NPS Form 10-900-b OMB No. 1024-0018
United States Department of the Interior
National Park Service

National Register of Historic Places Multiple Property Documentation Form

This form is used for documenting property groups relating to one or several historic contexts. See instructions in National Register Bulletin *How to Complete the Multiple Property Documentation Form* (formerly 16B). Complete each item by entering the requested information.

___X____ New Submission _____ Amended Submission

A. Name of Multiple Property Listing

World War II Shipwrecks along the East Coast and Gulf of Mexico

B. Associated Historic Contexts

(Name each associated historic context, identifying theme, geographical area, and chronological period for each.)

World War I U-boat Operations (28 July 1914 to 11 Nov. 1918)
Interwar Period (1919-1939)
World War II U-boat Operations Prior to U.S. Declaration of War (1 Sept.1939 – 8 Dec. 1941)
Operation Drumbeat-*Paukenschlag* (1 Jan.-July 1942)
U-Boat Battlefield Moves to Florida and the Gulf of Mexico (May 1942 – Feb. 1943)
Final Years (April 1943 – May 1945)
World War II Shipwrecks off the East Coast and Gulf of Mexico

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D. Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this documentation form meets the National Register documentation standards and sets forth requirements for the listing of related properties consistent with the National Register criteria. This submission meets the procedural and professional requirements set forth in 36 CFR 60 and the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation.

_____ _____ _____
Signature of certifying official Title Date

_____
State or Federal Agency or Tribal government

I hereby certify that this multiple property documentation form has been approved by the National Register as a basis for evaluating related properties for listing in the National Register.

_____ _____
Signature of the Keeper Date of Action

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Provide narrative explanations for each of these sections on continuation sheets. In the header of each section, cite the letter, page number, and name of the multiple property listing. Refer to *How to Complete the Multiple Property Documentation Form* for additional guidance.

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United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

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Name of Property
County and State World War II Shipwrecks along the East Coast and Gulf of Mexico Name of multiple listing (if applicable)

E. Statement of Historic Contexts

World War II marked a shift in naval warfare resulting from new tactical and technological advancements as well as a growth of superior leadership in the face of great adversity. Historian, author, and World War II veteran Nathan Miller expanded upon the changes to naval combat in his book *The War At Sea: A Naval History of World War II*.

> At the beginning of the struggle, naval strength was measured by the battleship, the admirals still thought in terms of the decisive encounter between fleets. . . . Aircraft carriers and submarines were regarded as dubious auxiliaries to the battle line. The war changed all that. Carrier based aircraft served as the first as an extension of the battleship's guns, and then, along with the submarine, took over the battleship's role. Together the carrier and submarine became the supreme arbiters of naval warfare (Miller 1997:10).

The change in naval combat during World War II resulted directly from the lessons of World War I, particularly the use of submarines by the German forces. The threat of German submarines, or U-boats, significantly changed the normal operations of both the naval vessels and the merchant fleets, extending the battlespace to the undersea landscape.

U-boat is the English version of the German word U-boot, an abbreviation of "Unterseeboot," (meaning "undersea boat"). It refers to German military submarines mostly employed in World War I and World War II. U-boats were only mildly effective weapons against surface warships, rather their true strength was their use hitting the enemy's economic lifeblood through commerce raiding and blockading merchant shipping.

The concept of stealthily attacking an enemy naval vessel undoubtedly predates Leonardo da Vinci's drawing of a subsurface attack vessel dating to the first part of the 16th century. The concept of a submerged craft that would attack other vessels was further refined in the 17th and 18th centuries. However, operational use of such a craft in wartime is generally attributed to American David Bushnell, whose 1775 wood and metal craft *Turtle*, built in early 1775, went into combat in the early Fall of 1776. *Turtle* attempted to sink the HMS *Eagle* in New York Harbor in September 1776 during the American War of Independence. This first attempt to use a submarine to sink a ship failed highlighting the technical difficulties of employing submarines in warfare.

That did not stop efforts to build other submersible craft for war. American inventor Robert Fulton built and successfully tested the submarine *Nautilus* in France in 1800-1801. French inventor Brutus Villeroi successfully tested a submarine in 1832, and Dr. Antoine-Prosper Payerne in 1844. Payerne built subsequent craft well into the 1850s (Delgado 2011:38-39). Prussian inventor Wilhelm Bauer built and tested a submarine at Kiel in 1851, and while it failed, successfully built a larger craft in 1855. The first submarine to successfully carry out an attack against a surface vessel was the Confederate *H.L. Hunley*,

which during the American Civil War sank USS *Housatonic* off Charleston's harbor on February 17, 1864.

The success of *Hunley* came at a time when the Civil War inspired the construction and use of a variety of submarines on both sides of the conflict. Post-war, American and European inventors further refined the craft, but it was Irish-American inventor John Holland's design for a submarine that ultimately convinced the world's navies to begin adopting hitherto spurned submarines. The U.S. Navy purchased its first Holland boat on April 11, 1900, and within a few years the U.K., Russia, Japan, Chile, Germany, and France had also adopted either Holland boats or designs of their own. Despite ongoing improvement of submarine designs, these craft were considered essentially untested by the world's navies, and a marginal weapon at best. The advent of World War I and German U-boat successes forever changed that view (Delgado 2011:121).

World War I U-boat Operations (28 July 1914 to 11 November 1918)

As with the other militarized European and American nations, Germany's submarine technology was slow to develop in the late 19th century. Significant progress towards producing an effective weapon was made in the first years of the 20th century with the construction of Germany's first functional submarine *Forelle*, which was built in 1903. The Russo-Japanese War led to additional submarine construction for export and the first vessel designated U-*1*. Sequentially numbered vessels improved the design with more torpedo tubes and diesel engines. At the start of hostilities in 1914, Germany had a fleet numbering 29 U-boats. By war's end, the German navy had built 375 U-boats of 33 separate classes belonging to 7 general types. Additional boats were finished after the war, the last one being UB-*133* in April 1919. The general types were: boats built for export (types U66 and UA), Gasoline-powered boats (types U 1, U 2, U 3, U 5, U 9, U 13, U 16, and U 17) ocean-going diesel-powered torpedo attack boats (types U 19, U 23, U 27, U 31, U 43, U 51, U 57, U 63, U 81, U 86, and U 93), U-Cruisers and Merchant U-boats (types U 151, U 139, and U 142), UB coastal torpedo attack boats (types UBI, UB II, and UB III), UC coastal minelayers (types UC I, UC II, and UC III), and ocean minelayers (types UE I and UE 2) (Showell 2006: 21-39; Helgason: [1995-2012]a.).

The typical ocean-going diesel powered World War I era torpedo attack U-boat roughly measured 71 meters long, 6 meters wide, 4 meters deep, and had a 9,000 mile range. Its 2,400 horsepower diesel engine propelled the submarine at 16 knots on the surface. Once submerged, it ran off electric batteries with a top speed of 8 knots. A World War I U-boat's armament consisted of a deck gun and from 6 to16 torpedoes fired from both bow and stern torpedo tubes. A 39 man crew operated the U-boat to a maximum depth of 50 meters. The U-boat's major advantage was that it was able to submerge and remain hidden to enemy ships while carrying torpedoes that could sink a ship with one shot. However, once submerged, U-boats were blind and nearly immobile. Even at the surface they could not keep up with the cruising speed of dreadnoughts and needed to pre-position themselves for an attack.

In August 1914 a group of ten German U-boats attacked Royal Navy warships in the North Sea and completed history's first submarine patrol. The mission was not a success, only one attack was carried

out without result and two of the ten U-boats were lost on the sortie. Later that same month the tactical promise of the U-boat was realized when the U-*21* sank the cruiser HMS *Pathfinder* off the heavily guarded entrance to the Firth of Forth (Scotland). The sinking was the second successful submarine attack in history, fifty years after *Hunley*'s. *Pathfinder* became the first ship to be sunk by a submarine's self-propelled torpedo. In September 1914, the U-*9* sank three British cruisers in quick succession off Holland and solidified the U-boat's role as a deadly weapon. The loss of HMS *Aboukir***,** *Hogue* and *Cressy* with 1,459 British sailors (with only 837 men rescued) was a major blow to the Allied morale even though the warships were outdated.

The conduct of World War I naval warfare dramatically changed with the first U-boat directed sinking of an unarmed merchant ship off Norway. The U-*17* boarded and then scuttled the British steamship SS *Glitra* on 20 October 1914 by acting like a stealthy surface commerce raider. Great Britain had declared a naval blockade of Germany in August 1914 and then a War Zone in November 1914 with an "enter at your own risk" policy. German commanders took this action as an effort to starve the German people. In retaliation they imposed a blockade of Great Britain and the English Channel enforced by the U-boats. The area was considered a War Zone and German policy was to destroy enemy and even neutral ships. By 1915 unrestricted submarine warfare was in full effect and focused on impacting commerce. This culminated on 7 May 1915 when the U-*20* torpedoed the liner RMS *Lusitania* 13 miles off Ireland.

The *Lusitania* sank in just 18 minutes and of the 1,959 people onboard, 1,198 were killed, 128 of them U. S. citizens. Later on 19 August 1915, the U-*24* sank the White Star liner SS *Arabic*, outward bound for America. It sank within 10 minutes, with the loss of 44 passengers and crew including 3 Americans. In 1916 U-boats made it to American soil. After re-fueling in Rhode Island, the U-*53* raided Allied shipping off Canada and the United States and upset the American naval forces which were forced to stand by since they were operating as a neutral nation. The German act was seen as an affront to the U.S. and this along with a major increase of U-boat activities against British shipping and the sinking of unarmed passenger vessels *Lusitania* and *Arabic* eventually led to the United States entrance into the war with the Allies (France, Russia, and Great Britain) on 6 August 1917.

The Allies were slow to develop effective measures to counter the U-boat threat. Eventually the tactics used included mine barriers, depth charges (filled with up to 500 pounds of TNT or its equivalent) set with hydrostatic triggers, rammings, Q-ships (warships disguised as unarmed merchant ships), zig-zag maneuvers, Huff-Duff directional finders, ASDIC/SONAR, and British submarines. However, the introduction of the convoy system with armed escorts proved to be the tool to defeat the U-boat. The British admiralty had long opposed convoys, believing that the Royal Navy did not have the capability to protect too many ships. Only the U-boat toll in 1917 after the resumption of unrestricted submarine warfare forced the Admiralty to adopt the convoy system. The technological limitations of the World War I U-boat made it incapable of successful action against escorted convoys.

> Of the 16,693 merchant vessels being escorted from May 1917 to November 1918 in one of the 1,134 convoys, 99% safely reached their destination. Although sinkings in June increased again to 696,000 tons, the drooping numbers of July (555,000 tons) were already foreshadowing the final

> outcome. It was the convoy system, which finally rendered the unrestricted campaign as unsuccessful and led to the defeat of Germany (Brechtelsbauer [1995-2012]a.).

U-boat operations continued through 1918 when Germany tried to stop the enemy trade routes around the British Isles, Artic, Mediterranean, and even the United States. The U-*151* arrived in May 1918 with a clear mission to attack American shipping. After it laid mines off Delaware, cut communication cables, and sank three schooners off Virginia, it then went onto sink and damage more vessels off New Jersey. The New York newspaper *PM* recalled the U-boat activities off the American coast on 15 January 1942.

> In the summer of 1918 U-boats conducted six separate raids on America's northeast coast, sinking or seriously damaging nearly 100 ships. Many of them were sailing craft of small tonnage, but mines laid by the submarines sent to the bottom the USS *San Diego*, 13,680 tons, and the USS *Minnesota*, 17,650 tons. One of the most startling raids occurred on Sunday, June 2, 1918, when a U-boat appeared off the Jersey shore and attacked six ships within view of bathers on the beaches. In July another U-boat shelled and torpedoed the tug *Perth Amboy* and four barges while vacationists watched from the backshore of Cape Cod.

The U-*151* returned to Germany on 20 July 1918 after a 94-day cruise in which she sailed 10,000 miles, sank 23 ships, and laid mines responsible for 4 more sinkings. Germany was in the process of sending more U-boats across the Atlantic again when the war ended in November 1918.

During World War I almost 5,000 merchant ships (12,000,000 tons) were sunk by U-boats, with the loss of 15,000 Allied sailors (Brechtelsbauer [1995-2012]b.). Great Britain suffered the worst with almost 3,800 attacks on its vessels. The United States suffered less than 200 attacks. The most successful U-boat, U-*35*, sank 226 ships (totaling over 5,000,000 tons) between 1915 and1918. Out of the 351 U-boats operating during the war, 178 were sunk in combat and 39 were lost under other circumstances. In total 5,000 German U-boat sailors died in combat. At the close of World War I Germany surrendered or broke up all its U-boats as required by the Treaty of Versailles. Despite Germany's defeat, U-boats proved immensely useful as a weapon against the island nation of Great Britain that depended so heavily on seagoing commerce. Germany's naval commanders internalized the lessons of submarine warfare as they chaffed under the disarmament imposed by the Allied Nations.

Interwar Period (1919-1939)

The twenty years between the end of World War I and beginning of World War II should have been a time when Germany had no U-boat activities. Germany's bitter pill, the Treaty of Versailles, limited the total tonnage of the German surface fleet and banned the construction of submarines, but many in the British government felt the punishment too harsh. German naval manufacturers exploited a loop hole in the treaty and set up a submarine design office in the Netherlands and a torpedo research program in

Sweden. These satellite manufacturing facilities ultimately began building U-boats, training crew, and re-establishing the German submarine fleet under the disguise that they were only doing research (Showell 2006:70). The British sough to reign in these activities with the bi-lateral Anglo-German Naval Agreement of 1935 by allowing the German Navy to build a submarine force capped at 45% of the submarine tonnage of the British Commonwealth. The overarching tenant of the agreement specified that total German naval tonnage could not exceed 35% of the Royal Navy and that Germany was only allowed to build vessels in proportion to those of the Royal Navy. The British viewpoint was that Germany with a "balanced fleet" could be more easily defeated than a German Navy comprised of U-boats, light cruisers, and "pocket battleships" designed for commerce raiding (Herwig 1996:236). Ultimately Adolf Hitler renounced the agreement on 28 April 1939, when it began to hamper his aspirations for European dominance. While the agreement was in force for only a few short years, it likely slowed the *Kriegsmarine*'s (the German Navy was renamed in 1935) build-up of a commerce raiding force that would nearly cause the downfall of the British war effort during World War II.

World War II U-boat Operations Prior to U.S. Declaration of War (1 September 1939 – 8 December 1941)

Germany knew that it could not directly take on the British Navy so they decided to use other tactics to fight in World War II. Submarines could not only attack military vessels but they could disrupt the supply chain by sinking merchant shipping. "From the earliest days of hostilities, the U-boat war on merchant shipping, the 'Supply War,' as it has been called, was prosecuted in answer to the British blockade of Germany" (Busch 1955:3).

At the outbreak of World War II the German submarine force consisted of 57 U-boats, with only twenty actually ready for sea. Germany produced only two to four new U-boats a month and in general was never really well prepared for a naval battle. Karl Doenitz, the German submarine force commander, believed that it would have been more appropriate for Germany to have a thousand U-boats at the beginning of the war instead of 50 (Morrison 1947:4).

Germany built and commissioned 1,154 U-boats of varying types from the mid-1930s through the end of the war. The most common and successful type was the Type VII. It was the workhorse of the German U-boat fleet and more than 700 of this model were constructed. Additional types included the Type I (difficult to handle due to their poor stability and slow dive rate), Type II (coastal boat mainly used for training), Type V, Type IX (ocean going boat that operated as far as the Indian Ocean and the South Atlantic), Type X, Type XI, Type XIV (used to resupply other U-boats and known as Milch Cows), Type XVII, Type XVIII, Type XXI (known as the Elektroboot), Type XXIII, Type XXVI, and the midget submarine (Showell 2006:73-87).

The Type VII U-boat was first launched in 1936 and served as an active player in the Battle of the Atlantic off the United States' shores. It had sufficient range and seaworthiness to reach the U. S. Atlantic coast and its armament and maneuverability allowed it to sink merchant vessels at an alarming rate. The Type VII was a medium range boat that was inexpensive and quick to build. It also required a

relatively small crew. Since it was considered a medium tonnage submarine, more submarines of this variety were allowed by the Anglo-German Naval Agreement (uboataces.com [2005-2012]a.). A Type VIIC U-boat measured 67.1 meters in length overall, was 6.2 meters in breadth, 9.6 meters in height, and drew 4.7 meters of water. It had a range of 6,500 nautical miles before it needed refueling. It was equipped with a 2,800-3,200 horsepower diesel engine that propelled it at 17 knots on the surface. Once submerged its electric batteries and motor pushed the submarine along at 7 knots with a range of 80 miles. Its weapons consisted of a single 88 mm deck gun, one 20 mm flak (anti-aircraft) gun, and 14 torpedoes positioned in 4 bow tubes and one stern tube. It additionally carried 26 TMA (moored) mines. A 44-52 man crew operated the U-boat with a max depth of 220 meters. The original Type VII U-boat was further modified to become an even more effective torpedo attack boat with a larger fuel capacity/range (Type VIIB), onboard active sonar (Type VIIC), a minelayer (Type VIID), and supply boat (Type VIIF) (uboataces.com [2005-2012]b.).

The other U-boat class that prowled the American shores was the Type IX. These long range vessels were ideal for making the transit back and forth across the Atlantic Ocean. They served as a counterpart to the Type VII and were used as a tactical command boat until the fall of France when land based transmitters served that role. More than 200 Type IX boats in 4 sub-classes were built, with the Type IXC being the common one operating off the East Coast and Gulf of Mexico. Germany built 54 of them and by the end the war 8 of them had sunk off the American coast. The main difference between an IX and IXC U-boat was it had a larger fuel capacity. The Type IX U-boats measured slightly more than 76 meters long and 6.5 meters wide. The submarine class had a height of around 9.5 meters, and drew 4.7 meters of water. The various Type IX models had ranges between 8,100 and 11,000 nautical miles on the surface. Type IX's were equipped with dual 4,400 horsepower diesel engines that propelled the submarines at 18 knots on the surface. Once submerged, electric batteries propelled the submarines at a cruising speed of 7 knots with a range of 63 miles. Its weapons consisted of a single 105 mm deck gun, one 37 mm anti-aircraft gun, one C30 machine gun, and 22 torpedoes. It had 4 torpedo tubes in the bow and two at the stern. It could also carry 44 TMA (moored) mines onboard. A 48-56 man crew operated the U-boat to a max depth of 230 meters (uboataces.com [2005-2012]c.).

On 3 September 1939, the *U-30* sank the unarmed British passenger steamship *Athenia* off Ireland. The attack marked the first British merchant ship casualty caused by a Nazi U-boat in World War II. One hundred seventeen passengers and crew of the 1,418 persons aboard (including 200 Americans), lost their lives. When the U-*30* attacked without warning it violated the Hague conventions and the London Naval Treaty of 1930, which allowed warships, including submarines, to stop and search merchant vessels, but forbade capture as a prize or sinking unless the ship was involved in military actions or carrying contraband. Should a naval vessel find sufficient evidence of military involvement to warrant sinking a merchant vessel, it was required to safely disembark passengers and crew. While Germany did not sign the London Naval Treaty of 1930, its 1936 Prize Rules (*Prisenordnung*) directed naval commanders to the treaty's restrictions. U-*30*'s departure from the commonly recognized rules of war created public furor in the United States and Great Britain that would only be fanned by the unrestricted submarine warfare that was to come. At the time, Hitler chose to deny that the *Athenia* had been sunk by a U-boat and blamed the sinking on the British Admiralty as a propaganda ploy to discredit Germany

(uboataces.com [2005-2012]g.).

