MEMORANDUM #1

To: Earhart Research Community
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It's Time to Retire the Old Reef Landing Theory

Overview: This challenges the long standing and still unproven theory that Amelia Earhart landed on a particular section of reef on Gardner Island.[1] It does not dispute that she landed on Gardner Island, just not on the reef. Since the reef landing theory began to take form about 1989 it has completely dominated the Gardner Island hypotheses to the detriment of research into other possible landing sites, the most obvious being the miles of beach's. So, are the foundations of the reef landing theory as sound as we thought? This memo reminds us of certain preconditions, that we must accept as fact, in order for the reef landing to possibly have occurred thereafter.

1. Before reading further, a critical point: If Earhart was ever in the vicinity of Howland Island (say < 100 miles) then a successful reef landing at Gardner Island is impossible. Gardner lies approximately three flight hours away[2]. There simply is not enough time to reach Gardner Island and land on the particular reef flat before the rising tide submerged the usable surface. Any scenario placing her near Howland Island, effectively rules out a reef landing at Gardner Island—full stop. In such case, there is no need to read any further.
2. Otherwise, for the reef landing to have occurred, other events had to occur first and all of the following statements must be true;
    A. Earhart was ~150 miles south of course[3], thus could theoretically reach Gardner Island in time to land on the reef flat before the rising tide made it unusable[4], assuming such a landing is possible in 6" of standing water at the midway point[5].
    B. That, to be that far off course, presumably due to wind, winds would have needed to be from the north or north-northeast to displace the flight 150 miles south of course[6]. (This contradicts known forecasts and all observed surface winds within 1,000 miles, which were typically easterly (NE-E-SE) trade winds of 10–20 knots — normal July conditions.)
    C. That, no celestial sextant sights were able to be obtained during the entire ~12-hour night flight, therefore no course corrections. And that they would press onward without course corrections. In effect, this requires the sky to have been obscured by clouds the entire ~1400 NM night leg with no opportunity for any sights, which contradicts her 1630z radio report of "partly cloudy", when only 2.7 before Howland.
    D. That, being ~ 150 miles south of Howland, the Itasca would have been hearing her radio transmissions by skywave (ionosphere refraction) and not normal groundwave, which is limited to less range than that. Itasca logged her signal strength as steadily increasing until loud and clear, which is atypical of skywave propagation. (Strength vs. range is normal for groundwave but not skywave.) Notably, TIGHAR's own probability chart puts the odds of hearing her "loud and clear" via skywave at only 50% when 150—250 miles south of course.[7]
    E. That, Earhart's 1030z sighting of ship lights[8] — either the *Myrtlebank* or the *Ontario*, the only two ships near her route — either occurred, meaning a radical course divergence happened later, or didn't occur, meaning she was already south of course by then and unchecked course error occurred most of night.

F. That, after circling Gardner Island and observing its nearly 8 miles of beaches[9], Earhart found nowhere suitable for even a few hundred feet of landing roll and therefore chose the reef instead[10].

G. That, Earhart, who was from Kansas, knew something about landing on coral reefs and was confident in her ability to pick this one tiny stretch of dry or partly dry reef, where only a few hundred feet is usable, as the best place to land.[11]

H. That, even if the reef landing zone was partially covered in water (it was by then), Earhart could have discerned from the air how deep it was and the surface under the water was smooth and safe to land on. (Navy sea planes searching for Earhart reported "It was noted that the reefs which from the air appeared to be close to the surface were, in reality, at least four to six feet or more deep" [12])

I. That, at approximately 2130z[13], the last possible time that the water would still be shallow enough[14], and just 1.3 hours after her last transmission received by the Itasca, Earhart was 350 miles south of Howland and landed on a small patch of reef, that was dry at touchdown and was covered in about 6" of water midway during rollout, then dry thereafter[15].

J. That, a tailwheel plane like the Electra, as in the opinion of unnamed 'experienced pilots' reef advocates quote and never demonstrated, can roll into 6" deep water at landing speed and not pitch over forward uncontrollably on to its back and come to rest upside down[16] [17] .

3. Accepting the reef-landing hypothesis requires believing that all of the above preconditions are true, despite the absence of hard evidence supporting any of them. At best, some of the above has been demonstrated as possible — however improbable.

4. Accepting multiple improbable conditions to occur simultaneously decreases the overall likelihood exponentially. As a simplified illustration only — not a precise calculation of this specific list — if just ten such conditions each had a generous 50% chance of occurring, the probability of all ten occurring simultaneously is 0.098%. That's roughly 1 in 1,024 — the same chance as flipping a coin 10 times in a row and getting heads every single time.

5. Now, after over a quarter century, this particular reef landing theory survives despite the complete lack of hard evidence and one failed expedition after another to find support. Now is the time to take a step back and ask ourselves how did we get here in the first place? Were our assumptions that the reef landing was possible and likely, as good as we thought?

6. Has anyone proven that landing on the most obvious place, the miles of beaches or even the lagoon, impossible? No. To the contrary, Navy search planes reported of Gardner Island "Given a chance, it is believed that Miss Earhart could have landed her plane in this lagoon and swam or waded ashore. In fact, on any of these islands it is not hard to believe that a forced landing could have been accomplished with no more damage than a good barrier crash or a good wetting."[18] (Presuming by "barrier crash"[19] they meant on land.)

