The Discovery of U-166: Rewriting History with New Technology

Abstract
During World War II, Hitler sent several of Germany’s U-boats to the Gulf of Mexico to conduct warfare on merchant shipping and halt petroleum shipments. In less than a year, fifty-six merchant vessels were sunk and several others were severely damaged. During that entire operation only one U-boat was lost in the Gulf of Mexico. That U-boat was the U-166. Since 1942 the U-166 was thought to have been sunk by the U.S. Coast Guard south of Isle Dernieres, Louisiana in the South Timbalier Area. Numerous surveys have crossed the area, but no trace of the U-166 was ever identified until recently.

In 2001, C & C Technologies, Inc. (C & C) began using the HUGIN 3000 AUV for offshore oil and gas surveys in the Gulf of Mexico. While conducting a pipeline survey for BP Exploration and Production Inc. (BP) and Shell International (Shell), C & C’s marine archaeologists identified a sonar target in the vicinity of the shipwreck, Robert E. Lee, which they thought might be the long sought after German U-boat, U-166. The oil companies approved further investigation with the HUGIN 3000, which revealed spectacular sonar and multibeam bathymetry images lending further evidence to the U-boat hypothesis. On May 31 a research team from C & C, the Minerals Management Service, BP, and Shell conducted an ROV investigation of the site confirming the identity and location of U-166 and its last victim, the Robert E. Lee.

Introduction
In January 2001, BP and Shell contracted C & C to survey a route for the Okeanos pipeline. In doing so BP and Shell supported the use of a newly developed deepwater survey vehicle. C & C would use their new HUGIN 3000 AUV, a state of the art deep-water survey vehicle. This AUV carries a full array of survey instruments and is capable of faster and more accurate surveys than conventional deep-tow systems. The oil companies willingness to take advantage of this new technology lead to an astounding discovery that helped solve a captivating historical mystery in the Gulf of Mexico.

The HUGIN 3000 AUV (High Precision Untethered Geosurvey and Inspection System, Autonomous Underwater Vehicle) is a third generation AUV by Kongsberg Simrad and the first commercially operated AUV capable of surveying to 3000 meters water depth. The HUGIN 3000 is the result of the cooperative efforts of C & C and Simrad, and was developed out of a commitment from BP for next generation survey technology. This AUV is integrated with a multi-instrument survey payload consisting of a Simrad EM 2000 (200 kHz) swath bathymetry system, dual frequency Edgetech Chirp side scan sonar (120 kHz and 410 kHz), and an Edgetech Chirp subbottom profiler. Because it is an untethered system, running on internal power, it can operate even in rough seas at faster speeds with greater mobility and accuracy than conventional towed arrays. AUV position accuracy is accomplished using an inertial navigation system coupled with the precision HiPAP (High Precision Acoustic Positioning) acoustic tracking system. Surveying in 1500 meters of water the HUGIN 3000 positioning is accurate to within 3 to 6 meters after post processing. Conventional towed systems are typically only accurate to 30 meters or more at the same water depth.

Historical Background
In 1942 the world was at war and Germany controlled most of Europe. Hitler launched Operation Drumbeat under the command of Admiral Karl Dönitz. Using the might of Germany’s Unterseeboote (U-boats), Operation Drumbeat would take the war to the coasts of America as Hitler’s predecessors had done in World War I. This time the U-boats would not be limited to the east coast of the United States, but would extend right into our back yard, the Gulf of Mexico.

In May 1942 with the sinking of the Norlindo by U-507, a wave of destruction began in the Gulf of Mexico. Within just a year, twenty-four German U-boats entered the Gulf of
Mexico and seventeen of them sent 56 merchant vessels to the bottom and damaged 14 others. Two of the vessels that fell victim to this onslaught were the freighters SS Alcoa Puritan and SS Robert E. Lee.²

The Alcoa Puritan was a 6,759-ton cargo freighter 397 feet in length and 60 feet at beam. She was headed to Mobile, Alabama from Port of Spain Trinidad with a load of bauxite. On May 6, 1942 she crossed paths with the U-507, commanded by Horro Schacht. The Alcoa Puritan was sunk approximately fifty miles southeast of the mouth of the Mississippi River.³