While Hitler had yet to order unrestricted submarine warfare, the *Kriegsmarine* had intentions in that direction. Admiral Doenitz believed that if Germany could sink 700,000 tons of Allied shipping each month, the shipyards would not be able to keep up with building replacements and Great Britain would be strangled. As German submarine manufacturers produced more U-boats, Admiral Doenitz expanded the submarine's operating theater further and further into the Atlantic. By January 1942 U-boats would be attacking on the American home front (Miller 1995:172).

The British Navy was ill-prepared to combat the U-boats menace. Falling back on lessons learned from World War I, the Allies restarted the convoy system for trans-Atlantic shipping. However, limited naval assets meant that convoy escorts were only available for the first part of the trip. Once away from shore, only a single armed merchant cruiser provided coverage. Even with such light protection the tactic worked, limiting convoy losses to 12 of the 229 British vessels sunk by U-boats between September 1939 and May 1940 (Miller 1995:36). The *Kriegsmarine* was fortunately not able to take full advantage of the lack of Allied resources due to its own shortcomings. Only a limited number of U-boats were available (likely due to the Anglo German Naval Agreement) and reliability issues with the G-7a trackless torpedo caused the loss of at least two U-boats, including the U-*39* on 14 September 1939. The submarine attempted to sink the aircraft carrier HMS *Ark Royal* off Scotland, but suffered from two torpedo misfires. The submarine was then spotted, hunted down, and depth charged making it the first U-boat lost in the conflict to Allied action.

The United States reacted to the *Athenia*'s loss and the German *Blitzkrieg* invasion of Poland by starting Neutrality Patrols on 4 September 1939. The action established a defensive border patrolled by U. S. warships and aircraft along 65 degrees west longitude from Boston all the way to Trinidad to track the movements of any foreign military vessels approaching America's shores (Scarborough 1990). These patrols were the first direct naval action taken in response to the European conflict, drawing a line very close to the U. S. shores that would have to be violated to draw direct U. S. military action. U. S. isolationist groups had taken great pains to prevent any chance of U. S. involvement in European hostilities with the passage of the Neutrality Acts of 1935, 1936, 1937. However, even the isolationists could not ignore Nazi Germany's invasion of Poland. Following shortly after the Neutrality Patrols, the Neutrality Act of 1939 passed on 4 November, allowed the "cash and carry" sale of arms to belligerent nations, but still prevented American ships and persons from entering the European conflict zone (Brinkley 2003:99).

Following the U-*47* torpedoing the battleship HMS *Royal Oak* at Scapa Flow on 14 October 1939, German officers successfully lobbied Hitler for permission to sink any vessel that sailed without lights or radioed it was under attack by a U-boat. To that end Admiral Doenitz issued instruction Number 154 to his commanders in the last days of November or first days of December 1939, which spelled out how German submariners should operate.

Rescue no one and take no one with you. Have no care for the ship's boats.

> Weather conditions and the proximity of land are no account. Care only for your own boat and strike to achieve the next success as soon as possible. We must be hard in this war. The enemy started this war in order to destroy us; therefore nothing else matters (Cheatham 1990:14).

By the summer of 1940, a total of 2.5 million tons of shipping had been sunk with the loss of only seven U-boats. As the German army gained control of France's Atlantic coast that summer, the *Kriegsmarine* gained strategic launching point for operations in the Atlantic. The U-boat bases in France at Lorient, St. Nazarine, Brest, La Pallice, and Bordeaux allowed operations to be closer to Britain's main sea channels. The seaways to these ports also had deeper water making it harder for the Allies to use mines to combat the submarines. British naval commanders slowly began to learn U-boat strategies and develop countermeasures. During the day, U-boat captains kept their vessels submerged, waiting for nightfall to attack. Nighttime assaults cloaked the submarine from counterattack and allowed the vessels to use their superior surface speed (17-19 knots as compared to submerged speed of 7 knots) to move into position. On the surface, U-boat gunners used their deck mounted guns to engage soft targets, reserving the torpedoes to more hazardous attacks. British submarine countermeasures included radar to locate U-boats on the surface at night, interception of German radio messages with radio direction finders, ASDIC (Allied Submarine Detection Investigation Committee) a type of active sonar to located submerged U-boats, and several varieties of depth charges mounted on surface vessels and airplanes. Active sonar homing torpedoes were developed during the war and used by aircraft to successfully target U-boats.

The single best tactic to combat the U-boats was the return to World War I's convoy system. The British analyzed their merchant vessel casualties in 1941 and perfected the system to optimize the available escorts. Historian Samuel Morison defined a convoy in his book *The Battle of the Atlantic.*

> A convoy is the supply train and reinforcement column of the sea. A group of merchant vessels or troop transports, highly vulnerable to surface or submarine attack when alone, steam in company escorted by warships of types able to ward off the anticipated attack; battleships, cruisers, and carriers deal with enemy warships, raiders, or aircraft; destroyers and smaller vessels to handle submarines (Morison 1947:17).

The overall convoy systems included European coastal Atlantic convoys, North Atlantic Convoys, North American coastal and Caribbean convoys, Mediterranean and North African coastal convoys, South Atlantic convoys, Indian Ocean convoys, Pacific convoys, and the Normandy invasion convoys. Each convoy system had several routes denoted with code names. Common routes included, HX (eastbound Halifax to Liverpool), SC (eastbound Sydney, Nova Scotia to Liverpool), ON (westbound Liverpool to Halifax or North America), OS (Liverpool to Sierra Leone), OG (Liverpool to Gibraltar), SL (Sierra Leone to Liverpool), and WS (Newfoundland or Labrador to Sydney, Nova Scotia). Oil tankers, troop transports, ammunition ships, and those loaded with vital military supplies were placed inside a preset formation, no more than five deep, to minimize exposure to the outside and unprotected seas. The typical convoy sailing in 1939-1941 consisted of 45-60 merchant ships sailing in 9-12 columns with

1,000 yards between columns and 600 yards between ships. British and Canadian destroyers and corvettes provided the armed escorts. Great Britain mandated that all its merchant ships travel in a convoy with armed escorts circling them to provide protection.

When the war ended Admiral Doenitz wrote, "The German submarine campaign was wrecked by the introduction of the convoy system" (Cheatham 1990:24-25). The convoy escorts protected their assembled merchant ships by actively engaging any U-boats that attacked. The successful use of convoys and aggressive British sonar and depth charge operations against attacking submarines led to a change of U-boat attack tactics late in 1940. Doenitz replaced the lone U-boat with a group of coordinated submarines known as *Die Rudeltaktik* or "wolf pack." Upon leaving Europe's coastal margin, groups of U-boats would shadow the Allied convoys waiting for an opportune time to launch a coordinated attack. U-boats targeted convoys between where Canadian or British escorts left and where they would be rejoined on the other side of the route. This unescorted zone provided the *Kreigsmarine* with an ample area of operation. This coordinated offensive strategy worked well for Germany, but it relied on high powered radio communications that left the submarines vulnerable to detection from radio direction finding technologies.

The use of coordinated U-boat attacks culminated in a period known to U-boat commanders as the "First Happy Time," which ran from June 1940 - February 1941 when the Allies took tremendous merchant vessel losses. Between June and October 1940 over 270 Allied ships were sunk by U-boats. The first U.S. merchant vessel sunk during World War II occurred on 8 November 1940 off Cape Otway, 120 miles from Melbourne, Australia. The 5,883 ton freighter *City of Rayville* struck a German mine killing one crewmember (Bunker 2006:4). Even though the United States was not officially in the war yet it started to sustain merchant vessel losses.

Winston Churchill, serving as Britain's Minister of Defense, officially recognized the U-boat's impact on Britain's war effort in March 1941, when he issued the Battle of the Atlantic directive. He warned that Germany was attempting to "strangle our food supplies and connections with the United States" (Miller 1995:173). His directive called for British air and naval assets to take an offensive strategy against the U-boats through deterring or destroying them at sea, in the shipyards, and by air. Additionally, at the same time as the directive, convoys were provided with additional coverage. Escorts that previously stayed with convoys for part way of the voyage now provided coverage for the entire trip.

The official end of the United States' Neutrality Act policies came on 11 March 1941 with the Lend-Lease Act, which allowed the United States to sell, lend or give war materials to nations it supported. The act made it possible for tremendous quantities of U. S. war material to enter the war zone, further shattering the thin veneer of U. S neutrality. Just short of a formal war declaration, American naval forces helped to protect trans-Atlantic convoys, intensified training, and continued to build military capacity. The first German and American military engagement in World War II occurred in April 1941. While patrolling off Iceland, The U.S. destroyer *Niblack* picked up an SOS radio broadcast from the Dutch freighter *Saleier*. As the *Niblack* picked up survivors from the *Saleier*, a lookout spotted a U-boat 1,400 yards away. The *Niblack* attacked the submarine, dropping several depth charges to no effect (Hoyt 1978:29-30). The next hostile encounter occurred on 9 June when U-*69* torpedoed and sank the

American freighter *Robin Moor* in the mid-Atlantic. A month later the battleship USS *Texas* sighted the U-*203* while patrolling off Greenland. The U-boat's commander tried to fire, but could not get in position. While ostensibly a neutral nation, the operating theater and actions of U. S. warships like the *Niblack* and *Texas* reinforced Germany's intention to prosecute its submarine war with little regard to America's political position (Hoyt 1978:30-31).

The just "short of war" activities continued in the contested seas of the Northern Atlantic with an encounter between the destroyer USS *Greer* and U-*652* on 4 September 1941 near Iceland. A British bomber patrolling in the vicinity of the U-boat attacked it with depth charges after detecting a sonar contact. Believing that the depth charges originated from the *Greer*, *Oberleutnant sur See* Fraatz commanded his vessel to fire a torpedo at the destroyer. The *Greer* counterattacked with a depth charge fusillade and the U-*652* countered with another torpedo over a several hour period. The *Greer* dodged the second torpedo, but was unable to re-establish contact, and eventually resumed course for Iceland (Morrison 1947:80). This was the first time a United States Naval vessel was fired upon by a German warship ship and led to President Roosevelt's "shoot on sight" order. Since the German submarine fired first, albeit mistakenly believing that it was under attack from the American warship, Roosevelt was able to use the engagement to further press for open war.

The United States continued its path to full war involvement as a result of the sinking of the U.S. destroyer *Reuben James*. Where the USS *Greer* dodged the torpedoes fired at it, the *Reuben James* was mortally wounded on 31 October 1941 by the U-*552* off Iceland while escorting a convoy from Newfoundland. It was the first United States Navy ship sunk by hostile action in World War II. Only 44 sailors out of the 159-man crew survived. Most of the Neutrality Acts' provisions were repealed on 17 November 1941 allowing merchant vessels to be armed and carry Lend-Lease cargoes to belligerent nations. Where the nearly open naval war taking place on the North Atlantic failed to push the U. S. Congress into a declaration of war; the surprise attack by Japanese submarines and carrier-based aircraft on the U. S. Pacific Fleet docked in Pearl Harbor, Hawaii on 7 December 1941 forced action. The United States formally declared war on Japan on 8 December 1941. Germany and Italy declared war on the United States on 11 December 1941, and the U. S. responded with a declaration of war on the same day.

Operation Drumbeat-*Paukenschlag* (1 January-July 1942)

At the beginning of 1942, Germany had a fleet of 91 U-boats. Twenty-three were in service in the Mediterranean, six positioned near Gibraltar, and four off Norway. Much of the remaining fleet was dockside being repaired; leaving only 22 submarines available for immediate Atlantic deployment (Cheatham 1990:25). Admiral Doenitz prepared a plan, in response to the United States declaration of war, to send these vessels to attack merchant shipping along the American East Coast. Doenitz correctly identified the western Atlantic as the weakest segment in the system that kept Great Britain fighting. By sinking ships along America's coast he hoped to cause a significant disruption in shipping that would stop Lend-Lease cargoes from reaching Great Britain and lower the morale of the Allied nations. Ideally, he intended to have his U-boats sink merchant ships at a rate greater than what was being

replaced in Allied shipyards to starve Great Britain of war material, fuel, and food. Admiral King, Commander in Chief of the Atlantic Fleet, unknowingly backed up Doenitz's plan by stating, "The fabric of shipping is closely interwoven; no single strand can be broken or snarled without destroying the basic pattern of the commerce of the world" (Freeman 1987:108).

> It was the East Coast of the United States, however, that interested Donitz most. A strike there would have much the same effect as the Japanese had had on Hawaii, revealing American vulnerability to a determined military foe. It would intimidate U.S. defenses and humiliate the civilian population. . . . The prospects of going after single, unescorted vessels in American waters were all more exciting to the admiral since, in his view, it was in the Atlantic battle against commerce that the war with England would be won or lost. . . (Gannon 1990:xvi).

A report from Doenitz, the Befehlshaber der U-Boote (BdU) (supreme commander of the German Navy), to Hitler in July 1942 detailed his thoughts about how he saw the U-boat affecting the American home front.

> U-boat warfare is a fight against enemy merchant tonnage. American and English tonnage work in conjunction and are therefore to be considered as a single unit. . . .The use of boats in the American area is right according to this standpoint of economic deployment. . . . The use of U-boats in this area is also in line with the opinion that the sinkings are a race with merchant shipping construction. America is the largest enemy ship builder. The shipbuilding industry area lies in the eastern states and it, and the industries connected with it, relies considerably on oil fuel. The main American oil area lies on the Gulf of Mexico, and for this reason the larger part of the American tanker tonnage used in the coastal traffic is from the oil fields to the industrial area. . . . For each tanker which is shot up the Americans loose not only the oil transport but it effects their new construction adversely. Therefore the sinking of this American transport tonnage seems to me especially important (Befehlshaber der Unterseeboote 1942:28-29).

The initial U-boat operations off the American coast were codenamed *Paukenschlag* ("Roll of the Drums") or "Operation Drumbeat." The Axis plan was also informally known as the Second Happy Time (the first Happy Time was the massive U-boat assault on British shipping in 1940-1941). Germany had only five Type IX U-boats ready at the beginning of the campaign (U-*125*, U-*123*, U-*66*, U-*130*, and U-*109*), but this small force proved more than capable of inflicting massive economic and physiological damage. "Each boat carried fourteen torpedoes, reserved for large ships, with tankers having the highest priority; other vessels were to be disposed of by gunfire" (Miller 1995:292-293). The first U-boat left Lorient, France on 18 December 1941 followed shortly thereafter by the rest of the small fleet.

Doenitz's plan directed his U-boat commanders to different parts of the North American coast from Maine to North Carolina out to 200 miles (known as the Eastern Sea Frontier). The first attacks on merchant shipping were planned for the northern commanders. Doenitz hoped to hide the capabilities and the number of deployed U-boats by attacking first off New England. Ideally for the U-boat commanders, U. S. forces would not strengthen their southern defenses allowing for a wave of sinkings as the campaign progressed (Wagner 2012:45).

The strategy of the German U-boat offensive to target the United States' East Coast was not unexpected by the American military. The War Diary from the Eastern Sea Frontier during World War II wrote, ". . . it was reasonable to assume that what the Germans had done with some success and with less effective submarine in the last war [World War I], they would try to do it again in this war" (Freeman 1987:22). Doenitz capitalized on the American weak link, the merchant sea lanes, with ships sailing alone, running from the eastern shore to the Gulf of Mexico and Caribbean. The ships were easy, frequent, and valuable targets especially the tankers. The War Diary went onto say, "These coastal waters present an alluring opportunity to a resourceful enemy who is looking for new hunting grounds" (Freeman 1987:23). "It was a submariner's paradise especially as many of their victims carried two of the most important cargoes in modern war, oil and bauxite (the ore used for making aluminum)" (Bunker 2006:34).

The one action that Admiral Andrews, commander of the U.S. Eastern Sea Frontier, did do in advance of the U-boats arrival was to make a plan to re-route merchant vessels through preset lanes or corridors that were easier to protect. He would implement these changes once the enemy actions began. "This was quickly decided upon since the current American shipping lanes stretched many miles off the Atlantic and were well known and documented by German Intelligence" (Wagner 2010:79). In December 1941, Andrews drew a reference line that ran up and down the coast based on various navigational aids. Merchant ships were to travel near the line so patrol vessels had a better chance of providing protection. Northbound vessels were to stay seaward of the line and southbound vessels were to stay inshore of the line.

After the initial U-boat attacks the shipping lanes were put into effect and modified based on enemy locations but merchant ships failed to use them fearing that they would have collisions between passing ships. It was finally agreed upon that a buffer zone would be established between the northbound and southbound lanes to alleviate merchant ship captains' fears (Wagner 2010: 79-83).

> With shipping routes modified, the ESF [Eastern Sea Frontier] began to wait and hope that keeping merchant vessels close to shore would stop or hinder U-boats operating relatively unchallenged. Unfortunately, the [Eastern Sea] Frontier soon discovered that individually routed merchant ships were still being sunk at an alarming rate, and that, until a convoy system was feasible, other measures intended to make coastwise sailing safer needed to be implemented (Wagner 2010: 83).

The U-boats first wave targeted shipping up near New England and subsequent waves made their way south to North Carolina and eventually into the Gulf of Mexico and Caribbean. The Commander of the Coastal Frontier, Rear-Admiral Andrews, stated on 22 December 1941 that if, "enemy submarines operated off this coast, this command has no forces available to take adequate action against them, either offensive or defensive" (Gentile 2006:21). Andrews was informed of the coming U-boat wave but little was done to combat it and he refused to initiate coastal black outs or the convoy system fearing it would provide more targets then if the merchant vessels sailed alone. The only positive action done just prior (only 1.5 hours) to the first U-boat attack off the East Coast was the closing of the ports of Boston, Portland, and Portsmouth.

Admiral Doenitz's order to his U-boat captains directed them to move into their assigned positions and stay out of sight until they received orders to commence Operation Drumbeat. As the U-boats crossed the Atlantic Ocean, coded radio messages to the U-boats set the attack date for 13 January, unless a high value target could be sunk such as an Allied warship or merchant vessel over 10,000 tons (Wagner 2010:46). On 12 January 1942, U-*123* jumped the gun, sinking the British merchant steamer *Cyclops* with two torpedoes 125 miles southeast of Nova Scotia with a loss of 94 lives. The next day, U-*130* sank the 1,582 ton Norwegian tanker *Frisco* and the 5,427 ton Panamanian merchant steamship *Friar Rock* off Newfoundland. While the first three ships sunk by German U-boats in the Western Atlantic were off Canada it would only take one more day for impacts closer to home.

