TIGHAR TRACKS

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Changing MYSTERY to HISTORY

About TIGHAR

TIGHAR (pronounced "tiger") is an acronym for The International Group for Historic Aircraft Recovery, a 501(c)(3) non-profit educational foundation.

TIGHAR's activities include:

- Investigating aviation and aerospace historical questions and mysteries through archival research, forensic data analysis, and archeological expeditions.
- Producing papers, publications, and videos to further the foundation's educational mission.
- Providing expert historical and archaeological research to government agencies for evaluation of cultural resources related to aviation/aerospace.
- Advocating for accuracy, integrity and professionalism in the field of aviation historical investigation and the preservation of the material culture of flight.

TIGHAR's activities are conducted primarily by member volunteers under the direction of a small full-time professional staff. The organization's research is publicly available via the TIGHAR website.

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On the Cover

Taken by an unknown photographer in Lae, New Guinea on July 1, 1937, this is the last known still photo of Amelia Earhart. Courtesy of "Remember Amelia," the Larry C. Inman Historical Collection on Amelia Earhart.

On the Web

http://www.tighar.org

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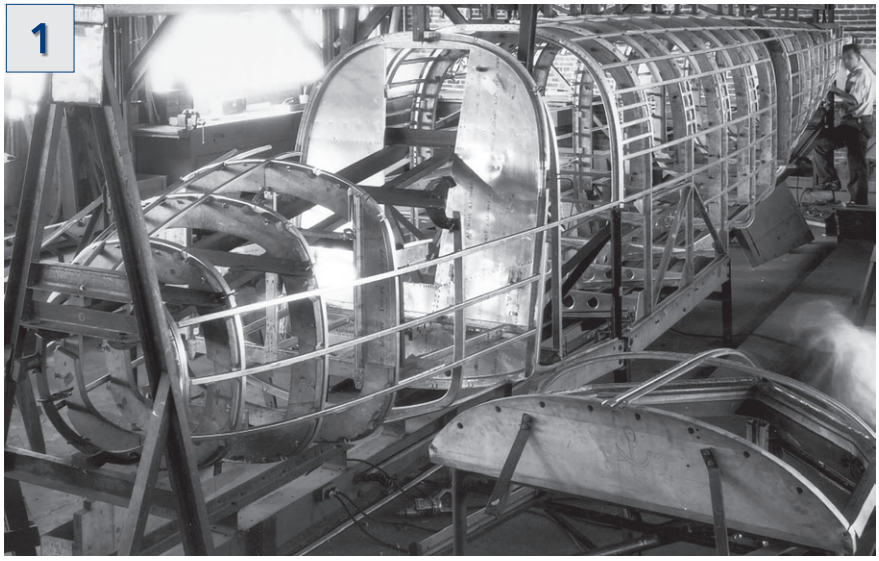
NEW DOTS, NEW CONNECTIONS

After ten years of negotiations, TIGHAR has succeeded in acquiring imagery that may finally prove whether TIGHAR Artifact 2-2-V-1 is the aluminum patch installed on the Electra in Miami prior to Earhart's departure on her second and fatal world flight attempt. Sixteen millimeter motion picture film taken at Lae, New Guinea on July 1, 1937 shows the Electra taking off for a test hop, followed by a scene of the plane being fueled for the next day's flight to Howland Island and a brief shot of Amelia standing with the oil company representative who was in charge of the fueling operation. Of greatest interest is the portion of the fueling scene that shows the patch on right side of the fuselage.

On March 11, 2019 the film was successfully scanned and digitized at a lab that specializes in archival footage. The film is in better condition than we expected and, even in the raw imagery, we can see new details. The best news is that the patch is visible in 235 frames of the film. That means TIGHAR's forensic imaging expert Jeff Glickman can use "super-resolution" software to combine individual frames to create a greatly enhanced image that should enable us to prove or disprove that TIGHAR artifact 2-2-V-1 is the patch.

Meanwhile, it is now apparent that bits of information once seen as incidental and unrelated, are connected and consequential. Deformation of the patch visible in the new imagery is indicative of stresses that trace back to the installation of the window it replaced and, ultimately, to the original construction of the airframe.