A few months later on July 20, 1942 the passenger freighter Robert E. Lee left Port of Spain Trinidad headed to New Orleans with approximately 270 passengers, 131 crew, 6 Merchant Marine, and limited cargo (Figure 1). Most of the passengers were American construction workers, their families, and victims of other U-boat sinkings in the Caribbean. They made their way though the Caribbean with a convoy, but after reaching the Florida Keys they split off from the convoy and continued through the Gulf of Mexico with a U.S. naval escort, Patrol Craft (PC) 566. PC-566 was put into action just five months earlier and outfitted as a sub-chaser. She was under the command of H. C. Claudius. This was his first naval command and the first mission for PC-566.⁴

They headed through the Gulf of Mexico toward Tampa, Florida for a scheduled stop to take on provisions. Conditions onboard the Robert E. Lee were said to have been horrendous and the passengers approached the captain and requested to disembark at Tampa. The captain agreed, but when a pilot was unavailable to take them into the harbor the captain decided to continue on to New Orleans, Louisiana. The naval escort requested instructions from the Commander of The Gulf Sea Frontier and was ordered to continue on to New Orleans with the passenger freighter. Just before midnight on July 29, 1942, the Robert E. Lee and PC-566 left Tampa and headed for New Orleans.⁵

At this time there was a German U-boat patrolling the shipping lanes off the southeastern coast of Louisiana. That U-boat was U-166. On July 27, 1942 the U-166, under the command of Hans-Günther Kühlmann, radioed the German Naval Command to inform them they had finished their mission of laying mines off the mouth of the Mississippi River. This was the first war mission for the U-166. Kühlmann had had very limited success during this patrol. He had sunk a 2309-ton vessel and two others that together totaled 100 tons. He was eager to add to his tonnage sank before heading home.⁶

The Robert E. Lee and her escort steamed across the Gulf and were about 45 miles southeast of the Southwest Pass of the Mississippi River. It was July 30 and a clear calm summer day. At 4:30 in the afternoon PC-566 was sending a radio message to the Port Authority of New Orleans when a torpedo slammed into the starboard side of the Robert E. Lee. The vessel began sinking quickly and the naval escort, which had been running about half a mile ahead of the Robert E. Lee sprang into action.⁷

PC-566 gained sonar contact on the U-boat and dropped two spreads of depth charges across its path as it tried to dive. After the attack an oil slick appeared on the surface. They were not able to regain sonar contact with the submarine after making extensive sweeps of the area. The PC-566 crew determined they had either chased the submarine from the area or had sunk it. The operation then turned into a rescue mission as they began pulling survivors from the water. The naval SC-519 and the pilot boat Underwriter joined them in the rescue efforts. The survivors were taken to shore at Venice, Louisiana, but twenty-five lives were lost from the Robert E. Lee.⁸

Two days later, on August 1, a U. S. Coast Guard Grumman J4F seaplane was on patrol out of Houma, Louisiana. The pilot was Henry White and his radio operator was George Boggs. About 30 miles off the Louisiana coast they came through the clouds and spotted a German U-boat on the surface. They radioed their position and circled around to attack the enemy submarine. The U-boat began to crash dive and was quickly slipping beneath the waves as White and Boggs deployed their only weapon, a single depth charge. The charge detonated near the U-boat and White and Boggs reported a light to medium oil slick on the surface. After returning to base they were instructed that the incident was classified. A year later they were informed it was the U-166 that they had sunk that day.⁹

For the next 59 years the location of the U-166 would be a mystery. The area in which the U-boat was thought to have sunk is in one of the most heavily surveyed regions on the globe. Remote sensing surveys for oil and gas development have crossed the area numerous times. For decades groups have scoured the seafloor in that area searching for the U-166, but no trace of the U-boat was ever identified.¹⁰

