The U.S. Army Air Forces in World War II

Air Power versus U-boats

Confronting Hitler's Submarine Menace in the European Theater

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in the European Theater

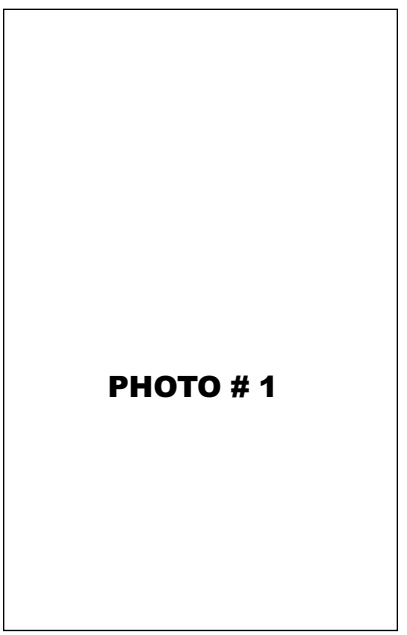
More than fifty years after World War II, America's major air power contribution to the war in Europe—in efforts such as Big Week, Regensburg, and Patton's dash across Europe—live on in the memories of airmen and students of air power. Never before had air forces performed so many roles in so many different types of operations. Air power proved to be extremely flexible: wartime missions included maintaining air superiority, controlling the air space over the battlefield; strategic bombardment, destroying the enemy's industrial and logistical network; air-ground support, attacking targets on the battlefield; and military airlift, delivering war matériel to distant bases.

Perhaps one of the least known but significant roles of the Army Air Forces (AAF) was in antisubmarine warfare, particularly in the European-African-Middle Eastern theater. From the coasts of Greenland, Europe, and Africa to the mid-Atlantic, AAF aircraft hunted German U-boats that sank thousands of British and American transport ships early in the war. These missions supplemented the efforts of the Royal Navy, the Royal Air Force Coastal Command, and the U.S. Navy, and helped those sea forces to wrest control of the sea lanes from German submarines.

German U-boats Threaten Allied Shipping: December 1941–June 1942

Before the United States entered World War II, the German submarine offensive against shipping across the North Atlantic was throttling Great Britain. U-boats were sinking merchant ships and tankers delivering war matériel from the United States faster than the British could replace them. The concern for both nations was that German submarines might counterbalance the advantage in resources that the United States provided to Great Britain under the Lend-Lease Act. In the long term, German control of the sea lanes might pose an even greater threat. Early in 1941, British and American leaders held secret meetings in Washington, D.C., to consider the possibility of becoming allies in a war against the European Axis (Germany and Italy) and Japan. The officials realized that an Allied war in Europe would eventually entail an invasion of Europe across the English Channel. Without American and British control of the shipping lanes, that invasion would be impossible.

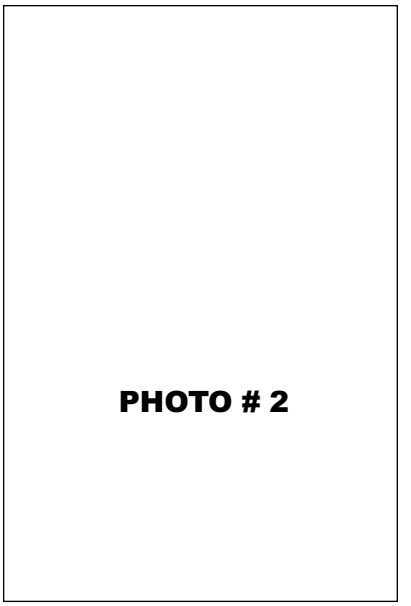
Meanwhile, enemy submarine forces concentrated on a single strategic objective: to sink enough Allied shipping to cripple the war effort. At the beginning of the war, Germany withdrew its U-boats from operational areas when Allied antisubmarine warfare severely limited their operations against shipping. But German dictator Adolf Hitler saw the Atlantic Ocean as his first line of defense in the west. Nazi U-boats could prevent the Allies from striking back with air and sea power, and from transporting troops and supplies to be used in any land invasion of Europe. When the United States formally declared war on Germany and Italy on December 11, 1941, Germany energetically pursued its submarine strategy.



Adm. Ernest J. King

The United States was grossly unprepared for an antisubmarine war. The U.S. Navy, under the command of Adm. Ernest J. King, was responsible for antisubmarine defenses, but it lacked trained manpower, specialized surface vessels, and long-range (400- to 600-mile radius) or very-long-range (up to 1,000-mile radius) aircraft. Thus, King had to call for support from the U.S. Army Air Forces (AAF) commander, Gen. Henry H. Arnold. But, like the Navy, the AAF was unprepared for antisubmarine operations.

AAF aircraft carried bombs rather than depth charges and lacked radar or other special submarine detection equipment. No trained personnel were available for the specialized job of detecting and attacking submarines from the air, and the AAF had no organization dedicated to antisubmarine operations. Perhaps the most serious problem was that the few combat aircraft on hand (approximately 3,000) were in sudden demand for many other important operations.



Gen. Henry H. "Hap" Arnold

Germany quickly took advantage of this unpreparedness. Within a month of the U.S. declaration of war, the first German submarine arrived in American waters. Between mid-January 1942 and the end of June, U-boats sank 397 ships—171 off the east coast of the United States, 62 in the Gulf of Mexico, and 141 in the Caribbean Sea. Many of these vessels were tankers. In the beginning of March, Adm. Karl Dönitz, commander of Germany's submarine fleet, used specially modified U-boats to refuel and resupply operational submarines. These "milch cow" submarines, as he called them, extended a U-boat's patrol of five to six weeks to averages of sixty-two days with one refueling and eighty-one days with a second refueling. This practice vastly expanded each submarine's effectiveness in the American theater.