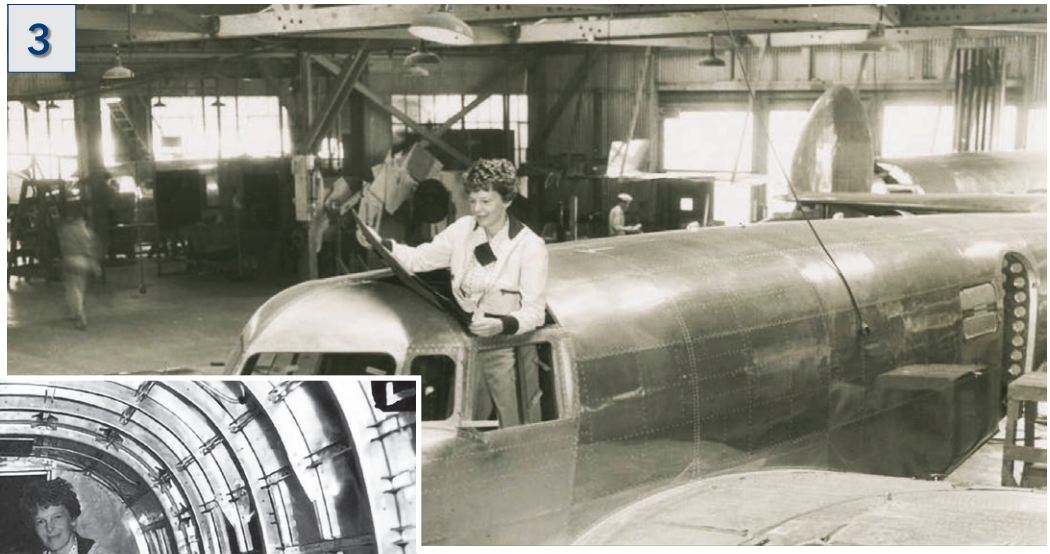
Cause and Effect

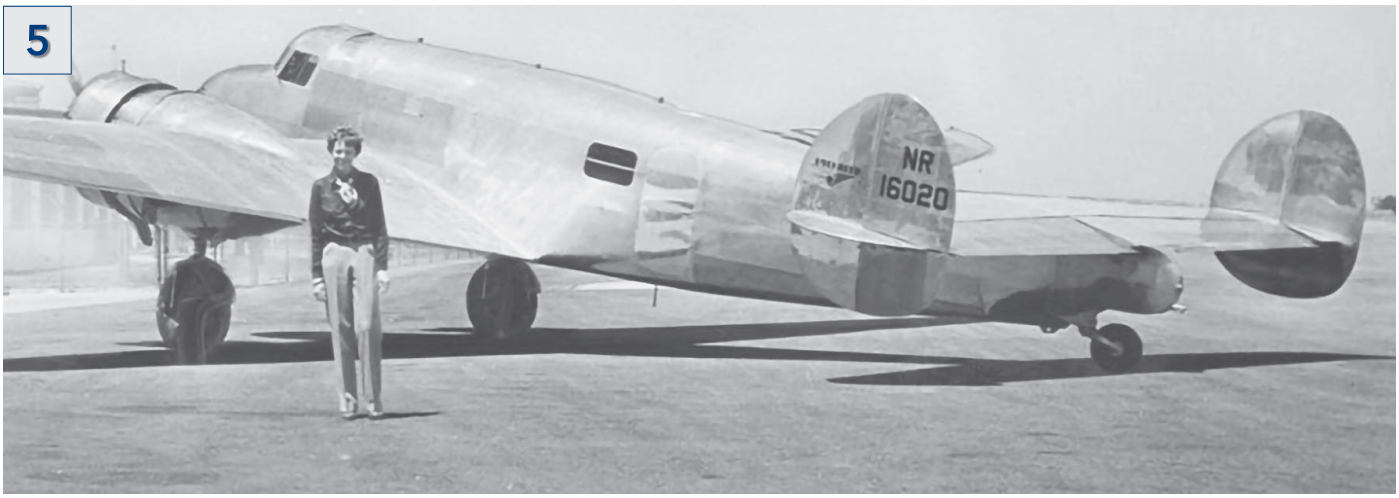


1. The Model 10, like most all-metal aircraft, is of semi-monocoque construction. Aluminum skins are riveted to circumferential formers and longitudinal stringers which distribute the aerodynamic loads.

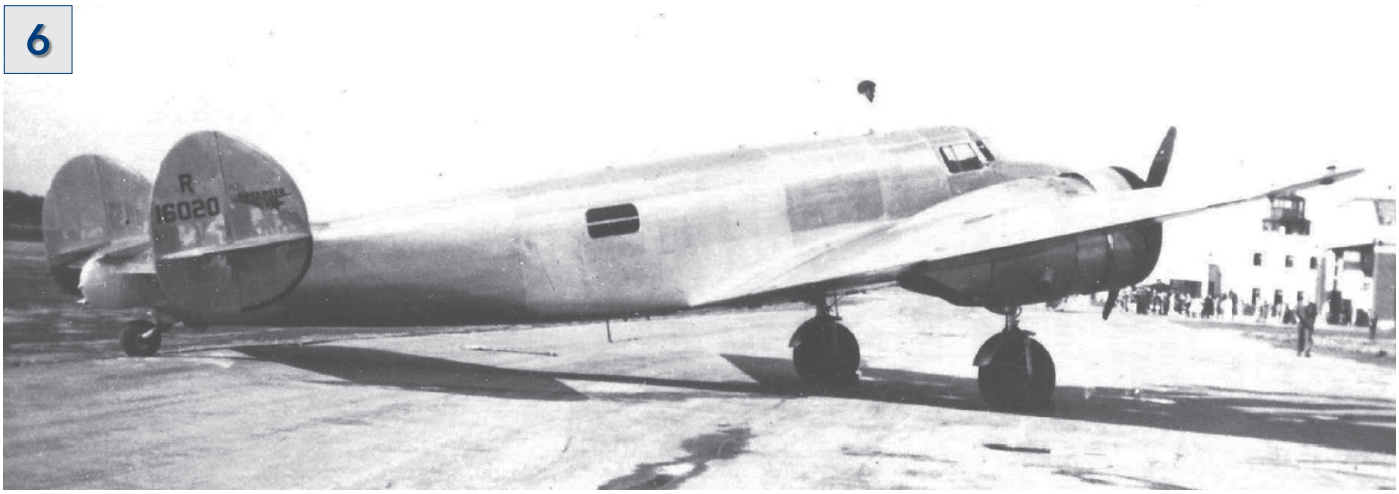
2. The Lockheed Model 10 was designed in 1934 to carry 194 gallons of fuel for a cruising range of 780 miles and a maximum gross weight of 10,500 pounds. In February 1936, when Lockheed engineers assured George Putnam they could deliver a Model 10E with a nonstop range of 4,500 miles, they knew the vastly increased fuel load meant the airframe would have to withstand the stresses of a gross takeoff weight of 16,500 pounds – 57% greater than anticipated in the original design.

3 & 4. Holes for doors and windows weaken the structure, so Lockheed made Earhart's 10E Special stronger by eliminating four of the five passenger windows on each side of the cabin, and leaving the normally-removed stringer in place for the one remaining window on each side.

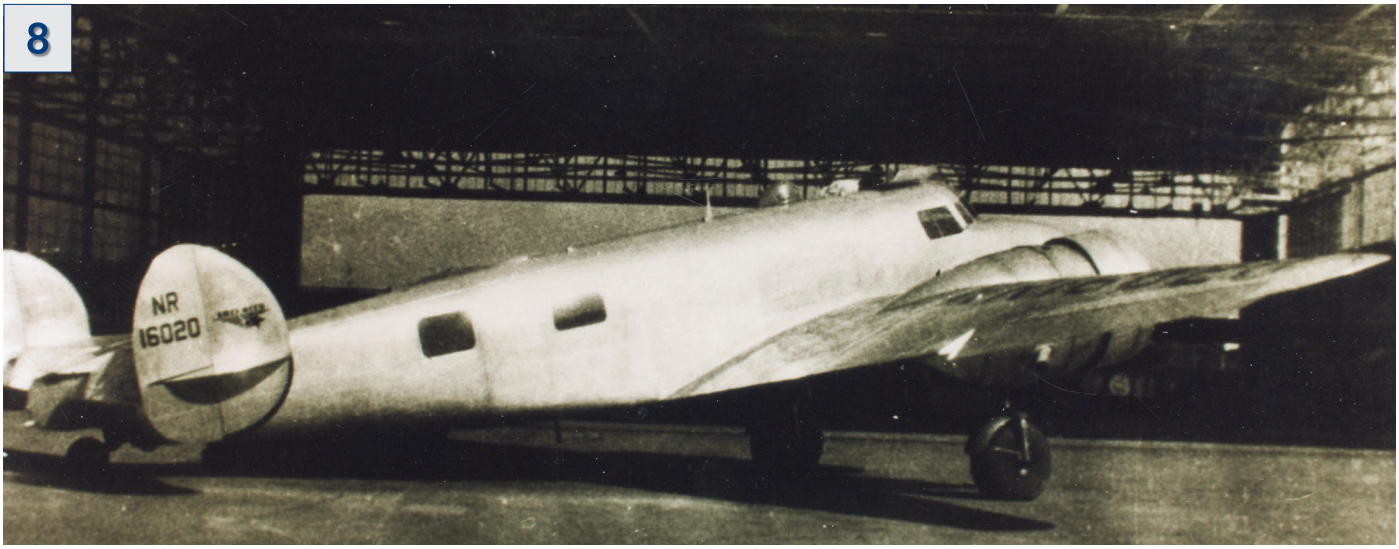




5 & 6. As delivered in July 1936, Earhart's Model 10E Special featured an immensely strong fuselage structure interrupted only by the solid cabin door standard on all Electras.



