

# *TIGHAR TRACKS*

THE JOURNAL OF THE INTERNATIONAL GROUP FOR HISTORIC AIRCRAFT RECOVERY



*Veryl Fenlason, TIGHAR #0053CE  
1937 – 2010*



## CONTENTS

Twenty-Five Years .....	3
The Plan For Niku VI .....	4
Approaching the Seven Site .....	6
Where is the Electra? .....	12
Connecting the Dots .....	16
What Might We Expect to Find? .	19
Veryl W. Fenlason .....	21
The TIGHAR Trilogy .....	23

## ABOUT TIGHAR

TIGHAR (pronounced “tiger”) is the acronym for The International Group for Historic Aircraft Recovery, a non-profit foundation dedicated to promoting responsible aviation archeology and historic preservation. TIGHAR’s activities include:

- Compiling and verifying reports of rare and historic aircraft surviving in remote areas.
- Conducting investigations and recovery expeditions in co-operation with museums and collections worldwide.
- Serving as a voice for integrity, responsibility, and professionalism in the field of aviation historic preservation.

TIGHAR maintains no collection of its own, nor does it engage in the restoration or buying and selling of artifacts. The foundation devotes its resources to the saving of endangered historic aircraft wherever they may be found, and to the education of the international public in the need to preserve the relics of the history of flight.

*TIGHAR Tracks* is the official publication of The International Group for Historic Aircraft Recovery. A subscription to *TIGHAR Tracks* is included as part of membership in the foundation (minimum donation \$55.00 per year). The editors welcome contributions of written material and artwork. Materials should be addressed to: Editors, *TIGHAR Tracks*, 2812 Fawkes Drive, Wilmington, DE 19808 USA; telephone (302) 994-4410, fax (302) 994-7945; email tigharpat@mac.com. Photographs and artwork will be returned on request.

## ON THE COVER

*Veryl Fenlason, TIGHAR #0058CE, on Nikumaroro.*

## ON THE WEB

**<http://www.tighar.org>**

## BOARD OF DIRECTORS

C. Graham Berwind III  
Bill Carter  
Arthur C. Carty  
Richard B. Gifford  
Richard E. Gillespie  
Thomas F. King, Ph.D.  
Russell E. Matthews  
Patricia R. Thrasher



# "You're going to fail."

We had come to the famous Philadelphia attorney and P-51 owner/pilot to solicit his support for our newly formed nonprofit aviation historical group. He looked at us from behind his massive oak desk and said, "You're going to fail. A charitable organization funded by public contributions hoping to recover historic aircraft for museums will never be able to compete with the wealthy private collector."

He was right. Our early efforts to win approval to recover B-17E 41-2446 (aka "The Swamp Ghost") were thwarted by a moratorium on all World War Two relics imposed by the government of Papua New Guinea. Twenty-five years later, the airplane is reportedly on its way back to the U.S. having been acquired by a wealthy private collector.

But the lawyer was also wrong. TIGHAR did not fail. Rather than try to compete with salvagers, TIGHAR became an advocate for responsible aviation archaeology and historic preservation. Instead of brokering acquisitions for museums, we focused on solving the great riddles. Did Nungesser and Coli cross the Atlantic before Lindbergh only to crash in Maine or Newfoundland? Do World War Two Luftwaffe aircraft survive in underground hangars like chariots in a pharaoh's tomb? And, of course, the Holy Grail of aviation mysteries – what really happened to Amelia Earhart? We approached these puzzles not as treasure hunters or adventurers, but as investigators

dedicated to developing and demonstrating the scientific method of inquiry as applied to aviation historical research.

We also tackled the tough questions of aviation historic preservation. Has a "fully restored" aircraft been preserved, or has the historic material that survived the teeth of time been destroyed for the sake of creating a more attractive exhibit? Where is the balance between the benefits of returning a rare airplane to flying condition and the danger of losing it in an accident? How can we prevent aluminum aircraft that have spent decades immersed in salt water from corroding away once they are recovered?

Twenty-five years after we were told we would fail, TIGHAR is a thriving Institute for Aviation History with dozens of scholars, scientists, and talented professionals volunteering their expertise on an array of ambitious international projects. As you'll read in this issue of *TIGHAR Tracks*, the prospects for the upcoming Earhart Project expedition are very exciting. Just as importantly, two historic aircraft recovery projects – To Save a Devastator and The Maid of Harlech – are making strides toward achieving what that lawyer a quarter of a century ago, said we couldn't do.

Through it all, it has been you, the TIGHAR members, who have made it all possible. This is your anniversary. We congratulate you and thank you. Twenty-five years is a good start.

**Western Reef Slope**

# THE PLAN FOR NIKU VI



**Seven Site**

*The relatively small size of the areas to be addressed on the Niku VI expedition is the product of twenty years of refining the Nikumaroro Hypothesis through research and field work. Satellite image courtesy of SpaceImaging.*

## ONSHORE ARCHAEOLOGY

**T**his year's expedition to Nikumaroro will continue the archaeological work at the Seven Site, the place deep in the bush on the atoll's remote southeast end that appears to be where the partial skeleton of a castaway was found in 1940. Features such as small cooking fires as well as artifacts discovered at the site during TIGHAR's 2001 and 2007 expeditions support the hypothesis that we have found the campsite where an ethnically European female resided for a time and ultimately died. The oldest datable object found at the site, a small bottle bottom with remnants of lanolin and oil (hand lotion?), was manufactured in New Jersey in 1933. The first permanent settlement on Nikumaroro was established in December 1938. So if the bottle was brought by the castaway, and if we assume that a living castaway would make herself known to the first settlers, it would seem that the castaway arrived, survived, and died sometime between 1933 and late 1938. The only ethnically European female known to have gone missing in the Central Pacific during that period was Amelia Earhart.

*Embossed coding on the bottom of this bottle bottom found at the Seven Site in 2007 shows that it was made by the Owens-Illinois Glass Company at the Bridgeton, New Jersey plant in 1933. Laboratory analysis of the black residue in the corner of the bottle shows it to be lanolin and oil. This was probably a small bottle of hand lotion. TIGHAR photo.*



Recent advances in the ability to extract DNA from touched objects as well as human remains make us hopeful that further discoveries at the site will reveal the identity of its unfortunate resident. If DNA from the Seven Site matches the Earhart reference sample now held by the DNA lab we've been working with, we'll have what most people would consider to be conclusive evidence that Amelia Earhart spent her last days on Nikumaroro.



## UNDERWATER SEARCH FOR THE ELECTRA



*Andrew McKenna takes a break during the 2001 shallow water search for airplane wreckage on the Western Reef Slope.*

In addition to the onshore archaeological work, we plan to carry out an underwater search for the wreckage of Earhart's Lockheed Electra using a Remote Operated Vehicle (ROV). All indications point to the aircraft having been landed on a particular strip of smooth coral reef at the island's western end. Our divers have searched the area down to 100 feet on previous expeditions but the reef slope is extremely steep and any wreckage is likely to be at least 250, and perhaps as much as 1,000 feet, down. A sidescan sonar sweep around the perimeter of the island was done by Oceaneering International as part of TIGHAR's 1991 Niku II expedition, but the sonar "fish" struck an underwater obstruction and was lost before the western end of the atoll was surveyed.

The two areas that will be the focus of this year's expedition – the Western Reef Slope and the Seven Site – are fundamentally different. One is underwater and can be accessed only by remote sensing. The other is on dry land and accessible to direct inspection once the vegetation has been removed (no small task). But there's a more important difference between the two locations. The Seven Site is an established archaeological site that has already yielded artifacts and features supportive of our hypothesis. The question there is what remains to be found? We're not likely to know until we've had chance to analyze and identify whatever comes out of the ground. It typically takes months and often years to identify the objects found, if they can be identified at all.

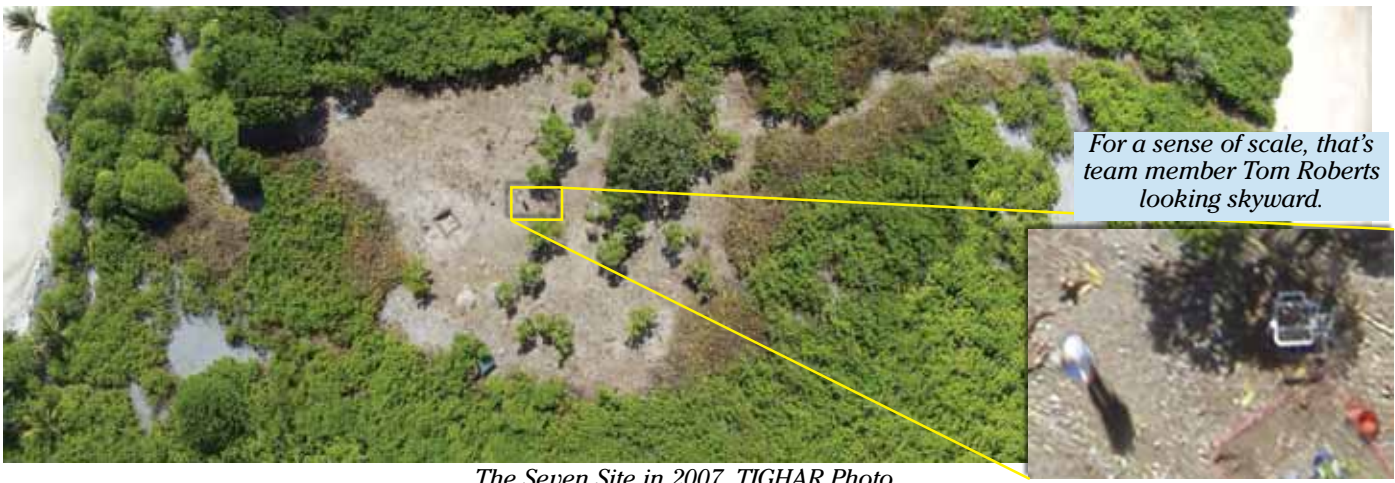
By contrast, the underwater reef slope is unexplored territory. It's where we think the wreckage of the plane should be, but that's a best guess based on stories and logic. Whether our guess is right remains to be seen. Unlike the Seven Site, positive results would probably be immediately apparent.