Following its success against the *Cyclops*, U-*123* motored south and on 14 January targeted the three-year old, 489-foot long, Panamanian tanker *Norness*. The unescorted *Norness* was en-route from New York to Liverpool via Halifax with a load of fuel oil when U-*123* spotted it 60 miles off Montauk Point, Long Island. The submarine's first torpedo fired at close range hit the *Norness*' port side waking up its Captain, Harald Hansen. Hansen recalled his surprise at the attack, "Nobody was expecting a submarine so close to American waters. I thought we are just as safe there as in New York Harbor" (Gentile 2006:29). The crew quickly clambered into the tanker's lifeboats and pushed away from the sinking vessel. Captain Hansen told a reporter for the *Brooklyn Eagle* on 15 January 1942 that, "The submarine passed so close to my lifeboat that I could hear its crew talking in guttural voices." U-*123* fired four more torpedoes into the *Norness* before it finally sank. Only two of the *Norness*' 41 man Norwegian crew perished in the attack. The Coast Guard cutter *Argo*, destroyer *Ellyson*, and fishing vessel *Malvina D*. rescued the survivors and landed them in Newport, Rhode Island.

On 15 January 1942, the New York newspaper *PM* reported the *Norness*' loss and passed along a warning from the U. S. Navy that U-boats were believed to be actively hunting along much of the East Coast. Warnings of this nature had little practical effect and clearly reveal the U. S. inability to fight back. U-*123* continued its hunt and sank the unescorted British steam tanker *Coimbra* on that same day a mere twenty-seven miles off Long Island. The five-year old, 423-foot long *Coimbra* was en-route from New York with a cargo of 9,000 tons of lubricating oil. Instead if sinking quickly, the tanker caught fired and burned. The U-*123*'s G7e torpedoes took the lives of Captain J.P. Barnard and 35 of the *Coimbra*'s 46 man crew. A Navy patrol plane spotted the survivors who were picked up by the destroyers *Mayrant* and *Grayson*. Few details of the *Coimbra*'s loss were reported in contemporary

newspapers as the U. S. Government began to restrict information that reflected poorly on American preparedness to combat the U-boat threat.

After the U-*123*'s impressive start it headed south to New Jersey while the U-*66* showed up along the American shores where is promptly sunk the 6,635 ton American steam tanker *Allan Jackson* 60 miles off North Carolina with a loss of 22 lives on 18 January. The merchant vessel was en-route from Columbia to New York with 72,870 barrels of crude oil and was not traveling within a convoy. "Hell on the high seas was described by a Jersey City survivor of the tanker *Allan Jackson* when he reached Norfolk, Virginia." wrote the New York newspaper *PM* on 20 January. The paper carried the following details of the tanker's loss related to a reporter by Ross F. Terrell, an able-bodied seaman. Two torpedoes struck the tanker in quick succession.

> "The oil splattered all over the ship and for 300 yards all around. The ship was ablaze from stem to stern immediately and all the surrounding water for about 300 feet in all directions caught fire. Flames leaped at least 100 feet in the air. I jumped into a lifeboat which we pulled into the wind in order to escape the flames. Then we rowed out of the circle of fire."

The first group of U-boats departed and were replaced by a fresh group that arrived in the Western Atlantic in mid-February 1942. A portion of this fleet known as Group Neuland began Operation *Westindien*, striking at the vulnerable oil infrastructure in the Caribbean. On 16 February, a U-boat shelled an oil refinery in Aruba followed by sinking six tankers off Maracaibo, Venezuela, and two more off Port of Spain, Trinidad and Tobago. U-boats, specifically the U-*128* and U-*504*, targeted Florida and sank the tanker *Pan Massachusetts* off Cape Canaveral and the tankers *Cities Service Empire*, *Republic*, and *W. D. Anderson* off Jupiter Inlet (Hoyt 1978: 85-86). U-*578* fired two torpedoes at the USS *Jacob Jones* on patrol off Delaware and New Jersey, sinking the destroyer and taking the lives of 138 of the 149 man crew. The destruction continued up and down the coast and over the next month. Five U-boats sank 35 ships totaling over 200,000 tons. These attacks just off America's shores failed to galvanize the U. S. Government into the simplest defensive action, an immediate coastal blackout. Blessed by this tactical advantage, U-boat commanders submerged their vessels during the day waiting patiently for night and their backlit merchant vessel targets.

> Residents of the sea islands off the Carolina coast could hear the diesel engine of the U-boats as they cruised close inshore at night. Panic raced up and down the Atlantic coast, and Nazi spies were rumored to be directing U-boats to their targets. Thick black oil from blasted tankers and debris from wrecked ships fouled Atlantic beaches. Tankers remained in port, because their crews feared being sunk. Insurance companies refused to provide coverage. The loss of

> tankers eventually led to the building of pipelines to carry oil from the fields and ports of Texas and Louisiana to the East Coast (Miller 1995: 293-294).

During March 1942, an estimated three U-boats operated off the North Carolina coast with another four to six U-boats cruising in other areas of the Eastern or Gulf Sea Frontiers. During the first two months of Operation Drumbeat, U-boats departed their bases and first headed towards Newfoundland before turning south along the North American coast. By March the U-boats just left home and headed west towards Cape Hatteras directly from European waters. U-boats devastated merchant shipping in March, sinking more vessels in that month then the two previous. The shortage of American forces at sea, on land, and in the air was taking its toll but things would eventually change.

April 1942 was nearly a repeat of March. The Eastern Sea Frontier remained the most dangerous area for merchant shipping in the entire world and the pattern of attack remained unchanged. Worldwide, U-boats sank 73 ships in April, 33% of the losses occurred in the Eastern Sea Frontier. Seventeen ships, 23% of the world total, were sunk in the Mid-Atlantic area alone, the second largest theater of U-boat activity (Freeman 1987: 166). An estimated five to eight U-boats were responsible for the tremendous destruction. U-boats' strategy of remaining submerged during the day and attacking at night with torpedoes followed by gunfire was tremendously effective against a poorly defended merchant fleet.

> They [the U-boat crews] found it easy, as easy as it had been in the early days off the British Isles, before the English had modernized their anti-submarine warfare techniques. As Admiral Donitz had sensed, the U-boats were dealing with amateurs, civilian captains who had no understanding of naval warfare and naval officers who had never learned how to combat submarines (Hoyt 1978: 52).

Status of Merchant Shipping on the U. S. East Coast

Merchant shipping activity along the Eastern Seaboard was widely distributed with little regard to its vulnerability as Operation Drumbeat commenced. The largest ports had significant quantities of shipping waiting to load or deposit cargos. U-boat commanders used these congregations and associated shipping routes as hunting grounds. Shipping congregated near New York and New Jersey, Virginia and North Carolina (especially the Outer Banks), Miami, and New Orleans. On any given day, approximately 66 ships plied southbound routes while 130 ships headed northward each day. An additional 35 ships left the Gulf-Caribbean for northern ports daily (Freeman 1987:53,109). These sea lanes were vital for the war effort and the reason Doenitz targeted the United States with such full force. Author Homer Hickam, Jr. wrote that,

> If lines were to be drawn on a map from Cape Race, Newfoundland, down the east coast of the North American continent and into the Gulf of Mexico and the Caribbean, they would coincide with perhaps the most

> congested sea lanes of the world. When the United States entered World War II, the industrial cities of the eastern seaboard were particularly vulnerable to the disruption of these lanes. Fuel was required to keep those cities from freezing during the winter, and most of that fuel was provided by ships hauling it from Curacao and Aruba in the Netherlands West Indies, from Venezuelan oil fields, and from the Gulf of Mexico. . . . The United States military was also vulnerable. The oil reserves of the United States were simply not large enough to meet the sustained, high demands of world conflict. To cut her supply lines along the Atlantic coast and to the south, would be in effect, to defeat the United States, to freeze much of her population, and force her out of the war (Hickam 1989:1).

Merchant ships, operated by dedicated merchant mariners, supplied the United States with both war related and non-war related goods and served as the lifeline for supplying the Allied forces. The United States had been actively rebuilding its merchant fleet after World War I and the Merchant Marine Act of 1936 further strengthened the country's commitment to maintaining and promoting maritime commerce. It required that an acceptable merchant marine be, "necessary for the national defense and development of [the] foreign and domestic commerce of the United States. . . . The law declared that an adequate merchant marine should be one to carry all the domestic water-borne commerce and a substantial portion of the water-borne exports and imports of the United States" (Dewey 1937:243). The U.S. merchant Marine fleet included all the privately owned and operated vessels sailing under the American flag. The act also included that these merchant vessels be capable of serving as a naval or military auxiliary during times of war. This provision would come into play during World War II when there were not enough vessels to support the conflict's need for supplies both at home and abroad. All ocean vessels under the flag or control of the United States were seconded to the War Shipping Administration during World War II under Executive Order 9054, February 7, 1942.

In addition to United States flagged vessels, Allied or neutral countries contributed to the movement of supplies and fuel by merchant vessels during World War II and were also subject to the losses associated with Germany's U-boat campaign of the American coast. Ships from Belgium, Brazil, Canada, Chile, Greece, Honduras, United Kingdom, Nicaragua, Norway, Panama, Yugoslavia, Latvia, and the Soviet Union all contributed to the war effort. There were roughly thirty-nine classes of merchant and civilian ships from these various countries that were possible U-boat targets during Operation Drumbeat. These vessels plied the waters of our coast with many falling victim to the German U-boat. Merchant ship varieties sunk by U-boats off the East Coast can be grouped into the following categories: freighters, tankers, barges, towboat/tugs, and schooners.

The United States merchant marine, as well as foreign-flagged vessels that were drawn into the Battle of the Atlantic represented vessels built over the previous five decades, from coal-fired steel freighters and coasters with various types of steam engines and boilers to the new generations of tankers that had emerged in the early 20th century. The vessels engaged in the Battle of the Atlantic, including those sunk

as victims of the U-boats represented a variety of ages and types as well as nationalities, but many of them fit into the increasingly specialized types of craft and vessels that resulted from scientific principles of naval architecture and industrialized shipbuilding practices which had emerged in the late 19th century and which took root in the early 20th century. By 1920, America was the world's leading shipbuilder as well as its most dominant industrial power, and these two factors were closely interrelated (Thiesen 2006:211-212). The "new American style of shipbuilding" of the early 20th century in particular is represented in the vessels lost in the Battle of the Atlantic which now rest as shipwrecks along the shores of the United States. They reflect changes in steel manufacture, the introduction of pneumatic riveting (replacing hand-riveted vessels), as well as labor-saving and more powerful tools such as multiple punching presses and cranes that utilized not only pneumatic but also electric power, which was more constant and reliable than steam (Thiesen 2006:173-176). The refinement of marine engines and boilers also benefitted from the new technology and the rise of petroleum as a fuel, and in time, less efficient coal-burning ship power plants were replaced and supplanted by oil-fired vessels. The final adaptation, welding, came into play at the advent of the war, and would be tested and refined during the conflict as the nation's shipbuilding program accelerated in response to U-boat sinkings with mass-produced Victory and Liberty ships that were prefabricated and welded.

The American merchant marine prior to the outbreak of the war was summarized in 1927 as 57 types of specialized ships from lightships, tugs, dredges and ferries to coast-to-coast vessels of varying types (Hardy 1927). These included some four million tons of American-built coast-to-coast shipping, approximately half of it engaged in coast-to-coast shipping via the Panama Canal (Hardy 1927:48). Most were either passenger and freight or freight-only ships ranging from 380 to 600 feet in length, including the Coast-to-Coast Type A, intended for transatlantic work, with the passenger and freight carriers having capacity for several hundred passengers and several thousand tons of cargo, while the freight-only ships were capable of carrying 11,200 to 12,614 tons dwt. of cargo (Hardy 1927:52-53). There were also Intercoastal Freighters (Type A1), Coastwise Tankers (Type A2), East Coast Passenger and Freight Ships which were noted as slow to adapt to Diesel propulsion and which sacrificed speed as well as lacked an appreciation of the value of speed itself (Hardy 1927:67). Many of these vessels, representing a veritable "museum" of American shipbuilding in its transition to a modern, scientifically designed and industrially built fleet epitomized by the wartime mass shipbuilding programs, would fall prey to the U-boats. They were replaced by Victories and Liberties as they rolled down the ways; in all, 2,751 Liberty Ships and 531 Victory ships would be launched during the war to offset losses in the Battle of the Atlantic along with more than 500 T2 and T3 tankers, all constructed under the auspices of the U.S. Maritime Commission.

The most common wartime-built ships were freighters. Freighters as a class were any sort of ship that carried personnel, cargo, goods, or materials. Freighters, such as Liberty or Victory ships, carried bulk items that were not liquid. These all-purpose vessels had several holds where cargo could be stored. In 1941, the U.S. Maritime Commission began its war time emergency cargo shipbuilding program that resulted in the construction of 2,751 Liberty ships and 414 Victory ships. The EC-class, E referring to emergency and C referring to cargo, was the overarching designation for freighters built in the United States during World War II. These wartime ship designs were designated as types EC1 (up to 399 feet);

EC2 (400-449 feet) and EC3 (450-499 feet). The most famous freighter type during World War II was the Liberty ship, an EC2. Capable of 11 knots from its 2,500 horsepower steam engine, Liberty ships could carry 10,800 deadweight tons as far as 17,000miles. The combination of the simplicity of construction, standardized plans, construction speed, simple operation, and large cargo carrying capacity made them an ideal emergency vessel to build. The change from custom built ships to a factory system allowed Liberty ships, by 1943, to be built in just over a month (National Park Service 2013).

Tankers are cargo vessels designed to carry bulk liquids like crude oil, lubricating oil, diesel, or gasoline. U. S. shipyards built three main types of tankers, T-1, T-2, and T-3. The T-1 tanker was produced to carry smaller cargoes such as gasoline and almost all of them went into the U.S Navy or the British Navy through the Lend-Lease Program. There were 133 T-1 tankers built between 1943 and 1945. The 300-foot long Maritime Commission vessels were designed to carry 2,210 tons of liquid cargo. The workhorse of the fleet was the T-2 tanker. Between February 1942 and November 1945, four shipyards delivered 533 T-2 tankers, the first vessels ever to have all welded construction. They measured 520 feet long with a capacity to carry 141,158 barrels in 9 sets of tanks. The 502-foot long T-3 tanker was the first ship bought by the Maritime Commission. Sixty-three were built between 1939 and 1945. Each could hold 134,000 barrels. During World War II, American tankers made 6,500 voyages with 65 million tons of fuel (equivalent to 80% of the fuel used by the Allied war machine) from the U.S. and the Caribbean to the war zone (Horodysky 2012a.). In an attempt to shut of this flow, U-boats preferentially targeted tankers resulting in more losses of this variety of ship than any other. Had U-boat attacks on tankers continued apace of the 1942 losses in 1943, the Allied war effort might have failed (Freeman 1987:195).

In addition to freighters and tankers, U-boats destroyed barges, towboats, tugs, and even schooners during Operation Drumbeat. Barges were classified as non-propelled platforms carrying a variety of cargoes from liquid to dry goods that required a tug or towboat to push/pull it along its route. Both ocean going and harbor tugs provided propulsive power for barges as well as escorting vessels needing assistance near port. Many schooners that survived into World War II continued to operate along the coast carrying bulk cargo, becoming easy U-boat targets.

The United States' merchant fleet at its entry into World War II totaled about 8,000,000 gross tons and was second only to Great Britain. Before the war about 50% of the U.S. ocean going merchant tonnage was associated with the coastwise or intercoastal trade. A U.S. Maritime Commission report stated that in 1940 there were 516 vessels of 1,000 gross tons or more in the coastwise trade and that number dropped to 384 vessels in 1941 (Shadburne 1943:32). Just before World War II there was a reduction in the number of operating coastwise vessels due to owners withdrawing vessels from the fleet, stopping operations, or selling their aging vessels to foreign companies. As war broke out the demand increased but there were not enough vessels to meet demand. In order to centralize the operation, movement, and capacity of merchant vessels still in service President Roosevelt established two agencies through Executive Orders to coordinate war time shipping. The United States followed the lead of other Allied countries by establishing agencies to control shipping. The United Kingdom had already formed its Ministry of War Transport in May 1941 to coordinate transportation policy and resources. It merged the

Ministry of Shipping and the Ministry of Transport and brought the responsibility for both shipping and land transport to a single department. Even earlier, the Norwegian government established the Norwegian Shipping and Trade Mission (Nortraship) in April 1940 to coordinate the Norwegian merchant fleet outside German-controlled areas.

The first step Roosevelt took was to coordinate the transportation policies and activities of U.S. Federal agencies as well as the domestic transportation system that included U.S. coastal merchant vessels. On 18 December 1941, Executive Order 8989 established the Office of Defense Transportation. The office coordinated and directed domestic traffic movements to prevent congestion and assure the orderly and expeditious movement of men, materials, and supplies to points of need. Domestic transportation covered under the Office included railroad, motor, inland waterway, pipe line, air transport, and coastwise and intercoastal shipping. More specifically within the Office, separate divisions were set up to handle inland waterway transport and coastwise and intercoastal transport (Roosevelt 1941).

> The responsibility of the Office is not to possess or manage transportation enterprises, but to "guide, co-ordinate and direct" to such extent as may be necessary. The successful accomplishment of this task requires the continuing co-operation of managements and employees of the carriers, shippers, the government agencies using transportation services, and government regulatory agencies (Eastman 1943:4).

U.S. merchant vessels engaged in domestic transportation were prime targets for German U-boats during Operation Drumbeat. They frequently sailed independently (not within a convoy) due to their schedule or port location. The Office of Defense Transportation could only recommend to a company ways to protect their ships, so many of them ended up falling prey to the U-boats and were subsequently sunk off the East Coast and in the Gulf of Mexico during World War II. Congress amended the Neutrality Act of 1936 on 17 November 1941 and approved the arming of U.S. merchant ships. By war's end American yards armed 4,865 U.S. ships, 1,119 foreign ships, and 247 U.S. ships under foreign flag. In addition to the weapons a Merchant Marine Armed Guard provided men onboard merchant ships to operate the guns although it was common for a ship's own crew to be in charge of firing the gun if called upon (Bunker 2006:23).

The second step Roosevelt took to centralize merchant shipping was to establish the War Shipping Administration (WSA) on 7 February 1942 by Executive Order No. 9054. He appointed Admiral Emory Land as its first administrator to "assure the most effective utilization of shipping by America for the successful prosecution of the war. . . . The new administration is expected to go a long way towards seeing that all available shipping space is used to best advantage and for the single purpose of winning the war" (*Manchester Guardian* 10 February 1942). The War Shipping Administration's Report to The President in 1944 clearly stated the role of the agency.

> The responsibility of the WSA. . . extended to all phases of shipping including the purchase or requisition of vessels for its own use or the

> use of the Army, Navy, or other Government agencies; the repairing, arming, and degaussing of WSA controlled vessels and Allied vessels under lend-lease provision; conversion of vessels to troop transports, hospital ships, and for other special purposes; training and providing ship personnel, operating, loading, discharging and general control of the movement of these ships; administering and marine and war risk insurance laws and funds, and the control of terminal and port facilities, forwarding and related matters (War Shipping Administration 1944:2).