7. To this day the interior of the island remains largely unsearched[20] and never with modern technology or even a drone. Ric Gillespie (TIGHAR) once rhetorically said himself "How many Electra's could you hide down there?" (Referring to the dense jungle before him.)[21]

8. A beach landing begs the question "So what became of the plane?" The answer could be as simple as sometime later, a strong wind, like a thunderstorm or winter storm such as the one that grounded the *Norwich City*, picked up the plane and flung it inland into the dense jungle. An empty Electra could become airborne with as little as 50-60 knots of wind, well within the possibility of these weather events. It only takes one gust. As a point of reference for this possibility, go to your local airport and note that all the parked light aircraft are tied to the ground with ropes—standard policy for good reason.

This memo may be viewed online at **www.Earhart2025.com/memo1**

[1] TIGHAR, "*Landing on the Reef"*, Earhart Project Research Bulletin #24 (July 7, 2000), https://tighar.org/Projects/Earhart/Archives/Research/Bulletins/24_ReefLanding/24_ReefLanding.html.l

[2] 350 nautical miles as measured on Google Earth Pro. A commonly accepted airspeed for the Electra was 130 knots, therefore 2.7 hours flight time, plus 0.3 hours to look for a suitable landing spot and setup for landing.

[3] Ric Gillespie, *One More Good Flight: The Amelia Earhart Tragedy* (TIGHAR, 2024), ch. 18 and accompanying "Positions Profile" chart.

[4] Bob Brandenburg, "*Time & Tide*", *TIGHAR Tracks*, Vol. 29, No. 1 (Feb. 2013), 53–60, Figure 6 (points N, S, and I), https://tighar.org/Publications/TTracks/2013Vol_29/February_2013/Time_And_Tide.pdf.

[5] TIGHAR's working assumption is that the Electra could land in 6" of standing water based on the opinion of unnamed experienced pilots. See footnote 4, heading "The Electra Landing Area"

[6] TIGHAR's materials appear to treat this position off course as an established premise rather than a value derived from specific analysis. Exactly what direction and velocity depends on when the course deviation begins. The author has calculated 020° at 13 knots if the deviation began early in the night, or 012° at 16 knots if after the 1030z report of ship sighting. Using a standard wind triangle as described in U.S. Federal Aviation Administration, *Pilot's Handbook of Aeronautical Knowledge*, FAA-H-8083-25 (current edition), ch. 16, p. 16-3..

[7] See footnote 3

[8] Randall S. Jacobson, Ph.D., "*The World Flight, Second Attempt: The Final Flight, Part 2: Midpoint to the Vicinity of Howland,*" tighar.org, https://tighar.org/Projects/Earhart/Archives/Research/ResearchPapers/Worldflight/finalflight2.html.

[9] The best place to inspect this yourself is using Google Earth Pro (free download).

[10] Since beaches change over the years due to natural causes, the present day appearance of the beach is not a reliable indicator of what the beach looked like in 1937. There are aerial photos of Gardner Island taken in 1938 showing the island that are now archived by the Air Force Museum of New Zealand that show miles of generally straight sandy beaches, particularly on the SW shore. https://airforcemuseum.co.nz/photographs/ and search for "Gardner" or "Gardner Island". See photograph LbA2352.jpg in particular.

[11] There are no documented cases of aircraft ever intentionally landing on a reef by choice. There are a few WWII cases where crippled aircraft crash landed on a reef. No textbooks or training materials mention reef landings then or now. Reefs were generally considered treacherous to ships and airplanes alike.

[12] Search report by Lt. John O. Lambrecht, USN, Senior Aviator aboard the U.S.S. Colorado, July 16, 1937.

[13] 2130z landing estimated following the 2115z "Sight Gardner", as posited in Ric Gillespie, *One More Good Flight: The Amelia Earhart Tragedy* (Annapolis: Naval Institute Press, 2024), map 6.

[14] See footnote 4.

[15] See footnote 4. Figure 6, points I, S & N which define the landing zone depth at 2130z.

[16] AI calculations indicate such conditions would cause uncontrolled pitch over. Estimates of the deceleration required to tip the aircraft forward onto its nose (≈0.2g, from main-gear/CG geometry per TCDS No. 590) versus the estimated deceleration from the main wheels entering six inches of standing water at a 40-knot landing roll (≈0.7–0.8g) were developed independently using Claude (Anthropic, Claude Sonnet 4.6), Grok (xAI), and Gemini (Google), June 2026, each prompted with the aircraft's weight, landing speed, tire dimensions, and the CG/gear data above, and 9000 pounds landing weight, forward CG. All three produced comparable results. A reader can reproduce or challenge this analysis by posing the same question, with the same inputs, to any current AI system with reasoning and search capability. Generally 20-35 knots was the maximum speed before uncontrolled pitch over would occur.

[17] Landing on 6" of standing water has never been tested. Two NASA studies tested deep standing water but not deeper than 2". NASA TN D-552 (Horne, Joyner, and Leland, 1960) and NASA TN D-3515 (Dreher and Horne, 1966).

[18] See footnote 12.

[19] A barrier crash is a Navy term for when a plane lands on an aircraft carrier and instead of being stopped by the tail hook, overshoots and runs into a "barrier" net or cables that are guaranteed to stop it, although with some damage.

[20] For example, TIGHAR last did a general search of the island in 1989 but was unable to penetrate the inland jungle more than a few feet. Since then expeditions have focused on specific areas considered most promising.

[21] See YouTube video "*Aerial Tour of Nikumaroro*" narrated by Ric Gillespie. 2012. Commentary starts at 21:30.