*The sonar tow "fish" struck an underwater obstruction and was lost before Western Reef Slope could be covered. TIGHAR photo.*

# Approaching the Seven Site

*Presented here is Dr. Tom King's briefing to the expedition team members who will work under his supervision at the Seven Site during the upcoming expedition.*



*The Seven Site in 2007. TIGHAR Photo.*



*Thomas F. King, Ph.D., Senior Archaeologist. TIGHAR photo.*

## INTRODUCTION: SOME BASIC ARCHAEOLOGY

Here are some things that everyone planning to work at the Seven Site should be aware of. A lot of it's pretty basic, but I thought it would be well to make sure we all understand one another.

Archaeology is all about **context** – the spatial relationships among things. It's from these relationships that we can reconstruct what happened in a given location, how a given thing came to be where it's found, which things got deposited in the site before other things, and so on.

In traditional archaeology we're very much concerned about both horizontal and vertical relationships. At the Seven Site there's not much to the vertical dimension; everything is pretty much in the top 10 cm. or so of the site. So in a way, what we do is a lot like crime scene investigation: where is the (smoking) gun lying vis-à-vis the broken flowerpot; that sort of thing.

This is why we're so careful about mapping, and plotting in the location of each item found. We do this with varying degrees of anal-retentiveness, but generally we want to record carefully where each thing is before we move it. We've established a central "datum point" over which we set up a total station, and we map everything in with reference to that point. We'll supplement the mapping with overhead Kite Aerial Photography and Pole Aerial Photography (KAP & PAP).

There are vertical relationships to be recorded, too. For example, by carefully examining such relationships we were able to determine that a lot of small clams were deposited on one small part of the site, then a layer of asphalt siding was laid over them, and then some corrugated iron was



*Kite Aerial Photography (KAP) uses a small digital camera mounted in a powered cradle suspended from the string of a kite flown over the target area. It's an economical way to get high-resolution aerial photos in remote locations. Pole Aerial Photography (PAP) uses the same principle but the camera cradle is attached to a long pole. TIGHAR photo.*

laid on top of the siding. We don't know what kind of time passed between these incidents, or why they occurred, but the fact that they were sequential might mean *something*, so it's good we were able to detect it.

Much of what we record on and recover from the Seven Site has no obvious relationship to Earhart, or even to the putative castaway who may have been Earhart. Such relationships may – or may not – emerge through later analysis, but no one should expect “aha!” moments in the field. We didn't recognize the probable rouge in the field; we just recognized that it wasn't coral or scaevola, and therefore it was unusual so we kept and recorded it. Similarly, we didn't recognize the mirror fragments as mirror fragments in the field. In 2001 one of our team had a lot of trouble understanding why it was so important to collect all the fish and bird bones, and complained a lot about the time it took to do so. But on analysis, the kinds of fish represented (the bird bone analysis isn't yet done) turned out to suggest that whoever was collecting and preparing the fish was not following standard Pacific island norms – and so was probably not an indigenous Pacific islander. That's an important piece of data. It's the slow accumulation of such data that gives us a basis for testing our hypothesis.

So the bottom line is, we'll be trying to record and map the locations of everything we find.

## TERMINOLOGY AND STANDARDS

There are some standard ways of doing archaeological fieldwork that we'll be adhering to, and some that we'll be modifying in various ways. And there's some terminology we use that everyone ought to be familiar with.

We use the metric system; measurements are in meters, centimeters, and occasionally millimeters.

We do not impose a metric grid system over the whole site. That's often done in archaeology, but it's time-consuming, tedious, and generally a pain in the behind when you're working a site like the Seven Site, on a convoluted ridge with lots of vegetation.

When we elect to concentrate on a particular location, however, we do lay down a metric unit or units within which to work. This is usually a 1x1 meter or 2x2 meter square, or a 1x2 meter rectangle, or a combination of multiple such polygons. Each square or rectangle (called a *unit*) is given a designator (examples from 2007: “SL-

3,” “WR-1”). Their locations are carefully mapped in, and we then map in things we find within a rectangle by measuring from two perpendicular sides.

We generally dig in 10 cm. levels, though in point of fact we seldom find anything deeper than 10 cm.

Everything from a given level in a given unit (and sometimes from a sub-unit – e.g. the NW quarter of Unit XB-7, 0-10 cm. level) is typically passed through a sieve or screen (we call them screens, the Brits call them sieves), and kept together in a labeled bag (or bags). ***It is critically important to label every bag accurately, and keep the label intact*** (don't let it get rubbed off). Surface finds are also “tagged and bagged.”

Our screens are PVC rocker screens lined with ¼” mesh hardware cloth. We have 1/8” gauge inserts that we seldom use, but have on hand just in case.

Saying the material from a level is “passed through” the screen is a bit of a misnomer, since the site is mostly coral rubble that just sits in the screen and glares at us. We go through it by hand, throw out the rubble, pick out the artifacts, and the little bit of humus that exists falls through.

We keep all “*artifacts*” – that is, things made by people, and many “*ecofacts*” – that is, things created by nature. Of course, we don't keep every chunk of *Scaevola* bark, or every lump of coral or marine shell, but we do keep all bones, turtle shells, etc.

We record all “*features*” – that is, concentrations of things that may represent human activity. Some examples of features we've recorded are:



Ric Gillespie and Bill Carter inspect a 1x1 meter unit during the 2007 expedition. This is GL-1 where a piece of thin plate glass was discovered on the surface. The artifact was later found to fit a similar piece of glass collected during the 2001 trip. Together, the pieces could be identified as the mirror from a 1930s compact. Nothing further was found in the GL-1 unit. TIGHAR photo.



*Lonnie Schorer exposes Clambush 2 in the SL-3 unit during the 2007 expedition. TIGHAR photo.*

“*Clambushes.*” Clambush is a term we made up for clusters of *Tridacna* (“giant”) clam valves, clearly the remains of someone’s clambake. We’ve found two, creatively labeled Clambushes 1 and 2.

“*Shell scatters.*” We’ve found only one of these so far; it’s a scatter of small “butter clam” (*Anadara* sp.) valves, also probably the remains of a meal.

“*Birdbone scatters.*” As the term implies, these are scatters of bird bones.

“*Corrugated iron features.*” Sheets of corrugated iron, reduced to rust on the ground.

We also record the locations and characters of such natural features as living trees, dead trees, pits, swales, irregularities in the ground surface, etc.

We systematically scan the surface of the site with metal detectors, as well as visually.

In 2007 we also scanned about half the surface of the site using the Clauss/King Unpatented Daylight Ultraviolet Scanner (UDUS). Bones and teeth fluoresce in UV light. It worked, but didn’t reveal any human bones or teeth, and is very tedious to use. It was necessary to rake the surface in advance of UDUS scanning.

What I’ve just described is our standard way of doing business at the Seven Site. We propose this year to do things a little bit differently, as described below.

## RESEARCH PLAN

We have four goals at the Seven Site in 2010:

- ❖ Make sure we’ve characterized the geography of the site correctly – that its components don’t extend beyond the area we’ve cleared of vegetation and examined;
- ❖ Examine the entire site in much greater detail;
- ❖ Collect a more comprehensive body of information on features and artifacts; and



*Tom Roberts screens coral rubble during the 2007 expedition. TIGHAR photo.*

- ❖ Make a particular effort to collect material that might present recoverable DNA, and **GUARD AGAINST ITS CONTAMINATION!**

The site presents some serious physical challenges, notably:

It’s covered with *Scaevola*, a truly nasty shrub, which must be cut and removed; it’s hard



*Dave Mason digs a “hit” found by Ric Gillespie using a White’s Electronics SurfPro metal detector. TIGHAR photo.*

to remove because wherever you try to put it, there's more *Scaevola* growing.

Much of what we're interested in is right on or very close to the surface, easily disturbed by walking around on it, dragging *Scaevola* over it, etc.