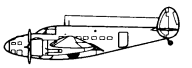
By June, the U.S. Navy, supported by the AAF, had driven most of the U-boats from the east coast, but enemy submarines continued to wreak havoc on Allied shipping in the Gulf of Mexico and the Caribbean Sea. The Allies lost three million tons of shipping and five thousand men, mostly in American waters, during the first half of 1942. The loss of cargo grievously endangered Great Britain's ability to continue the war.

The AAF Response: Tactics, Technology, and Organization

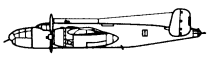
Reacting to the ferocity of the U-boat offensive, the AAF developed and adopted tactics that exploited the submarine's need to surface frequently. A submarine emerged daily, usually at night, to recharge its batteries, ventilate the boat, and permit crew members to come topside. It often traveled or pursued convoys on the surface because its submerged speed averaged three knots (nautical miles per hour), whereas its surface

Adversaries in the Battle of the Atlantic

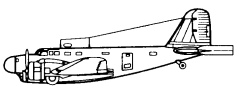
Relative Sizes of USAAF Aircraft and German Submarines



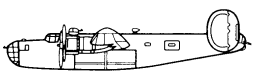
Lockheed A-29



North American B-25

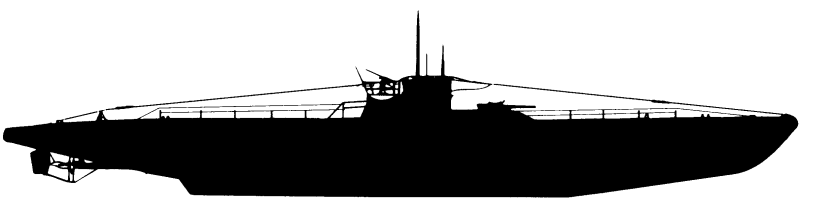


Douglas B-18



Consolidated B-24

Boeing B-17



German Type VII *

100'

The Type VII U-Boats were the most numerous German submarines in the North Atlantic.

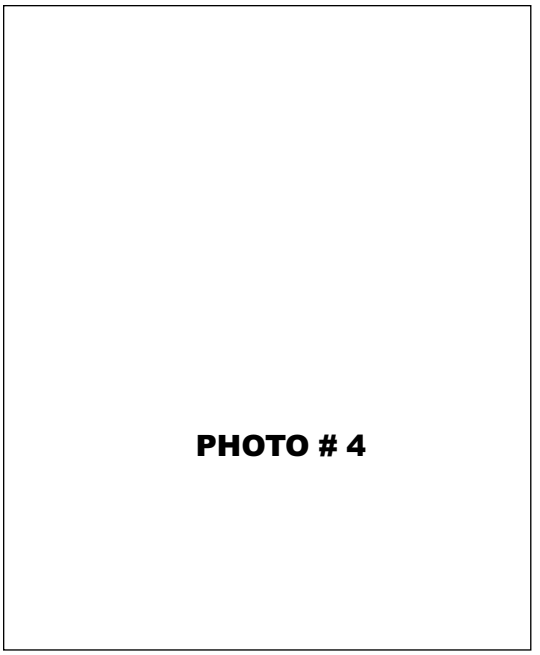
speed was about fifteen knots, much faster than the ten knots of most merchant ships. Furthermore, submarines remained on the surface to maneuver for attacks and usually to fire their torpedoes or guns before submerging. When Allied escort ships discontinued their search for the submerged U-boats, the Germans could emerge again and circle ahead of the convoy to make another attack. Aerial patrols prevented this maneuver by forcing submarines to dive frequently and remain submerged too long to catch up with the convoys.

By June 1942, the AAF was conducting two broad types of antisubmarine patrols. At the request of the U.S. Navy, AAF crews often escorted Allied convoys to prevent enemy submarines from attacking ships at close range. However, the AAF preferred to take the offensive by flying routine aerial patrols. Searching coastal waters and areas stretching one hundred miles out to sea required precise navigation, reliable communications, and sudden attacks to surprise U-boats traveling on the surface.

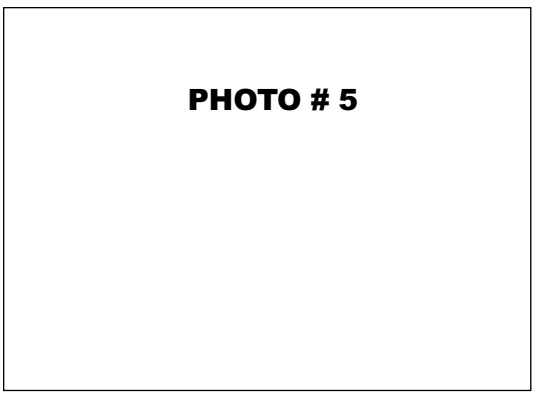
Regardless of the type of patrol, aircrews normally flew hundreds of hours without sighting a submarine. Boredom could not be allowed to dull the crew's reflexes because a successful attack had to take place no more than fifteen to thirty-five seconds after a submarine submerged. Surprise was crucial in sinking or heavily damaging a submarine. Once a target was spotted visually or by radar, the pilot achieved surprise by flying in clouds, with the sun behind the aircraft. Attacking at an angle of 15 to 45 degrees increased the chances of a hit or near-miss. The pilot would fly as low as possible, preferably about fifty feet above the water, and would ideally drop the depth bomb within twenty feet of the submarine's pressure hull. The aircrew dropped depth bombs in clusters of six spaces, to fall at fifty- to seventy-foot intervals. As the aircraft passed over, the crew would also fire their machine guns in an effort to damage the submarine and suppress antiaircraft fire.

