

TIGHAR TRACKS

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The Knob That Wasn't



TIGHAR ARTIFACT 2-6-S-45 HAS BEEN IDENTIFIED. It is the “closure” portion of a type of “spout and closure” which was patented on December 20, 1932. This type of top was used on cans for a wide variety of products such as light lubricating oils and solvents. Whether the artifact’s presence on Nikumaroro is attributable to the castaways (Earhart and Noonan?), the Gilbertese colonists, Gerald Gallagher, the U.S. Coast Guard, or someone else is unknown and probably unknowable. Nonetheless, we now know what the thing is. We know it is not an adjustment knob from an aeronautical navigation instrument, or a starter button from a Lockheed Electra, or any of dozens of other speculative identities which have been considered since it was found at the Seven Site a year ago.



Artifact identification is, of course, at the heart of accurate analysis of any archeological site. The process by which we unlocked the identity of Artifact 2-6-S-45, including the mistakes we made along the way, serve as an illustration and a lesson in the methodologies that are leading us, step by step, toward the answer to the Earhart riddle.

Lesson Number One: First Impressions Count

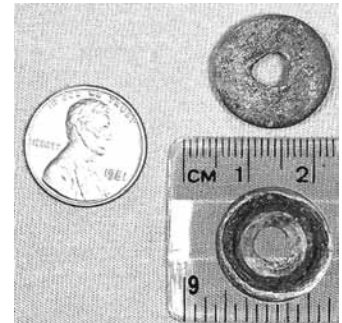
When initially found by Dr. Tom King, he thought the object was a small metal cap for a container of some kind. Closer inspection, however, revealed an absence of threading and the presence of damage around the central hole made it clear (or so we thought) that the object had once been attached to a shaft. Knurling around the edges completed the impression that what we had was a knob which originally turned a shaft which, in turn, performed some function on an instrument or device.

Our first description of the artifact was published in the November 2001 issue of *TIGHAR Tracks*.

From TIGHAR Tracks, November 2001:

ARTIFACT NUMBER: 2-6-S-45

Material: Non-magnetic silver-colored metal beneath rust-colored exterior. The exterior edge has small grooves and there are letters (worn and, so far, illegible) on the upper surface which may include patent information. There is a separate internal channel around the interior surface.

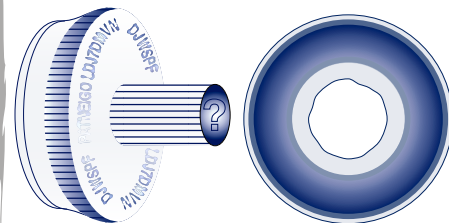


Weight: approx. .2 oz.

Condition: Good. Bent and broken.

Speculation: This appears to be a knurled adjustment knob. There may have been a separate, smaller concentric knob that turned a disk that rotated within the internal channel. This suggests a knob for making coarse and fine adjustments to some kind of small instrument or machine.

If we can decipher the letters on the exterior surface we might be able to make a positive identification.



Ironically, our theoretical reconstruction of what the artifact originally looked like was remarkably accurate.

Lesson Number Two: No Name Calling

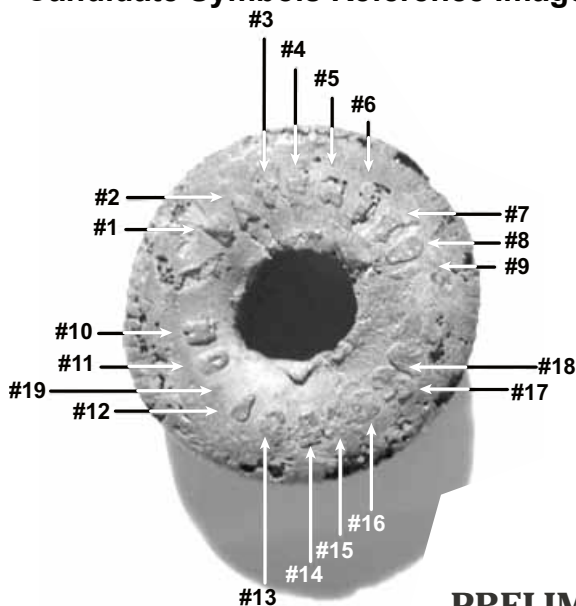
Because it looked like a knob we started to refer to it as “the knob” and that was a mistake because it tended to prejudice our thinking. If it was a knob it was about the right size to be an adjustment knob for an aeronautical bubble octant and that would be very nice indeed, but we also recognized that our best avenue of investigation was the inscription cast into the surface. The problem was how to decipher it.