7. On December 28, 1936 the Bureau of Air Commerce approved the construction of a runway on Howland Island, and preparations for Earhart's world flight moved into high gear. For the long Pacific legs, Amelia had chosen sea captain Harry Manning to be her navigator. Although experienced at nautical navigation, Manning had never done celestial sightings from an aircraft. To provide him with better visibility for observations, changes were made to the Electra. By early February, when Amelia, Manning (left), her husband George Putnam (center), and mechanic Ruckins "Bo" McKneeley (right) arrived in New York to announce that Amelia would begin the world flight in March, the window stringers had been cut out and a new window installed in the cabin door.

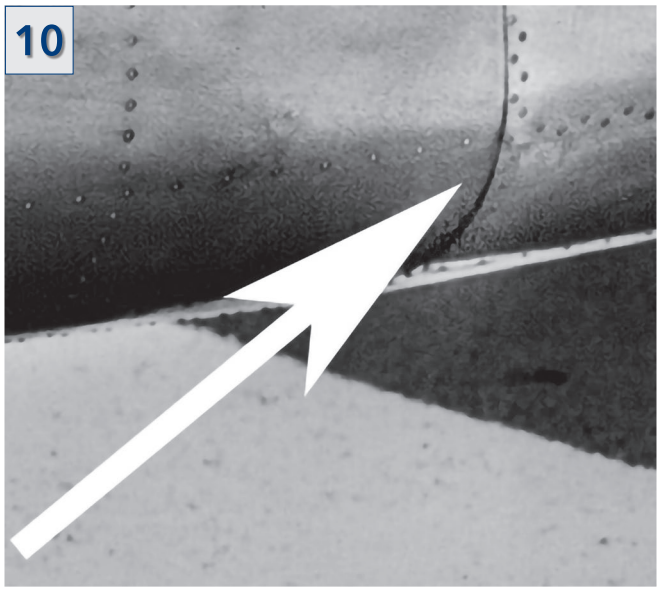


8. Of greater consequence was the addition of a large window on the right-hand side of the fuselage in what would normally be the lavatory compartment.

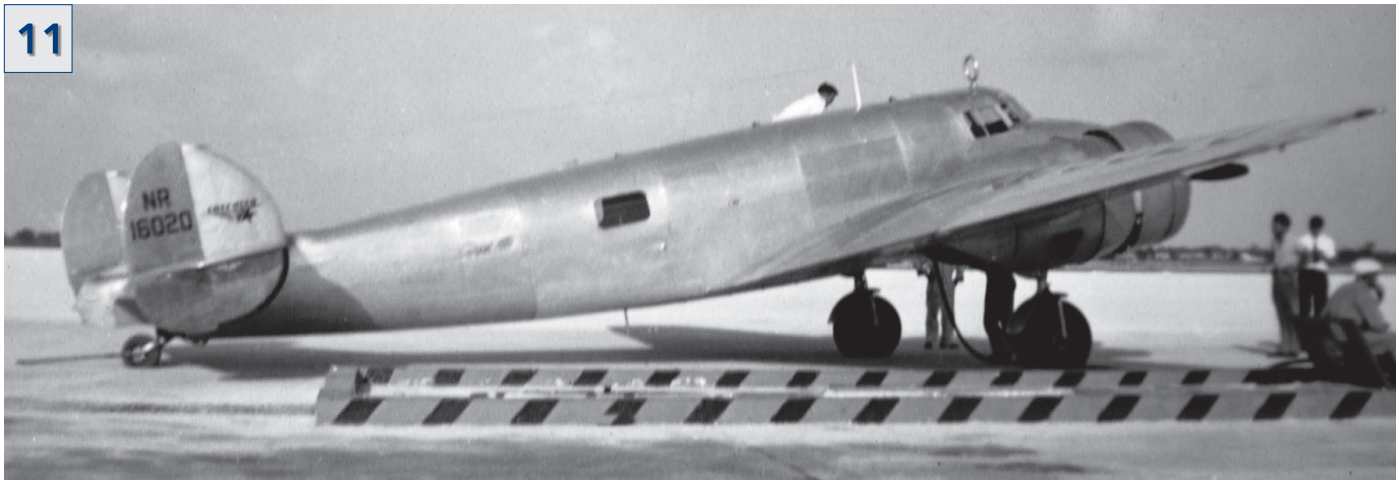
9. This is the interior wall of a Lockheed Model 10 in the area where the new window was installed. Making a hole for the window meant removing a large section of load-bearing skin (outlined in red), cutting a circumferential former, losing two vertical stiffeners, and cutting out sections of two stringers. The effect was to weaken the ability of the fuselage to withstand vertical loads. There was no Bureau of Air Commerce approval for cutting away these structures and no government inspection of the work. Had there been an inspection it's likely that the aircraft's license category would have been reduced to Experimental, thus cancelling the world flight.

10. Despite the ill-advised modifications, the fuselage held up well, even through the groundloop accident in Hawai'i which ended the first world flight attempt and led to Manning's departure from the project. On May 23, 1937, when Earhart, Putnam, Fred Noonan, and Bo McKneeley arrived in Miami for the start of her second world flight attempt, Amelia landed at the wrong airport. Realizing her mistake, she immediately took off and flew the short distance to the correct field where the press eagerly

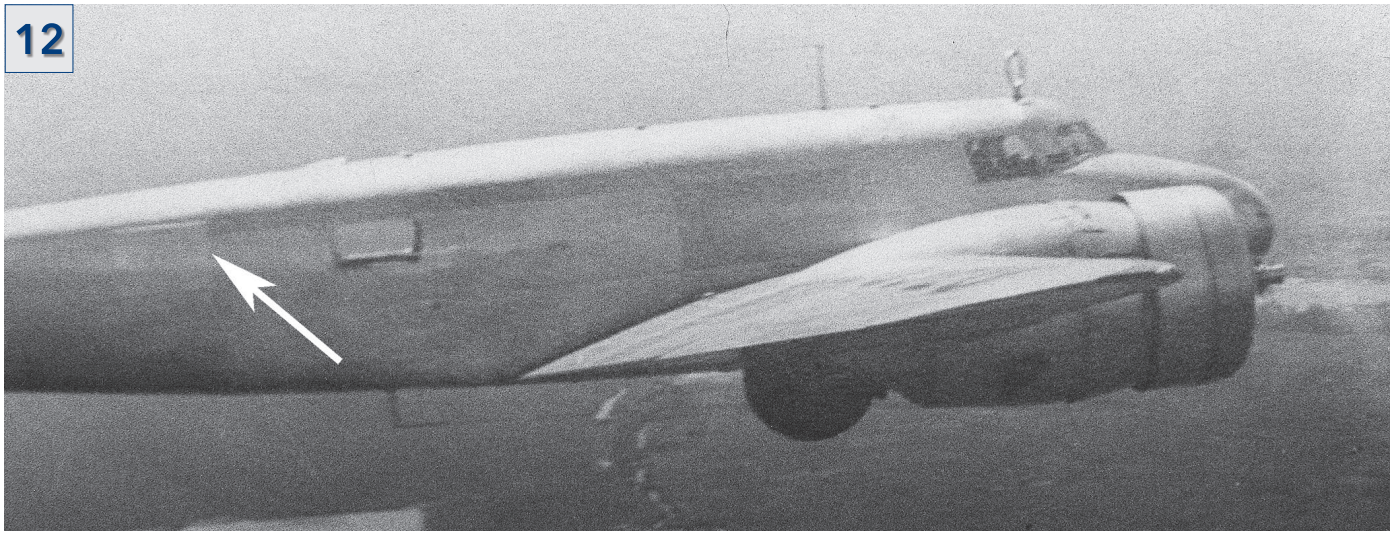
awaited her arrival. Embarrassed and rattled, she botched the landing and dropped the airplane in so hard that, according to a reporter for the Miami Herald, “you could hear the screech of metal all over the airport.” McKneeley was so concerned that he put the aircraft in the hangar to inspect the landing gear for damage. None was found, but a photo taken several days later shows that the “screech of metal” was the upward flexing of the weakened empennage (tail section) resulting in a slight separation of the fuselage skins at the base of the bulkhead just forward of the large window.