The top 3-5 cm. of the site is a sort of pavement of coral gravel, a deflated surface through which the smaller-grained material has sifted. As a result, artifacts and features tend to be hard to see even though they're virtually on the surface,



*John Clauss uses the UDUS to scan for bones or teeth at the Seven Site in 2007. TIGHAR Photo.*

and almost always in the top 10 cm. of the "soil" (There really isn't any soil; it's coral rubble with patches of humus and fire features).

In the past we've cleared the *Scaevola* off areas of the site (dragging it to clearings where it could be piled, or just throwing it deeper into the bush), done systematic metal detecting, ultraviolet light scans, and raking, and excavated selected locations (mostly fire features) employing standard archaeological methods. I think we now understand the site well enough to take a somewhat different approach.



*Andrew McKenna assaults the scaevola with pneumatic loppers in 2007. TIGHAR photo.*

This approach will be destructive: I propose to turn over essentially the entire surface of the site. This is an inherent problem in archaeology: we destroy what we study.

## PROPOSED FIELDWORK

As soon as we arrive on the island and get a boat into the lagoon, I propose to move a team to the Seven Site to begin clearing *Scaevola* at the NE corner of the area we cleared in 2007 (which will certainly have grown up again, but appears from recent satellite imagery to have grown up rather lightly). It should take us about two days to clear the 2007 area. We'll carry the cuttings back into the Buka forest NW of the clearing and pile it there (first carefully checking the debris-pile site to make sure we're not covering something up). We won't necessarily stick to the limits of the area cleared in 2007; the basic idea is to clear an area about 30 meters wide running along the crest of the ridge that bisects the site. Needed technology will include pneumatic loppers, chain saws or other brush cutters, knives, and trimmers.

As soon as the cutters have cleared an area of about 10x30 meters, I propose to peel two people off to cut in from the ocean side to a location 30 to 50 meters SE of the 2007 cleared area. Having reached the ridge (along a path of least resistance plotted in satellite imagery), this team will clear a good broad swath back to the 2007 clearing, enabling us to make sure that the site's features don't extend any farther along the ridge than we've mapped.

By about Day Three on the site, while the exploratory cutting team is cutting SE of the cleared area, we should be able to get to work on actually "excavating" the site. I figure that we'll stake out a line perpendicular to the ridgeline and running right across it, near the NW end of the clearing. Along this line I figure we can



deploy about 7 team members, each responsible for about 5 meters of the line. We'll also need to set up the total station surveying instrument over Datum 3, the most convenient of our datum points to use in mapping along the ridge. We'll



hold 2 or 3 screens (sieves) in readiness. One team member will serve as Evidence Manager (EM), making sure that anything that might have DNA on or in it is collected with sterile gloves, and that all bags are correctly labeled with provenience data.

Each person along the line will then begin simply scraping the surface with a trowel, moving the top 5 cm. or so of coral rubble back behind him or her to expose and examine the surface. He or she will go on and do the same thing to the 5 cm. or so of finer-grained material underlying the surface armor. Every time an artifact, feature, bone, or anything else other than coral and *Scaevola* detritus is encountered, it will be shot in by the total station crew, labeled and bagged, always using latex gloves to avoid DNA contamination. An exception will be made for ferrous metal, which is ubiquitous on the surface; it will be mapped and sampled, but not collected in its entirety.



As the clearing is completed, clearing crew members can trade off with surface scrapers, or give special attention to particular locations, or open up areas that the exploratory team has found (if any).

Assuming the site is not much more extensive than what we mapped in 2007, I estimate that by the end of 14 days we will have turned over the

entire surface of the ridge, finding and recording whatever is there to be found. Besides field notes and total station mapping, we will document the site using Kite Aerial Photography and Pole Aerial Photography. We will use the daylight ultraviolet scanner on any areas where there is reason to think that bones might be lurking.

## ANCILLARY RESEARCH AT RITIATI/KARAKA VILLAGE

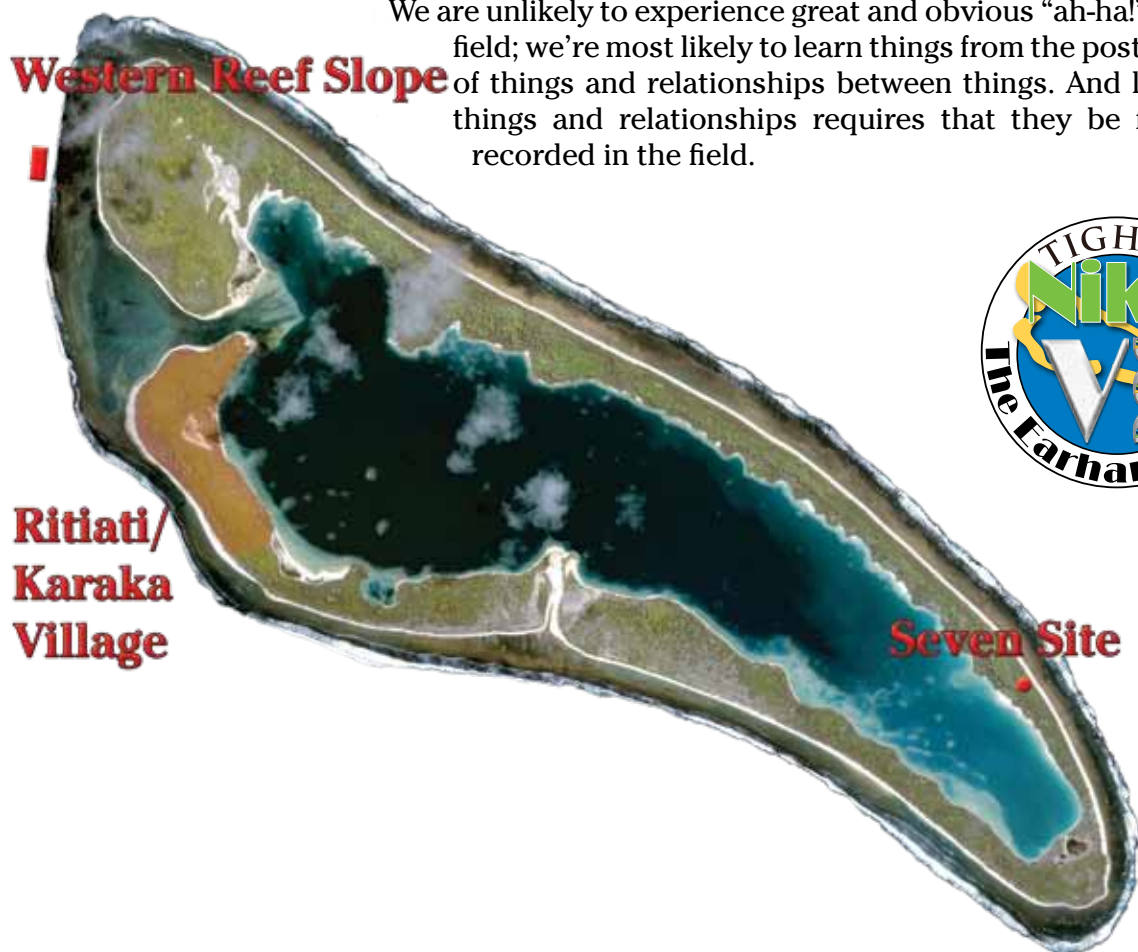
Study of fishbones from the Seven Site by Dr. Sharyn Jones of the University of Alabama at Birmingham has suggested that the patterns of fish procurement and consumption are unlike those found in indigenous cooking sites – in other words, that whoever cooked the fish was probably not a Pacific Islander. It would help us evaluate the typicality of the fish remains at the Seven Site if we had something from Nikumaroro itself with which to compare them – that is, if we had the cookfire of a demonstrably local population.

Although we do not have a “campfire” produced by such a population on Nikumaroro, we do have domestic cookhouses in the colonial village of Karaka, on the land unit called Ritiati in the north-central part of the island. I propose to excavate one or two cookhouses in Karaka Village to gain material to compare with the fire features at the Seven Site.

## BOTTOM LINE

The main thing I want to impress on everyone is that everything we do and observe must be carefully recorded, and that as with so many other things in life, what’s important is location, location, location.

We are unlikely to experience great and obvious “ah-ha!” discoveries in the field; we’re most likely to learn things from the post-fieldwork analysis of things and relationships between things. And learning from such things and relationships requires that they be fully and carefully recorded in the field.



# WHERE IS THE ELECTRA?



If Earhart and Noonan, died on Nikumaroro, where is the Electra? The short answer is, we don't know. We can, however, make a few logical deductions about where it can't be and where it might be.

- ❖ If any of the nearly two hundred radio distress calls that were heard for at least four nights after the disappearance were genuine – and about half of the reported signals do seem to have been genuine – then the aircraft had to have made a relatively safe wheels-down landing and been able to run an engine to recharge the batteries.
- ❖ That means the distress calls could not have been sent if the plane landed in the lagoon or the ocean.
- ❖ Had the airplane landed on the beach or in any of the atoll's few open areas it should have been discovered by the Navy's aerial search, later island inhabitants, or TIGHAR's searches.
- ❖ That leaves as the only alternative the atoll's fringing reef, which dries at low tide and is smooth enough in some places to land an airplane.



