

# TIGHAR TRACKS

A Publication of The International Group for Historic Aircraft Recovery  
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The beginning of a new year is a time for looking back to see how we got to where are, and for looking forward to see how we might best get to where we want to go. In 1988 we inaugurated the Earhart Project to test the hypothesis that the final flight of Amelia Earhart ended on the

island of Nikumaroro in the Phoenix Group. As the project completes its fifteenth year it is fitting and useful that we summarize what we've learned and what we're doing to move the project toward a definitive conclusion.

## Summary of Evidence

### We have learned that:

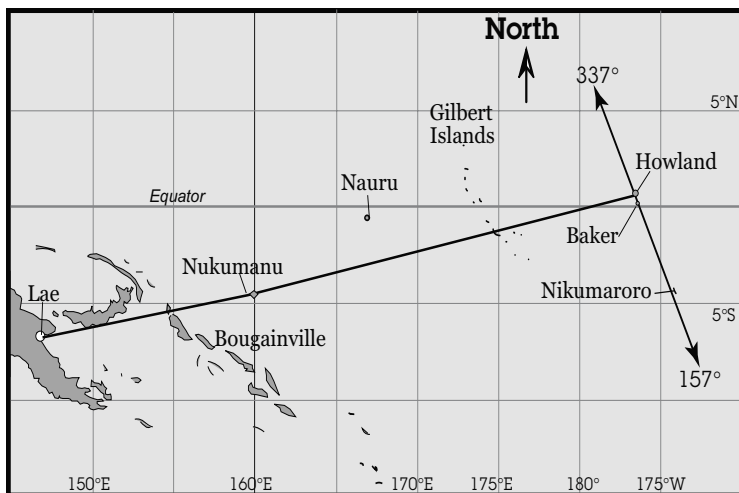
No one heard an in-flight distress call from the aircraft and Earhart never said she had run out of gas. The last radio call received by the *Itasca* was a position report that came at a scheduled transmission time. Earhart said that she was on a particular navigational line and that she was proceeding along that line. No floating wreckage was ever found. There is no direct evidence that the aircraft went down at sea.

Official reports show that proceeding southeastward on that line toward land was recognized by the naval officers directing the 1937 search as the flight's most probable course of action. The islands on that line are Howland, Baker, and Nikumaroro. Earhart did not reach either Howland or Baker.



Documents verifying the amount of fuel aboard the aircraft at takeoff and contemporaneous Lockheed fuel consumption reports and recommendations clearly indicate that the aircraft should have had more than enough fuel to reach Nikumaroro.

Radio calls heard for several days following the disappearance suggest that the aircraft was on land and intact enough to run at least one engine during that time. No transmissions would have been possible had the aircraft been afloat. Radio direction finder bearings taken on some of the signals indicate that they originated in the vicinity of Nikumaroro.



*Earhart's line of position, July 2, 1937.*

Aircraft components found in the abandoned village on Nikumaroro were apparently collected by the villagers and are consistent with Lockheed Electra parts but not with any other known aircraft. Most of the parts have been locally modified in various ways.

The diary of a British colonial officer who visited the uninhabited island three months after the Earhart disappearance mentions "signs of previous habitation." The officer, interviewed by TIGHAR, recalled that the site "looked as if someone had bivouacked for the night."

Tidal and reef surface data collected by TIGHAR at Nikumaroro have been used in conjunction with published tidal data to hindcast the conditions that existed on the reef at Nikumaroro during the window of time on July 2, 1937 when the Earhart flight could have reached the island. The data show that, in the area where later anecdotal accounts suggest the landing was made, the reef surface was smooth enough and the water level was low enough to permit a relatively safe landing.