With the generous help of the U.S. Naval Academy’s Nondestructive Testing Laboratory in Annapolis, Maryland we were able to subject the “knob” to inspection using a Scanning Electron Microscope (SEM). Unfortunately, extreme magnification did not make the features

cast into the surface any easier to read, even after cleaning with ultrasound, but the SEM did reveal the rather startling fact that the object was made of lead. In fact, that was the problem. The soft lead features had been distorted by impacts to the surface of the “knob” but it did appear that the word PATENT was present. If there was also a patent number present we should be able to make a positive identification.

Forensic imaging specialist Jeff Glickman at PHOTEK in Portland, Oregon next took on the challenge of deciphering the elusive inscription. After trying a variety of techniques including X-ray and CT Scan he settled on precisely controlled lighting and enhanced digital photography as the best method for reconstructing the features or at least narrowing down the possibilities. Many hundreds of hours of work later he submitted his Preliminary Letter of Opinion.

TIGHAR Artifact 2-6-S-45 Candidate Symbols Reference Image



Source Image: DSCN0046.TIF

Image: Unprocessed/Raw

Image Size: 15MB

Imager: Nikon Coolpix 5000

Imager Configuration: Macro, Fine, Noise Control On

Illumination Source: Mole-Richardson Mini-Mole

Illumination Configuration: Direct, 45 degrees.

Processed by PHOTEK

May 8, 2002 (Updated June 2, 2002)

Portland, Oregon

Jeff Glickman

503-949-6200

*Jeff Glickman examines Artifact 2-6-S-45.
TIGHAR photo by P. Thrasher.*



PRELIMINARY LETTER OF OPINION

July 12, 2002

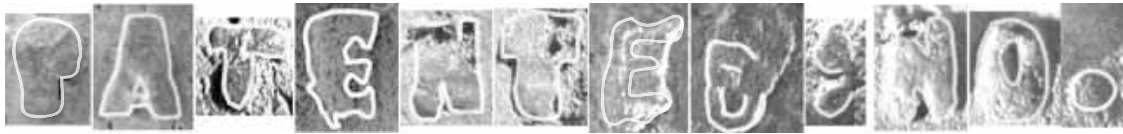
Dear Mr. Gillespie:

This letter is my preliminary opinion regarding TIGHAR artifact 2-6-S-45 which has been in my possession and under examination since May 4, 2002. 2-6-S-45 is commonly known as the “knob” and appears to have multiple raised symbols on its surface. On May 8, 2002, the JPEG image “knobref.jpg” was created using a Nikon 5000 digital camera, diffuse lighting, and the macro lens setting. The resulting knobref.jpg image defines 19 candidate symbol sites. During the course of the examination of 2-6-S-45, photomicrographs were taken of each of the symbol sites, and subsequently analyzed.

Analyses were performed in a controlled lighting “white box” consisting of a three-sided box of white foam core. A Celestron Microscope with a custom-built CCD imager was placed in the center of the white box. A 4x objective and a 10x eyepiece lens were used for the duration of the analysis. The CCD imager was connected to a frame grabber on an IBM-PC compatible computer. Captured images were analyzed using proprietary software, and individual symbol reports were prepared using Adobe Photoshop™. The illuminator used was a Mole-Richardson Co. Mini-Mole Type 2801 S/N 32375 with a Type 280108 Mole Focal-Spot collimator. The illuminator was mounted on a Matthews Studio Equipment (MSE) C-STD 2xR, FL 20.