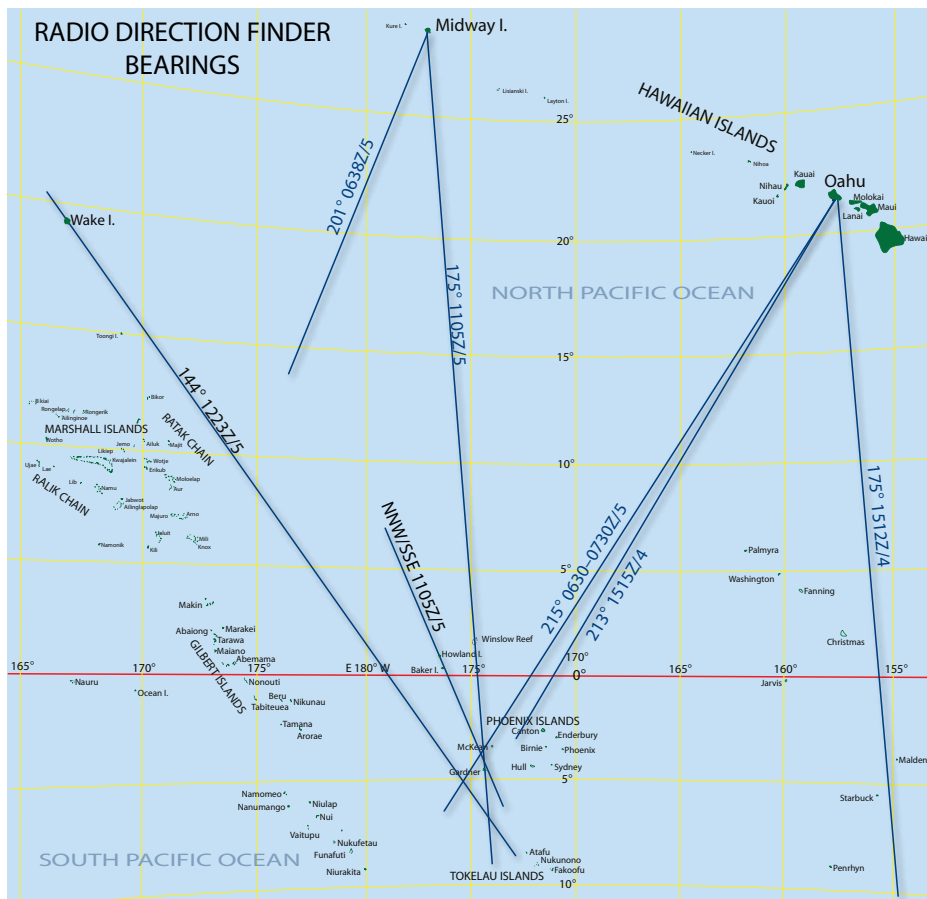
*In 2001 TIGHAR inspected the section of reef just north of the shipwreck. The reef surface is smooth enough and, at low tide, dry enough to land a Lockheed Electra.*

## COULD THE ELECTRA HAVE LANDED ON THE REEF AT NIKUMARORO?

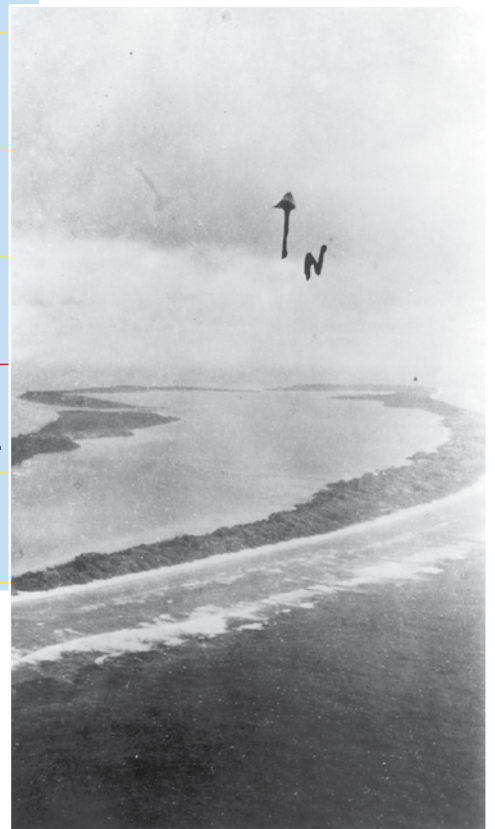
- ❖ The island is on the navigational line Earhart said she was following in the last in-flight radio transmission heard by *Itasca*.
- ❖ They should have had more than enough fuel to get there.
- ❖ The tide was low and the reef was dry during the time they could have arrived.
- ❖ The reef is smooth enough in places to permit a safe, if bumpy, landing.

## ARE THERE ANY CLUES THAT THE AIRPLANE WAS LANDED ON THE REEF AT NIKUMARORO?

- ❖ The times when credible radio distress calls were heard over the next four nights correspond with times when the water level on the reef at Nikumaroro was low enough to provide enough prop clearance for an engine to be run.
- ❖ Directional bearings taken by Pan American and the U.S. Coast Guard on radio signals believed to be sent from the missing plane crossed in the vicinity of Nikumaroro.
- ❖ By the time Navy search planes flew over the island a full week after the disappearance, the credible radio calls had stopped. The pilots and observers saw “signs of recent habitation” on the officially uninhabited atoll but no aircraft. A photo of the island taken during the Navy search shows that the tide was high with significant surf on the reef edge. If there was an aircraft there it was hidden by the surf.



Most of the radio bearings taken on distress calls believed at the time to have been sent from the Earhart aircraft cross in the vicinity of Gardner Island (Nikumaroro). The notations on the lines denote the bearing, time, and date. For example: 175° (bearing); 1105Z (11:05 Greenwich); 5 (July 5, 1937).



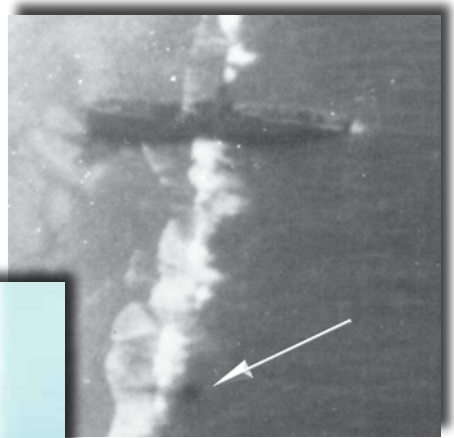
This photo of Gardner Island (Nikumaroro), taken from one of Colorado's search planes on July 9, 1937, confirms that the tide was high and there was heavy surf along the reef edge. The hand-drawn north arrow points due West.

## IS THERE ANY EVIDENCE THAT THE PLANE WAS THERE AND, IF SO, WHERE?

**Date:** December 1, 1938

**Source:** Photograph

An aerial photo taken as part of the New Zealand Survey shows what appears to be an anomaly just below the surface on the reef edge just north of the shipwreck. The sea was calm with minimal surf on the reef.



**Date:** Sometime between January 1940 and November 1941

**Source:** Anecdotal recollection in 1999 TIGHAR interview

Emily Sikuli (née Segalo Samuela), teenage daughter of the island's carpenter Temou Samuela, saw debris that her father told her was airplane wreckage on the reef edge at low tide about 100 meters north of the *Norwich City* shipwreck.



**Date:** 1942

**Source:** Photograph

An aerial photograph shows the effect of severe weather that struck the island in January 1939. At that time the stern of *Norwich City* separated and tumbled down the reef slope into deep water. Other debris from the shipwreck was scattered shoreward. The photo shows no sign of the anomaly seen in the 1938 photo.



**Date:** 1944

**Source:** Anecdotal recollection in 1995 TIGHAR interview

U.S. Navy PBY pilot Jon Mims saw island residents using an airplane control cable as a fishing line leader for large fish. When he asked where they had gotten the cable the islanders said there was an airplane wreck on the island when the first settlers arrived in 1939. When he asked where the wreck was they said they didn't know.



**Date:** Sometime between 1946 and 1963

**Source:** Anecdotal recollection in 1997 TIGHAR interview

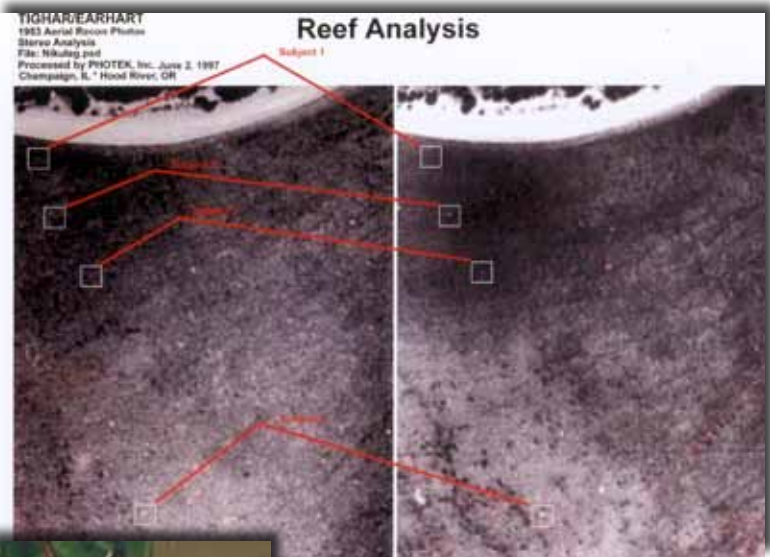
Island schoolteacher Pulakai Songivalu saw airplane parts on the lagoon shore opposite the main passage. The parts were salvaged by island residents for local purposes.