A specially equipped four-engine Consolidated Vultee B–24 Liberator was the AAF's best answer to the submarine threat, particularly in the European-African-Middle Eastern (EAME) theater. The B–24 entered the conflict in the winter of 1942. When the U.S. Navy deployed its escort carriers in mid- to late-1943, the Liberator provided the most effective means for locating and attacking U-boats operating more than four hundred miles offshore. The U.S. Navy and the Royal Air Force (RAF) Coastal Command also flew the antisubmarine plane.

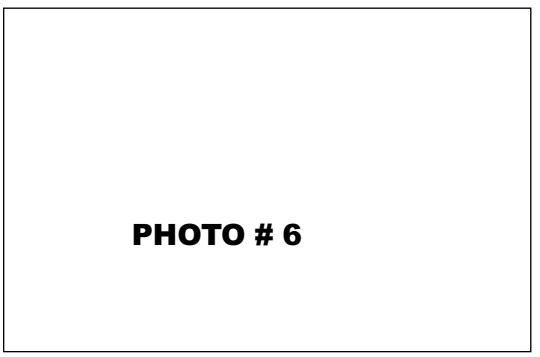
Carrying up to 2,500 gallons of fuel, the modified B–24 had an impressive range—about three hours of patrol time after flying a thousand miles from its base. A mission could last sixteen hours, although the average was ten to twelve hours. The Liberator flew day and night, except in bad weather. The heart of the antisubmarine B–24's capabilities was its microwave radar equipment, known as Airborne Surface Vessel Detection ten millimeter (ASV–10) radar. A skillful operator could identify a surfaced submarine at more than forty miles and the conning tower at fifteen



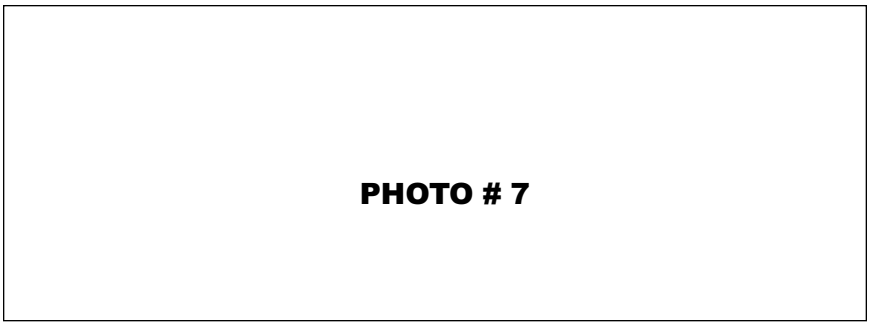
A B–24 Liberator on antisubmarine patrol delivers a death blow by depth charge to a cruising German submarine.



Her stern ripped open by the force of the charge, the U-boat sinks to her grave in the Atlantic.



Two days later, the crew of another B–24 sights six German U-boat crewmen afloat in a rubber dinghy more than one hundred miles from the place where their submarine was destroyed.



The Consolidated Vultee B–24 Liberator was the most effective AAF aircraft for locating and attacking enemy submarines.

to twenty miles. Other special equipment included the absolute altimeter, the magnetic anomaly detector (MAD), and the long-range aid to navigation (LORAN).

The absolute altimeter used a modified microwave radar to determine an aircraft's altitude within ten feet. It replaced the much less exact barometric instrument and permitted aircraft to fly safely as low as fifty feet when attacking submarines. Lower-altitude attacks substantially improved the chances of destroying the target.

The magnetic anomaly detector located any change in the magnetic field of the earth created by a large metal object such as a submarine. MAD-equipped aircraft patrolled areas where submarines had been spotted but had submerged. Crews often combined MAD with a radio sonobuoy, a technique designed to detect the sounds of a submerged submarine. Thus, MAD permitted an intensive air search with a high probability of success.

Aircraft equipped with LORAN received radio signals from three known points, thus allowing navigators to pinpoint their locations within four miles at a range of 1,200 to 1,500 miles from the transmitters. LORAN permitted efficient control of forces converging on submarines for intensive attacks. It also allowed a navigator to guide patrolling aircraft to the most likely location of a surfaced submarine, as determined from intelligence information.

The modified B–24 carried six 500-pound depth bombs; four 20-mm, forward-firing cannons; and six .50-caliber machine guns. In the fall of 1943, several B–24s were fitted with a chin turret housing four more machine guns for increased forward firepower. Depth bombs had shallow fuse settings, and when dropped on a submerging submarine, their blunt shape caused them to sink slowly and explode at a depth of about twenty-five feet. Vessels equipped with adjustable depth charges attacked U-boats immersed at greater depths.