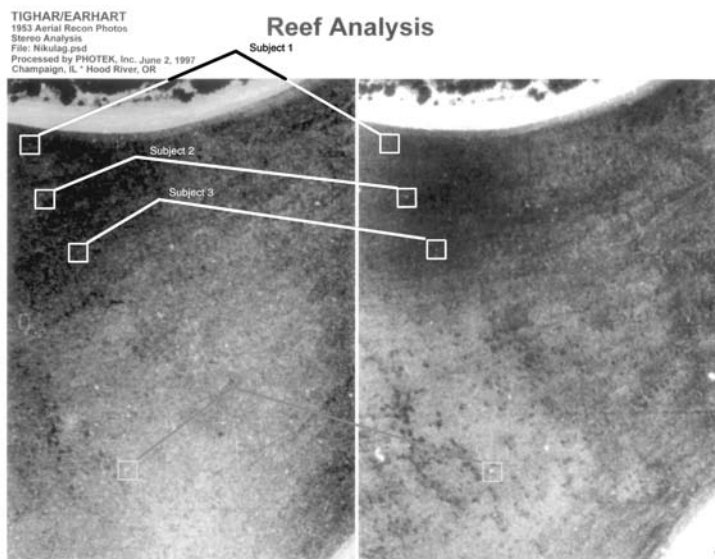


Official British files document that, in 1940, the remains of a castaway were discovered on the island. Artifacts found with the bones suggest the presence of a man and a woman who were not Pacific islanders and appear to be consistent with items known to be associated with Earhart and Noonan. A sextant box found with the bones had numbers on it that are similar to numbers on an existing sextant box known to have belonged to Fred Noonan. Extensive research has turned up no alternative explanation for the presence of the bones and artifacts.

There is a site on the island that matches the description of the place where the bones were found. Archaeological excavations at that site have produced evidence that it was occupied for a period of time by a person or people who were using found objects as tools, living off

When aircraft from the battleship USS *Colorado* searched the island from the air one week after the disappearance "signs of recent habitation" were reported on the uninhabited island. However, no ground search was carried out.

Anecdotal accounts from several independent sources tell of an airplane wreck at Nikumaroro that was already there when the first settlers arrived in late 1938. The various accounts are consistent in describing wreckage seen on and near the reef at the northwest end of the island. Forensic examination of aerial photography of that area taken in 1953 suggests the presence of light-colored metal debris on the reef at that time. Components from the wreck are said to have been put to local use by the settlers.



*Forensic imaging analysis of 1953 photos. Imaging courtesy of Jeff Glickman, Photek Inc.*



*TIGHAR archaeological dig on Nikumaroro, 2001. TIGHAR photo by R. Gillespie.*

local fish, birds, turtles and shellfish, and opening local clams (which somewhat resemble oysters) in ways that are not typical in the Pacific islands but are commonly employed in opening oysters in the United States.

In 1941 a British colonial physician in Fiji examined the partial skeleton found on Nikumaroro and judged it to be that of a short, stocky European or mixed-race male. The bones themselves have since been lost but measurements of the bones taken by the British physician have been evaluated by forensic anthropologists who, using modern methods and databases, judged the skeleton as most probably being that of a relatively tall white female of northern European descent.

In short, fifteen years of work has brought us confirmation that Earhart should have reached Nikumaroro and could have reached Nikumaroro, and that a series of highly unusual events occurred on Nikumaroro which, at this point, seem inexplicable unless Earhart did reach Nikumaroro.

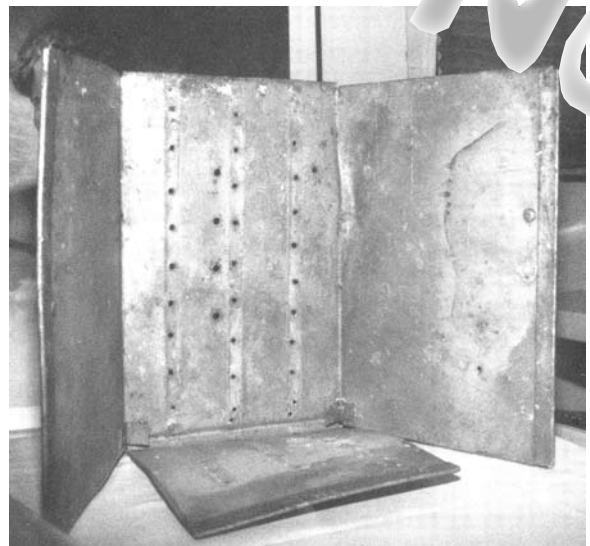


**D**iscovery is a process, not an event. The points listed in the Summary of Evidence are the pieces of the puzzle that have, so far, survived intense scrutiny. Others have not, and still others remain an enigma. Information or objects which appear to be highly significant upon initial, and even subsequent detailed inspection, sometimes prove to be ambiguous or downright disappointing as more information becomes available.