**Date:** 1953

**Source:** Photographs

Forensic imaging of two aerial mapping photos shows what appears to be a debris field of four pieces of light colored metal roughly 4 feet square on the reef flat downstream of the possible wreck site.



**Date:** Sometime between 1958 and 1963

**Source:** Anecdotal recollection in 1997 TIGHAR interview

Tapania Taeke, between 5 and 10 years old, saw a piece of an airplane wing on the reef in roughly the same area as the debris field in the 1953 photos.



**Date:** November 1991

**Source:** Artifact

TIGHAR's second expedition to Nikumaroro found a section of badly torn aluminum airplane skin that appeared to have been washed ashore in a severe storm that had struck the island since our initial visit in 1989. Whether the artifact could be from the Electra is the subject of intense controversy but the circumstances of its discovery strongly suggest that it came from the sea and was flung ashore by the storm.



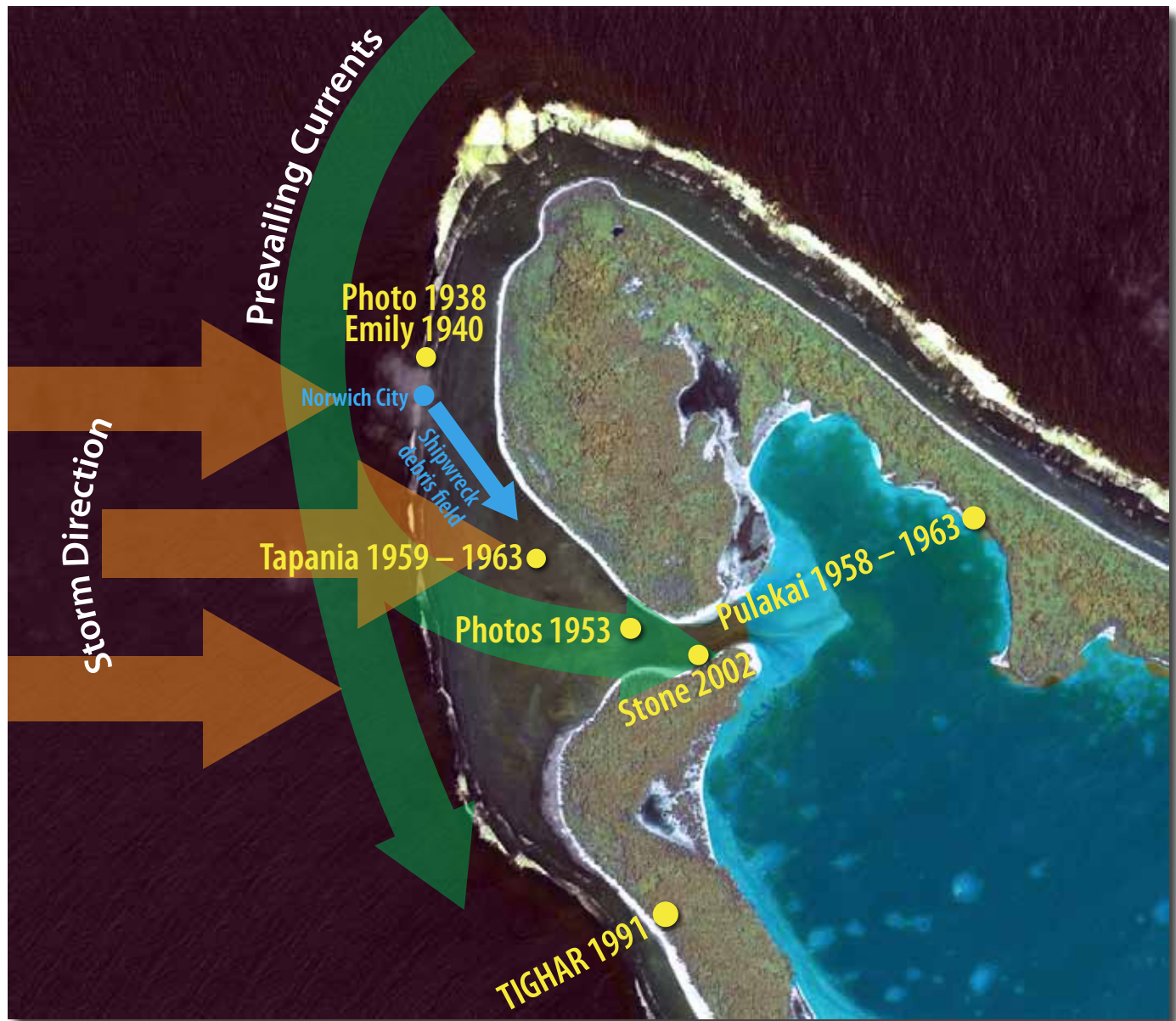
**Date:** June 2002

**Source:** Anecdotal recollection in 2002 TIGHAR interview

During a New England Aquarium marine biology expedition to the island in 2002, the expedition leader, Dr. Greg Stone, saw a wheel (no tire) near the shore in the main lagoon passage that looked to him like it might be an airplane wheel. Greg was familiar with TIGHAR's work and, because the wheel was so easy to see, he assumed that TIGHAR had examined it and dismissed it. Only after leaving the island did he learn that we had never seen such an artifact at Nikumaroro. After close questioning, his description of what he saw sounded right for a wheel from the Electra so we mounted a special expedition in 2003 to see if we could re-locate it. Unfortunately, in the interim, more storms had devastated the west end of the atoll and the object that Greg Stone had seen was gone.



# CONNECTING THE DOTS



Some of the clues are stronger than others. Forensic imaging from two photos is much more reliable than an anomaly in a single photo. Human memory is notoriously frail, but it is interesting that all of the clues, so far, appear to tell a consistent story that conforms with the known natural forces affecting wreckage distribution as evidenced by debris from the *Norwich City* shipwreck.

## BREAKIN' UP IS HARD TO DO

This is how the Electra may have broken up over time in such a way as to explain the various photos and reports of wreckage seen and not seen. We have good information about the reef surface where the plane seems to have landed, and good information about the underwater environment down to about 100 feet. Beyond that we have only general information from soundings done by the U.S. Navy in 1939. The shelf at 250 feet may or may not be there. It was reported by a diver on a New England Aquarium expedition in 2002 who was suffering from nitrogen narcosis.

### July 2, 1937

NR16020 is landed near the surf line on the dry reef north of the *Norwich City* shipwreck.

### July 2 – 6, 1937

Earhart and Noonan send radio distress calls during hours of darkness and low tide.