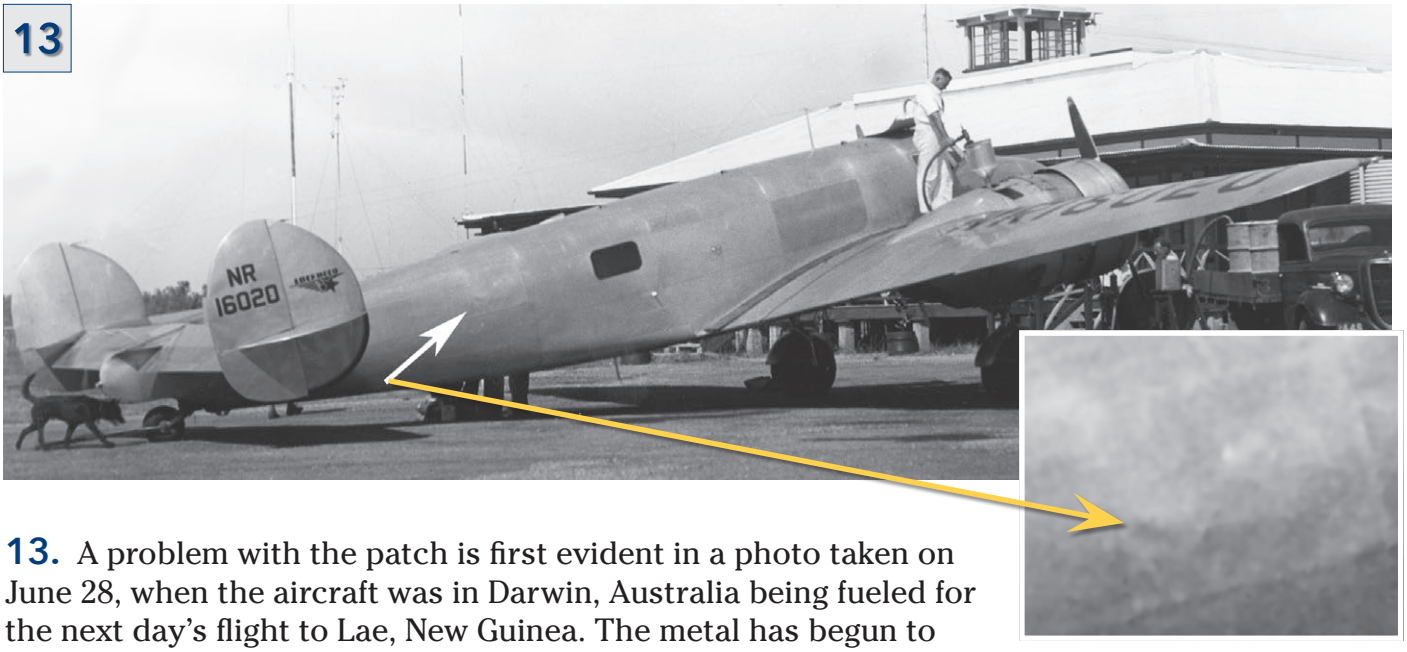


11. It’s likely that the same flexing also cracked the window, which was replaced with the shiny aluminum patch seen in this photo taken the day before Earhart and Noonan left Miami on June 1, 1937 – but installing the patch merely covered the hole. It did not restore the structural integrity of the empennage.

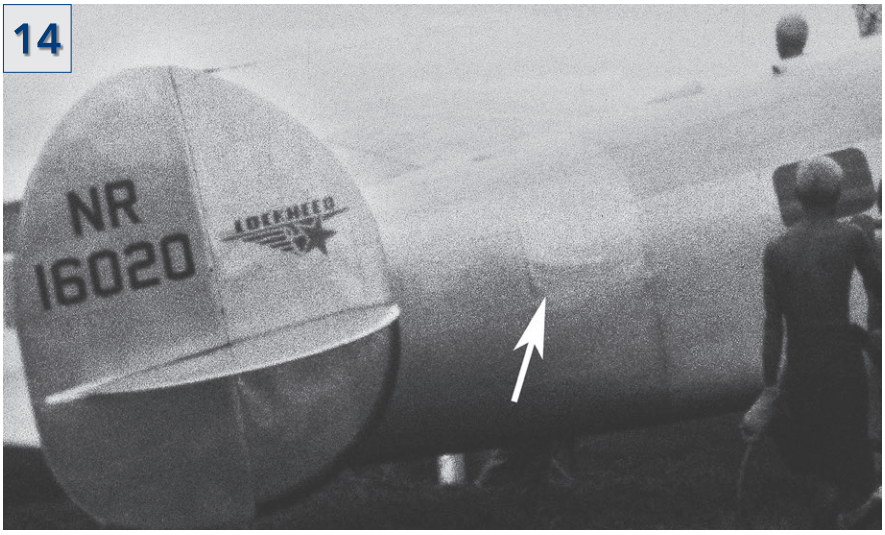


12. In this air-to-air photo taken over Java about three weeks later, the patch is less shiny but appears smooth and intact.

