reduction by expansion estimates and possible strong headwinds which required the use of more fuel to keep up speed. Lastly, claims of storms and adverse weather conditions which are heavily used to support the ocean-landing theory have also been disproven. However, even if there were stormy conditions, this would not rule out an emergency landing on Nikumaroro in the event that Earhart and Noonan could not spot Howland Island, their target. Certainly, the pair would elect to land on whatever land source they came across in the event of an extreme emergency weather crisis. All in all, the theory that Earhart and Noonan crashed into the Pacific Ocean is merely speculation based on the most likely outcome in the absence of initial tangible evidence pointing to the contrary. But, as more evidence and analysis has emerged supporting the Nikumaroro theory, it must be regarded as a real possibility.

Logically, those supporting the original ocean-crash theory argue that their claims must be the more likely option since there was not much proof at the time backing the Nikumaroro theory. However, this has become untrue in recent years as more evidence has turned up: archaeological findings consistent with items that would have been on the Electra, bones which have been proven extremely similar to Earhart's measurements, et cetera. Evidence to the contrary is far less tangible and largely based on assumptions: if the Navy didn't find the Electra on land, then it must have sunk into the ocean as a result of a crash water-landing. The evidence that *is* used by adopters of the original theory is often shaky: adverse weather conditions, fuel shortages, and the original bone analysis claims have all had logical holes poked in them. There is little tangible evidence pointing toward an ocean landing (no oil slicks seen on the open water during the search, no floating Electra spotted), but there is palpable evidence supporting an emergency landing on Nikumaroro.

The Nikumaroro theory uses deductive reasoning based on evidence to produce logical claims. For example, the presence of a lifeboat and oars on the plane means that it is very likely that Noonan and Earhart would have gone for these items in the case of a water landing, especially since the plane would have been floating, as backed by evidence of the buoyancy engineered into the fuel tanks of the plane. In this case, the pair would have been found by the US Navy and Coast Guard, especially since the ocean-crash theory suggests that Earhart and Noonan were within a closer radius to Howland Island which was being searched. However, the fact that this was not the case contradicts the ocean-crash theory, further heightening the probability that the Nikumaroro hypothesis was reality. The presence of concrete evidence of physical artifacts makes the Nikumaroro theory far more attractive than its counterpart.

Conclusion

Arguably the most famous aviator of her time, Amelia Earhart's disappearance shook the world. In the years following, analysis supporting a new cause of death sparked massive contradictory discourse. One side argues in favor of the Navy's initial report: Earhart and Noonan ditched their plane into the sea after running out of fuel searching for Howland Island. The other claims that they ended up on Nikumaroro Island, where they lived out their final days. A detailed analysis found that there is far more tangible evidence pointing toward Earhart being on Nikumaroro Island than there is of her not. Additionally, the evidence pointing to the contrary (a crash landing into the ocean) is ambiguous, easily challenged, and based mainly on assumptions rather than hard, concrete evidence. The Nikumaroro argument is logically stronger and better supported, with Jantz's 2018 bone analysis providing groundbreaking affirmation. The mysterious and tragic disappearance of Amelia Earhart may remain unsolved, but her

influence on aviation and women's rights cannot be overshadowed by the enigma and chaos of her demise.