### July 7 or 8, 1937

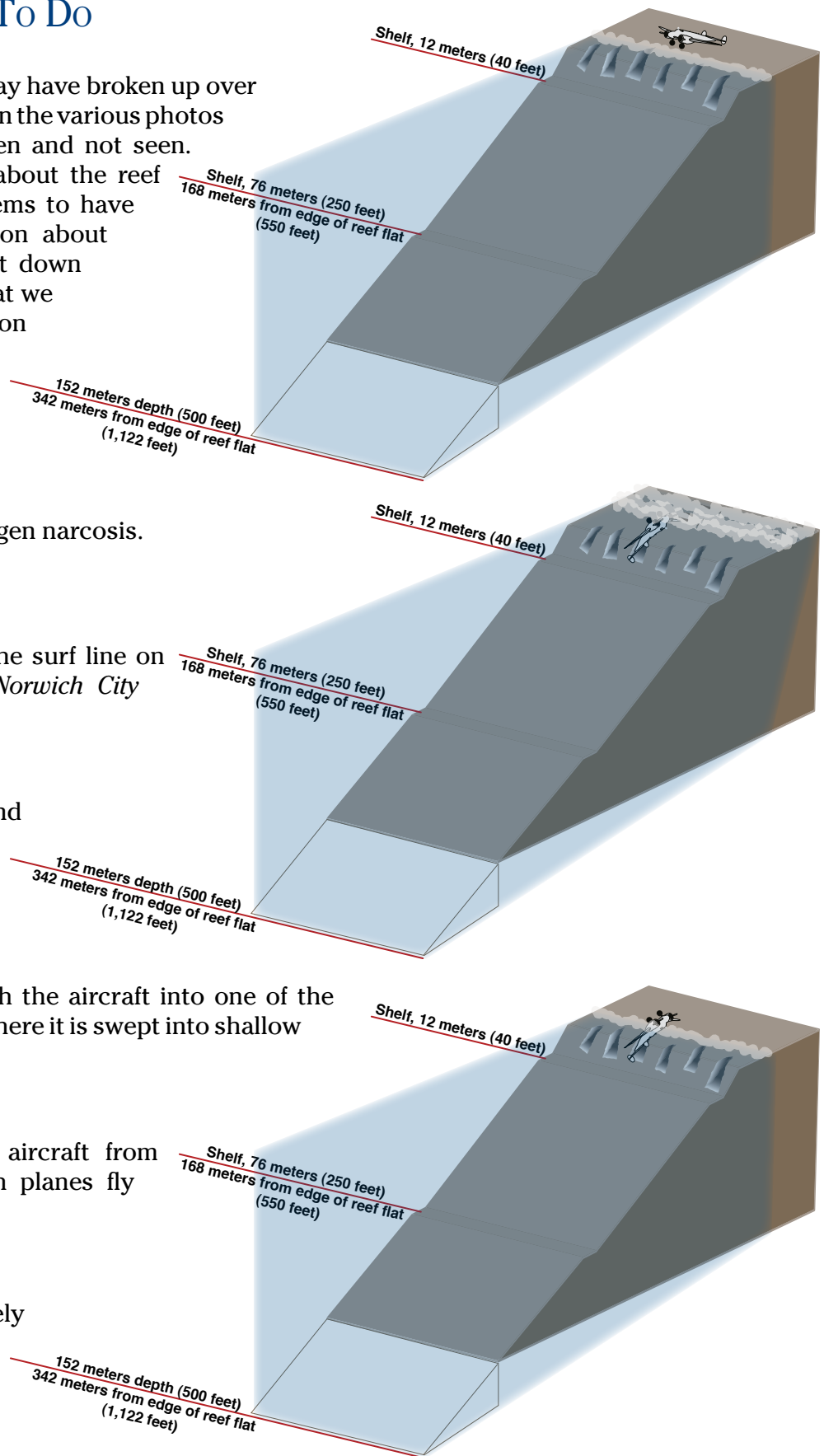
Rising tides and surf wash the aircraft into one of the “spur and groove” features where it is swept into shallow water in the surf zone.

### July 9, 1937

Breaking surf hides the aircraft from view when the Navy search planes fly over the island.

### December 1, 1938

The aircraft remains largely intact but hidden from view in shallow water just off the edge of the reef. Parts of the wreck are visible above water at unusually low tides on calm days.



### 1939

Fishermen from the new island settlement discover the wreck and salvage useful pieces. They know it's an airplane but have no interest in what airplane it is or how it got there.

### Spring or summer 1940

Emily Sikuli sees some of the wreckage on the reef on a calm day at low tide.

### November 1940

Severe westerly weather shifts the wreck onto a reef shelf at a depth of about forty feet.

### 1941 – 1952

The airplane remains on the reef shelf, battered but largely intact.

### 1953

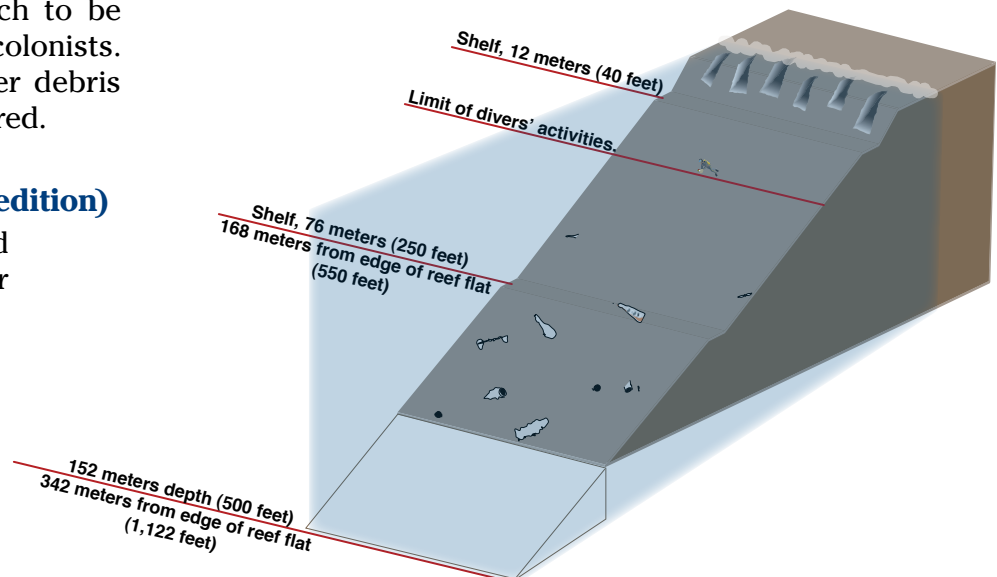
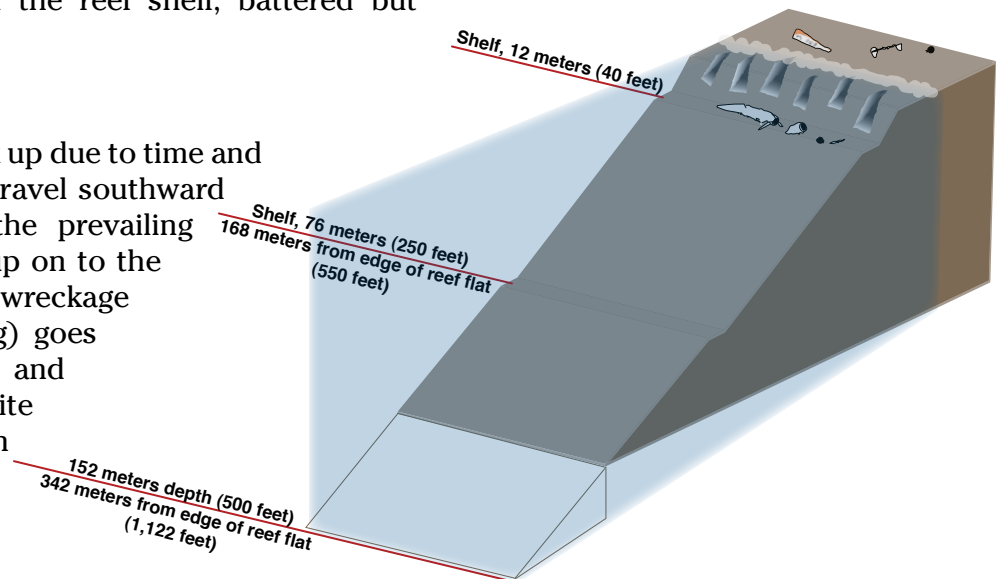
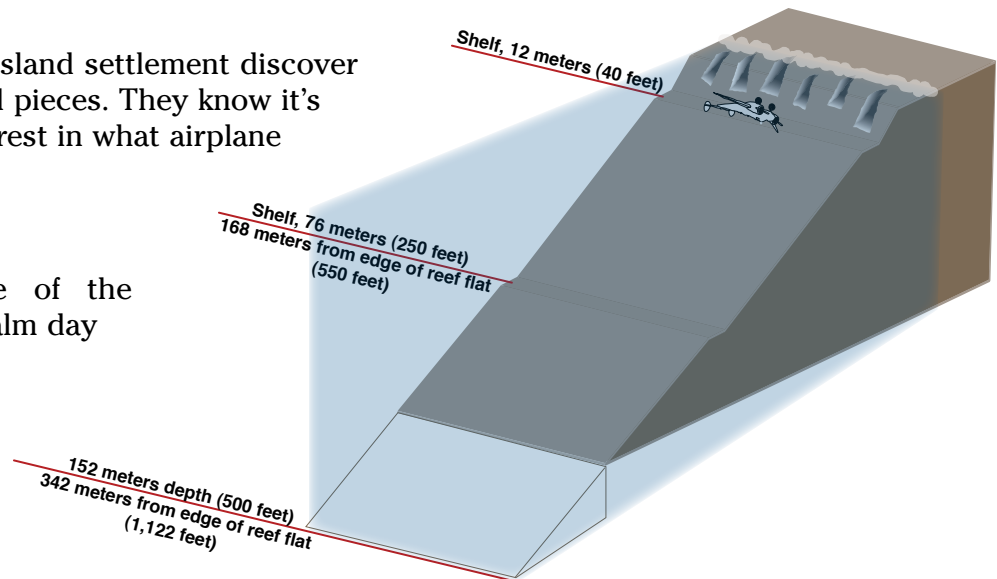
The wreck begins to break up due to time and storms. Lightweight pieces travel southward along the reef face with the prevailing current. Some are thrown up on to the reef flat in storms. Buoyant wreckage (fuel tanks, wooden flooring) goes through the lagoon passage and washes up on the opposite lagoon shore where it is seen by Pulakai Songivalu.

### 1958 – 1963

Wreckage continues to wash up on to the reef flat and beach to be salvaged and used by the colonists. Other lightweight underwater debris becomes more widely scattered.

### By 1989 (first TIGHAR expedition)

Storm action has shifted debris below 100 feet (diver limit).