### **The Navigator's Bookcase**

An aluminum navigator's bookcase found on Nikumaroro during our first expedition in 1989 at first appeared to very possibly have been mounted in Earhart's Electra. After two years of investigation we were ultimately able to determine that it matched an installation in a very limited production run of B-24s. Other B-24 parts have been found in the village and there was

a known wartime B-24 wreck at Canton Island. That wreck appears to be the most likely source of the B-24 parts found on Nikumaroro because it is known that people from the island worked on Canton during the post-war period.

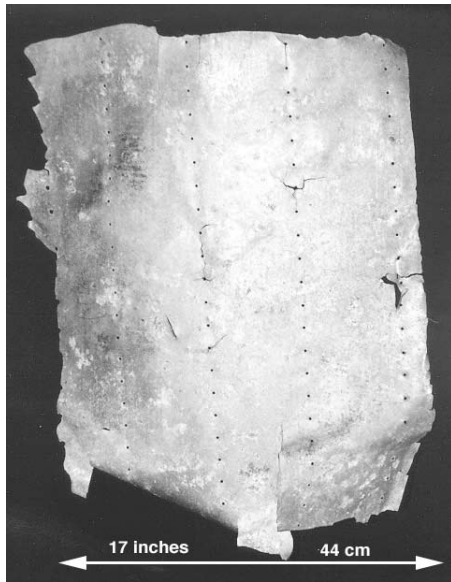




## The Airplane Skin

A section of airplane skin found during the 1991 expedition exhibits literally dozens of features that suggest that it came from a repaired part of Earhart's Electra. The rivet pattern does not quite match anywhere on a Lockheed Electra or any other aircraft type that we have been able to check but nobody knows just how the belly of NR16020 looked after it was repaired following the accident that ended Earhart's first World Flight attempt. The airplane skin remains an enticing question mark.

Maybe



## The Shoes

Two shoe heels and a fragmented rubber sole found during our 1991 expedition seemed, for a while, to be very strong evidence.

- The artifacts were found on the same part of the island where a British colonial officer had seen "signs of previous habitation" during an October 1937 visit.
- One of the heels was a "Cat's Paw Rubber Co. – USA" replacement heel that matches a mold used by the company in the mid-1930s.
- Stitching marks in the sole indicated to experts that the shoe was a "blucher oxford" type.



The tightness of

the stitching in the sole and a small brass eyelet found nearby led experts to conclude that they probably came from a woman's shoe.

- Numerous photos show that Earhart wore blucher oxfords during the World Flight.
- One photo of her standing on the wing of the Electra permitted an accurate scaling of her shoe based on the known spacing of rivets.
- The size of the shoe in the photo and the re-assembled sole found on the island appeared to be similar.
- Variations in the color of the heels of Earhart's shoes in other photographs suggested that she may have had the heels replaced prior to the final flight.
- An early story about Earhart's bones being found on Nikumaroro specifically mentioned the presence of shoes.



For a while it really looked like we had found the replacement heel and the sole of one of Earhart's shoes and the heel from one of Noonan's shoes, but continued research began to change the picture.

- Further work with the shoe-on-the-wing photo pointed up size discrepancies with the re-assembled sole found on the island.
- Extensive archaeological work at the site during the 1997 expedition failed to turn up any other evidence of habitation.
- The discovery of official British documentation describing the finding of bones on Nikumaroro led to the identification of an apparent castaway campsite far from where the shoe parts had been found in 1991.

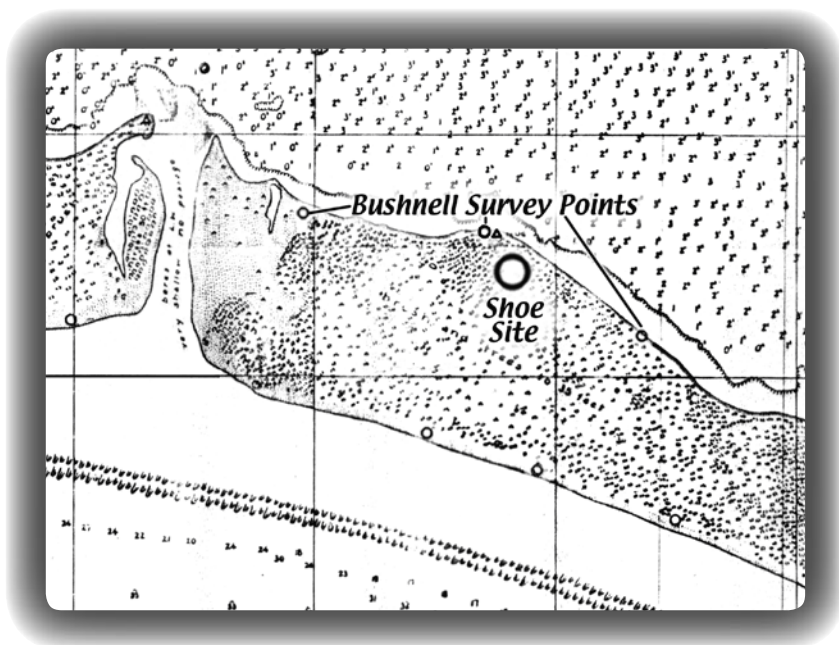
- Further scrutiny of photos of Earhart's shoes revealed that the apparent variation in heel color was due not to replaced heels but to the presence of unusual two-tone heels – dark colored on the outer half and lighter colored on the inner half – not at all like either heel found on the island.