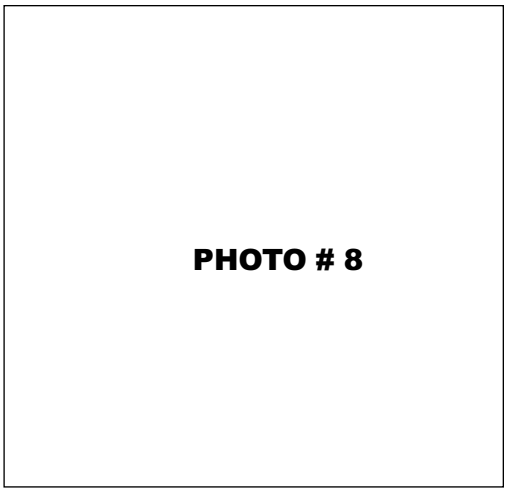
Reorganization of the AAF's antisubmarine forces was the final strategy designed in response to the specialized demands of the U-boat threat. Serious disagreements had arisen between the U.S. Navy and the AAF over antisubmarine tactics and the control of AAF forces in U.S. waters. To resolve these conflicts and improve the control and training of AAF antisubmarine forces, Arnold decided to centralize the forces under one organization. On October 15, 1942, the AAF established its Antisubmarine Command under Brig. Gen. Westside T. Larson. The I Bomber Command had been the AAF's primary antisubmarine unit since the beginning of the war, so it provided most of the personnel, aircraft, and equipment for the new command. The new organization introduced unity of command for antisubmarine forces within the War Department. Training, administration, and maintenance also grew more flexible and effective. Although the AAF's antisubmarine groups and squadrons continued under the operational control of the U.S. Navy, they benefited from the reorganization as well.

The Battle of the Atlantic: July 1942–May 1943

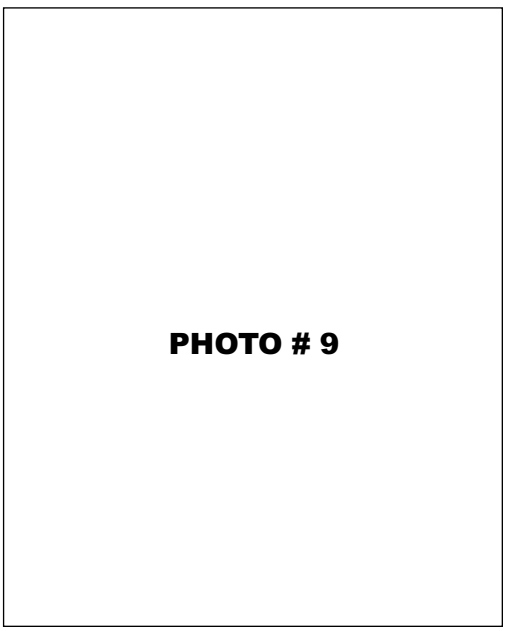
During the AAF's antisubmarine reorganization, the most important battle of the antisubmarine war in the EAME theater raged in the North Atlantic. Following the policy of seeking the most lucrative targets, Adm. Dönitz redeployed most of his U-boats to the North Atlantic in July 1942. The Allies responded by providing aerial coverage for escorted convoys crossing via the great circle route between ports on the east coast of the United States and Great Britain—except for a five-hundred-mile gap between 25°W and 45°W longitude. Dönitz deployed his wolf packs in screens at both ends to intercept convoys sailing into the gap. The eastern screen fell entirely in the EAME theater.

Dönitz soon had the advantage of superior tactical intelligence while British intelligence faltered. At the onset of the war, Britain had successfully deciphered enemy military codes encrypted by a German code machine called Enigma. This intelligence, known as Ultra, was one of the most important secrets of World War II. In February 1942, the German navy replaced the Enigma machine from the Atlantic U-boat network with a more complex version that created codes the British could not decipher for the rest of the year. Redirecting the convoys on a short notice to avoid wolf packs was hopeless. The Germans also began reading the Allied convoy code in February and used the information to intercept the convoys.

Free from aerial attack and supplied with exceptional intelligence, the U-boats could take advantage of other Allied difficulties in the North Atlantic. Between September 1942 and March 1943, fuel shortages forced shipping convoys to take the shortest track, the great circle routes across



Enigma message coding machine



German soldiers using the Enigma machine in the field.

the North Atlantic. Meanwhile, the winter weather created rough seas and limited visibility, which frequently allowed the submarines to approach convoys undetected.

By August 1942, eighty-six German submarines were hunting in the North Atlantic; this number remained virtually constant until June 1943, except for a brief period in November and December 1942. Exploiting Allied handicaps, the Germans successfully located and intercepted convoys during this time more frequently than at any other time in the war: from

August to November, they sank seventy ships in the North Atlantic. Over those four months, Germany lost thirty-three submarines to Allied attacks, one in a collision, and another to a mine. Seventeen of the losses occurred in the North Atlantic. The Allies damaged only seven U-boats during convoy attacks.

Following the Allied assault landings in North Africa on November 8, 1942, the Germans redeployed most of their submarines from the North Atlantic to the mid-Atlantic, off the northwest African coast, and in the approaches to the Straits of Gibraltar. A relatively small force—twenty to thirty submarines compared with the normal force of eighty to ninety—continued to harass North Atlantic convoys in November and December. The Germans sank twenty-one ships, but lost only one U-boat.