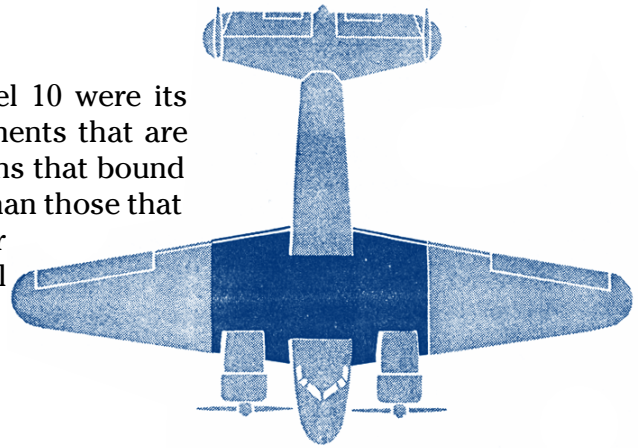


# WHAT MIGHT WE EXPECT TO FIND AND WHERE SHOULD WE LOOK FOR IT?

Most of the Lockheed Electra was made of thin aluminum sheet riveted to lightweight aluminum bulkheads and stringers. After all these years, it seems likely that what is left of those structures is an underwater debris field scattered along the reef slope southward from the spot where the plane originally went over the edge. It appears that, in big westerly weather events, pieces continue to wash ashore only to be swept away again in the next storm. At this point, locating pieces of lightweight wreckage would seem to be largely dependent upon serendipity. Relying on luck is not a great search plan.

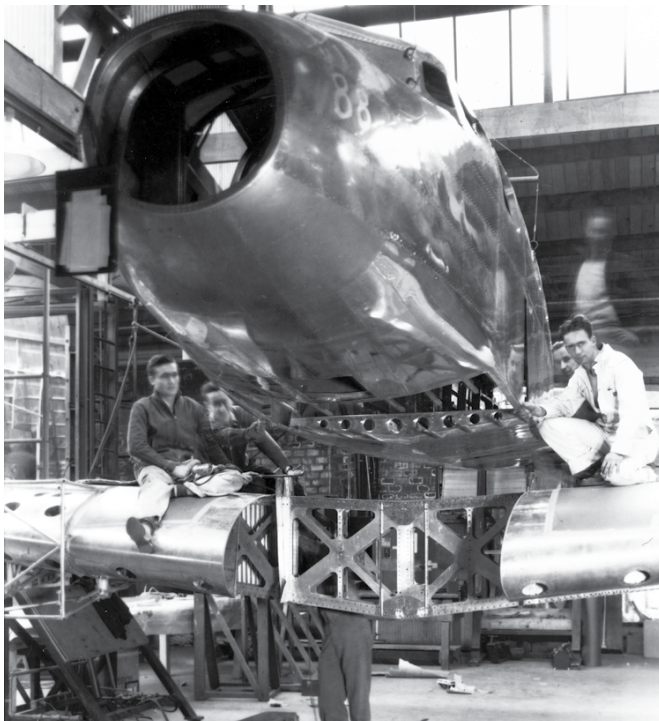
## The Center Section

The heaviest and most durable parts of the Model 10 were its center section and engines. They are also the components that are least likely to have traveled very far. The aluminum skins that bound the center section together were significantly thicker than those that covered the cabin, nose, and empennage. The center section also housed the main battery, the standard fuel tanks, and the landing gear and flap motors.



## Center Section Group

*The Center Section Group as shown in the Lockheed Parts Manual for the Model 10 Electra.*



*In this photo, taken during the construction of the Electra, AE is sitting on the portion of the main beam that passes through the fuselage. In a break-up due to wave action, the lightweight cabin structure would likely be broken up and carried away. The wooden floor panels would float. The massive center section should remain largely intact.*

*The center section was the aircraft's core structure and was built around a massive "main beam" that served as the wing spar and also carried the load from the main landing gear.*





*The two 550 hp Pratt & Whitney R-1340 S3H-1 "Wasp" engines weighed 805 pounds each.*

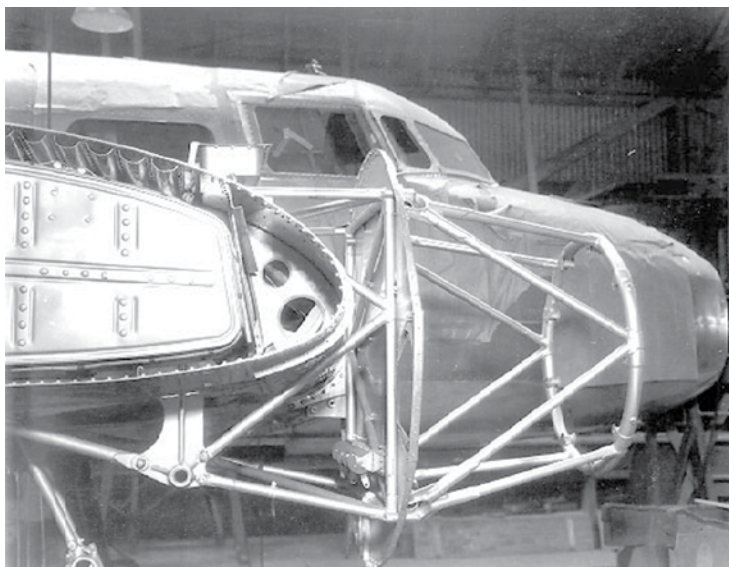
## The Engines

The engines were attached to the outboard ends of the center section by steel tube mounts. Basically, the props pulled the engines, which pulled the mounts, which pulled the center section to which everything else was attached. The engine mounts are extremely strong when pulled forward but are not designed for side loads. In a series of events such as we theorize, separation of the engines from the mounts would be expected but the propellers would not be likely to separate from the engine. A detached radial engine with the prop still attached might slide, but it won't roll.

The center section and the engines have a high ratio of mass to surface area and might be expected to have moved down the reef slope over time until they reached a depth at which disturbance from even major storms was not sufficient to dislodge them. It's difficult to imagine that depth as being much more than 500 feet. Unlike the lighter pieces, they should not move very far laterally from where they initially went over the edge.

It would seem, therefore, that our best targets for an underwater search are the big heavy pieces – the center section and engines – that should be down-slope from where the plane came to grief. The wreckage should be below one hundred feet but probably not much deeper than 500 feet.

Again, all of this is guesswork. Deductive reasoning. Sherlock Holmes stuff. If we've connected the dots correctly we may be rewarded with an important discovery. If not, we'll have to take whatever we learn, try to figure out where we went wrong, formulate a new hypothesis about where the wreckage is, and go look there. It's call the scientific method. It's cumbersome and often frustrating, but it works – and we have lots of practice.



# REMEMBERING

## VERYL W. FENLASON

Veryl Fenlason joined TIGHAR in 1985, the year the organization was founded. We've lost count of how many expeditions he participated in, but whether dodging swarms of black flies in the hills of downeast Maine, pulling a magnetometer across a frozen pond in Newfoundland, or hacking through the jungles of Nikumaroro, Veryl defined and embodied what became the TIGHAR ethic. He was never out to have an adventure – he was there to get the job done. Veryl was a Minnesota dairy farmer and his idea of “hard work” and “uncomfortable” were on a different scale than most people's. If we didn't find what we were looking for (which was almost always the case) he never got discouraged. At the end of the day he'd push his hat up and say, “We just haven't looked in the right place yet.” His laugh was ready and loud and almost always directed at himself.

Veryl was a frugal man. When he asked me if he could mount his own TIGHAR expedition to a remote pond on the high muskeg of

Newfoundland to continue our search for l'Oiseau Blanc I inquired as to how he planned to get there.

He said, “We'll just hike in.”

I said, “A helicopter would be a lot easier.”

“How much do they get?”

“The last time we chartered one it was \$800/hour.”

“Forget that. You and John [Clauss] hiked in and another time you and Kent [Spading] hiked in.”

“Yeah, that's why I'm suggesting a helicopter.”

“We'll hike in.”

Another long-time TIGHAR, Gary Quigg, picks up the story from there.



Of all my TIGHAR trips, I spent the most one-on-one time with Veryl during the last Project Midnight Ghost expedition in Newfoundland in 2006. Veryl was our indefatigable leader, supported by Tom Roberts, Walt Holm and myself. A lean and mean muskeg team assaulting English Pond and its caribou-trailed environs.

The island was angry on the late afternoon we set off westward through the muck and snarl, after days of delay waiting on gear lost in the familiar airport baggage shuffle. We had only a few hours of daylight left, and the wind and rain blew through us as we made our way in knee-high “Ketchikan tennis shoes” (rubber boots) and heavy packs.

Veryl, loaded down with more than 60 pounds on his back, was his immutable jovial self. Laughing off the misery, he was the prototypical dairy farmer watching over his herd. He was there as the literal rock to lean on when we crossed the stony, rolling washes and the muskeg with deep holes hungry for feet and ankles. The man was as solid physically as he was in character. At the time

Veryl was 69, and those of us 25 years his junior hoped we would have half his stamina, aerobic capability and stalwart good nature if we reached that age.