U.S. flagged ocean vessels or those under the control of the United States, with the exception of Army, Navy, and Coast Guard vessels or ships engaged in the coastwise, intercostal and inland transportation, fell under WSA (*New York Times* 10 February 1942). The WSA focused on the overseas transport of cargoes essential to the war effort and civilian economy while domestic coastal merchant vessels fell under the advisement of the Office of Defense Transportation. The WSA was administratively split off from the U.S. Maritime Commission who focused on the oversight and construction of new government merchant vessels. The WSA became the U.S. Government's ship operating agency while the Maritime Commission its shipbuilding agency.

The WSA, in many cases, took over ownership of oceanic merchant vessels including dry cargo ships and tankers while their original civilian owners still served as the general agent who managed, maintained, and equipped them. At the time of Pearl Harbor the U.S. merchant fleet numbered 1,375 vessels. By 31 July 1945 the WSA had 4,267 large vessels (1,000 gross tons or more) under its control (Yale Law Journal 1946:584). The large increase in tonnage resulted from the massive shipbuilding program undertaken by the U.S. Maritime Commission.

By June 1942 the WSA became more organized and developed a detailed management plan. The five part plan called for the end of nonessential imports so that shipping space could be made free for war materials, triangular routing of ships to minimize travel in ballast, better loading to fully utilize storage capacity and allow no more than 15% of the cargo capacity to go unused, elimination of non-essential stops, and reducing the time ships stayed in port (*Washington Post* 8 June 1942; *New York Times* 3 January 1943). WSA's major focus during World War II was the shipping requirements of the Army and Navy as well as the transport of lend lease goods to Great Britain and Russia. The bulk of export cargoes were destined for Europe and North Africa with Australia and the Hawaiian Islands also being major war time ports (War Shipping Administration 1944:4, 14). Most of the WSA vessels sailed under a coordinated and escorted convoy but they were not immune from danger. Japanese, German, and Italian submarines successfully sank over 1,500 vessels worldwide between 1 September 1939 and 8 May 1945 (Horodysky 2012c.).

World War II saw a peak in the activities of the U.S. Merchant Marine, including shipbuilding to make up for the losses encountered by U-boats. Recognizing that the U-boat depredations were going to severely hamper the U. S. war effort, Roosevelt's goal by February 1942 was to use the U. S.'s industrial capability to replace all of the losses to Operation Drumbeat and even increase the quantity of available

merchant tonnage. Roosevelt started the largest merchant-ship construction program in history with a goal of twenty-four million tons of shipping by the end of 1942, and double the tonnage in 1943 (Miller 1995:298). The U.S. Maritime Commission, established under the Merchant Marine Act of 1936, worked in conjunction with the Office of Defense Transportation and WSA to facilitate war time activities especially shipbuilding. The Commission funded and administered a massive shipbuilding program to replace the old World War I era vessels that made up the bulk of the U.S. fleet at the beginning of World War II. Vessel construction was either entirely financed by the government or funds were given to private entities to subsidize their efforts. This new fleet, as well as older existing vessels, was called upon to aid the military by delivering troops or supplies. Between January 1942 and September 1945 U.S. shipyards launched 5,304 ships. The feat was, "probably the greatest achievement of industrial production that the world had ever seen" (Bunker 2006:14). The use of merchant vessels to supply the war effort both at home and overseas was incredibly important and why the German U-boats sought them out as targets.

> While no one element can be singled out as a decisive factor in the Allies' victory, merchant shipping must rank as one of the most influential. The War Shipping Administration, in their final report to President Harry S. Truman on the role of the merchant marine aptly summarizes the effort of the entire Allied merchant navies. The United States was a member of a fighting team of United Nations that won the greatest war in history. There were three major players who represented the United States on that team: Our fighting forces overseas, the production army here at home, and the link between them – the United States Merchant Marine. . . . Never before has the maritime power of America been so effectively utilized. Its naval and merchant fleets became the difference between victory and defeat. Just as our Merchant Marine linked American overseas forces with American production, so it aided in cementing the United Nations into one fighting unit not separated, but joined by the oceans. In this capacity, the United States Merchant Marine, possessing finally the largest number of merchant ships in the United Nations' pool of shipping, can probably be credited as the greatest single strategic factor in the defeat of the Axis powers (Mercogliano 2001:46,47).

Merchant vessels and their crews were in extreme danger sailing along the United States coast. The stealthy U-boat fired torpedoes with no warning; merchant mariners had little time to safely abandon their vessel let alone ward off an attack. Most mariners only knew of a U-boat's presence after their ship was sinking out from under them. While some merchant ships were fitted with deck guns and trained gunners, in practice these defenses were of little use against a stealthy attack. The biggest threat to merchant seamen was burning oil. The volatile cargos often exploded upon being hit by torpedoes and remained on fire for many hours. A burning oil slick remained at the surface long after a vessel sank from view making a rescue of anyone in the water extremely hazardous. The sinking of the tankers *San Delfino* and *Atlas* off Cape Hatteras illustrated this peril. Twenty-eight crew members of the *San Delfino*

perished in a burning oil slick while thirty-two survivors from the *Atlas* received treatment for burns when landed in Morehead City, North Carolina (Cheatham 1990:51). If sailors escaped in a life raft, they risked being swept into the Gulf Stream and taken far out into the Atlantic Ocean. One survivor from the sunken *Alcoa Guide* drifted offshore for a month before being rescued. He was the sole survivor recovered from a life raft that initially escaped the sinking with four of *Alcoa Guide's* crew. War Shipping Administration records indicate that the U.S. Merchant Marine suffered the highest rate of casualties of any service in World War II. Official totals place the number of merchant ships sunk due to enemy action in World War II around the world at 1,554 vessels. Seven hundred and thirty-three vessels were over 1,000 gross tons. Uncounted number vessels were damaged by torpedoes, shelling, bombs, kamikazes, mines, etc. (Horodysky 2012b.).

People living in coastal cities and towns along the Eastern Seaboard in 1942 witnessed the destruction of Operation Drumbeat firsthand. Whether marked by towering columns of smoke by day or a red glow at night, torpedoed tankers left the most obvious mark of their end. Beachgoers frequently encountered oil on the beaches and sometimes, more horrifically, the bodies of lost merchant mariners. Debris, from life rafts to buoyant cargo and ship structure, sometimes yielded the names of these casualties. Sitting on the sidelines of a battlefield, coastal citizens saw the paltry number of American first responders like the U. S. Coast Guard or moth-balled U. S. Navy destroyers recalled into service, flying overhead or departing harbor on patrol. Success was marked by the safe rescue of a torpedoed ship's crew, but in reality it meant little to the U-boats, which continued to strike at will (Freeman 1987: preface).

German U-Boat Offensive Strategy

The exact number of U-boats responsible for the destruction of merchant shipping off the United States is unknown. Contemporary estimates placed 19 U-boats operating in the United States Strategic Area (roughly, the western half of the Atlantic), in January 1942, 28 in February-April, 35 in May, and 4 in June. However, it's likely that there were no more than 12 U-boats at any given time in the Eastern Sea Frontier (Morrison 1947:128).

The German Type VII and IX U-boat made up the majority of submarines operating off the United States. Both varieties carried enough fuel for a cruise of around 40 days that allowed a two week passage west, two week offensive operations in the Eastern and Gulf Sea Frontier, and a two week passage back to the Axis bases in France. U-boats that faced a shortage of fuel or supplies were resupplied in theater by "Milch Cow" Type XIV U-boats, which had a range of 12,300 miles and could carry 720 tons of diesel fuel. U-boats met the Milch Cows at pre-determined rendezvous points and received torpedoes, ammunition, fresh food, water, and other supplies. "The tankers noticeably improved the effectiveness of the U-boats. . . . Each 'milk cow's' supply of fuel oil could replenish twelve of the smaller Type VIIC boats with four weeks of fuel or five of the larger Type IXC boats with eight weeks of fuel, enabling them to carry on operations in the remotest parts of the gulf and Caribbean" (Wiggins 1990: 86).

The Type VIIC submarines carried 14 torpedoes while the larger Type IXC subs carried 22. Similarly, Type VIIC had 88 mm offensive canons and Type IXC carried 105 mm canons, both capable of sinking an unarmed or unprotected merchant ship alone. Many times, U-boat commanders employed their deck mounted cannons to finish off a merchant ship that had been disabled, but not sunk by a torpedo. "Their usual tactics, in the early months of 1942, were to approach a shipping lane at periscope depth, lie in wait on the surface at night, and launch torpedoes from seaward against a vessel whose silhouette might be seen against the shore lights" (Morrison 1947:129). This tactic worked exceeding well until May 1942 when the U. S. Government issued the first blackout orders for coastal American cities. "Later in the spring (of 1942), when the night became shorter and the ineffectiveness of our anti-submarine warfare had been demonstrated, the U-boats became bolder and attacked in broad daylight, even surfaced" (Morrison 1947:130). The wolfpack tactics that had been used on the other side of the Atlantic were not readily used off the United States because of the insufficient number of U-boats available at one time and the large geographic area close to enemy shore (uboataces.com [2005-2012]d.).

By the time that U-boats began stalking the U. S. East coast, German torpedoes had become highly effective weapons after initially suffering from faults that limited their reliability. The *Kreigsmarine* standard Model G7 torpedoes were 23 feet 7 inches long and 21 inches in diameter and carried a 617 pound warhead composed of Hexanite (a TNT derivative). The torpedoes' warhead could be set to detonate on contact or with a proximity fuse that detected the magnetic field created by a vessel. Early models could be programmed to run straight at a target or make a single turn shortly after its launch and then run a straight course. The G7a T1 torpedo used a steam powered drive train that could push the torpedo to 44 knots at a range of 6,500 yards or at 30 knots out to 15,300 yards. This model was noisy and left a trail of visible bubbles that rose to the surface as it travelled to its target. Smart U-boat commanders chose to use this weapon at night over long ranges to obscure the trail. U-boat commanders seeking to attack in daylight without the telltale bubble trail could use battery-powered variants designated G7e T2 or G7e T3. Its dimensions and warhead remained the same as the G7a T1 but the torpedoes counter rotating propellers left no bubbles. While less detectable the battery-powered G7e had a reduced range of 5,470 yards at 30 knots early in the war that was improved to 8,200 yards at the same speed when additional larger batteries were added later in the war. By 1943, the *Kriegsmarine* had introduced a passive acoustic homing torpedo. It had two onboard hydrophones that steered it to the target's noise signature, most likely a large merchant vessel or warship. Allied forces responded by trailing acoustic noisemakers, known as "Foxers" designed to cause the torpedo to explode well astern (uboataces.com [2005-2012]e.; DiGiulian 2012).

If a U-boat was spotted by an armed escort or military vessel, its best defense was concealment through diving. However, it took at least 30 seconds to crash dive to a depth deep enough to evade a depth charge attack. Depth also reduced the effectiveness of active sonar systems used to track a submerged submarines whereabouts. U-boats were difficult to locate once submerged, therefore anti-submarine tactics taught that submerged U-boats could be waited out as the submarine could not travel at much speed away from its dive location.

Another offensive tactic used by the *Kriegsmarine* during Operation Drumbeat was the laying of mines off major United States East Coast ports. Germany gained mine laying experience earlier in the war from placing the weapons off Great Britain, Ireland, and in the English Channel. German mine laying was a great success; sinking 120 vessels in the first six months of the war. In May 1942, Doenitz ordered several U-boats to mine the approaches to American harbors. Germany's naval command knew that America lacked counter mine capabilities and that the new strategy would divert Allied naval forces to this effort. The U-*87* was initially sent to New York with 10 TMB mines, but was then diverted to Boston, the U-*373* went to Delaware Bay with 15 TMB mines, and the U-*701* went to the Chesapeake Bay with 15 TMB mines. Each U-boat deposited its mines in shallow water (20-30 meters) 1000 meters apart. These mines were set to stay active for two months and detonated by the magnetic or acoustic signature of a passing ship. Additional mines were laid off Jacksonville, Florida in August 1942 and Charleston, South Carolina in September 1942. German commanders hoped that mining the shallow waters would force ships into deeper water where U-boats could more easily reach them. The initial round of mine laying continued until 10 November 1942 after which these operations were suspended until a new offensive in June 1943.

U-*701* caused the first mine-related casualties in the Western Atlantic when it mined the entrance of the Chesapeake Bay in June 1942. While en-route from Key West to Norfolk, Convoy KN109 entered the U-*701*'s minefield on 15 June. The mines damaged the American tanker *Esso Augusta* and American tanker *Robert C. Tuttle*, but both sailed on. The British anti-submarine trawler HMS *Kingston Ceylonite* was not so lucky, it ran into a mine in the same area and sank. Not realizing the convoy was in a minefield the U. S. Coast Guard Cutter *Bainbridge* dropped eight depth charges that detonated another mine damaging itself. The channel was closed, swept of mines, and quickly reopened. Unfortunately for the Allies, not all the mines had been removed and the American freighter *Santore* struck a mine and sank on 17 June while waiting for its convoy to depart (Hickam 1989:255-257). North of the Chesapeake, a minefield laid by U-*373* claimed the tug *John R. Williams* off Cape May, New Jersey on 24 June. Fourteen crewmembers perished when the tug sank (Levie 1993:80-81).

The only defensive weapon merchant vessels had against mines was degaussing or demagnetizing. Since the mines were detonated by a vessel's magnetic field methods were employed to counteract a ship having a natural magnetic signature. Bands of wire were fastened around a ship's metal hull from bow to stern and an electric current was run through the wire to neutralize the ship's magnetism (Bunker 2006:26). While the quantity of German mines and their tactical impact was relatively small off the United States coast, the threat of mines closed ports, changed shipping routes, and moved resources away from effective submarine countermeasures.

Operation Drumbeat's devastation continued through July 1942. The United States was stretched thin with wars in two oceans and a shortage of suitable escort vessels. American commanders had apparently not studied the lessons taught the British during World War I and had spent little money towards a commerce escort fleet or anti-submarine warfare assets. German commanders nicknamed this period the "American Shooting Season."

> In all some 2.5 million tons of shipping were sunk from January to July 1942, in what the U.S. Navy called the Eastern, Gulf, and Caribbean Sea Frontiers. . . . Tanker loses imperiled future military operations, and dozens of merchant seamen lost their lives as their ships sunk under them. It was the worst defeat ever suffered by the U.S. Navy, because, unlike Pearl Harbor, it was not a surprise attack (Miller 1995:294).

Between January and July 1942 German U-boats successfully sunk 242 vessels off the Canadian and American coast with two additional merchant ships lost dues to submarine laid mines. The breakdown of vessels sunk by U-boats by month is as follows: January 35 vessels, February 32 vessels, March 43 vessels, April 40 vessels, May 48 vessels, June 29 vessels and July 19 vessels. In August there would be an additional four vessels lost (Hickham 1989:296-304).

United States Defensive Strategy

In February 1942, Admiral Andrews assumed control of the Eastern Sea Frontier, created from the old North Atlantic Naval Coastal Frontier and the Southern Atlantic Sea Frontier. The Eastern Sea Frontier's headquarters in New York City compiled and analyzed intelligence on Allied shipping and German U-boats locations. Andrews had almost no suitable vessels to patrol this massive area stretching from Maine to Florida. The assets at his disposal included seven Coast Guard cutters, four converted yachts, three 1919 vintage patrol boats, two 1905-era gunboats, and four wooden submarine chasers. Around 100 aircraft were available, but most were only capable of short range activities and training duties. Given the deplorable shape of this command, it's not surprising that U-boats sank merchant freighters and tankers up and down the coast without resistance. Samuel Eliot Morrison described the task facing the U. S. Navy thus,

> . . . in order to combat the U-boats, new organs of naval administration had to be set up, hundreds of new surface ships and thousands of new planes built, new technical devices developed by scientists in laboratories, schools to train naval personnel in anti-submarine warfare established, and officers trained to instruct in these schools. . . . The amount of study, energy, and expense necessary to combat a few hundred enemy submarines is appalling (Morrison: 1947:203).

Responsibility for a response to the U-boat attacks fell upon the shoulders of Admiral King (Commander in Chief of the Unites States Fleet and later appointed Chief of Naval Operations), but he was pre-occupied with the Japanese actions in the Pacific at the time and did little to combat the growing U-boat threat. There was extreme difficulty, "establishing a well-organized, closely integrated, homogenous striking force from a collection of disparate craft acting under different commands and operating together for brief and indefinite periods" (Freeman 1987:173).

American military forces were at a severe disadvantage during most of 1942 as neither they nor the British could decipher the German messages being sent by the U-boats. Germany, on the other hand, knew what messages the Allied ships were transmitting and receiving and could use this to locate targets for the U-boats. The Allies could use the U-boat's radio signals and direction finding electronics to locate submarines; however, the message's content was still secret. The highly sophisticated German Enigma code machines produced codes that were very difficult to break. Even when the Allies successfully broke the codes later in the war, Germany reconfigured the Enigma machines to strengthen their codes.

By the beginning of February the first group of five U-boats had returned home and fresh boats and crews replaced them on the war front. Following these early successes and the apparent inability of the U. S. Navy to stop the attacks, Admiral Doenitz finally received acknowledgment from Hitler of the U-boat's critical role. The center of the Operation Drumbeat battlefield was the North Carolina coast, especially near Cape Hatteras, where U-boats frequently prowled. "Allied losses off Cape Hatteras were so numerous that the aptly named 'Graveyard of the Atlantic, was being called a new name by the freighter and tanker crews: 'Torpedo Junction'' (Wagner 2010:1). The large numbers of ships passing by the eastern tip of North Carolina's coast while heading up and down the Gulf Stream meant U-boats had many targets to choose from.

When the U-boats reached the Canadian and American coast in January 1942, the American military infrastructure had only one dedicated anti-submarine ship, the Coast Guard cutter *Dione*. Assigned to coastal convoy escort duty, the *Dione* operated from Norfolk, Virginia patrolling the waters off Virginia and North Carolina and making regular mail runs to the Outer Banks lightships. With the U-boat attacks escalating, *Dione* was ordered to keep a lookout for U-boats and also assist torpedoed ships in distress. Its captain, Nelson McCormick, decided to take a more offensive strategy and start daytime searches using sonar and other sound detection gear to find submerged U-boats waiting for their next target (Hickham 1989:28). The *Dioine* would soon be joined by numerous other ships and planes to deter the U-boat threat in the Graveyard of the Atlantic.

Merchant ship captains tried to reduce the likelihood that they would be torpedoed by turning off their nighttime running lights and by sailing in a zigzag pattern. Neither technique proved particularly helpful. Even the fastest ships fell prey; the U-*106* sank the 15,355 gross ton Swedish cargo vessel *Amerikaland* on 3 February 1942 ninety miles east of Virginia Beach. This modern freighter was one of the fastest merchant ships in the world and would be one of the largest ships sunk in the Eastern Sea Frontier. It was sunk while en-route from Baltimore to Chile to pick up a cargo of ore. Five of the thirty nine man crew did not survive the initial sinking. The remaining thirty four men made it into three lifeboats that were separated from each other in the Gulf Stream. The first lifeboat, with three men passing away before rescue, was found and its survivors taken to Curacao. The second lifeboat, with one man succumbing onboard from his injuries, was picked up and its men taken into New York. The third life boat turned up in Brazil with one dead from exposure (Gentile 2006:58).