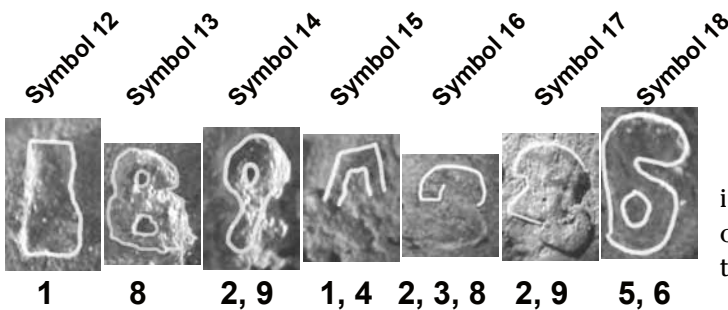
Each symbol site was examined using "Optical Tomography." This method uses an intense and highly collimated broad-spectrum illuminator which is rotated through 360 degrees in the XY plane around the artifact. After each rotation, the angle of the illuminator is increased by 5 degrees in the YZ plane. The resulting series of shadows reveal the detailed surface topography of an individual symbol on the artifact.

As previously reported, symbols 1 through 9 are **PATENTED**; symbols 10, 11 and 19 are **NO.**, which account for 12 of the 19 symbols.



Seven of the 19 symbols remain. Given the context "PATENTED:" and "NO." it is presumed the remaining 7 symbols are numeric, representing a United States utility patent number. These 7 symbols contain more contamination and damage than the initial 12, which resulted in ambiguity for some symbols. Information regarding each symbol can be found in the corresponding email for each individual symbol. This opinion letter shall summarize the findings of these 7 emails.

For each symbol numbered 12 through 18, the visible features of the symbol were compared with the features required for each number "0" through "9." Each number "0" through "9" was either excluded or included on the basis of the visible features as a candidate symbol for the site. For some sites, this meant the symbol could be one of N possible numbers. The process of eliminating numbers at each site reduces the search space from 10 million possible patents. The following summarizes the numbers by site:



The number of possible combinations is computed by multiplying the number of possible values at each site together: $1 \times 1 \times 2 \times 2 \times 3 \times 2 \times 2 = 48$. These 48 combinations are enumerated below in numerically ascending order. Each of these 48 combinations constitute a US patent number, each of which was retrieved using the online repository at the US Patent and Trademark office

located at www.uspto.gov. [At this point Jeff inserted a lengthy table of his findings at the patent office. We have omitted this information to save space, but it is included in its entirety at <http://www.tighar.org/Projects/Earhart/Bulletins/knobbulletin/knob9.html>.]

The first of the two patents of immediate interest is: #1891395: Gun Sight, issued 12/20/1932 to G.O.C. Probert. The diagram in this patent shows a knob similar to 2-6-S-45; however, the gun sight is for field artillery. Perhaps one could argue that during WWII field artillery might have been stationed on Nikumaroro, but

there is currently no historical evidence to support this. Note that Probert was a British citizen seeking

protection for his invention in the United States. This suggests that if 2-6-S-45 originated from a gun sight, that it might have been of British origin or manufacture, and possibly brought to Nikumaroro by an Australian, New Zealander, or Britain.

The second of two patents of immediate interest is: #1824826: Engine Starter, issued 9/29/1931 to Charles Marcus of the Eclipse Machine Company.

This is interesting because William Bendix invented the automatic starter drive to eliminate hand cranking of automobile engines in 1911 and 1912. Bendix successfully licensed his design to Eclipse Manufacturing Company in 1913. Presumably over the next 15 to 20 years, Eclipse developed this technology, culminating in this patent which is a direct connect automatic electric starter specifically for aircraft engines. What is most interesting is that when I inquired with about how Earhart's engine was started, I was told that the Lockheed 10E had an Eclipse direct electric starter, type E-160. While possibly coincidental, this is interesting enough to warrant research into the specific installation of the 10E's E-160 to determine if there are any components which resemble the knob.