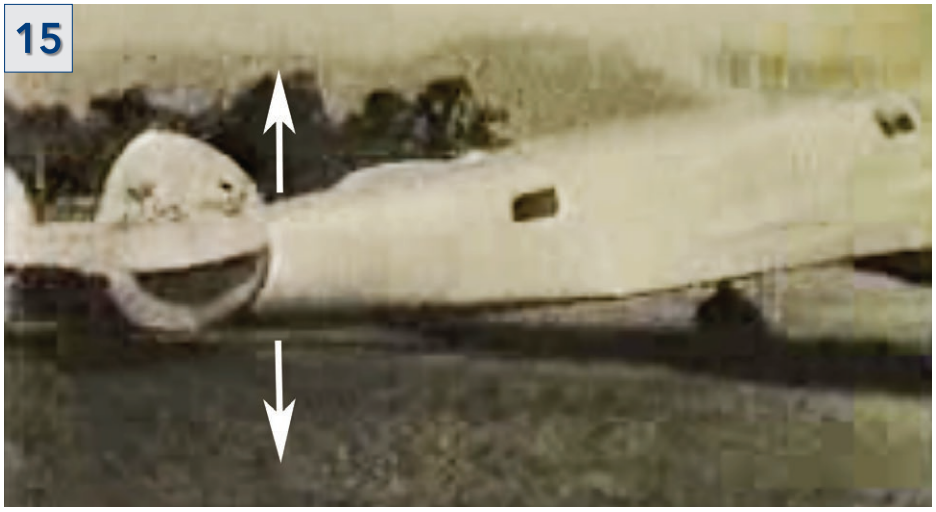




13. A problem with the patch is first evident in a photo taken on June 28, when the aircraft was in Darwin, Australia being fueled for the next day's flight to Lae, New Guinea. The metal has begun to buckle in the lower left-hand corner of the patch.



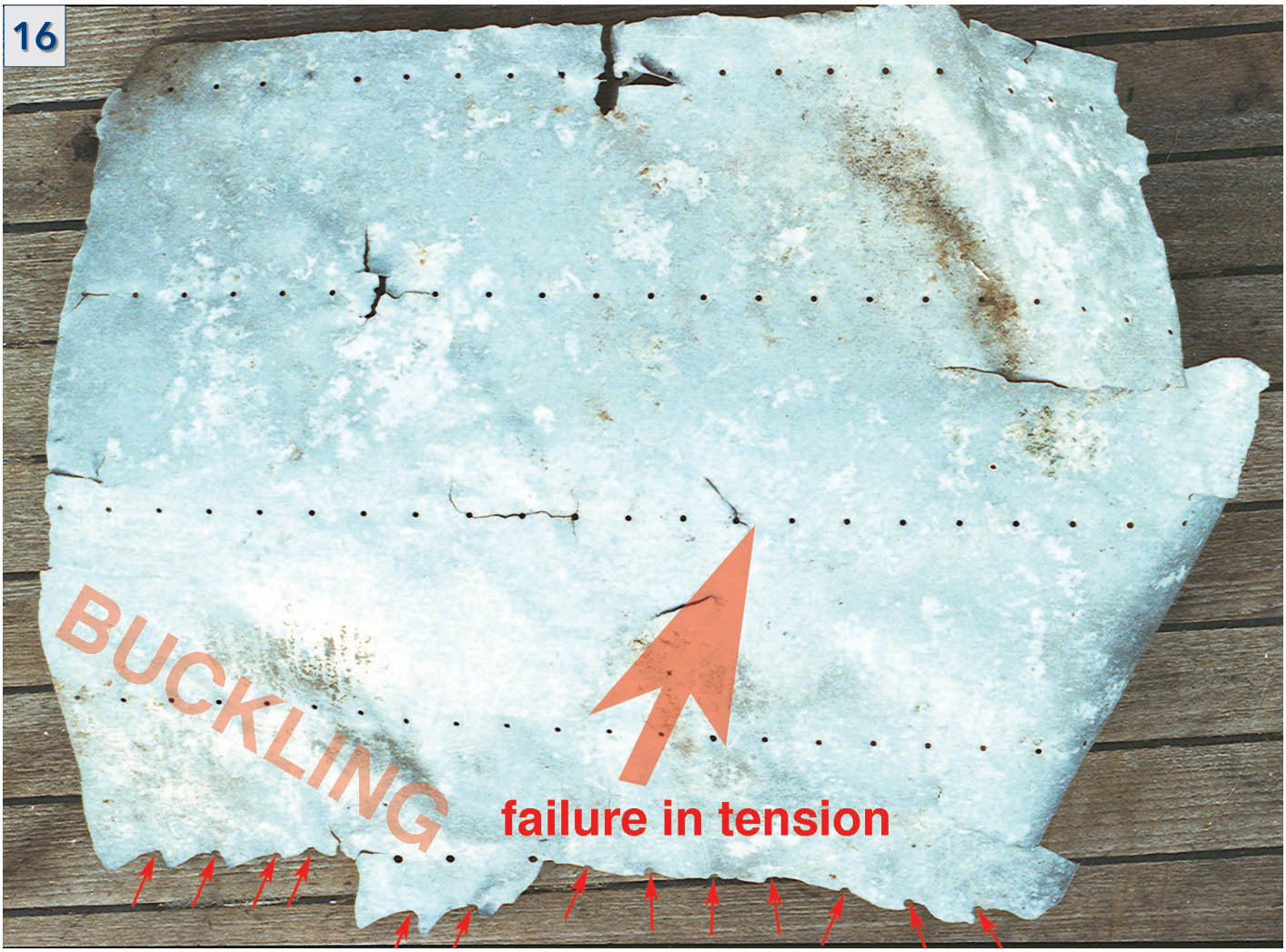
14. By the time the aircraft was being fueled in Lae on July 1, the problem had grown worse. In the raw imagery from the recently acquired film, it is apparent that vertical flexing of the empennage has caused the buckling to increase along the bottom edge where the patch was anchored to a particularly heavy stringer which, in the original structure, featured a double row of staggered rivets. "Super-resolution" analysis of the newly acquired film should reveal more detail of how the patch was riveted to the aircraft.



15. Image resolution in the film of Earhart's departure for Howland Island the next day is too poor to see the patch, but the unprecedented weight of the fuel load and the long taxi to the far end of the airstrip put increased flexing loads on the empennage as the tailwheel bounced along the unpaved surface. The buckling and stress on the lower edge of the patch could only have grown worse.

Why It Matters

16. There is no evidence that the weakened empennage or the buckled patch contributed to the failure of the flight to reach its intended destination, but there is an intriguing similarity between the stresses evident in the new photos of the patch and the damage exhibited by TIGHAR Artifact 2-2-V-1. When oriented to the way the artifact appears to match the patch, the lower left hand section is buckled and the bottom edge has failed in tension along a double staggered row of rivets. Might the heavy taxi and takeoff at Lae, the long flight, and a rough landing on the reef at Nikumaroro have caused the bottom edge of the patch to tear away as exhibited by 2-2-V-1? Further investigation may enable us to quantify the forces involved. As always, new insights lead to new questions and the need for new research. ■



The Glenn Miller Project, Phase Two:

The One That Got Away

The impetus for The Glenn Miller Project is a story told by a fisherman who briefly pulled up an airplane that might have been the C-64A Norseman in which Major Glenn Miller disappeared. Phase One of the project established the known facts surrounding the disappearance and determined that it is possible that the aircraft carrying Miller went down in the English Channel in the area described by the fisherman. Phase Two is an analysis of the fisherman's tale with the objective of permitting an informed decision about whether to proceed to Phase Three, a physical search for the wreckage. Data for Phase Two was collected, in part, during a TIGHAR research trip to England in December 2018.