The United States initiated several small scale operations to defend its shores with little success.

President Roosevelt's yachting experience led him to direct the U. S. Government to form a cadre of several hundred civilian yachts and fishing boats to form a coastal picket line in February 1942. Known officially as the "Corsair Fleet" by the U. S. Coast Guard, this floating militia was more popularly known as the "Hooligan Navy" (Snow 2001:170). While the scantily armed fleet boosted American civilian morale and rescued merchant mariners whose ships had been torpedoed, it did little to combat the U-boats. The Hooligan fleet was limited to fair weather operations and had no deterrence factor at all. This desperate tactic was followed up by the conversion of four merchant vessels, into decoys or Q-ships in March 1942. The ships were directed to act like decoys, drawing unsuspecting U-boats into close enough range to be fired upon. The Q-ships were heavily armed with an assortment of guns, depth charges, and grenades. Their hulls were usually filled with cork or another buoyant cargo so if they were hit by a torpedo they would not sink (Hickham 1989:108-109). The concept had been tried during World War I with mild success, but met with disaster on 26 March. U-*123* torpedoed the Q-ship *Atik* with the loss of all 141 members of her crew. In relation to the number of sailors involved in a naval operation, the *Atik*'s loss was the U.S. Navy's single most self-destructive operation of the war. The Q-ship concept was abandoned soon after the incident (Miller 1995:303).

Lacking a robust naval fleet to actively engage marauding U-boats, the convoy system was the only realistic defense to protect large numbers of merchant ships; however, merchant captains were skeptical of its utility. Other preventative measures suggested to merchant captains by the U. S. Navy included traveling through areas of frequent U-boat attacks only during the day, keeping lookouts, keeping ships blacked out at night, and steering a zigzag course. Another defensive action that lessened the likelihood of U-boat attacks was the diversion of shipping to inland and coastal waters. The Cape Cod Canal was an important component of this strategy; it cut 120 miles off the trip from the south to Boston and moved vessels into shallow water away from prime U-boat hunting grounds (Hickham 1989: 160). Before full scale convoys with escorts materialized the United States provided protection to key points along the East Coast where shipping converged early in 1942. A temporary fleet of destroyers made antisubmarine sweeps and escorted groups of vessels down the coast during the day. Each escort handing its fleet off to the next as the merchant vessels proceeded along the coast. This stop-gap measure, known as "Bucket Brigades" was not expected to eliminate the U-boat menace. Admiral Andrews hoped that the measures would somewhat limit the merchant ship casualties until sufficient anti-submarine assets were available (Miller: 1995:303-304).

Some of the first new assets to arrive on scene were twenty-four British trawlers that had been converted for anti-submarine duties. The trawlers arrived in March 1942 and began providing full coverage to convoys between Halifax and New York. While armed with a four-inch deck gun, machine guns, depth charge launchers, and modern sonar, the trawlers were significantly outmatched by the U-boats' speed and firepower. Not surprisingly, at least one trawler became a U-boat casualty while serving as a convoy escort. After crossing the Atlantic, the HMT *Bedfordshire* began patrolling the waters off Cape Hatteras during April 1942 crewed by British and Canadian sailors. Operating in this hotbed of U-boat activity, the *Bedfordshire* contributed to the safe passage of merchant vessels until the U-*558* torpedoed the trawler on 11 May off the coast of Cape Lookout, North Carolina. All on board were lost and word of the loss of *Bedfordshire* only reached U.S. forces when several of the crewmembers bodies washed

ashore on Ocracoke Island, North Carolina (Hickham 1989: 208).

In comparison to converted merchant craft, the destroyer was the ideal platform for anti-submarine duties. Its speed, maneuverability, submarine detection equipment, and sea keeping ability made it equal to the task of hunting down the U-boat fleet (Freeman 1987: 97). The U. S. Navy slowly began to deploy destroyers to the Eastern Sea Frontier in March 1942, but insufficient numbers and ineffectual deployment limited the craft's impact. Initially, U. S. Navy commanders stationed destroyers off the ports with the highest level of U-boat activity leaving other areas vulnerable. Fourteen destroyers patrolled the East Coast in March 1942, with a paltry total of only 63 days at sea out of a possible 434 days (Freeman 1987: 129). In April 1942, 23 destroyers patrolled a total of 140 days out of a possible 690 days. An average cruise was six days at sea (Freeman 1987:169, 202).

The United States military slowly got into gear with the construction of sub chasers and patrol craft as well as a training school for antisubmarine warfare and sonar operations. Lessons learned by the British in the eastern Atlantic were incorporated into the western Atlantic convoy system resulting in fewer merchant vessel casualties in the Eastern Sea Frontier. By April 1942 Admiral Andrews had a surface fleet of twenty-three large (90+ feet) and forty-two small (75 and 83-foot) Coast Guard cutters, three 173- foot patrol craft, 12 Eagle patrol boats, and converted yachts, and fourteen armed British trawlers. The air assets included 84 Army and 86 Navy planes deployed from Maine to Florida ready for antisubmarine patrol (Hickham 1989:158-159).

The U. S. Navy's anti-submarine offensive actions finally destroyed the first U-boat on 13 April 1942. While patrolling off the Outer Banks of North Carolina, the USS *Roper* engaged the U-*85*. The submarine was on its fourth war cruise having previously sunk three merchant ships totaling over 15,000 gross tons. Around midnight, the USS *Roper* detected the submarine on radar 2,500 meters away. The surfaced U-*85* fired a stern torpedo and tried to run from the destroyer. However, the USS *Roper*'s superior speed (it could make 28 knots) allowed it to close with the sub and fire on it with its machine gun and three inch deck gun. It then dropped a pattern of eleven depth charges, sinking the U-*85*. U. S. sailors observed German sailors abandoning ship and in the water around the submarine, but no rescue attempt was made till the next morning. USS *Roper*'s commander feared that if the destroyer stopped to rescue the survivors, it would fall prey to another U-boat as the vessels often operated in tandem. As a result, none of the German submariners survived. USS *Roper* recovered twenty-nine floating bodies that were later buried at the Hampton National Cemetery, Virginia.

U. S. forces attempted to use minefields to combat the U-boat menace. The minefields were part of a system of harbor defenses and convoy protection techniques that included anti-submarine nets and shore batteries. The thought was that since there were not enough vessels on hand to stop the U-boats or protect merchant shipping then minefields were the next best option. Between January and May 1942, the United States laid minefields in areas that were favorable to U-boat operations such as the Chesapeake, Florida, Massachusetts, North Carolina, and New York as well as passages from the Caribbean into the Atlantic Ocean. These minefields were not a barrier aimed at simply killing U-boats, rather they were more like mined anchorages where merchant ships could congregate at night and be safe

near harbor entrances (Wagner 2010:83).

Cape Hatteras and Cape Fear, North Carolina were the priority locations for the construction of the first mined anchorages. By the end of May 1942 these minefields were completed. Patrol boats cruised on station near the minefields to help vessels safely navigate the area and keep a look out for U-boats. Unfortunately, soon after the North Carolina minefield was completed it showed the indiscriminate nature of mines. On 11 June, the tanker *F.W. Abrams* entered the minefield during bad weather unawares, hit three mines, and sank. The vessel was en-route from Aruba to New York with 90,000 barrels of oil. All of its 36 crew was rescued. The incident demonstrated that minefields were not only a hazard to the enemy but also to allies, something Admiral Andrews repeatedly emphasized.

In response to the *F. W. Abrams* sinking, two converted fishing trawlers, the YP-*388* and YP-*389* (YP meaning yard patrol) assumed duty near the Hatteras minefield to warn friendly vessels of its location and serve as escorts. Ill equipped to take on a U-boat, the YP-*389* fell prey to the U-*701* on 19 June. The U-boat attacked the YP-*389* off Diamond Shoals, North Carolina with its deck and anti-aircraft guns killing 6 of its 24-man crew (Wagner 2010:91-96). The minefield was proving to be far more dangerous to Allied vessels than its intended target.

Slightly less than a month later, in the vicinity of Diamond Shoals, U-*576* attacked Convoy KS-520, sailing from New York to Key West. The U-boat's first two targets, the American freighter *Chilore* and Panamanian tanker *J.A. Mowinckel*, received crippling but not fatal torpedo strikes. To prevent a total loss, the vessels' captains headed inshore to beach the vessels. While under escort from the USS *Spry*, the vessels entered the Hatteras minefield and both hit mines. Surprisingly, the mines did not send the *Chilore* and *J.A. Mowinckel* to the bottom. On 19 July, two tugs were set out to tow the incapacitated vessels to shore. In the process, the tug *Keshena* struck a mine and sank (Wagner 2010 97-100; Hickham 1996:286).

After firing torpedoes into the *Chilore* and *J. A. Mowinckel*, U-*576* torpedoed and sank the Nicaraguan freighter *Bluefields*. On the positive side for the Allies, U-*576* did not escape. The armed American merchant ship *Unicoi* sailing in convoy KS-520 fired upon the U-*576* and two Navy Kingfisher aircraft dropped depth charges on it. As a result, the U-*576* upended and sank immediately with all 45 hands on 15 July (NOAA/Monitor National Marine Sanctuary 2010). Following the KS-520 fiasco, the coastal minefield strategy was not expanded. Admiral King left the minefield in place until April 1943 and then ordered its removal, but the clean-up was less than complete. Nautical charts still denote the area as hazardous; only 1,303 of the 2,500 mines were removed.

Evidenced by the inability to control the U-boat threat in the opening months of Operation Drumbeat, U. S. Naval forces slowly realized that the only effective way to provide coverage for merchant shipping was the convoy system. The United States Navy, particularly Admiral King, was initially lukewarm to the convoy idea, feeling in March 1942 that the technique actually risked shipping. That adequate numbers of escort vessels were slow to deploy to fully protect the Eastern Sea Frontier further exacerbated the problem. Ultimately, the intolerable number of merchant vessel casualties in the Spring

of 1942 forced a change. By May, Admiral King felt that convoys were, "not just one way of handling the submarine menace; it is the only way that gives any promise of success" (Cheatham 1990:29). With this realization, a day and night interlocking convoy system running all the way to Key West was put in place on 15 May 1942, when the Convoy and Routing Section of the Chief of Naval Operations, headed by Rear Admiral M. K. Metcalf, became a section under the Commander in Chief of the U.S. Navy headquarters. Around 1 June 1942, the Convoy and Routing Section took control of the routing and reporting of all merchant shipping and troop convoys in the United States strategic area (Morrison 1947:206).

The process of creating a convoy began with Convoy and Routing Section creating a convoy order that laid out its planned route and schedule. This information was then handed off to the originating port's convoy directors to finish off the convoy's logistical planning with an eye towards maximum efficiency (Hickam 1989:229). The first official southbound convoy between Hampton Roads and Key West sailed 14 May 1942 with the northbound convoy sailing the next day. Later in May a northern link between New York and Halifax was added to the convoy chain and by the end of the month a ship could sail from Key West to Halifax and back with ample coverage by escorts. Each convoy needed seven surface craft: two destroyers, one corvette, two coast guard patrol craft, and two British trawlers (Hickam 1989:230). Airplanes provided additional coverage. Any fewer escorts were felt to be insufficient to that task. Additional convoy escorts were freed up after the Battle of Midway in June 1942 as military planners determined that Japanese threat to convoys in the Pacific was reduced.

The convoy system was complex and difficult to manage. It combined three separate convoy routes between Key West and Halifax into one system. Ships and planes associated with five different Naval districts had to function together as a cohesive unit. Independent merchant ships at either end of the convoy route had to coordinate their activities (Freeman 1987: 265). The most important aspect of the convoy system was the protection of merchant shipping between Canada and England that fueled the overseas war effort. The smaller coastal convoys off the U.S. coast served as feeders for the main cross Atlantic routes. These two systems had to be tied together in a way that provided constant protection. By the end of August 1942 an interlocking convoy system allowed ships to run on predetermined paths on regular schedules. The coordinated arrivals and departure of convoys was scheduled so that northbound coastal convoys were timed to arrive in New York right before transatlantic convoys departed for Great Britain. The two main convoys that all other routes tied into were the Key West-New York and return (KN-NK) and Guantanamo-New York and return (GN-NG) (Morison 1947:260). The convoys, consisting of 40 to 50 merchant ships, reduced the ability of U-boats to target unprotected merchant ships, significantly raising the U-boats risk of counter-attack. Merchant vessel losses in the Eastern Sea Frontier dropped off from 23 in April to 5 in May, 13 in June and 3 in July. After July, there were no merchant vessels lost in the Eastern Sea Frontier for the remainder of 1942 (Morrison 1947:257). The convoy system was so effective that during the last three months of 1942 the Eastern, Gulf, and Panama Sea Frontiers suffered no losses from enemy U-boats. However, U-boat causalities continued to occur in the Caribbean. The interlocking convoy system remained in place until war's end in May 1945. As merchant vessel losses diminished towards the end of 1942, Admiral Andrews recognized that it was not necessary to destroy each and every U-boat, but only to keep them from

attacking through aerial patrols and close convoy protection (Hickam 1989:238).

The American coastal defensive strategy was possible only through air support. Like the surface fleet, insufficient aircraft were available in January 1942 to counter Operation Drumbeat when it began. Neither the U. S. Navy, U. S. Army Air Force, nor the U. S. Coast Guard had the aircraft or crews on the East Coast to undertake the longer range offensive and defensive sorties to combat the U-boat force. Despite their shortcomings the Army Air Force and Navy combined resources and started patrols in the Eastern Sea Frontier. Smaller fighter-type airplanes, like the Lockheed A-29 Hudson, Grumman J2F Duck, Vought OSU Kingfisher, and Curtis SOC Seagull, flew out to 40 miles offshore from bases in Portland, ME and covered territory down to North Carolina. The larger medium and long range bombers, like B-24 Liberator, B-25 Mitchell, B-17 Flying Fortress, and B-18 Bolo flew farther offshore to 300-600 miles.

The Civilian Air Patrol (CAP) augmented the military's efforts in March by flying their own planes to scout for U-boats and assist in rescuing shipwreck survivors. The CAP established 21 stations between Maine and Texas and put pressure on German U-boat commanders to stay submerged during the day. In the Eastern and Gulf Sea Frontiers the CAP flew 64,000 hours during the first five months of 1942 as compared with 27,000 hours by the Army Air Force and 72,000 hours by the Navy (Morrison 1947:280). Eventually planes carried magnetic anomaly detectors and radar allowing them to detect surfaced and even submerged U-boats. By the end of April, 86 Navy aircraft (planes, blimps, PBYs) and 84 Army Air Force aircraft (planes) defended the Eastern and Gulf Sea Frontiers.

A U. S. Army Air Force Lockheed A-29 stationed at Cherry Point, North Carolina was the first U. S. aircraft responsible for a U-boat kill. It dropped three depth charges on the U-*701* on 7 July 1942 off Cape Hatteras, North Carolina. The aircraft's crew spotted the submarine running on the surface and attacked before it could slip away below the surface. The depth charges damaged the U-boat's pressure hull preventing it from blowing its tanks and the U-*701* quickly sank to the seafloor. Two groups of submariners, totaling 36, bailed out and swam to the surface. The men drifted with the Gulf Stream for two days before being rescued by the U. S. Coast Guard. Ultimately, only seven German crew members survived and were imprisoned in U. S. POW camps for the remainder of the war. The sinking of the U-*701* was followed up by the sinking of the U-*576* by a combination of American aerial and surface efforts on 15 July 1942 in the same area. Two Kingfishers aircraft from Cherry Point dropped depth charges on the submarine followed up by gunfire from the U.S. merchant vessel *Unicoi*, which sent U-*576* to the bottom. Although only two of the 12 German U-boats sunk off the United States during World War II were sunk by airborne efforts; patrolling aircraft greatly limited the time the submarines felt safe to attack off the Eastern Seaboard (Freeman 1987:249).

U-Boat Battlefield Moves to Florida and the Gulf of Mexico (May 1942 – February 1943)

As the United States finally put in place effective defensive tactics to mitigate U-boat operations off the East Coast the *Kriegsmarine* sought new strategies to continue their assault on merchant shipping. At

the same time Doenitz was dealing with internal politics, Hitler ordered him to move his headquarters from St. Nazaire to a suburb of Paris after a British raid. Doenitz felt this move would lessen his ability to command the U-boats and lose personal touch with his commanders. Hitler also demanded that Doenitz send more submarines to the Mediterranean to help the troops in Africa. This left only 10 U-boats available for service in the Atlantic (Hickam 1989:238-239).

Following the early success of Operation Drumbeat the U-boat's *guerre de course* was becoming significantly more dangerous. Convoys limited the number of suitable targets and aircraft carrying radar could detect surface U-boats both day and night. However, opportunities to sink foreign flagged freighters and tankers sailing alone could be had off the Florida coast. These independently sailing foreign flagged merchant vessels were now the prime U-boat targets. To take advantage of these lone ships, Doenitz moved his U-boat fleet south since effective counter measures put in place by the United States by July 1942 had put a serious dent in the U-boat offensive off New England and the mid Atlantic.

> In the sea area off Hatteras successes have dropped considerably. This is due to a drop in the traffic (formation of convoys) and increased defense measures. Of the boats stationed there in the recent period only two, U 754 and U 701 have had successes. On the other hand U 701 and U 215 have apparently been lost, and U 402 and 576 badly damaged by depth charges or bombs. This state of things is not justified by the amount of success achieved. The two remaining boats (U 754 and 458) will therefore be removed (Befehlshaber der Unterseeboote 1942b.:39).

Ever since the first attacks in January 1942, U-boat operations had slowly moved southward focusing on the unescorted oil tankers that sailed from Caribbean, Gulf Coast, and South American ports. At the start of Operation Drumbeat in February the Gulf Sea Frontier was established (similar to the Eastern Sea Frontier) that covered the Florida Coast and Straits, Bahamas, Gulf of Mexico, the Yucatan Channel, and most of Cuba. Captain Russell S. Crenshaw was Commander, Gulf Sea Frontier until 3 June 1942, when he was replaced by Rear Admiral James L. Kauffman. The available naval forces were limited and included a small converted yacht, two 165-foot Coast Guard cutters, one 125-foot cutter, and various airplanes. The headquarters was located in Key West, Florida (Morison 1947:135).

The first U-boat known to have sunk a vessel in the Gulf Sea Frontier was the U-*128*. It sank the 8,202 ton American tanker *Pan-Massachusetts* on 19 February forty miles southeast of Cape Canaveral, Florida. The 450-foot long tanker was headed to New York loaded with 104,000 barrels of refined petroleum, gasoline, kerosene, and diesel oil. Of the 38 man crew 18 survived the incident. The U-*504* then sank two more ships in the area on the 21st, the *Republic* and an unidentified tanker, and one more, the American tanker *W.D. Anderson*, on the 22nd. Even with these early successes, it was not until May that U-boat commanders concentrated their efforts in these southern waters (Morison 1947:135).

In May 1942, the U-*507* became the first German U-boat to fully enter the Gulf of Mexico. It sank the American freighter *Norlindo* 80 miles northwest of the Dry Tortugas on 4 May with the loss of 5 lives.