Offshore Surveys

In 1986, Shell Offshore, Inc. had interests in the deep waters of the Mississippi Canyon Area in the Gulf of Mexico. To explore this region they contracted John E. Chance and Associates to conduct a survey using a 4075 EDO deep-tow system. While performing the survey they detected two shipwrecks. The only shipwrecks the U.S. Department of the Interior, Minerals Management Services (MMS) listed in the vicinity were two World War II casualties, the Robert E. Lee and the Alcoa Puritan.¹¹ At the time no archaeological assessment was required in deepwater lease blocks and it would not be until 1994 before any archaeologists would review the data and prepare an assessment. Given the current information it was realistic to assume the Robert E. Lee and the Alcoa Puritan had been found. No further investigation of the shipwrecks were conducted because of the expense and
more importantly the time involved in conducting deep water surveys with a towed array (Figures 2 & 3).

In January 2001, the Chance family was again surveying the Mississippi Canyon Area. BP and Shell contracted Thomas and Jim Chance’s company, C & C, to survey for the proposed Okeanos pipeline route. This survey was conducted using C & C’s HUGIN 3000 AUV, which was under contract to BP at that time. It is interesting to note that Jay Northcutt, onboard for the survey in 1986 as the manager of deepwater survey operations was now the project manager for the AUV survey of the Okeanos pipeline route in 2001. The proposed route was to pass in the vicinity of the reported location of the Robert E. Lee and Alcoa Puritan. The AUV crew expected to at least see the Robert E. Lee along the survey route.

As anticipated, a large shipwreck was detected at the edge of the AUV’s survey corridor in 1500 meters of water. C & C Marine Archaeologists Robert A. Church and Daniel J. Warren contacted archaeologist Dave Ball at the MMS to verify the identity of the vessel as the Robert E. Lee. In order to satisfy engineering concerns of routing a pipeline near a potential debris field and out of a sense of duty to preserve sites of historical or archaeological significance, BP and Shell sponsored a second investigation survey around the Robert E. Lee and the suspected location of the Alcoa Puritan. Rick Davey (BP client representative) proposed a region grid survey, which was far beyond the few investigation lines the archaeologists had hoped. Because the survey could be conducted quickly with the AUV while in the area, the oil companies decided to have C & C conduct a 2-mile by 1.5-mile investigation survey in the area to precisely position any wreckage or outlying debris of both shipwrecks. In March 2001, the first investigation survey was conducted. The investigation survey consisted of seventeen (17) survey lines at 150 meter line spacing for a total of 31.7 nautical line miles. The entire investigation survey took less than 9 hours to complete using the AUV, a fraction of the 80 or more hours a conventional deep-towed system would have required.

Upon completion of the offshore work the data from the archaeological survey was reviewed by C & C’s marine archaeologists. As they analyzed the data the archaeologists realized that the scattered debris formally identified as possibly the Alcoa Puritan did not match the characteristics expected of a 6,759-ton freighter. The sonar contacts consisted of two large sections lying approximately 500 feet apart with debris of various size scattered between them (Figure 4). The largest section of debris measured approximately 200 x 20 feet. The other major section measured approximately 55 x 20 feet. The combined length of the two sections, 255 feet, was just over half the size of the Alcoa Puritan (397 feet long by 60 feet at beam). Based on this data Church and Warren were doubtful the target was the Alcoa Puritan, but they did not immediately rule it out. They developed a working hypothesis, which include several possibilities for this debris. One of these possibilities included the German submarine, U-166. The U-166 was a Type IX-C U-boat and that type of vessel measured 252 feet in length by 22 feet at beam. The sonar image, though not conclusive, was almost exactly what the archaeologists anticipated seeing if they were so lucky as to come across the U-166. Circumstantial evidence seemed to support the U-166 hypothesis. The question remained, however, how could the U-166 be located over 140 miles from where it was reportedly bombed and within less than a mile of the U-boat’s last victim? The answers began to fall into place when Warren suggested that the two Coast Guard aviators had possibly bombed a different U-boat. Research indicated there were three German U-boats in the Gulf of Mexico on August 1, 1942, the U-166, U-509, and U-171. Evidence quickly pointed toward U-171 being the U-boat that White and Boggs had attacked.