So far, we have been unable to find corroboration of the fisherman's tale, leaving us with the most difficult task in historical investigation: assessing the credibility of an undocumented anecdotal recollection.

Over a period of about three years, the fisherman has described his experience to TIGHAR researchers on five occasions.

- An initial meeting with TIGHAR researcher David Morris in England circa 2015, during which Dave took notes and the fisherman, with Dave's help, made sketches.
- A November 29, 2017 phone call with Dave which was memorialized in an email to Ric Gillespie the same day.
- A December 21, 2017 phone call with Dave Morris memorialized in an email to Ric Gillespie the same day.
- An in-person interview with Dave Morris, Ric Gillespie, TIGHAR researcher Ernie LeRoy, and TIGHAR videographer Mark Smith on December 10, 2018. Ernie took notes of the conversation and Mark made an audio recording.
- An interview with Ric Gillespie at the U.K. Hydrographic Office on December 11, 2018. Mark recorded the interview on video.

The fisherman freely admits, "Some of the things I tell you may have been told to me by other people but I'm trying to tell you the exact truth of what I saw and not surmise anything else."

A comparison of notes and recordings shows his basic narrative of what happened has not changed, with new details being added with each succeeding rendering. His description of events in 1987 seems consistent and logical, but his recollection of how he later came to associate the aircraft with the Glenn Miller disappearance is ambiguous.

In analyzing the fisherman's story we'll look at three aspects of his account:

1. How the features of the aircraft he says he saw match, or differ from, a USAAF C-64 Norseman.
2. How the condition of the aircraft he says he saw matches, or differs from, what the Miller aircraft might reasonably have looked like in 1987.
3. How he came to connect the wreck with the Glenn Miller disappearance.

The Aircraft

Configuration

Fisherman: Single round engine, high-wing monoplane with fixed landing gear and a large door on the left side of the fuselage.

The C-64 Norseman was a radial-engine, high-wing monoplane with fixed landing gear and a large door on the left side of the fuselage. There were other radial engine, high-wing light aircraft types that served with the USAAF, but none had a large door on the left side of the fuselage.

His description of the aircraft's configuration matches the Miller aircraft.

Wingspan

Fisherman: Wings stuck out at least 12 feet beyond the frame of the trawl on each side.

The frame supporting the trawl was 17 feet wide. Adding 12 feet on each side gives a wingspan of approximately 41 feet. The wingspan of a C-64 Norseman is 51.5 feet.

His estimate of the aircraft's wingspan is similar to the Miller aircraft.

Length

Fisherman: The front 12-15 feet or so was out of the water and the rest of the tail still in but the undercarriage and wings were out.

The fuselage of the C-64 is 32 feet long. If roughly half of the aircraft was out of the water the tail would be in the water and the undercarriage and wings would be out.

His description of the aircraft's length matches the Miller aircraft.

Wing struts

Fisherman: We had to cut one of the V-shaped struts.

The C-64 has V-shaped wing struts.

His description of the aircraft's wing struts matches the Miller aircraft.

Color

Fisherman: The propeller was black. The nacelle and engine cowling was, I think, black and the top of the aircraft was black but the rest of it was silver.

The Miller aircraft, 44-70285, was manufactured under a contract awarded in Fiscal Year 1944. All known photos of FY 1944 C-64s serving in England show a black two-bladed prop and black paint on the top surface of the nacelle and engine cowling.The rest of the aircraft is painted silver.

His description of the aircraft's color matches the Miller aircraft.

Markings

Fisherman: There was *[sic]* scant remnants of a US star emblem on the wing covering and a big star on the side of it as well as I remember. All that was on it was a star in, like, a circle. There were no [invasion] stripes on it.

The Miller aircraft had standard USAAF insignia – a white star in a blue circle with white bars on either side – on the underside of the starboard wing and on each side of the fuselage. None of the FY 1944 C-64s had invasion stripes.

His description of the aircraft's markings matches the Miller aircraft.

Propeller Blades

Fisherman: There were three blades on the propeller.

All C-64s serving in England had two-bladed propellers. A three-bladed prop was tested on a C-64 at Wright Field in 1945 and found to be more efficient than the two-blade. Some C-64s were subsequently modified, but the Miller aircraft in 1944 cannot have had a three-blade prop.

His description of the aircraft's propeller blades differs from the Miller aircraft.

Propeller Hub

Fisherman: There was a big round nut on the prop about 10 inches in diameter.

None of the photos of Norsemen in military or civilian service show anything on the prop hub. There is only one known photo of a Norseman with a "big round nut" on the prop. The aircraft, C-64 43-5174 was kept at the Noorduyn factory for 23 months for flight tests including various float and landing gear configurations.

His description of the aircraft's propeller hub differs from the Miller aircraft.

Parachute Cords

Fisherman: There were what appeared to be the cords (risers) of a parachute coming out of the cabin door.

According to Miller's assistant Lt. Donald Haines who was present when Miller boarded the aircraft, there were no parachutes aboard.

His description of parachute cords differs the Miller aircraft.

Condition

General Condition

Fisherman: The aircraft was in immaculate condition. I can't emphasize how clean it was. There wasn't a mark on the aircraft, not a rip, tear or anything.

For a fabric-covered aircraft that had been submerged in the English Channel for 43 years to be in immaculate condition would be extremely improbable.

His description of the aircraft's condition differs from the probable condition of the Miller aircraft.

Sand

Fisherman: The aircraft was full of sand that was rinsing out. That area was shingle, shell and sand and I think it was buried up.

If the aircraft was completed buried in sand it might preserve the fabric.

His description of sand rinsing out of the aircraft matches conditions that could account for the unusual state of preservation.

Prop Bent

Fisherman: The last 18 inches of each propeller blade was bent back about 18 inches.

A propeller contacting the water in an idling power-on ditching would typically sustain this kind of damage.

His description of the bent propeller blades matches the damage expected in a ditching.

Wing Separation

Fisherman: The pressure of the trawl caused one of the wings to break off where it connected to the fuselage.

The C-64 was prone to groundloop accidents causing one wing to strike the ground. In at least one such accident, the wooden main spar broke where it connected to the fuselage.

His description of the wing separation matches the known ability of the C-64 wing to separate at the fuselage.

Connecting the Wreck to Miller

In the absence of independent corroboration, when and how the fisherman realized that the wreck he pulled up might be the Miller aircraft is an important consideration in assessing his recollections. He may have been the victim of a phenomenon we've often encountered in other investigations. At TIGHAR we call it "Saipan Syndrome" after the many supposed eyewitnesses to Amelia Earhart in Japanese custody on Saipan.