So what was a woman's blucher oxford shoe with a 1930s vintage American replacement heel doing on Nikumaroro? There remains the possibility that it is an Earhart shoe that does not appear in any of the photos but it is perhaps more plausible that the identification of the sole as being from a woman's shoe (a judgment based primarily on the tightness of the stitching holes) was in error. The presence of a man's 1930s vintage blucher oxford shoe with an American replacement heel might be attributed

to the November 1939 survey of the island by personnel from the USS *Bushnell*. The map of the island that resulted from that survey shows that one of the observation points used was on the lagoon shore just a few hundred feet from where the shoe parts were found.

As the Earhart Project's research continues, other pieces of evidence that now seem compelling may lose their luster, but the search for the truth requires that we follow the facts wherever they lead.



# HOW WE DO IT

**M**ost of the project's research is carried out by the Earhart Project Advisory Council. EPAC, as we call it, is made up of about 30 hand-picked TIGHAR expedition veterans, board members, scientists, and scholars who function as a group and in ad hoc committees. When we feel that some topic of research might benefit from a shotgun approach we throw the question out to the 800+ subscriber Earhart Search Forum email group. The forum is an active, enthusiastic, and sometimes raucous assembly of TIGHAR mem-



THE AMELIA EARTHART  
SEARCH FORUM



bers, not-yet members, and wouldn't-dream-of-being members who discuss and debate every imaginable aspect of the Earhart mystery.

When we have solid results to report they usually appear first as articles in *TIGHAR Tracks* and, after a suitable time, as Research Bulletins on the TIGHAR website. While we want to share our findings with anyone who is interested we also feel that our first obligation is to you, the folks who make it all possible.

At any given time literally dozens of topics related to the Earhart Project are under investigation. Here is a brief description of the current "top ten."

## 1 DADO RESEARCH

As described in the September 2003 issue of *TIGHAR Tracks* and in the Research Bulletins section of the TIGHAR website, we now have at least three and possibly four examples of an aircraft component known as a "dado" that have been recovered from the abandoned village on Nikumaroro. These artifacts are currently preserved at the Maryland Archaeological Conservation Laboratory in St. Leonards, MD. They appear to be from the cabin of a civilian

aircraft that had a wooden floor and used 1/4 inch kapok or "seapak" insulation. Earhart's Electra fits that description. We have established that the cabin furnishings of Lockheed Electras regularly featured dados but, so far, we have been unable to locate engineering drawings that detail their construction. Electras surviving in museums are, by definition, aircraft that enjoyed a long service life and have had their interior furnishings (headliner, cabin wall upholstery, etc.) replaced and upgraded. Documenting exactly how original Lockheed Electra dados were constructed has therefore proven to be something of a challenge. While efforts to locate engineering drawings continue, a special EPAC team is planning a number of expeditions for the coming year which will seek to locate and examine old "forgotten" Electra crash sites in the hope of finding surviving examples of original dados. Two wrecks on mountains in New Zealand, a wreck in Alaska, and another in Idaho are currently being researched.



Lockheed 10A C/N 1128 crashed on Mt. Ruapehu in New Zealand on November 23, 1948. Photo courtesy Howard Alldred.

(Incidentally, if a reconnaissance in the spring shows the Idaho wreck to be suitable, we'll use that site as the focus for the 2004 Aviation Archaeology course and Field School later in the year. Look for more on this in the next *TIGHAR Tracks*.)