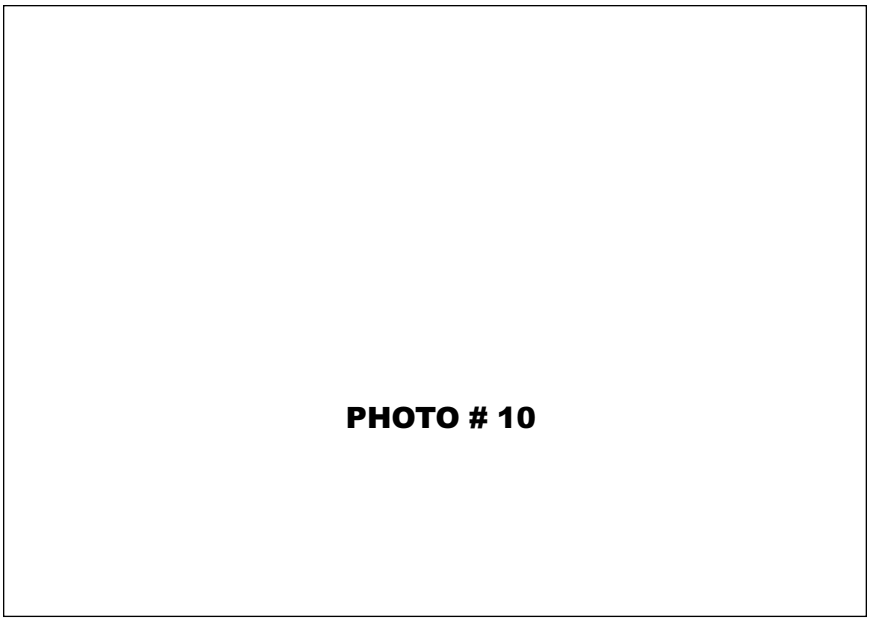
In December, the scales began to tip in favor of the British. Cryptologists began again to decipher the German U-boat code. By March 1943, the Allies confirmed what the British had suspected the previous December: the Germans were reading the Allied convoy code. The Allies finally instituted a new code in June 1943 to confound enemy intelligence operators. By August, the British were reading German messages almost as soon at they were intercepted. The Allies had regained the advantage in the intelligence battle.

Early in 1943, the Germans retained the strategic initiative in the Battle of the Atlantic. The submarine offensive severely threatened the Allies' ability to transport cargo. In the last quarter of 1942, the United States began to build merchant ships rapidly enough to offset losses inflicted by the U-boats. For their part, the Germans were building enough submarines to replace their losses and increase the number of operational U-boats at sea.

At an Allied conference in Casablanca, Morocco, in January 1943, the Allies adopted a renewed resolve. Great Britain and the United States agreed to give the war against the German submarines first priority. Modified B–24 aircraft would be used to patrol the North Atlantic aerial gap because escort carriers were not yet available. After the conference, the British immediately began operating antisubmarine B–24s from bases in Ireland and Iceland to cover the eastern part of the gap.

In the meantime, Dönitz positioned most of his operational U-boats against the North Atlantic convoys. The submarines sank 31,700 tons of Allied shipping for every U-boat lost from January to March 1943. Eighty-five ships succumbed to the German submarines, at a cost of only eight U-boats. In April, the AAF Antisubmarine Command moved three B–24 squadrons to Newfoundland to cover the western half of the gap. Two AAF units, the 1st and 2d Provisional Bombardment Flights, began flying a few B–25D Mitchell bombers on convoy coverage from Blue West One, an airfield on Greenland.

Meanwhile, the U.S. Navy deployed its first escort carrier to close the North Atlantic gap in aerial coverage. The combination of the new carriers and the use of Ultra information to direct convoys around the U-boat



Gathered for an Allied conference in Casablanca, Morocco, in 1943, President Franklin D. Roosevelt, *seated left,* and Prime Minister Winston Churchill, *right,* turn to discuss a point with Gen. George C. Marshall, *standing fourth from left.* AAF commanding general Henry Arnold stands second from left.

screens effectively neutralized the German submarine offensive. In April and May 1943, the Allies lost thirty-eight ships totaling 218,000 tons in the North Atlantic convoy battles, but between April 25 and May 20, they destroyed sixteen U-boats engaged in attacks on convoys. In these two months, the Germans sank 13,625 tons of Allied shipping for every submarine lost, about half the ratio for March. So, on May 26, Dönitz withdrew virtually all German submarines from the North Atlantic, essentially conceding victory to the Allies in the Battle of the Atlantic. Almost 1,700 Allied ships crossed the ocean in June and July 1943 without any losses.

Following the defeat in the North Atlantic, Dönitz changed U-boat strategies. Rather than trying to disrupt transatlantic supply lines, he switched to a more defensive strategy of tying down large Allied antisubmarine forces in widely scattered areas. Small groups of submarines deployed to the east coast of the United States, the Caribbean Sea, the coast of Brazil, the Atlantic coast of North Africa, and the Indian Ocean. In the long run, those U-boats had minimal effect on the war, and German submarines could not retard the buildup of Allied forces in Great Britain preparing for the invasion of occupied Europe.

Hunting in the Bay of Biscay: November 1942–October 1943

While AAF antisubmarine units played a minor role in the Battle of the Atlantic, they made a far greater contribution in assisting British forces on patrol in the Bay of Biscay. To reach patrol areas in the Atlantic from July 1940 until October 1943, almost a year after the AAF ceased antisubmarine operations, most German submarines sailed from four French ports through the Bay of Biscay. From the west coast of France and the north coast of Spain, the bay extends to Ushant Island off the coast of Brittany, France, south to Cape Finisterre at the northwest tip of Spain. Approximately 300 miles from north to south and 120 miles east to west, the Bay of Biscay was a relatively confined transit area that could be patrolled by long-range aircraft flying from bases in Britain.