It begins with a memorable but inexplicable experience. Over time, the details of the incident fade, as do all memories. This is known as "memory transience."[1] After many years, often decades, the individual becomes aware that the unexplained event may be related to a famous mystery. Their mind fills in gaps in their recollection of the event with details that fit the mystery. This is known as "memory bias."[2] We all do it in other contexts. We tend to remember events the way we want them to have happened. Memories of other events may be transposed onto the incident if they strengthen the connection to the mystery. This is known as "misattribution."[3]

The result can be a completely sincere but almost totally false recollection. There is no intention on the part of the individual to fabricate or elaborate. It is, rather, an honest willingness to provide useful information and a natural desire to feel important. The positive attention the individual gets for "solving" the famous mystery reinforces their conviction that the unwittingly embellished memory is accurate.

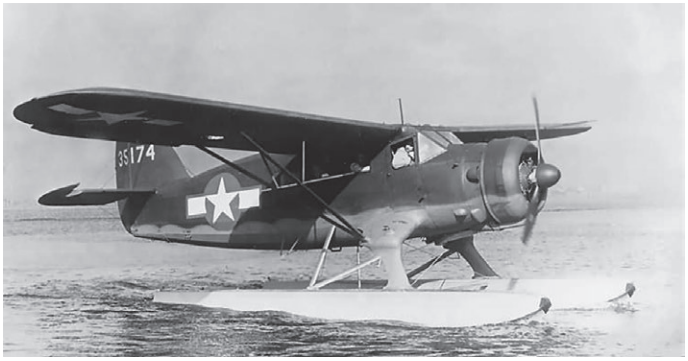
The fisherman's explanations of how he came to connect the incident in 1987 to the Miller aircraft are less consistent than his descriptions of the incident itself. The account he gave in our December 12, 2018 interview was ambiguous.

"I trawled the aircraft out" in 1987 and "never thought about it for a while. I saw some pictures in either '89 or '90 and said to the wife, 'That's the aircraft that we dragged up.' And it must have been some reason it was Glenn Miller. I don't know why I come to that."

Photos of C-64s are not common, even in books and articles about World War II aircraft. There is no way to know, but it seems likely that he saw a picture of a Norseman in an article about the Glenn Miller disappearance. Even so, it's significant that his reaction was "That's the aircraft that we dragged up." The general size and configuration of the wreck were apparently similar to a Norseman, but details he now remembers that do, and do not, match the Miller aircraft could have been influenced by the picture and by other photos of C-64s he has seen since then.

The fisherman remembers a three-bladed propeller. The Miller aircraft had a two-bladed prop, but there are photos of later C-64s with three-blades.

The fisherman remembers a "big round nut" on the propeller hub. The Miller aircraft almost certainly had no such feature but there is at least one photo of a C-64 with a spinner on the hub and what appears to be a three-bladed prop.

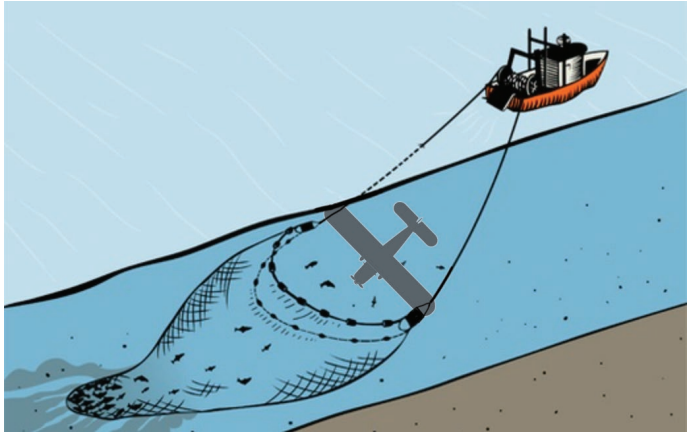


1 *The Seven Sins of Memory.* Daniel L. Schacter, Houghton Mifflin, 2001.

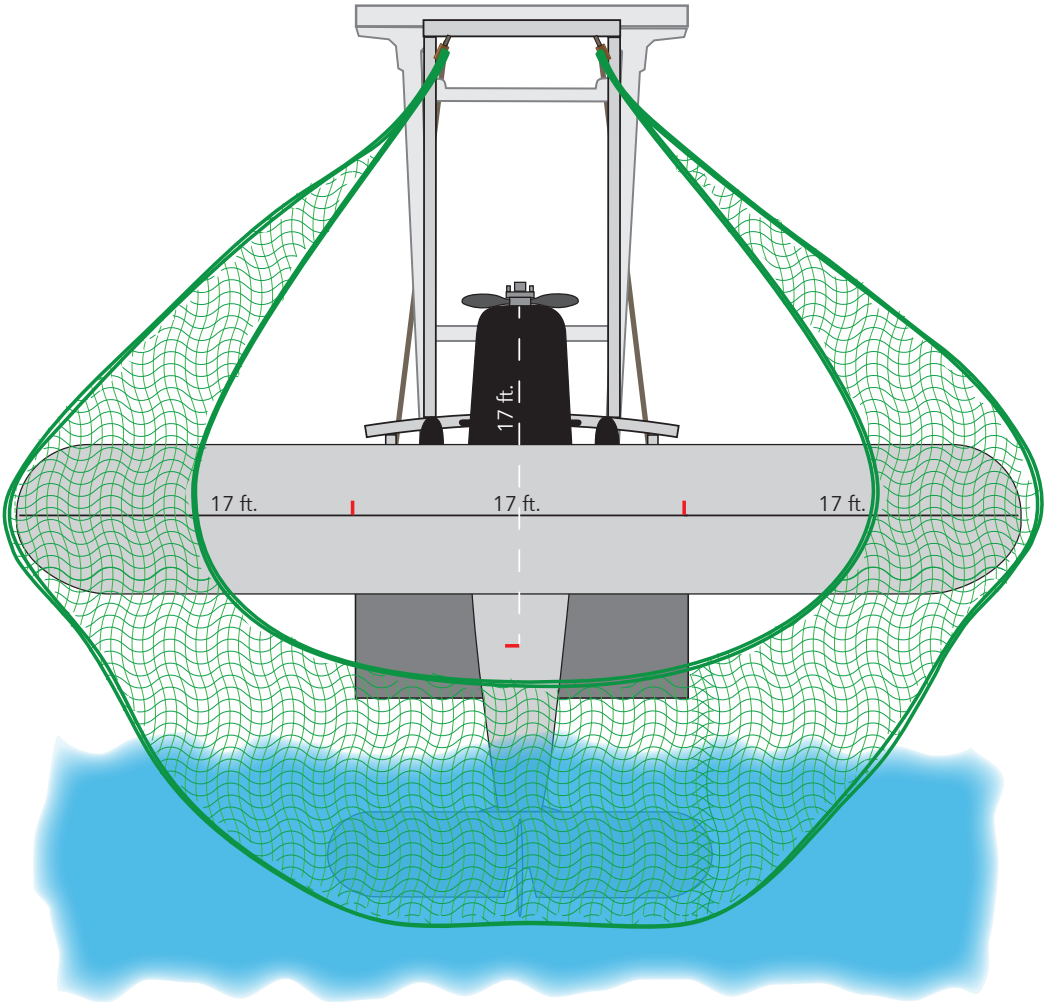
2 Ibid.