The U-171, commanded by Günther Pfeffer, entered the Gulf on July 23, 1942 and was operating between Galveston and New Orleans. Pfeffer’s focus was to be on the Port of Galveston, but he found that the waters off Galveston were too shallow and radioed that he was moving toward the New Orleans area. U-171 sank the R. M. Parker, Jr. on August 13, 1942 within three miles of the location that White and Boggs made their attack on a U-boat. Therefore U-171 was operating in the right area during the right time period. The ship’s logs for most of the U-boats are available in the U. S. National Archives and researchers can look up where each boat was and what operation they were conducting on any given day. But, this is not the case for U-171. On October 9, 1942, the U-171 struck a mine and sank in the Bay of Biscay after returning from their patrol in the Gulf of Mexico. Pfeffer survived along with over half his crew, but twenty-two crewmen and the ship’s logs went down with the boat. Pfeffer reconstructed his logs from memory and noted that between July 27 and August 13, 1942 a “flying boat” had dropped a depth charge on the U-171, but they escaped without damage. A new hypothesis was therefore developed that explained the whereabouts of U-166 and identified the U-boat that White and Boggs attacked. The evidence indicates that the debris to the east of the Robert E. Lee was the remains of the U-166, which PC-566 sank following the attack on the Robert E. Lee. That information combined with the historical research further indicates that White and Boggs bombed the U-171 on August 1, 1942.

Additional Investigation Survey
With the development of the U-boat hypothesis, C & C informed Rick Davey of BP and then Jonathan S. Smith of Shell, of the suspected U-166 discovery. A meeting was then held on May 9, 2001 with the MMS to disclose the information of the possible new discovery. Two weeks later BP, Shell, and C & C met with the U.S. Coast Guard in New Orleans, which was followed by a second meeting at the MMS. At this meeting it was decided that Shell would
arrange for ROV to take a research team to the wreck sites. Because of the importance of the historical find, BP and Shell sponsored further AUV investigations of the Robert E. Lee and the suspected U-166 sites.

The second investigation survey (May 17, 2001) of the suspected U-boat site in 1500 meters of water consisted of thirty-three (33) tracklines, 450 meters long run at 10 meter line spacing over the site. The tracklines were run in three different directions so that each set of eleven (11) parallel tracklines were at a 60 degrees angle to the other two sets of tracklines (Figure 5). The survey was run closer to the seafloor (within 15 meters) allowing tighter beam angle spacing for the multibeam bathymetry. This created a smaller horizontal footprint per beam on the seafloor, thereby allowing depths to be resolved better and increased resolution. This tight grid pattern provided excellent data acquisition for detailed examination, and took the AUV less than two hours to complete. Such a survey would have been difficult to accomplished using a towed system because of prohibitive cost and maneuverability.

The first two investigation surveys of the U-boat site collected side scan data simultaneously, at 120kHz and 410kHz. On May 26 & 27, 2001, a third investigation survey was conducted only collecting 410kHz sonar data. This was an effort to further increase sonar resolution by increasing the ping rate of the 410 kHz sonar. The results of this survey were spectacular (Figure 6).

The revealing sonar and bathymetric data collected during the archaeological investigations provided further evidence supporting the U-boat hypothesis. The conning tower and other features of a U-boat could clearly be recognized from the 410 kHz side scan sonar images and the dimensions matched exactly with the dimensions of the U-166. When the side scan sonar image was overlaid with an outline of a type IX-C German U-boat, it matched perfectly. The bathymetry data showed the main section of debris was lying in a two-meter deep impact crater and the section suspected to be the bow had approximately two meters of relief above the seafloor (Figure 7). The next step was to ground truth this significant historical site with a Remotely Operated Vehicle (ROV) to visually verify and further document the find.

The ROV Investigation

On May 31, 2001 a research team from BP, Shell, C & C, and the MMS headed out to conduct an ROV investigation of the Robert E. Lee and the U-166. Marine archaeologist Jack Irion and Richard Anuskiewicz of the MMS joined the archaeologist from C & C and the team of professionals assembled from Shell and BP for the expedition. The research team utilized the Gary Chouest, an anchor-handling vessel on contract to Shell and equipped with an Oceaneering Millennium VI ROV.