The freighter was in ballast traveling from Mobile, Alabama to Cuba. Whereas, East Coast U-boat casualties began to diminish in May 1942, losses in the Gulf Sea Frontier jumped to 41 ships totaling 219,867 gross tons, almost double the Eastern Sea Frontier losses in April. Of those losses, 55 per cent was tanker tonnage, a heavy blow to the Allied war effort (Morrison 1947:137).

The U-boats found fertile hunting grounds in the Gulf of Mexico just off Mississippi and Louisiana. The U-*507* continued its hunt and sank the cargo vessel *Alcoa Puritan* on 6 May 50 miles south of the Mississippi River. It was sailing from Trinidad to Mobile, Alabama with a cargo of bauxite (aluminum ore) when it was torpedoed and sunk. The U-*507* would go on and sink many more vessels and become one of the most successful U-boats of the campaign, sinking 8 vessels in the Gulf. Following the *Alcoa Puritan*'s loss, the commander of the Gulf Sea Frontier declared the area a danger zone as the attacks continued into June with heavy losses. Even air support did not stop the U-boats. On 13 May, the tanker *Gulf Penn*, escorted by a patrol bomber, was sunk in two minutes. The submarine had lain in wait for her in a patch of muddy water.

A second tanker, *David McKelvey*, was also sunk in the same area before midnight. At almost the same moment a Mexican tanker, *Portrero del Llano*, was torpedoed and sunk near Miami (Morrison 1947: 138-139). Unhindered by the concerted defensive efforts put into place in the Eastern Sea Frontier, the U-boats could again operate as they had done early in 1942 off New England and Cape Hatteras. As a result, May in the Gulf Sea Frontier holds the distinction of being the month and area with the most merchant casualties during the war (41 ships, 219,867 gross tons). Six or seven U-boats were responsible for all of the losses (Morrison 1947:142; Wiggins 1995:53).

On 12 May, twenty-seven crewmen were killed when the tanker *Virginia* was hit by the U-*507* a mile and a half off the entrance to Southwest Pass, Mississippi River. The unarmed and unescorted tanker was carrying 180,000 barrels of gasoline destined for Baton Rouge, Louisiana. The U-*507* struck as the tanker stopped to pick up the harbor pilot. The *Virginia* burst into flames and sank within minutes. The Eight Naval District described the *Virginia*'s loss as one of the greatest maritime tragedies in the Gulf of Mexico's history. Admiral Doenitz wrote in his memoirs that, "The Americans, apparently, had not anticipated the appearance of U-boats in such a far distant part of the Caribbean as the Gulf of Mexico. . . . Once again we had struck them in a soft spot" (Wiggins 1995: 56).

The Gulf Sea Frontier forces made significant efforts to hunt the U-boats and established convoys to protect merchant shipping, but many unescorted merchant vessels still traveled throughout the Gulf region. "Within twelve months, twenty-four German U-boats entered the Gulf. Seventeen U-boats sent 56 merchant vessels to the bottom and badly damaged 14 others" (Church et al. 2007:7). In July the U-*166* entered the area and concentrated in the area off the Mississippi River's mouth. "The U-boat's mission was to lay mines and attack merchant shipping. Although nine TMB mines were successfully laid only a few hundred yards off the jetties in the Southwest Pass of the Mississippi River, none detonated" (Church et al. 2007:7). The U-*166* went on to sink the passenger freighter *Robert E. Lee* 45 miles south of the Mississippi River on 30 July 1942. The *Robert E. Lee*'s escort, the *PC-566*, immediately depth charged the U-*166* and sank it taking the lives of all its 52 man crew. The U-*166* was

the only German U-boat sunk in the Gulf of Mexico.

The American military's response to the U-boat activity in the south was complimented by the laying of minefields in April and May 1942 near Key West to protect the convoy assemblages. As with the Hatteras minefield, the Key West minefield had many disadvantages. It caused the re-routing of shipping south of Key West, adding an extra 20 hours of steaming time. The minefield also caused the sinking of the USS *Sturtevant* on 26 April, killing 30 men, and three merchant vessels between 15 June and 2 July 1942 (Morrison 1947:136). In August, a Galveston-Mississippi convoy was also established to protect the valuable tankers that supplied the war effort with fuel. The convoy coverage was extended from the Passes to Key West by September 1942.

Operation Drumbeat's last push occurred in June and July. During those months there were more U-boats then had even been off the American coast. In June there were 10-18 and in July at least 16. The increased number of U-boats was matched by the American determination to stop the destruction. Despite the active submarines the amount of sinkings was low due to the effectiveness of the convoy system and level of aerial coverage. Merchant shipping finally adopted the convoy system throughout the Gulf Sea Frontier by August 1942 and the U-boat assault lessened and the war turned in favor of the Allies. "The U-boats were forced to fight for their prey. . . . Most shipping was under convoy and enjoyed the protection of both surface and air escort, and the arrival of radar-equipped planes permitted night coverage as well."

America seemed to be getting the upper hand, and the Germans now had to search hard to find any more "sitting ducks" (Wiggings 1990:1995). On 27 July 1942, Doenitz made a radio broadcast and declared that despite the "exaggerated hopes' raised by the U-boat campaign, 'the harsh realities of the submarine war' meant that 'more difficult times lay ahead of us" (Miller 1995: 316-317). It is thought that his remarks were a warning sign that the early successes could not be maintained and the German people should be ready for casualties.

Doenitz withdrew most of his U-boats and ended Operation Drumbeat. He continued to occasionally send U-boats to the America's coast until the end of World War II but they were never wildly successful and not part of a larger organized campaign. A compilation of the forces available to the Eastern Sea Frontier between March and July 1942 and Gulf Sea Frontier between February and June 1942 shows the gradual increase in aircraft and vessels. While the numbers only slightly grew, the expertise and understanding of U-boat tactics, as well as their suspected locations, contributed to the American success at ending Operation Drumbeat.

31-Mar-42	11-Apr-42	26-May-42	26-Jun-42	Jul-42
66 Navy planes	68 Navy planes	172 Navy aircraft	209 Navy aircraft	141 Army aircraft
16 Navy PBYs	4 Navy blimps	16 coastal patrol ships	1 110' sub chaser	192 Navy aircraft
4 Navy blimps	54 Coast Guard planes	2 Eagle class patrol vessels	7 173' patrol craft	11 patrol craft
84 Army planes	3 173' patrol vessels	9 gunboats	7 gunboats	12 barges
3 173' coastal patrol ships	1 110' patrol vessel	2 patrol yachts	5 patrol yachts	17 trawlers

5 Eagle class patrol vessels	5 patrol yachts	24 yard patrol craft	3 125' Coast Guard cutters	1 93' sub chaser
7 patrol yachts	5 Eagle boats	10 85'-79' Coast Guard cutter	10 165' Coast Guard cutters	6 private yachts
5 93'-110' submarine chasers	8 125' Coast Guard cutters	23 81'-83' Coast Guard cutter	18 trawlers	1 minesweeper
15 75' Coast Guard cutters	4 165' Coast Guard cutters	1 92' Coast Guard cutter	10 destroyers	6 110' sub chaser
27 80'-83' Coast Guard cutters	19 trawlers	1 110' Coast Guard cutter	7 sub chasers	1 Coast Guard patrol craft
11 125' Coast Guard cutters	2 gunboats	7 125' Coast Guard cutters	57 75'-83' Coast Guard cutters	4 173' patrol craft
7 158'-165' Coast Guard cutters	23 destroyers	4 165' Coast Guard cutters	14 aux. motor minesweepers	15 75' Coast Guard cutters
14 British trawlers		11 trawlers	7 auxiliary vessels	2 80' Coast Guard cutters
		16 destroyers	3 mine layers	1 79' Coast Guard cutter
				32 83' Coast Guard cutters
total: 170 aircraft and 94 vessels	**total: 126 aircraft and 70 vessels**	**total: 172 aircraft and 110 vessels**	**total: 209 aircraft and 149 vessels**	3 125' Coast Guard cutters
				10 165' Coast Guard cutter
				10 destroyers
				17 177' patrol craft
				7 gunboats
				total: 333 aircraft and 156 vessels

Table 1. Available aircraft and vessels in the Easter Sea Frontier during March-July 1942 (Freeman 1987:129-132, 202-203, 370, 293-295, 443-444).

Feb-42	Apr-42	May/June 1942
2 Army bombers	2 Army bombers	2 Army bombers
14 Army observation planes	14 Army observation planes	14 Army observation planes
19 Coast Guard planes	19 Coast Guard planes	19 Coast Guard planes
1 yacht	3 yachts	4 yachts
2 165' cutters	6 165' cutters	6 165' cutters
1 125' cutter	3 125' cutter	3 125' cutter
	2 destroyers	2 destroyers
total: 35 aircraft and 4 vessels		6 83' Coast Guard cutters
	total: 35 aircraft and 14 vessels	16 patrol craft/sub chasers
		2 motor mine sweepers
		total: 35 aircraft and 39 vessels

Table 2. Available aircraft and vessels in the Gulf Sea Frontier during February-June 1942 (Morrison 1947:135-144).

Germany was overextending itself and its U-boat campaign by the end of 1942. It had submarines in the Northern Waters, North Atlantic, American Coast, West Indies/Caribbean, Central Atlantic/West Africa, South Atlantic/South Africa, Black Sea, and Mediterranean. The Battle of the Atlantic was moving away from the American Coast and back to the North and Central Atlantic where there were more targets. Operation Drumbeat ended but U-boats continued their assault back in the western North Atlantic. “The last six months of 1942 marked the zenith of the U-boats’ success. Starting in August, after the tonnage

sunk off the American coast had begun to decline, Admiral Donitz resumed day-and-night offensive in the North and Mid-Atlantic, maintaining for four months a force of over one hundred U-boats at sea against the Allied convoys" (Busch 1955:88).

The use of convoys did not deter the German commanders; rather it caused a rise in their victory. Wolf packs and crew confidence along with experience culminated in November 1942 being the month with the highest amount of merchant shipping sunk around the globe by U-boats at 700,000 tons or 117 ships. Of these, 72 ships were in a convoy but with the triumph came greater Allied resistance. Advancements in hydrophones, sonar, and depth charges caused U-boat tactics to consistently be changed.

By the start of 1943, only a handful of U-boats prowled the American coast. "[They] crept along the coast like ghosts, checking the convoys, reporting to Doenitz on the weather, and stealing away into the night" (Hoyt 1978:345). That year introduced a new U-boat tactic. "The new approach took the form of 'long periods of quiet followed by cautious and rapid attacks when the German U-boat commanders were in the opinion they had lulled our forces into complacency" (Wiggins 1990:176). Even though the U-boat presence had lessened off the American coast, Admiral Andrews did not relax U. S. forces operations; in fact they continued to develop anti-submarine weapons in preparation for if and when Doenitz would send his fleet back again. The defensive air commands also expanded and the Eastern Sea Frontier offices were moved to a larger space.

Final Years (April 1943 – May 1945)

Doenitz launched a second U-boat campaign on the American shores in April/May 1943. He had persuaded Hitler into agreeing to send more U-boats in a final attempt to impact the war supplies arriving in Britain. Germany was building U-boats at a faster rate than could be sunk by the Allies. During the last six months of 1942 Germany built 121 U-boats and only 58 were lost. At the beginning of 1943 Doenitz had 212 operational submarines out of a total of 393 in service compared 91 operational and 249 submarines in service in 1942. The winter/spring of 1943 was the climax of Germany's assault (Gannon 1990: 395).

On 23 April a U-boat torpedoed a merchant ship 540 miles off Jacksonville, Florida and several days later a military blimp spotted a U-boat in the same vicinity. Another plane out of Newfoundland spotted a U-boat 180 miles east of Cape Sable confirming that the German submarines were headed back west. Finally on 29 April a U.S. patrol plane spotted 11 U-boats 40 miles east of Bermuda including one Milch-cow variety (Hoyt 1978:389-391). It had been nine months since an attack and the military commanders were planning on consolidation, reducing, and redirecting the U.S. Sea Frontiers' forces. The American military would be tested again and by the beginning of May the U-boats were back offshore with new tactics. "The U-boat captains used different techniques these days, in the presence of that constant over flight of bombers and patrol planes. The submarine was staying down below and coming up only occasionally for a quick periscope look" (Hoyt 1978:394).

As soon as a U-boat's location was known air and sea support was called in, and unlike in 1942, there

were enough forces to engage and destroy the enemy. Pilots were well versed at using depth charges and surface vessels knew how to attack. One major advancement used by the Americans was the hedgehog or mousetrap, a British invented device that threw a number of small mortar bombs ahead of a vessel. In the past, a vessel had to pass directly over a U-boat before dropping a depth charge that was set to detonate at a predetermined depth. A depth charge also needed to be within 10 feet of a U-boats hull to fatally wound it. Now a U-boat could be attacked anytime by several charges, increasing the likelihood of a hit.

The hedgehog was better than depth charges because the target depth did not have to be known, there were no warning signs of attack as a vessel did not need to maneuver before launching, there was little water disturbance allowing sonar to accurately track a target, and it only took a direct hit from 1 or 2 bombs to sink a U-boat. The hedgehog's success rate was 25% compared to 7% with depth charges.

During 1943 and 1944, U-boats suffered increased losses also due to the use and advancement of Allied A.S.V. (airborne surface vessel radar) outfitted on maritime patrol aircraft. It caused a rise in attacks on U-boats both during the day and at night. Germany developed a radar search receiver which helped but not for long, as the conditions were becoming more hazardous as the Allies strengthened their convoy escorts and U-boats could no longer get close enough to fire their torpedoes. Anti-U-boat weapons and specialists grew culminating in the construction of British and Dutch merchant aircraft carriers (MAC) or bulk cargo ships retrofitted with flight decks where aircraft could be launched and recovered. These cargo ships maintained their cargo carrying capabilities but provided convoy air cover beyond the reach of land based planes. MAC ships were a later offshoot of the previously built catapult aircraft merchantmen (CAM) used earlier in the war. CAMs were British merchant ships equipped with a rocket propelled catapult system to launch a single plane (Busch 1955:120).

U-boats found it harder and harder to do their job and morale amongst crews was very low. For every two ships sunk in the North Atlantic, one U-boat was lost. Doenitz temporarily withdrew his submarine force from the North Atlantic while he found a way to avoid radar detection, which would turn out to be the snorkel or air mast (this allowed U-boats to stay submerged at periscope depth while recharging their batteries). In May 1943 Admiral Sir Max Kennedy Horton, Britain's Commander in Chief Western Approaches, stated, "The tide of the battle has been checked, if not turned, and the enemy is showing signs of strain in the face of the heavy attacks by our sea and air forces" (Busch 1955:121). Aircraft had forced the U-boats to stay submerged for such long periods of time that they became handicapped in finding or following merchant ships. The small successes were not justified by the expense anymore.

The U-boats still remained active in the South Atlantic and Indian Ocean forcing the convoy system to continue while a new type of torpedo, the G7es or Zaunkönig T-5 acoustic torpedo, was put online. This torpedo had a passive acoustic homing device to steer itself to the target. U-boats did have some additional successes with convoy attacks but they were short lived. Despite these attempts, German U-boats tried again in the North Atlantic but only managed to sink 14 ships between 19 September 1943 and 15 May 1944. In fact during September 1943 not a single ship was sunk by a U-boat in the Eastern Sea Frontier and during the first two weeks of the month not a single ship was lost in the whole Atlantic.

Allied skill and determination had changed the tide of the war and driven the Germans home. The mid-Atlantic gap for convoys that had persisted from the beginning of the war was closed by long range aircraft and a larger number of escorts. U-boats no longer had a place to hide or operate free of Allied forces. As shipbuilding efforts, both merchant and military, rose and loses declined Doenitz's plan to sink ships at a faster rate than new ones could be built failed. Supplies poured into Britain and North Africa and the liberation of Europe was coming next.

After the Allied invasion of France in June 1944 and the U.S. Army's occupation of Brittany, the U-boats were forced to operate out of Norway which limited their patrol locations. They were restricted to areas north of the Gibraltar/Hatteras line where Allies concentrated their anti-submarine efforts.

> The Ubootwaffe would stay at sea, with commendable determination, but never again would it be the effective fighting force that was once the scourge of the ocean. Donitz shifted his dwindling units to various suspected "soft spots" in the Atlantic, including again, the American shore, but for the next two years no such spots existed. . . . The huge hostile ocean stood ominously silent. The attempt to wage unlimited war with limited means was over (Gannon 1990:397).

The last U-boat attack in American waters took place on 5 May 1945 when U-*853* torpedoed the U.S. steam merchant vessel *Black Point* five miles off Point Judith, Rhode Island. The steamship was en-route from Newport News, Virginia to Weymouth, Massachusetts with a cargo of 7,759 tons of coal. Out of the 46 man crew, 34 survived the incident. Doenitz sent all the U-boats a cease fire order on 4 May but it was unclear if the U-*853* received it or not.

Immediately after the *Black Point*'s loss, the U-*853* was hunted down by three American warships, destroyer escorts *Atherton* and *Amick* and Coast Guard frigate *Moberly*. They spread out and systematically scanned the area with sonar until finding the submarine by the sounds from its propellers. The U-*853* was hit multiple times with over 200 depth charges and hedgehogs over a twenty-four hour period. In the end the U-*853* was sunk with the loss of all of its 55 man crew (Gentile 2006:354-358).

The last action in the Battle of the Atlantic occurred over a two day period in May 1945 when the Allied (Norwegian) minesweeper NYMS 382 was hit by a torpedo from the U-*1023* and sank off the United Kingdom on 7 May. On that same day, the U-*2336* attacked convoy EN 491 while it was en-route from Hull, England to Belfast, Ireland via Methil, Scotland. Two ships were lost, *Sneland I* and *Avondale Park*. *Avondale Park* became the last merchant vessel sunk during the Second World War. Finally, on 8 May, the U-*320* was damaged by depth charge from a Royal Air Force Catalina plane off Norway. The U-*320* managed to survive the incident but was scuttled by its crew to avoid capture. It was the last German U-boat sunk as a result of direct enemy action.

World War II officially ended on 2 September 1945 (with Germany previously surrendering on 8 May).

The remaining 174 U-boats, at sea or in port, were surrendered to the Allies. By the end of World War II the submarine was considered as the most powerful and destructive of all warships. U-boat commanders' ultimate goal was to cut the lifeline of their Allied enemies and this objective guided their tactics throughout the war on both sides of the Atlantic Ocean.

Historian Nathan Miller wrote that, "In the final analysis, Donitz was battling the productive capacity of American shipyards rather than the convoy escorts. The Allied victory was won as much on the building ways as on the stormy waters of the Atlantic. . ." (Miller 1995:347-348). Germany's only chance at winning the Battle of Atlantic, on both sides of the Atlantic, was in the beginning when anti-submarine tactics had not been put into effect. Unfortunately, for Germany, Doenitz did not have enough U-boats when the war began to have a fighting chance. Hitler's lack of support for the submarine program also hurt Germany's efforts to impact merchant shipping.