During the days out in the boonies, through storm, fog, close encounters of the caribou kind, difficult drysuits, technically tough terrain, and bad singing, Veryl was unflappable ... and laugh out loud funny. It seemed like every time we stopped for a breather on the long hike out, as we looked at each other with that, “You gotta be kidding me” expression, there was Veryl with that puckish grin and an ironic Minnesotan understated expression ... dissolving us in laughter.

Veryl stepped in a deep muskeg hole on the hike out. We could tell it hurt his knee like hell, but he was not one to allow pain any recognition. I suspect he could simply stare it down with his will. Undaunted, he shouldered his pack and trekked forward with each searing step until we put all the miles back to the van behind us. Strength is most often silent.

Back at the hotel, Veryl and I laid on our beds in the room after a long shave and shower. It was good to be clean and enjoy a soft mattress. As we lay there talking about his family, Minnesota and the upcoming celebratory prime rib dinner, he stopped ... looked at me with those smiling eyes

and said, "Next time I'm telling Ric we need a damn helicopter up here!"

You were, and are, an inspiration Veryl. A man among men. God speed. Rest in peace. We are so blessed to have been among your friends.



*Veryl Fenlason, Tom Roberts, Walt Holm, and Gary Quigg in Newfoundland.*



# The TIGHAR Trilogy

## Thirteen Bones

2009

A NOVEL BY TOM KING

In 1940 British Colonial Service officer Gerald “Irish” Gallagher discovered the partial skeleton of a castaway on Nikumaroro, the recently-colonized Pacific atoll he had been sent to administer. The bones were probably those of Amelia Earhart. In twenty years of research, TIGHAR has assembled a number of documented facts about that event, the context in which it occurred, and its aftermath – but like Irish, we have only a few pieces of the puzzle.

TIGHAR’s senior archaeologist Thomas F. King, PhD, has boldly fleshed out in fiction what is missing in fact. *Thirteen Bones* is not a story of Amelia Earhart. She has only a brief, if excruciatingly memorable, cameo in the opening chapter. Nor is *Thirteen Bones* a novel of His Majesty’s Western Pacific High Commission and its failure to recognize the significance of Gallagher’s discovery. The sahibs of the empire are there but distant. *Thirteen Bones* is a story of the people who lived on Nikumaroro and how the thirteen bones of a forgotten castaway touched their lives.

Tom King spins his tale through the eyes of a Gilbertese boy whose family is among the handful of colonists brought to Nikumaroro in 1939 to carve out a new life on the wild and previously uninhabited atoll. Tom has extensive experience as a scholar of Pacific island cultures and his genuine affection for the people of Oceania is apparent on every page. He also has an intimate familiarity with Nikumaroro, having supervised

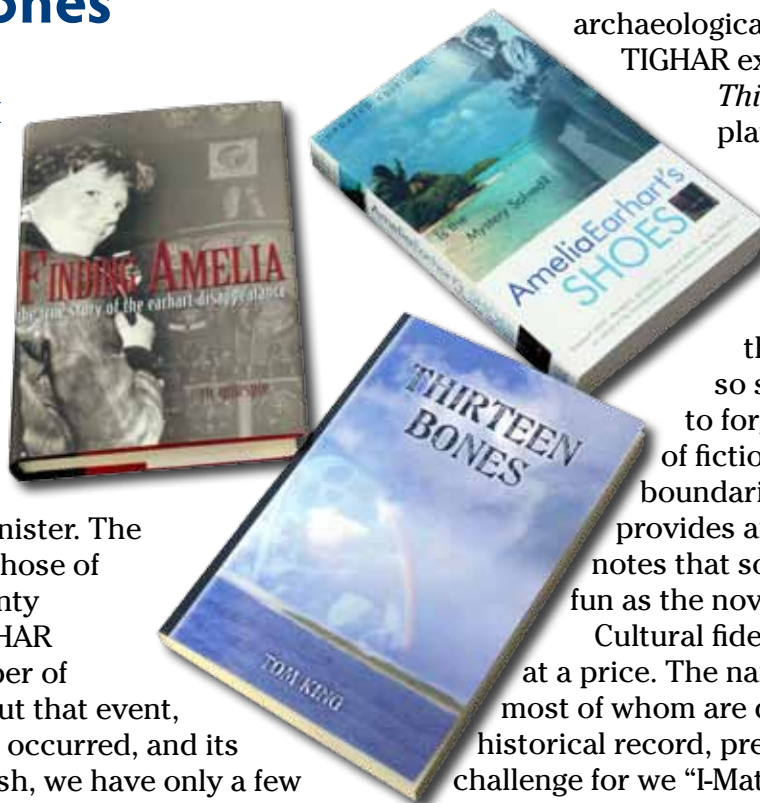
archaeological operations in four TIGHAR expeditions to the island.

*Thirteen Bones* presents plausible motivations for actions and events that we know happened but don’t know why. The novel weaves imagined events into the factual framework so skillfully that it’s easy to forget that this is a work of fiction. To help keep the boundaries clear the author provides an end chapter of factual notes that some will find as much fun as the novel itself.

Cultural fidelity, however, comes at a price. The names of the characters, most of whom are drawn from the historical record, present something of a challenge for we “I-Matang” (westerners).

The novel’s main character Keaki is the son of Ieaira and Boikabane who come from Arorae. Got that? Don’t worry. There’s a handy Guide to Key Actors, Place Names and Terms to help you keep things straight. Sometimes the names even get away from the author. The southern lagoon passage is consistently misspelled Baureke. It’s Bauareke. (When in doubt, add a vowel.) The name of the island carpenter is sometimes rendered as Temou and sometimes Tumuo. He appears in the guide as Tumuo. The man’s name was Temou. It’s a small complaint. Keeping track of names in *Thirteen Bones* is easy compared to most Russian novels. Also, the popularity of scatological insults among the island youth, although accurate, may seem needlessly crude to readers whose sense of humor is not lower than octopus poop.

*Thirteen Bones* is a good read that brings Nikumaroro’s colonial period to life in ways that a straight historical narrative never could. I thoroughly enjoyed it and recommend it highly.



# Amelia Earhart's Shoes – Is the Mystery Solved?

UPDATED EDITION 2004

THOMAS F. KING, RANDALL S. JACOBSON,  
KAREN R. BURNS, KENTON SPADING

Let's be honest. There is no way that three Ph.D.s and an engineer can write a readable book, and *Amelia Earhart's Shoes* is an eminently readable book. Tom King wrote *Shoes*, Randy and Kar helped keep the facts straight, and Kent organized the notes, bibliography, and index. It was a fine collaboration that produced an excellent, and for the most part accurate, account of the first sixteen years of TIGHAR's investigation of the Earhart/Noonan disappearance. Sadly, the otherwise scrupulously factual narrative is marred by an excursion into bald-faced fiction when the author describes TIGHAR's executive director as "brash," "abrasive," "impatient," "haughty," "dashing," and "maddeningly pigheaded." I'm none of those things. Okay. Maybe dashing.

Kidding aside, I encourage anyone who is interested in The Earhart Project to read *Shoes*. Tom does a great job reconstructing the frustrations and failures that plagued the early years of the project. When all you hear are announcements of positive results it's easy to think that the process of discovery is like walking up a flight of stairs when, in fact, it's more like climbing a rocky slope in the dark. Wrong turns, slips, falls, and disappointments are the rule. Progress toward success comes at the pace of a hermit crab and is far more dependent upon blind dumb luck than we like to admit.

*Shoes*, in addition to being a chronicle of the project's early years is, itself, a snapshot in time. The first edition, was published in 2001. The updated softcover edition came out in 2004. At that time our picture of events at the archaeological dig we call "the Seven Site" was still sketchy but we had begun to suspect that we might really be on to something. *Shoes* ends with mention of another expedition planned for 2005. In fact, it would be 2007 before we could scrape together the funding to return to Nikumaroro, but that trip would prove our suspicions well founded and pave the way for the 2010 effort.

# Finding Amelia – The True Story of the Earhart Disappearance

HARDCOVER EDITION 2006

RIC GILLESPIE

As the author of *Finding Amelia* I'm in no position to review the book, but I can attest that it is unique among the many books that have been written about the famous flyer's final flight. The book does not delve into the realm of speculation but rather explains and documents what is known about Earhart's attempt to fly around the world, the cascade of errors that led to her disappearance, and the confusion that reigned during the massive U.S. Government search that failed to find her. Throughout *Finding Amelia*, myths that have, for decades, clouded attempts to solve the mystery fall like shattered glass and the documented facts of the case make it clear that there was always more mix-up than mystery. Still, *Finding Amelia* draws no conclusions about Earhart's fate. *Finding Amelia* is a history book.

Every non-fiction author claims to write a true story. The hardcover edition of *Finding Amelia* backs up its claim to historical accuracy by including a data DVD containing digital copies of the actual documents cited in the book's nearly one thousand footnotes.



THE INTERNATIONAL GROUP FOR  
HISTORIC AIRCRAFT RECOVERY  
2812 FAWKES DRIVE  
WILMINGTON, DE · 19808 · USA  
302.994.4410 · WWW.TIGHAR.ORG