The first glimpse of the vessel was the unmistakable conning tower of a German U-boat. The 105mm deck gun, 37mm and 20mm antiaircraft guns were clearly visible. Although there was some initial confusion concerning the conning tower “wintergarden” configuration, that was soon resolved with additional research. Each feature videoed proved to match that of the U-166.

The investigation of the bow section provided a revealing look at what caused the destruction of the U-boat. A large indentation is visible in the top of the deck, which appears to be the result of a depth charge explosion. Just aft of this damaged area the bow had torn away from the rest of the vessel and the serrated metal flares outward as if caused by an internal explosion. Possibly a depth charge exploded right on the deck, rupturing the pressure hull, which then caused an internal explosion. It is speculated that salt water rushing into the battery room or a torpedo in that location of the U-boat could have caused such an explosion.

The ROV vessel was then moved a mile to the west to collect detailed video images of the final resting place of the Robert E. Lee. The Robert E. Lee has subsided into the seafloor and the torpedo damage was hidden below the mudline. Many points of interest were recorded including the deck gun on the stern, two lifeboats lying off to the port side of the ship, the brass signal bell on the bow, but the most spectacular find from the Robert E. Lee was the ship’s telegraph (Figure 8), which was used to communicate from the bridge to the engine room. The telegraph was found lying over 200 feet off the port side of the Robert E. Lee. It was all alone standing upright on the seafloor. Because it was made of brass, it was in pristine condition and most the words on the face were clearly legible. The engine room indicator arrow was in the “STOP” position and the handle was back in the “FINISHED WITH ENGINES” position, a command that was never executed.

Conclusions

One of the first commercial surveys by the HUGIN 3000 AUV was a success with historical implications. It set a historical benchmark for the offshore oil and gas industry, and at the same time helped rewrite a chapter of World War II history. The discovery of the illusive German submarine, U-166, was the result of cooperation between BP, Shell, C & C, and the MMS, and involved the development of cutting edge survey technology. Although a route near the wrecks was acceptable from an engineering standpoint, BP and Shell, recognizing the sites as war graves, chose to reroute the Okeanos pipeline to completely avoid the sites and associated debris field.

Because of the use of the AUV, investigation surveys were conducted that were beyond the requirements of the MMS. The research and assessment by the archaeologists, due in part to the regulatory requirements of the MMS, led to the new hypothesis concerning the U-166 and U-171.
companies’ willingness to explore potentially significant archaeological resources led to one of the most intriguing historical finds in the Gulf of Mexico in recent years. The combined efforts of the team revealed the final resting-place of the Robert E. Lee and the U-166, solving a great mystery of World War II in the Gulf of Mexico.

References


8. Wiggins, Torpedoes.


Figure 1 – Photograph of the passenger freighter Robert E. Lee taken by the U. S. Cost Guard on January 20, 1942. Photo courtesy or Mariner’s Museum, Newport News, VA.

Figure 2 – Side scan sonar image of the shipwreck Robert E. Lee collected in 1986 (Shell International).

Figure 3 - Side scan sonar image identified as the Alcoa Puritan in 1986 (Shell International).
Figure 4 – Side scan sonar image (120 kHz) of the German submarine, U-166 collected by the HUGIN 3000 in 2001.
Figure 5 – AUV Site Investigation Survey of the U-166. This survey was conducted in 1500 meters of water and run at 10 meter line spacing. This survey took approximately two hours to complete.

Figure 6 – Side scan sonar image (410 kHz) of the German submarine, U-166 collected by the HUGIN 3000 in 2001.
Figure 7 – EM2000 Multibeam Bathymetry Image of the U-166 collected by the HUGIN 3000 AUV. This is a 3D Perspective Fledermouse image. The Bow of the U-boat is to the left and the crater containing the conning tower and stern is to the right.

Figure 8 – Telegraph from the bridge of the Robert E. Lee as it was found standing upright on the seafloor.