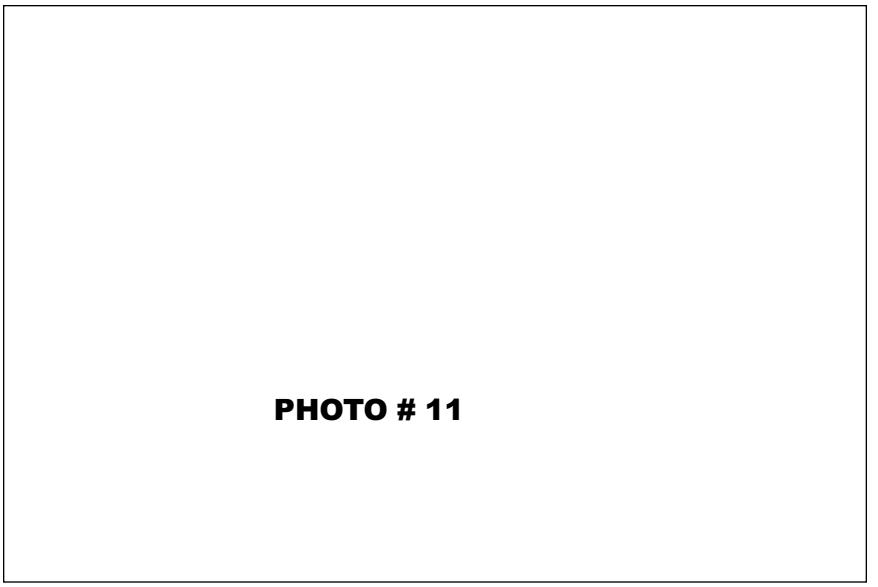
The RAF Coastal Command, in charge of Britain's aerial antisubmarine effort, patrolled the bay as frequently as possible. To assist the British, the AAF sent antisubmarine groups at two different times. The first joined the RAF Coastal Command in February 1943, before moving to North Africa. The second operated over the bay from July through October 1943.

By the fall of 1942, the Germans had equipped their submarines with a warning device to detect longwave radar and thus avoid being caught on the surface. The RAF Coastal Command immediately requested a contingent of B–24 Liberators equipped with microwave radar, which the enemy could not detect. In response, the AAF sent the 1st Antisubmarine Squadron, under the command of Lt. Col. Jack Roberts, to Great Britain in November.

While stationed at St. Eval, Cornwall, the 1st Antisubmarine Squadron operated under the control of RAF Coastal Command. It flew its first mission on November 10, long before reaching its full strength of sixteen aircraft. Subsequent flights were nominally in support of Operation Torch, the Allied invasion of North Africa. They were, however, essentially training missions that extended up to six hundred miles into the Atlantic Ocean south and west of the British Isles. The squadron quickly became familiar with the British methods of flight planning, communications, patrol patterns, and administration and learned to use the new microwave radar equipment aboard the B–24s. Soon the aircrews were accustomed to long and exhausting missions of ten to twelve hours.

Two months later, in January 1943, the 2d Antisubmarine Squadron joined the 1st at St. Eval. The two squadrons became the 1st Antisubmarine Group (Provisional) on January 15, the day before their first command patrol.

Augmented by the American squadrons, the RAF Coastal Command planned a nine-day offensive in the bay to coincide with the February return of German submarines from convoy battles in the North Atlantic.



The Junkers Ju 88 was a medium-range, twin-engine fighter that flew cover for German U-boats in the Atlantic.

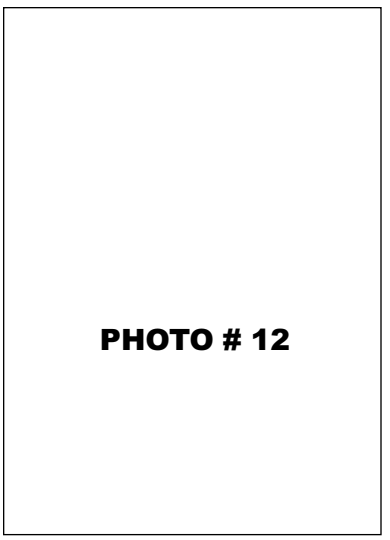
Beginning on February 6, the command flew over three hundred missions, which resulted in nineteen sightings and eight attacks. With the advantage of microwave radar, the American B–24s accounted for fifteen sightings and five attacks. On the 10th, "Tidewater Tillie," a Liberator of the 2d Antisubmarine Squadron, piloted by 1st Lt. W. L. Sanford, sank U–519 about six hundred miles west of Lorient, France—the first U-boat kill by the AAF in the EAME theater.

In the four months that American B–24s were stationed in Great Britain, their aircrews flew 1,966 hours in 218 missions, sighting twenty German submarines, attacking eleven, and sinking one. On the average, they made one sighting for every 98.3 hours of flying time and one attack for every 177.8 flight hours. The Americans achieved these results despite losses from enemy aircraft attacks.

In February, after Dönitz complained that his submarines received inadequate air support, the Luftwaffe increased the number of medium-range, twin-engine fighters flying cover for the submarines crossing the Bay of Biscay. The 1st Antisubmarine Group encountered Ju 88s on four occasions and damaged at least two enemy aircraft, losing one B–24 in aerial combat; two other Liberators failed to return from their missions and may have been shot down by Ju 88s. Overall, the group lost sixty-five crew members and seven B–24s between November 1942 and March 1943. The Americans flew the last patrol over the Bay of Biscay on March 5, before deploying to North Africa.

In April the continued pressure from the RAF Coastal Command led Dönitz to change his methods of operations. U-boats crossing the Bay of Biscay were ordered to submerge at night, surface during the day to recharge batteries and travel more swiftly, and fight any attacking aircraft. The last tactic proved to be a serious mistake. A month later, the British sank seven submarines in sixty-four attacks, at a cost of six aircraft. The German commander did not realize the Allies' uncanny ability to locate submarines with microwave radar and Ultra intelligence. On June 1, he ordered the submarines to cross the bay in groups, believing that their combined antiaircraft flak would drive off the British aircraft. Two weeks later, the Germans lost another U-boat, and two more were severely damaged. The commander also ordered the submarines to cross the bay submerged and to surface only to charge batteries, but that practice seriously harmed crew morale at the beginning of their patrols. Slowing down the submarines shortened their time on battle stations once they cleared the bay and allowed the RAF Coastal Command more time to locate them when they surfaced. Dönitz also failed to revoke the fatal order that required surfaced submarines to fight off attacking aircraft.