## 2 CORRUGATED METAL RESEARCH

Analysis of Scanning Electron Microscope (SEM) data collected for TIGHAR by the U.S. Naval Academy Engineering Lab in Annapolis, Maryland, of samples of very rusted fragments of corrugated metal recovered from a variety of sites on Nikumaroro show that several large sheets of corrugation that were apparently laid out on the ground at the Seven Site are different from all other corrugation found on the island. Research is continuing to determine the possible significance, but one working hypothesis is that the castaway(s) salvaged corrugated iron from the old Arundel coconut planting operation at the west end of the island and brought it to the Seven Site as a means of channeling rainwater for collection.

## 3 IDENTIFICATION OF ARTIFACTS: 2-6-S-03 A&B

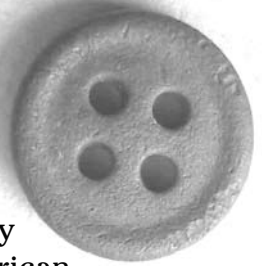
These small, amateur-fashioned devices that incorporated American-made woodscrews were found at the Seven Site and have, so far, defied identification. Numerous hypotheses have been tested and rejected. Research continues.



## 4 BUTTON RESEARCH

A button, brown in color, was recovered from the Seven Site during the 1996 expedition that first located the site. Its size suggests that it was a trouser button. Work by the FBI Lab and a laundry list of museums and button experts have established that it is of American manufacture and dates from the mid-1930s or later. So far we've been unable to match it to any U.S. Coast Guard or Navy button. There is a dark discoloration on one part of the button that

experimentation with similar buttons suggests was caused by a brief (a few seconds) exposure to flame. Of the categories of individuals known to have been present at the site at various times – Pacific islanders, British administrators, U.S. Coast Guardsmen – none seems to have been a likely source for the button, so we're left with the possibility that it came from an item of clothing owned by the castaway. If the castaway had an American button it follows that the castaway might well have been an American.



## 5 FORMER NIKUMARORO RESIDENT INTERVIEWS

We've recently made contact with former Nikumaroro residents in Australia and New Guinea who are able to answer many of the questions we have about island folklore and who can carry our research to other former residents who now live in the Solomon Islands. These important new contacts are bringing an avalanche of new information that can be correlated with archival sources and are giving us a better understanding of events on the island.

## 6 ITASCA RADIO LOGS RESEARCH

We're currently working with a group of former Navy radio operators who are providing some valuable new insights into the radio logs of the *Itasca*. Although the radio logs are the best contemporaneous documentation of what was going on during the Earhart flight and subsequent search, they are written in an archaic and arcane shorthand that must be accurately deciphered.

## 7 POST-LOSS RADIO STUDY

This massive project continues to plod toward publication. As sections of the study are completed we'll post them on the TIGHAR website for peer review and critique so that we



can make any needed corrections before we commit to print. When completed it will be a landmark document in Earhart research.

## **S** TIDAL RESEARCH

Using new data collected during last summer's Niku Vp expedition, analysis is underway which will enable us to verify and refine our reconstruction of conditions on the reef during the crucial days in 1937.

*Tidal gauge used during NikuVp.  
TIGHAR photo by Howard Alldred.*



## **D** NIKUMARORO GEOMORPHOLOGY RESEARCH

Expert assessment based on direct observation and historical data of how storm activity has influenced the island and the distribution of artifacts over the years is giving us a better picture of why we've found what we have, why we haven't found more, and where we should look next.

## **10** G.I.S. CONSTRUCTION

The volumes of photographic and cartological data we have collected on Nikumaroro are being assembled by Select GIS Services of Northampton, MA into a comprehensive Geographical Information System (GIS) which will be an important, not to say revolutionary, new tool in assessing the significance of what we already know and planning what we should do next.

## A BUSY NEW YEAR

In addition to the ongoing research described above, look for a new up-dated paperback edition of *Amelia Earhart's Shoes*, the popular 2001 book about TIGHAR's quest authored by senior archaeologist Dr. Tom King, forensic anthropologist Dr. Karen Burns, oceanographer Dr. Randy Jacobson and researcher Kenton Spading.



AND AS IF AMELIA WERE not keeping us busy enough, some fresh rumblings from Newfoundland may mean new opportunities for our oldest and dearest quest – Project Midnight Ghost, the search for the White Bird of Nungesser and Coli. There is also an entirely new project in the works concerning an extremely rare World War Two aircraft. We'll say more about these new developments as soon as we can. Stay tuned. It's going to be an exciting year.