I recommend a review of all 48 patents, and detailed investigations into the above two patents with the intent of provably including or excluding them as matches to 2-6-S-45.

Ric, thank you for the opportunity to work with you again, and I look forward to our next project together. Please call me with any questions you may have.

Sincerely,
 Jeff Glickman, Photek
 Board Certified Forensic Examiner
 Fellow, American College of Forensic Examiners
glickman@PhotekImaging.com · 503-949-6200

The field artillery gunsight was easy to eliminate – the largest artillery that was ever on Nikumaroro was a .30 caliber machine gun at the Coast Guard Loran station – but the coincidence of the Eclipse starter was intriguing. The Lockheed Model 10E used Eclipse Type E-160 starters for its Pratt & Whitney engines. Research quickly revealed that there is nothing on an E-160 starter that looks anything like Artifact 2-6-S-45 but the starter buttons in the cockpit were the right size. The buttons, however, were shielded by a spring-loaded metal cover so old photos did not reveal what they looked like.

And the Winning Number is....

Meanwhile, researchers on TIGHAR's Earhart Search Forum email group were exploring others of the 48 possibilities Jeff Glickman had identified and in early August, Angus Murray of Sheffield, England hit paydirt when he found a collector who had a can of "Revelation Gun Oil" which featured a spout and closure bearing the same inscription as Artifact 2-6-S-45 right down to the colon after the word "PATENTED." The correct interpretation of the patent number on the artifact is 1891826.



Photo courtesy Angus Murray

As Angus wrote to the Earhart forum:

"[E]verything dropped into place. Lead is a most unusual engineering material and I can think of few examples where it might be used as a knob. As a closure however it has a number of advantages. It is easily crimped

into place. It forms an effective seal at the resealable end of the spout. It will produce no sparks in a lighter-fluid refill application. "... This is one application that makes complete sense. It is also easy to see how the ragged hole arises in the middle, from where the spout has been broken out."

To complete and confirm the identification process, Kenton Spading (TIGHAR #1382EC) located a collector in Minnesota who had a can of Permatex "Solvo Rust Oil" with the same kind of spout and closure. TIGHAR was able to purchase the can for direct comparison to the artifact.



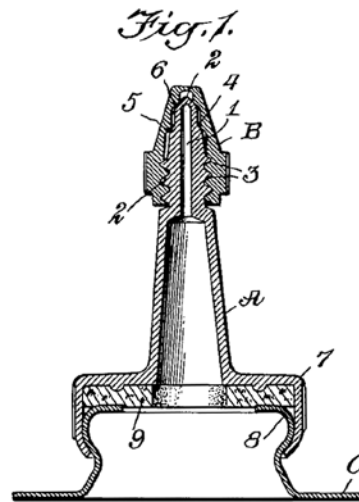
As with the gun oil can found by Angus, the spout on the rust oil can bears the same inscription and patent number as Artifact 2-6-S-45 but the shape of the cap is somewhat different.

If we were able to find an exact match we'd know what product our artifact was associated with and that information might give us a better idea who left it there, but gun oil, lighter fluid, and light lubricating oil are all possibilities that could be associated with the Coast Guard, the colonists, or even Earhart.

The artifact, however, has been identified. A question has been conclusively answered and, in archeology as in life, conclusive answers are rare. In working our way through the identification process we have built relationships, developed techniques, and learned lessons that will help us identify other artifacts. The quest continues.



TIGHAR photos by R. Gillespie.



1,891,826
E. L. M^oGINNIS
 SPOUT AND CLOSURE
 Filed Jan. 15, 1932
Dec. 20, 1932.

This is one of the illustrations from the 1932 patent application for the spout and closure.