The additional antisubmarine B–24s that Sir John Slessor, commander of the RAF Coastal Command, had been requesting from the United States since March finally arrived in late June 1943. The AAF Antisubmarine Command sent the 4th and 19th Antisubmarine Squadrons directly from Newfoundland to St. Eval. Benefiting from the experience of the squadrons based there earlier in the year, the 4th and 19th were organized on July 8 as the 479th Antisubmarine Group under Col. Howard Moore. Administrative support came from the Eighth Air Force, and the group served under the operational control of the RAF Coastal Command. In August, the 479th moved from St. Eval, the RAF's main base for the Bay of Biscay operations, to a less-crowded base at Dunkeswell, approximately seventy miles to the east. One month later, the group received the aircraft and air echelon of the 6th and 22d Antisubmarine Squadrons.



Sir John Slessor

Having received renewed support and reinforcement, the Coastal Command planned more intensive operations over the Bay of Biscay, using aircraft and surface vessels no longer needed on the convoy routes. The Allies soon developed an effective killer-hunt operation. The Coastal Command arranged new search patterns, having

aircraft fly parallel courses three times each day in a wide area north and northwest of Cape Finisterre. The AAF B–24s patrolled the southernmost areas near the coast of Spain.

The revitalized American patrols found good hunting. On July 13, the 479th Antisubmarine Group flew its first mission over the bay. Only a week later, 1st Lt. C. F. Gallmeier, a B–24 pilot from the 19th Antisubmarine Squadron, bombed U–558 approximately 150 miles north of Cape Finisterre. The U-boat's crew abandoned ship just as the B–24, flying on three engines, turned toward its home base. That same day, near the area of Gallmeier's attack, a pair of German submarines shot down an AAF Liberator. All aboard were killed. That was the only AAF B–24 lost to U-boat antiaircraft fire in the Bay of Biscay offensive because enemy submarines usually failed to seriously damage the attacking aircraft before being forced to submerge. On July 28, a B–24 of the 4th Antisubmarine Squadron sank U–404, two hundred miles north of Cape Finisterre.

As large numbers of aircraft and naval vessels were released from North Atlantic convoy duty in mid-1943, the pace of the deadly killer-hunt operations in the Bay of Biscay quickened. When a patrolling aircraft spotted and unsuccessfully attacked a German submarine, it radioed the location to its home base. The information was passed on to higher headquarters, which dispatched a force of ships and aircraft to maintain contact with the submarine and attack as the opportunity arose.

In a single engagement on one exceptional day, the Allies' killer-hunt tactics netted three German submarines in the Bay of Biscay. On July 30, 1943, an AAF B–24 Liberator spotted three U-boats almost 150 miles north of Cape Finisterre. Short on fuel, the pilot radioed the position and brought to the area one British Sunderland, a four-engine flying boat; two British Halifax aircraft, a four-engine long-range bomber; another AAF B–24; and a U.S. Navy flying boat. These five aircraft attacked the three submarines through a barrage of antiaircraft fire. Eventually, a Halifax ruptured the pressure tank of U–462, and the other Halifax left. Soon, a Royal Australian Air Force Sunderland arrived to attack and to sink U–461. As a British task force of surface vessels sailed onto the scene, another Halifax destroyed U–462. The warships then blew up the submerged U–504 with depth charges. This effort, involving aircraft and ships of five Allied armed services, epitomized joint tactical cooperation in antisubmarine warfare. Three days later, about 250 miles north near the northwest area of the cape, another B–24 of the 4th Antisubmarine Squadron sank U–706—the last kill scored by the AAF B–24s in the bay. The 479th Antisubmarine Group ended operations with only one more sighting and unsuccessful attack between early August and October 31, 1943.

Instead of attacking submarines, the AAF B–24 Liberators spent August and September fighting German aircraft. For two months, the Luftwaffe provided enough air coverage to threaten Allied aerial control over the Bay of Biscay. Although the B–24 aircrews avoided combat whenever

possible, enemy aircraft aggressively pursued the fight. Ju 88s, usually flying in groups of six or more, accounted for a dozen Allied aircraft lost, including two AAF B–24s, and fourteen American lives. Still, the Luftwaffe could not drive the Allies from the bay.

All in all, the Bay of Biscay operations met the RAF Coastal Command's expectations. The 479th Antisubmarine Group flew an average of only 54 hours per sighting in July 1943, an exceptional record compared with most AAF Antisubmarine Command patrols, which flew hundreds of hours off the east coast of the United States and in the Caribbean Sea without a single sighting. From July 13 to August 2, the 479th's aircrews sighted twelve submarines, attacked seven, and sank three. During that time, the relatively small area of the bay accounted for about a quarter of all Allied attacks on U-boats and almost 40 percent of those destroyed. The entire Allied offensive, from mid-May to early August, destroyed twenty-eight U-boats and severely damaged seventeen others, forcing them to return to home port for repairs. Seldom could a U-boat surface in or near the Bay of Biscay without being spotted by an aircraft. German submarine forces could not recover the initiative they had lost during the convoy battles in the North Atlantic earlier in the year.

Guarding the Straits of Gibraltar: March–October 1943

Complementing the Bay of Biscay operations by the 479th Antisubmarine Group were the efforts of the 1st and 2d Antisubmarine Squadrons in the Moroccan Sea Frontier. The AAF Antisubmarine Command moved these two squadrons from St. Eval, Great Britain, to Port Lyautey, Morocco, in March 1943 to shore up scanty Allied antisubmarine defenses in the Atlantic approaches to the Straits of Gibraltar. German U-boats had very recently sunk four ships in an Allied convoy about a hundred miles off the coast of Portugal. Over the long term, the Allies wanted to increase air antisubmarine patrols and convoy coverage to protect their preparations for the impending Tunisian offensive and the subsequent invasion of Sicily.