"The Germans' attempt to rupture Allied sea communications was the longest battle fought during the Second World War, beginning on 3 September 1939, and ending on 8 May 1845. It was also overall, the most complex battle in the history of naval warfare" (Gannon 1990:398). All in all, German U-boats sunk 2,775 Allied merchant ships, amounting to 14,573,000 tons. Seven hundred and fifty four U-boats were lost equaling 87% of their operational submarines (Gannon 1990:416). Despite the U-boat's successes they never interrupted or stopped the merchant shipping along the American coast, across the Atlantic, or in Europe. Britain's supply lines remained open throughout the war.

World War II Shipwrecks off the East Coast and Gulf of Mexico

Merchant Vessel Losses by U-boats

Merchant vessels were the largest vessel type to be impacted by World War II along the United States' East Coast and Gulf of Mexico. In total, 158 merchant vessels were sunk by German U-boat actions, either by torpedoes or use of deck weapons. There were 147 ships lost in 1942, 7 in 1943, 2 in 1944, and 2 in 1945. The most losses occurred in 1942 between February and May which coincides with Operation Drumbeat. Losses by geographic region include 71 off Virginia/North Carolina, 51 off Florida/Gulf of Mexico (including Louisiana and Texas), 23 off Maryland/Delaware/New Jersey/New York, 8 off Rhode Island/Massachusetts/Maine, 4 off South Carolina/Georgia, and 1 off Puerto Rico.

The vessel type U-boats sank with the most success was the freighter (with 86 losses) followed by tankers (with 61 losses). Additional vessel types include tank barges, fishing vessels, passenger vessels, wooden schooners, and tugs. Merchant ships from around the globe sailed off the United States' shores between 1942 and 1945 but it was the American flag vessels themselves that suffered the most at the hands of Doenitz and his U-boat commanders.

Eighty-five or over 50% of the merchant vessels sunk were American. The British suffered the second most casualties with 15 followed by Norway and Panama each respectively with 13. Other merchant vessel nationalities affected were Honduran, Brazilian, Nicaraguan, Dutch, Mexican, Canadian, Cuban,

Swedish, Yugoslavian, Argentinean, Latvian, Chilean, Greek, and Soviet (Hickham 1989:296-304; Brechtelsbauer [1995-2012]c.; Horodysky 2012b.; Sheard 1998:149).

Month	1942	1943	1944	1945
Jan	15	0	0	0
Feb	21	0	0	0
March	27	0	0	0
April	28	2	1	1
May	25	1	0	1
June	16	1	0	
July	12	1	0	
August	3	0	0	
Sept	0	0	0	
Oct	0	0	0	
Nov	0	0	0	
Dec	0	2	1	
TOTAL	**147**	**7**	**2**	**2**

Table 3. Merchant Vessel Loses by U-boats off the United States' East Coast and Gulf of Mexico during World War II (Brechtelsbauer [1995-2012]c.; Hickham 1989:296-304; Horodysky 2012b.).

Allied Military Vessel Losses by U-boats

There were five military vessel losses off the United States' east coast during World War II as a result of U-boats. The first vessel to be lost was the American USS *Jacob Jones* (DD-130). The 314 foot long destroyer was built in 1919 in Camden, NJ. During World War II it served as a patrol vessel off the Mid-Atlantic until its loss off Delaware on 28 February 1942. The U-*578* torpedoed the *Jacob Jones* while it was operating off Cape May and the Delaware Capes. Only eleven of the 149 man crew survived. The *Jacob Jones* was the first American warship sunk by the enemy after Pearl Harbor. Today the shipwreck lies 32 miles off Cape May in 120 feet of water. The engine and boilers are the only large identifiable features besides portions of the hull that stick up 3 to 4 feet from the sandy bottom. The site has not been archaeologically documented or assessed to see if it meets the National Register criteria.

On 2 May 1942, the 215 foot long American patrol yacht USS *Cythera* (PY 26) was sunk by torpedoes from the U-*402* 115 miles east of Cape Fear, North Carolina. Only two of the 71 man crew survived the incident. The *Cythera* was a steel civilian yacht that was retrofitted by the Navy in 1941/1942 to serve as a patrol and escort boat. It was on its way from Norfolk, VA to Pearl Harbor when it was sunk by the U-boat. The U-*402* took onboard its two survivors and brought them back to France and placed them in a POW camp until the end of the war. The remains of the *Cythera* have not been located.

A few days later on 11 May 1942, the U-*588* sank the British anti-submarine trawler HMT *Bedfordshire* (FY 141) also off North Carolina. The British vessel was loaned to the U.S. Navy for patrols off Cape Lookout. All of the thirty seven crew members were lost with the ship. The shipwreck lies in 100 feet of water 25 miles offshore of Beaufort Inlet. In 2009 National Oceanic and Atmospheric Administration's Office of National Marine Sanctuaries' maritime archaeologists documented the *Bedfordshire* and

assessed its remains. It is broken into three separate pieces with the highest relief only rising 4 feet above the seafloor due to the damage from the torpedo hit.

The next military vessel sunk by a U-boat was the United States Navy yard patrol boat USS YP-*389*. It was originally built as a fishing trawler but was acquired by the Navy in February 1942. It was torpedoed by the U-*701* 20 miles off Cape Hatteras, North Carolina on 19 June 1942. Six sailors went down with the vessels with 18 surviving the attack. In 2009 National Oceanic and Atmospheric Administration's Office of National Marine Sanctuaries' located the shipwreck in 300 feet of water. The YP-*389* is relatively intact and resting upright on its keel.

The last military vessel sunk off the East Coast or Gulf of Mexico by a U-boat was the American patrol gunboat USS *Plymouth* (PG 57). The gunboat was sunk on 5 August 1943 by the U-*566* while it was providing escort service for a convoy headed from New York to Key West, FL. It sank within two minutes with only 85 out of the 155 man crew surviving. The exact location of the incident is not known since the shipwreck has not yet been located.

Vessel Losses by Mines

Mines took down seven vessels off the United States' east coast during World War II. Allied mines accounted for four of those loses and German mines accounted for the other three loses. The American destroyer USS *Sturtevant* (DD-240) was the first vessel sunk by a mine. It departed Key West, FL on 26 April 1942 and two hours outside port, while serving as a convoy escort, it hit several Allied mines eight miles north of the Marquesas Keys. Fifteen of its crew were lost with the ship and 152 survived. The shipwreck lies broken in two large pieces in 60 feet of water.

The American tanker *F. W. Abrams* was the second vessel sunk by a mine but unfortunately it was also an Allied laid mine off North Carolina. The freighter hit the mine and sank on 11 May 1942 while exiting the protection of a mined harbor off Cape Hatteras where it had sought refuge for the night. It lost sight of its escort, veered off course, and hit a mine. While trying to beach itself it hit two more mines and sank in 90 feet of water. The American freighter *Edward Luckenbach* and American tug *Keshena* were the other victims of Allied mines.

The *Edward Luckenbach* sank in 65 feet of water off Key West, Florida on 2 July 1942 and the *Keshena* sank in 90 feet of water off Cape Hatteras, North Carolina on 19 July 1942. All three of those sites have been located and explored by sport divers but the *Keshana* is the only one that has undergone archaeological documentation. In 2011 National Oceanic and Atmospheric Administration's Office of National Marine Sanctuaries' maritime archaeologists documented the site and assessed its remains.

In June 1942, three vessels were lost as a result of hitting German mines of the American coast. The first vessel was the armed British trawler HMS *Kingston Ceylonite*. It was escorting a convoy when it hit the mine, laid by U-*701*, off Virginia Beach on 15 June 1942. It lies in 60 feet of water and is a popular dive site. Two days later on 17 June, the American freighter *Santore* would run into the same U-*701*,

minefield off Virginia and sink. It lies in 60 feet of water and is a known dive site. The final vessel lost due to a German mine, laid by U-*373* off Cape May, was the American tug *John R Williams* which sank on 24 June 1942 off New Jersey. All three vessels have been located but none have been the subject of an archaeological assessment.

U-Boat Losses

Germany suffered many U-boat loses around the world during World War II. The exact number of U-boats lost is not known but between 1939 and 1945 approximately 766 submarines sank taking the lives of around 30,000 German sailors, or 75% of the total U-boat force (there were 1,154 U-boats that were commissioned just before and during World War II). The deadliest year was 1944 with 249 loses but the single deadliest month overall was May 1943 with 41 loses. Most of the U-boats sank because of Allied surface ships and shore based aircraft equipped with depth charges. Fifty U-boats are missing in action and their fate is still unknown (Helgason [1995-2012]b.).

There are twelve U-boats that sank off the United States' East Coast and Gulf of Mexico as result of World War II wartime activities. The limits of this U-boat shipwreck analysis are the extent of the Eastern Sea Frontier and Gulf Sea Frontier. The U-boats sank in three main regions, New England near Massachusetts, the Mid-Atlantic near Virginia or North Carolina, and the Gulf of Mexico. These areas represent the significant battlefield locations during and after Operation Drumbeat.

The first U-boat lost off U.S. shores was the U-*85* that sank off North Carolina on 14 April 1942 and the last was U-*853* that sank off Rhode Island on 6 May 1945. All of the U-boats were sunk by depth charges or gunfire from ships or airplanes. Of those twelve only seven have been positively located and identified, the U-*85*, U-*352*, U-*701*, U-*166*, U-*550*, U-*869*, and U-*853*.

Name	Type	Launch Date	Number of War Patrols	Number Ships Sunk/ Damaged	Cause of Sinking	Survivors	Casualties	Date Lost	Wreck Location (general)	Wreck Location (State)	Wreck Located
U-85	VII-B	4/10/1941	4	3/0	Gunfire From Ship	0	46	4/14/1942	East Coast: Mid Atlantic	North Carolina	Yes
U-352	VII-C	5/7/1941	2	0/0	Depth Charge From Ship	33	15	5/9/1942	East Coast: Mid Atlantic	North Carolina	Yes
U-701	VII-C	4/16/1941	3	9/2	Depth Charge From Plane	7	39	7/7/1942	East Coast: Mid Atlantic	North Carolina	Yes
U-576	VII-C	4/30/1941	5	4/2	Depth Charge from Plane & Gunfire/ Ramming From Ship	0	45	7/15/1942	East Coast: Mid Atlantic	North Carolina	No

U-166	IXC	11/1/1941	2	4/0	Depth Charge From Ship	0	52	7/30/1942	Gulf of Mexico	Louisiana	Yes
U-521	IXC	3/17/1942	3	4/0	Depth Charge From Ship	1	51	6/2/1943	East Coast: Mid Atlantic	Virginia or Maryland	No
U-550	IXC/40	5/12/1943	1	1/0	Depth Charge & Gunfire From Ship	12	44	4/16/1944	East Coast: New England	Massach-usetts	Yes
U-869	IXC/40	10/5/1943	1	0/0	Depth Charge From Ship	0	56	2/11/1945	East Coast: New England	New Jersey	Yes
U-548	IXC/40	4/14/1943	4	1/0	Depth Charge From Ship	0	58	4/19/1945	East Coast: New England	Massachu setts	No
U-879	IXC/40	1/11/1944	1	0/1	Depth Charge From Ship	0	52	4/30/1945	East Coast: Mid Atlantic	North Carolina or Virginia	No
U-857	IXC/40	5/12/1943	3	2/1	Unknown	0	59	4/x/1945	East Coast: Unknown	Unknown	No
U-853	IXC/40	3/11/1943	3	2/0	Depth Charge From Ship	0	55	5/6/1945	East Coast: New England	Rhode Island	Yes

Table 4. German U-boat Loses off the United States during World War II (Brechtelsbauer [1995-2012]d.).

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F. Associated Property Types
(Provide description, significance, and registration requirements.)

Name of Property Type

World War II Shipwrecks along the East Coast and Gulf of Mexico.

Description

World War II shipwrecks along the East Coast and Gulf of Mexico are categorized as shipwrecks with a wooden, iron, steel, or ferro-cement hull that sank due to enemy action during the German U-boat campaign along the United States' East Coast and Gulf of Mexico during World War II. Shipwrecks sunk as a result of Allied or German mine fields laid off the East Coast and Gulf of Mexico during World War II (to sink U-boats or protect shipping from U-boats) should also be considered under this nomination. A final category of vessels losses include those that were sunk while on a war time patrol as a result of collisions or storms. Patrols types include, but are not limited to, anti-submarine or convoy duties.

The ships sank between 13 January 1942 and 6 May 1945, the period of German U-boat operations in United States' waters. The shipwrecks are located in federal waters starting from the state/federal boundary extending to the outermost boundary of the National Historic Preservation Act's jurisdiction in federal waters which is the Exclusive Economic Zone (EEZ) or out to 200 nautical miles. All vessels constructed and lost prior to 6 May 1945 would be at least 50 years old and meet the minimum qualifications to be considered a historical property as defined by the National Register of Historic Places criteria. The shipwrecks are considered casualties of war and can be classified as an Allied merchant vessel, Allied military, or Axis military vessel. Some vessels sunk during World War II are considered purpose built for war time activities, while others were adapted to meet the needs of war time maritime commerce and naval actions. Adaptation of peace time vessels for war time transportation and military use was expected but historical information does often not contain specifics about the changes made to individual vessels.

There were numerous classes of Allied merchant ships during World War II lost in the Western Atlantic off the United States' East Coast and Gulf of Mexico. The main types include passenger, tankers, freighters, barges, towboats/tugs, and schooners. Merchant vessels for the purpose of this multiple property listing include those controlled or chartered by the War Shipping Administration (WSA) as well as those not under the WSA's control. The vessels could also either be U.S. or foreign owned. In addition to merchant vessels there were Allied (American and British) military ships lost as well as Axis (German) military vessels. Historical record indicates that the known Allied military ships include two American destroyers, a Q-ship, a patrol yacht, patrol boat, and patrol gunboat as well as two British armed anti-submarine trawlers. The only Axis military vessel type sunk was the German U-boat. While it is possible that there are other Allied merchant, Allied military, or Axis military casualties off the America coast, numerous historians have combed the records and lists are known to be accurate and complete.

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Review of historically reported vessel losses based on primary and secondary sources of information such as newspapers, popular shipwreck books, databases, and personnel communications yielded the following list of 187 vessels that were lost off the United States' east coast and in the Gulf of Mexico and meet the National Register of Historic Places criteria. Vessels below are listed in chronological order in which they sank and included only vessel losses associated with U-boat or mine activity. There might be vessels that meet this nomination's criteria that are not included on this list such as vessels lost during war time patrols as a result of storms and collisions and not during conflict or interaction with a German U-boat or mine.

Allied Merchant (163)

Norness	*Naeco*	*Gulfpenn*
Coimbra	*Dixie Arrow*	*Potrero Del Llano*
Brazos	*Equipoise*	*Amapala*
Allan Jackson	*City of New York*	*Gulfoil*
City of Atlanta	*Allegheny*	*Heredia*
Lady Hawkins	*Barnegat*	*Halo*
Ciltvaira	*Menominee*	*Plow City*
Norvana	*Tiger*	*Persephone*
Olympic	*Rio Blanco*	*Hamlet*
Venore	*David H Atwater*	*Berganger*
Empire Gem	*Otho*	*C. O. Stillman*
Varanger	*Byron T Benson*	*Sheherazade*
West Ivis	*British Splendour*	*Cities Service Toledo*
Francis E. Powell	*Lancing*	*Port Nicholson*
Rochester	*Atlas*	*Managua*
W.L. Steed	*Esparta*	*Cherokee*
Amerikaland	*Malchace*	*Santore*
India Arrow	*San Delfino*	*San Blas*
San Gil	*Gulfamerica*	*Rico Tecero*
China Arrow	*Tamaulipas*	*Major General Henry Gibbins*
Major Wheeler	*Chr Knudsen*	*Rawleigh Warner*
Ocean Venture	*Ulysses*	*John R Williams*
Tolosa	*Leslie*	*Manuela*
Blink	*Korsholm*	*Nordal*
Buarque	*Margaret*	*Ljubica Matkovic*
Olinda	*Empire Thrush*	*William Rockefeller*
Miraflores	*Alcoa Guide*	*Empire Mica*

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Pan-Massachusetts	*Robinhood*	*Edward Luckenback*
Azalea City	*Desert Light*	*Alexander Macomb*
Republic	*Steel Maker*	*Bayard*
Cities Serice Empire	*Chenango*	*Umtata*
W.D. Anderson	*Pipestone County*	*J A Moffett Jr*
Mamura	*San Jacinto*	*Nicholas Cuneo*
Marore	*Arundo*	*Benjamin Brewster*
R P Resor	*Ashkhabad*	*R.W. Gallagher*
Leif	*Taborfjell*	*Bluefields*
Arabutan	*Worden*	*Keshena*
Cayru	*Bidevind*	*Baja California*
Gulftrade	*Ocean Venus*	*Chilore*
Hvosleff	*Laertes*	*Oaxaca*
Caribsea	*Sama*	*Robert E. Lee*
Albert F Paul	*Joseph M. Cudahy*	*Manzanillo*
John D Gill	*Munger T. Ball*	*Santiago de Cuba*
Tolten	*Norlindo*	*R M Parker Jr.*
Trepca	*Alcoa Puritan*	*Gulfstate*
Lemuel Burrows	*Halsey*	*West Imboden*
Ario	*Amazone*	*Panam*
Australia	*Ontario*	*Esso Gettysburg*
San Demetrio	*Ohioan*	*Bloody Marsh*
Ceiba	*Torny*	*Touchet*
Kassandra Louloudi	*Lubrafol*	*Libertad*
E M Clark	*F W Abrams*	*Pan-Pennsylvania*
Papoose	*Virginia*	*Cornwallis*
W E Hutton		*Swiftscout*
Liberator		*Black Point*

The exact location of approximately half of these vessels is empirically known. Some 32 (or nineteen percent) of the 163 Allied merchant vessels have been archaeologically examined in some fashion. Much of this work has been done by the National Oceanic and Atmospheric Administration's Office of National Marine Sanctuaries or the Bureau of Ocean Energy Management. None of those sites are listed on the National Register of Historic Places. An additional 54 vessels have been located but their shipwrecks have not been documented. Preliminary searches have not located any World War II era merchant vessel similar in vessel type to the above list held in a museum collection.

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Allied Military (7)
USS *Sturtevant* (DD-240) – U.S. Clemson class destroyer
USS *Jacob Jones* (DD 130) – U.S. Wickes class destroyer
USS *Cythera* (PY 26) – U.S. patrol yacht
HMS *Bedfordshire* – British armed naval trawler
USS YP-*389* – U.S. yard patrol boat
HMS *Kingston Ceylonite* – British anti-submarine trawler
USS *Plymouth* (PG 57) – U.S. patrol gunboat

The only Allied military sites that have been archaeologically examined are the HMT *Bedfordshire* and the YP-*389*. National Oceanic and Atmospheric Administration's Office of National Marine Sanctuaries' maritime archaeologists documented the two sites in 2009 during larger project to record the Battle of the Atlantic shipwrecks off North Carolina. Neither of these two military vessels are listed on the National Register of Historic Places. The USS *Sturtevant*, USS *Jacob Jones*, and HMS *Kingston Ceylonite* have been located but not undergone archaeological site assessments yet. Numerous military vessels from World War II are owned as floating museums in the United States today but none of the above vessel's classes (Clemson class destroyer, Wickes class destroyer, World War II patrol yacht, yard patrol boat, or patrol gunboat) are included in those collections.