3 Ibid.

There are parts of his recollection that seem to be examples of "occult" information – details that could be true of the Miller aircraft but could not be obtained from photos. The estimated wingspan and length of the aircraft, as measured relative to the known dimensions of the ship and trawl, are similar to a Norseman, and the way a wing separated at the juncture with the fuselage and floated away is consistent with the way the C-64's wooden wing is known to fail. The bent prop he describes suggests a ditching rather than a crash. When a fixed gear aircraft is ditched



it almost always flips inverted. That is consistent with the way the wreck came up in the trawl, nose first with its belly toward the boat, suggesting that it had been lying on its back facing away from the direction of the trawl. A high-wing aircraft on its back on a sandy bottom could have its wings and much of the fuselage and tail preserved in an anaerobic (oxygen-free) environment. The sand he saw running out of the fuselage could explain the unusually good condition of the aircraft.



CONCLUSIONS

The fisherman's tale is an uncorroborated anecdotal recollection. Much of what he remembers could be the result of "Saipan Syndrome" – false memory influenced by association with a famous mystery – but there is sufficient occult information in his story to suggest that the wreck he pulled up was a ditched C-64 Norseman. The Miller aircraft is the only unaccounted-for C-64, and we have found no evidence that eliminates the fisherman's location as a possible site for the loss. Based on the currently available evidence, it is possible and even probable that he encountered the Miller aircraft, but re-locating the wreck would be a formidable task.

Whatever aircraft the fisherman hauled up in 1987 and whatever its condition at that time, it will be much worse now – at best, a mangled steel tube frame and the remains of an engine possibly buried in sand. Compounding the problem is the uncertainty about exactly where he was when he dropped the wreck and how far it may have since been moved by currents or later contact with trawlers.

Cost/Benefit of a Search

The English Channel is a difficult environment littered with centuries of wrecks, but it is not on the far side of the world and the target area is fairly well defined. The cost of a comprehensive sonar and ROV search for the fisherman's wreck would probably run in the neighborhood of $30,000. (By comparison, similar searches for the Earhart aircraft cost in the millions.) The historical benefit of solving the mystery of Glenn Miller's death is incalculable.

Phase Three

The fisherman's tale, however flawed, is the best – indeed, the only – known clue to the whereabouts of whatever remains of Norseman 44-70285. A search for the wreckage, however difficult, is the only way to know whether it can be located. TIGHAR will, therefore, proceed to the search phase of the Glenn Miller Project. We'll need to identify the ship to be chartered, the technology to be deployed, the personnel, the timing, the logistics, and the cost of a search operation. Your continued support of the Glenn Miller Project will be crucial. ■

TIGHAR
THE GLENN MILLER PROJECT

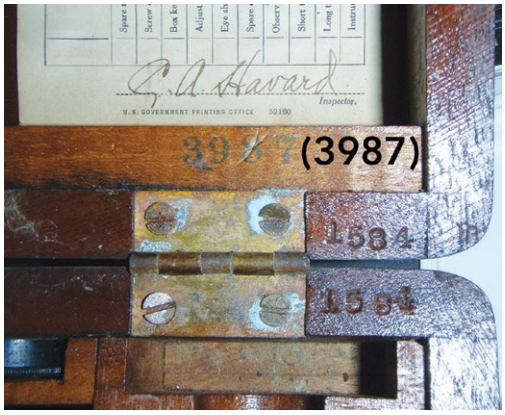
The Sextant Box Conundrum

Among the objects Gerald Gallagher found near a partial skeleton in 1940 was a wooden box that had once contained a sextant.

Gallagher reported,"Sextant box has two numbers on it 3500 (stenciled) and 1542 – sextant being old fashioned and probably painted over with black enamel. … No sextant was found. Only part discovered was thrown away by finder but was probably part of an inverting eyepiece." The box was said to appear to have been "used latterly merely as a receptacle." – possibly meaning that the interior fixtures designed to hold the instrument and attachments had been removed.

The young Colonial Service officer naturally assumed the box had belonged to the unfortunate castaway – but did it? Recent discoveries have left us with a puzzling conundrum.

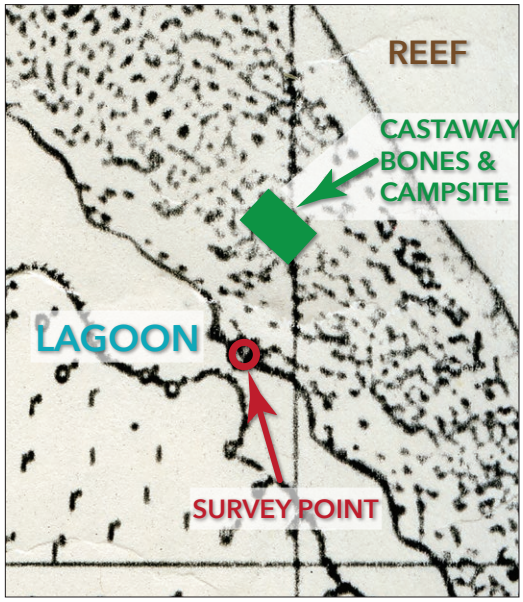
TIGHAR research established that the numbers identify the sextant in question as a Brandis Navy Surveying Sextant. The 3500 is the Brandis "maker's number" and the 1542 is the "N.O. number" assigned by the U.S. Naval Observatory when the sextant was initially calibrated.



Brandis sextants were delivered in a wooden box with the matching maker's number stenciled on the inside. The Naval Observatory pasted a certificate on the inside of the lid and sometimes stamped the N.O. number into the wood.

Noonan is known to have often used a Brandis Navy Surveying Sextant as a back-up instrument. Our hypothesis has been that castaway Earhart used Noonan's sextant box to carry essential possessions such as the sextant's inverting eyepiece lens useful for starting fires.

However, documentation discovered last year in the National Archives shows that a Brandis Navy Surveying Sextant with the N.O. number 1542 was assigned to the survey ship USS *Bushnell* as late as January 1939. In November of that year, personnel from Bushnell carried out a mapping survey of Gardner Island. One of the observation points on the map resulting from the survey is about 100 yards from where the bones were found ten months later.



- Did the box for sextant 3500/1542 somehow get left near the skeleton by the Bushnell surveyors? The surveyors did not find the skeleton and the official report of the survey makes no mention of lost equipment. Why was there no Naval Observatory inspection sticker on the box found by Gallagher and why would it look like it had been used "merely as a receptacle?"
- It is now clear Noonan did not own sextant 3500/1542, but in TIGHAR's extensive cataloging of Brandis sextants and boxes, it is not at all uncommon for sextants to be in the wrong box. Was Noonan's Brandis sextant in the box for 3500/1542?

In either case, we're faced with a bizarre coincidence. Further research may resolve the conundrum. ■