Axis Military-German U-boats (12)
U-*85* – type IXC/40
U-*352* – type VII-C
U-*701* – type VII-C
U-*576* – type VII-C
U-*166* – type IXC
U-*521* – type IXC
U-*550* – type IXC/40
U-*869* – type IXC/40
U-*548* – type IXC/40
U-*879* – type IXC-40
U-*857* – type IXC/40
U-*853* - type IXC/40

The only U-boat sites that have been archaeologically examined are the U-*85*, U-*352*, U-*701*, and U-*166*. National Oceanic and Atmospheric Administration's Office of National Marine Sanctuaries' maritime archaeologists documented the U-*85*, U-*352*, and U-*701* in 2008 during larger project to record the Battle of the Atlantic shipwrecks off North Carolina. All three of these U-boats are popular recreational dive sites and have been subject to heavy artifact collection. The U-*166* was documented in 2003 by archaeologists from the Bureau of Ocean Energy Management, C&C Technologies, Inc., and the PAST Foundation. The U-*166* lies in over 5,000 feet of water so it has been largely undisturbed. None of these four U-boats are listed on the National Register of Historic Places. There are five World War II era U-boats held in museums around the world. The only one in the United States is the U-*505* (type IXC)

which is at the Museum of Science and Technology in Chicago. It is also listed on the National Register and as a National Historic Landmark due to its unique status as a war prize. There is only one U-boat shipwreck protected by an underwater preserve, the U-*1105*. In 1995 Maryland designed the U-*1105* as its first historic shipwreck preserve and it is now part of NOAA's National Marine Protect Area System. The U-*1105* (type VIC) was a war prize and turned over to the United States after Germany's surrender. In 1949 it was sunk off Piney Point, Maryland during depth charge testing by the Navy.

To date, approximately 97 World War II shipwrecks have been located (85 merchant vessels, five allied military vessels, and seven U-boats) and approximately 37 of those sites have been archaeologically investigated (31 merchant vessels, two allied military vessels, and four U-boats) along the East Coast and Gulf of Mexico. Currently, none of those sites are listed on the National Register of Historic Places. Sites have been documented with varying degrees of completeness from side scan sonar or multibeam sonar surveys to remotely operated or autonomous underwater vehicles projects as well as diver assessments. Each shipwreck site consists of different level of site integrity from some very intact vessels to others that have little remains protruding above the sediment. Cultural artifacts were found within the vessel's structure as well as around the wreck sites on the seafloor. Site preservation also varies between sites and was effected by site formation processes such as vessel type, cargo, cause of sinking, post war wreck removal actions, shipwreck location/depth, and level of human interaction with the site (i.e. diver access and fishing).

Significance

Shipwrecks nominated under this multiple property submission are historically and archaeologically significant at the national level due to their involvement in World War II. They qualify for listing on the National Register of Historic Places under criteria A (associated with events that have made a significant contribution to the broad patterns of our history) and criteria D (have yielded or may be likely to yield, information important in history or prehistory) in the areas of transportation, commerce, military, and historical archaeology. The shipwrecks qualify for listing under criteria A because they have a well-documented and significant association with World War II and the German U-boat campaign to target merchant shipping off the United States' east coast and Gulf of Mexico. The U-boat campaigns off America's coasts and in its waters were the single most protracted battle fought by the United States in World War II, spanning the length of the war and thousands of miles of coastline. The shipwrecks will also qualify under criteria D because their archaeological remains will answer research questions about vessel construction, cargo, shipboard life, and their wrecking events that historical materials have not covered. The span of vessel construction and types covers a century of development and changes in naval architecture, propulsion, navigation, and armament and represent types of ships now completely vanished but once common participants in the regular maritime trade, coastal and overseas, of the United States from the 1890s to the 1950s. The shipwreck remains are part of the larger maritime battlefields and cultural landscape of America's participation in World War II which includes waters close to home, but also in distant oceans near foreign countries. Detailed statements about how shipwrecks would qualify under criteria A and D are covered below.

Merchant Shipping along the United States during World War II (criteria A)

The abundance of unprotected merchant shipping on the United States' Eastern Seaboard and in the Gulf of Mexico provided a significant opportunity for Germany's submarines or U-boats. They targeted merchant vessels in hopes of impacting the movement of war time supplies within the United States and abroad. The convoy system that developed as a result of the U-boat threat changed the way goods were moved in order to minimize the chances of being sunk. Ocean going merchant ships, typically freighters and tankers, supplied and fueled the Allied war effort and were vital to the success of strategic campaigns that led to the war's end. The Allied merchant vessel shipwrecks are significant due to their role as a link between war time goods being produced back home and troops fighting on the front line. They sailed throughout war both alone and in convoys despite the dangers from U-boat torpedoes and guns. To qualify under criteria A, a merchant shipwreck must possess enough integrity to be identified and connected to the larger merchant shipping network during World War II.

Allied Military Response to U-boat Attacks during World War II (criteria A)

The Allied military response to the German U-boat actions was reflective of tactics developed during World War I. However, American military commanders were unprepared for the *Kriegsmarine* to strike so close to U. S. shores and did not have the physical assets nor tactics to combat the U-boats in the first months of 1942. Over the course of three years the tide of the war changed and German U-boats were unable to reach their goal of sinking more merchant shipping than could be replaced. The Allied military shipwrecks are significant because they contribute to the broad patterns of history, more specifically war time naval military efforts. A shipwreck site must have enough structural integrity to be identified and demonstrate its association with Allied anti-U-boat operations.

Axis (U-boat) Military Actions off the United States in World War II (criteria A)

The German U-boat campaign that started with Operation Drumbeat in January 1942 and continued until Germany's surrender in May 1945 was a significant part of World War II that occurred closest to America's shores. The coordinated U-boat attacks on merchant shipping along the East Coast and Gulf of Mexico caught the American military and merchant shipping community off guard. Defense against the threat ultimately required centralization and organization of military and civilian vessels, airplanes, and manpower to limit the U-boats targets. The use of submarines by Germany to go after the Allied supply chain instead of targeting military assets was groundbreaking. The U-boat shipwrecks are significant because they are directly associated with Germany's campaign against American shipping. They were the weapons used to directly attack Allied shipping and military defenses and their physical remains on the ocean floor are a link to our past struggles for freedom. The physical remains must convey that the shipwreck is a U-boat and was used in the historical context as referenced previously in this nomination.

Vessel Design, Use, and Adaptation (criteria D)

Archaeological information can record details about vessel design, use and adaptation to war time pursuits. Merchant ships were often times retrofitted to carry specific supplies needed for the Allied campaign. They were also outfitted with armaments such as deck mounted guns to fend off U-boat attacks. The historical record is vague about how these vessels were altered to support these weapons. While a number of Allied military vessels were purpose built, like the USS *Jacob Jones*, many, like the HMT *Bedfordshire*, were adapted for military service. The *Bedfordshire* was built in 1935 as a commercial fishing trawler, but was bought by the British Admiralty in 1939 and repurposed for anti-submarine and escort duty. Documentation of the shipwrecks can record features not captured in the historical record. Lastly, research can uncover details about U-boat construction and use. U-boat design and weaponry was constantly evolving throughout the war and more importantly during the three years they roamed the American coast. Many German records were destroyed at the end of the war making an archaeological site the only place, in many circumstances, to learn about military vessel construction.

Merchant Cargo Transport (criteria D)

The tremendous numbers of merchant vessels, diversity of vessel type, and cargo transported along the east coast and in the Gulf of Mexico made it difficult to record and conserve shipping documents. The geographic distribution of ship owners, departure ports, and arrival ports also made it challenging to track cargo movements during the war. Often, a cargo manifest might not include all the supplies onboard especially during war time to avoid being a target of enemy attack or sabotage. Archaeological investigations can yield information about what a vessel was transporting as well as how it was stored and how the vessel was built or modified to carry a specific cargo (i.e. a freighter vs. a tanker).

Shipboard Life (criteria D)

Future site investigations can provide information about the lives of crewmen who operated both military and merchant vessels during World War II. Little documentation of the crew's day to day life onboard exists in the historical record, making archaeological investigation a significant way to yield insight into the livelihood of military or merchant seamen. Archaeological information derived from a single shipwreck might show differences and/or similarities in the crew's background, ideology, economic status, and life-ways through documentation of personal items and family mementos. Artifacts found on shipwrecks may yield information that illuminates differences and/or similarities between geographic locales based on the vessel's home port or the crew's cultural affiliation.

Wrecking Event (criteria D)

Events surrounding the sinking of an Allied merchant, Allied military, or German U-boat in many cases, can only be examined through an analysis of its archaeological remains. Information extracted through the archaeological investigation of the shipwreck site can identify the cause of the vessel's demise and the crew's activities onboard just prior to and during the sinking event. In most cases little or no detailed

information exists in the historical record about the wrecking event since this information was kept secret during wartime. Local newspapers might have covered the story were censored to minimize panic by the American people or to protect Allied anti-submarine activities. In many cases there was great loss of life so there were few survivors to chronicle the sinking event. Analysis of the wrecking event may yield information about where exactly a torpedo, mine, depth charge, or gunfire hit. Archaeological survey might reveal deficiencies in the design and operation of a vessel that may have contributed to the vessel's demise. Variables such as a vessel design or age, its engine's type and age, the amount of knowledge crew members had in operating new technology, or the variety of anti-submarine weapons onboard at the time of the loss can lend greater depth to the story of the German U-boat campaign off America and its maritime veterans.

Registration Requirements

In order for a shipwreck to be eligible for listing as part of this multiple property submission under criteria A and D at the national level, there must be physical evidence that a shipwreck was a vessel sunk as a result of World War II activities off the United States' East Coast and Gulf of Mexico and it must be located in federal waters out to the EEZ and can be either American or foreign flagged as well as merchant/civilian or military. The property must potentially yield information on the history of wartime merchant shipping, Allied military actions, or Axis (U-boat) actions during World War II. Key registration requirements are that the property must have sufficient structural integrity to visually convey the historic function, design, and use of the vessel, whether it is a merchant ship, military vessel, or U-boat. It can be purpose built or adapted for war time use. Site integrity must be sufficient for archaeological investigation to also yield information about vessel design, use and adaptation, cargo stowage, shipboard life, and its wrecking event.

Evidence of its location should consist of a multibeam or side scan sonar image at minimum. To be considered eligible for individual listing, the archaeological site must have sufficient integrity for archaeologists to determine that the shipwreck is a vessel that sunk during World War II through documentation of diagnostic features that indicate its function and identity. Historically reported vessel losses may be used in tandem with archaeological information to ascertain the site's identity and age. Sites may be eligible even if disturbed by natural forces or human interactions as long as enough archaeological integrity remains to have the potential to yield useful information.

Artifacts will not be considered individually eligible or as contributing to the significance of a multiple property submission unless they can be associated with a specific shipwreck. If such artifacts have the potential to yield information because of their own characteristics apart from any associated with a wreck, they may be considered as significant objects, as opposed to a site.

Threats

World War II shipwrecks have been located in depths ranging from 50 feet to over 6,000 feet. The character of the physical remains present at a shipwreck site results from the wrecking process and

subsequent impacts from natural and anthropogenic forces. The wrecking process for World War II vessels lost in federal waters includes three separate causal factors that influence site preservation. Torpedo attack was a leading cause of vessel destruction. The torpedo hit and subsequent explosion caused major structural failure of a vessel's hull as well as fire. Due to the various locations of the torpedo impact as well as cargo volatility the amount of structure entering the archaeological record differs from case to case. Impacts from American and German mines were another cause of vessel loss. Again the archaeological record would vary based on vessel cargo and mine impact location. Lastly, the archaeological remains of German U-boats sunk due to depth charges and surface gunfire will differ compared with a larger military or merchant vessel sunk because of torpedoes or mines.

All materials submerged in the marine environment undergo degradation based upon environmental factors and the material's composition. Largely constructed of iron or steel, World War II era vessels are digested slowly by marine organisms and bacterial decomposition. Metal hulls, fastenings, and machinery corrode and lose tensile strength. The archaeological site's degradation reaches a plateau where the degradation process slows and concretions develop that encase and protect metal objects. Material buried in the sediment is the best preserved as it is surrounded in an anoxic environment that preserves both organic and inorganic material.

The most significant threat to World War II historic shipwrecks is from commercial and recreational fishing activities. Negative impacts to site's can be directly correlated with their location in areas subject to gillnet fishing, bottom trawling, and hook and line bottom fishing. Bottom trawling has the greatest negative impact potential. Single impacts from trawl gear may crush or disarticulate hull structure and remove artifacts from the site. Repeated trawl gear impacts can completely destroy a shipwreck. Trawl nets may also become entangled in the wreck structure, impeding public access and archaeological research. Gillnet fishing also negatively impacts shipwreck structure through the deployment and recovery of the net. Gillnet fishermen often intentionally set their gear on shipwreck structure. While the net itself weighs very little, weighted lines and anchors destroy artifacts and structure. Gillnetting's greatest negative impact results when the fishermen recovers the gear and finds it snagged on the wreck. Gillnetters can exert tremendous pull on their gear in an attempt to break the snag free, leading to destruction of shipwreck structure. Oftentimes gillnet fishermen cannot recover their net; it remains entangled in the wreck continuing to fish and impeding access. These abandoned nets also act as underwater sails and exert tremendous force on a wreck as oceanic currents pass through a site.

Additional threats to World War II shipwrecks come from recreational diver activities. While diving will not necessarily damage a shipwreck, certain diving practices and activities have the potential to impact historical resources. The techniques, both above and underwater, associated with diving on a shipwreck may negatively impact a shipwreck if not done with care and resource preservation in mind. To access sites, boats often drag their anchor across the seafloor, through debris fields, or into the shipwreck itself in hopes of locating or securing to a site. Repetitive anchoring on, or securing a down line to, a shipwreck can increase its rate of structural deterioration and reduce the site's archeological and historical significance. Once underwater, divers' actions can be low-impact, such as observing the

shipwrecks and their marine life or photographing and videotaping the site. But high-impact actions, such as souvenir collecting and the removal of artifacts reduce a site's archaeological significance. Artifacts lose their provenance once removed from a site and are no longer able to provide as much information about their history. Additionally, artifacts recovered from the marine environment deteriorate if not properly conserved and thus lose their ability to educate the general public.

Current Protection

The federal mandate to protect and manage historical resources arises from various U.S. federal regulations and laws as follows:

- Antiquities Act of 1906
- Historic Sites Act of 1935
- Archaeological and Historic Preservation Act of 1960
- National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. § 470 et seq.)
- Department of Transportation Act of 1966 (section 4(f))
- Presidential Order 11593 of 1971
- National Environmental Policy Act (NEPA) (Section 101(b)(4))
- National Marine Sanctuaries Act (NMSA) of 1972 (16 U.S.C. § 1432 et seq.)
- Archaeological Resource Protection Act of 1979 (ARPA) (16 U.S.C. § 470aa et seq.)
- Sunken Military Craft Act (Pub.L. 108-375, 10 U.S.C. 113 Note & 118 Stat. 2094-2098, Title XIV)
- Department of State Public Notice 4614

All federal agencies must comply with all laws and regulations of the Federal Archaeology Program, such as the National Historic Preservation Act (NHPA) and Archaeological Resource Protection Act (ARPA). These regulations require the federal agencies to develop a heritage resource inventory and management program, oversee federal activities that may affect historic and cultural resources, and nominate potentially eligible sites to the National Register of Historic Places. In addition to complying with Section 110 of the NHPA, federal agencies are required by Section 106 of the same act to take into account such actions that may impact historic properties and to allow the Advisory Council on Historic Preservation an opportunity to comment on such actions.

G. GEOGRAPHICAL DATA

World War II activities off the United States' east coast and Gulf of Mexico took place off the coast of the following states: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas. These states were included in the U.S. military's Eastern Sea Frontier and Gulf Sea Frontier which centralized the protection of merchant shipping, defense of the coast, and anti-U-boat operations. This area also covers the extent of the German U-boat campaign off American shores during World War II.

The known shipwrecks that may be eligible under this nomination are sunk off Maine, Massachusetts, Rhode Island, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Louisiana, and Texas. The waters and bottom land covered under this nomination include the state/federal boundary out to the extent of the EEZ, which is 200 nautical miles. This area constitutes the boundary of this multiple property nomination.

H. SUMMARY OF IDENTIFICATION AND EVALUATION METHODS

The multiple property listing has been developed based upon historical and archaeological research on World War II shipwrecks started in 2008 by the National Oceanic and Atmospheric Administration's (NOAA) Office of National Marine Sanctuaries (ONMS) and Monitor National Marine Sanctuary (MNMS). Since a large number of World War II shipwrecks sites lay very near the MNMS, the ONMS has been researching and documenting these sites to have a greater understanding about the Battle of the Atlantic and Operation Drumbeat. The ONMS' Battle of the Atlantic project seeks to develop a better understanding of the areas context to allow historians, archaeologists, and the general public with a better appreciation of the individual shipwreck sites' background and significance. It also places these shipwrecks in a larger maritime cultural landscape and provides data for education and outreach initiatives.

Research from primary and secondary sources provided the background for the historical context section of this nomination. A multitude of books and websites have written about the German U-boat campaign during World War II and this nomination aimed to compile that information in a concise manner with a focus on the campaign off the United States' east coast and Gulf of Mexico. The historical context serves as a way to link together shipwrecks located all around the coast. Their individual stories differed but the reason behind their loss remained the same. They are tangible connections to a dramatic time in United States and world history.

Initial research for the shipwreck portion of this nomination was based off of an inventory of shipwrecks compiled by NOAA for the U.S. Coast Guard that contained vessels carrying potentially hazardous or polluting cargoes. The Remediation of Underwater Legacy Environmental Threats (RULET) database contained vessel particulars as well as wrecking information. The list was supplemented by additional research in secondary source materials to develop a comprehensive list of World War II loses off the east

coast and Gulf of Mexico. The survey identified a range of resources all sunk due to war time activities as a result of the German U-boat campaign. Three main categories of vessels identified are Allied merchant, Allied military, and Axis military. The only Axis military vessels lost were German U-boats. Information about shipwreck locations and archaeological survey results was gathered from government reports as well as popular dive guides and general shipwreck books/websites.

Archaeological data analysis is based off a wide range of survey methodologies. The type of information gathered (i.e. multibeam sonar vs. a diver) and level of individual site documentation varies considerably. In some cases trained maritime archaeologists gathered the data during targeted projects while other times untrained sport divers reported their observations on blogs and websites. The analysis is only as good as the information gathered so the accuracy and completeness varied based on the information source. Technologies used for site assessments included multibeam sonar, side scan sonar, remotely operated vehicles, autonomous underwater vehicles, and divers. Data gathered from these instruments are digital point clouds, still photos, video, and visual surveys. The nominated properties must have had enough archaeological data available to provide an exact location, determine its identity, and convey its tie to the historic context of World War II and the German U-boat assault on America.

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