The 1st and 2d Antisubmarine Squadrons operated fifteen B–24s from Port Lyautey, joining two U.S. Navy PBY Catalina squadrons patrolling from Morocco. The two squadrons were assigned to the Northwest African Coastal Air Force for administration and placed under the operational control of the U.S. Navy's Fleet Air Wing 15, which answered to the commander of the Moroccan Sea Frontier. (The Northwest African Coastal Air Force was the Allied organization responsible for air operations in the Mediterranean Sea.) The AAF units flew their first mission on March 19, despite shortages of spare parts, equipment, and maintenance personnel. Ordinarily, three B–24s flew daily on operational missions, covering an area as far south as 30°N, as far north as Cape Finisterre, Spain, and as far west as a thousand nautical miles from Port Lyautey.

Much of the time, the Liberators flew convoy coverage for ships sailing from or approaching the Straits of Gibraltar.

On March 22, three days after the squadrons' first mission, 1st Lt. W. L. Sanford scored the first U-boat kill in the North African campaign. Flying "Tidewater Tillie," he attacked and sank U–524 in the Canary Islands area, more than six hundred miles southwest of Port Lyautey. Patrolling in scattered clouds at twelve hundred feet, the aircrew made a surface-radar contact at a range of about five miles. A few seconds later, the copilot sighted a broad wake. The pilot flew into a cloud and turned to follow the wake. As the aircraft emerged, the crew spotted the submarine. With the sun behind him, Sanford flew two hundred feet above the water at two hundred miles per hour until the B–24 crossed the U-boat. Because of the aircraft's camouflage and Sanford's careful approach, enemy lookouts did not spot the aircraft until it was too late to dive. The bombardier released four depth bombs sixty feet apart, and their explosion broke open the submarine's stern. In less than two minutes, the submarine sank, leaving several survivors clinging to debris.

By June, the B–24 aircrews had spotted and attacked several enemy submarines but they had not sunk another one. The situation improved dramatically in July, following the June 19 reorganization of the 1st and 2d Antisubmarine Squadrons into the 480th Antisubmarine Group, under the command of Col. Jack Roberts. In late June, Dönitz doubled the number of submarines screening the approaches to Gibraltar. In July, under intense pressure from the Bay of Biscay offensive, the U-boats began hugging the Spanish coast as they left their French ports. The coastal mountain ranges of Spain formed a backdrop that interfered with microwave radar detection of surfaced submarines. Once past Cape Finisterre, the U-boats sailed southwesterly off the coast of Portugal. Thus, many submarines were concentrated in a relatively small area of the mid-Atlantic between the Azores and the Straits of Gibraltar, well within range of the 480th Group's B–24s.

From July 5 to July 15, the 480th Antisubmarine Group sighted fifteen U-boats, detecting twelve of them with radar at an average range of eighteen miles. One sighting occurred at night. That relatively high number of detections can be attributed to several factors: advanced microwave radar, carefully planned patrols, and the use of Ultra information to plot probable locations. Of the fifteen U-boats sighted, the group attacked thirteen, sank three, and damaged several more. The first kill was U–951, sunk by a B–24 of the 1st Antisubmarine Squadron on July 7, over four hundred miles west of Lisbon. The next day, a Liberator of the 2d Antisubmarine Squadron destroyed U–232 about two hundred miles northwest of Lisbon. The 1st Squadron scored again on July 12 when it sank U–506 about five hundred miles west of Cape Finisterre.

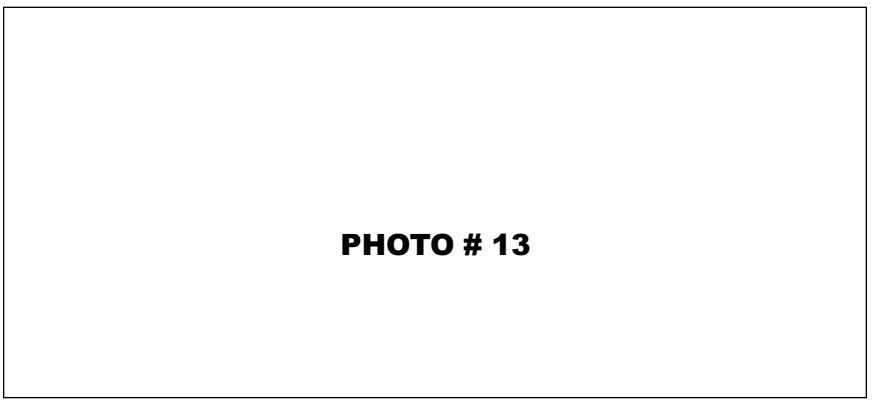
Sightings tapered off after mid-July as submarines began to travel submerged or at night as near the coast line as possible. Dönitz redeployed

most U-boats further west in the mid-Atlantic, beyond the Liberators' range. There they became prey to the U.S. Navy's escort carriers. Between June and October, the escort carriers, guided by Ultra intelligence, located and destroyed nine of the ten refueling submarines operating in the mid-Atlantic. This dealt a severe blow to the offensive capabilities of the entire German submarine fleet.

Although the 480th Antisubmarine Group located no submarines in August, it did engage in antiair operations. The Luftwaffe mounted intense air patrols in the Moroccan Sea Frontier with the long-range, four-engine Focke-Wulf 200 Kondor maritime patrol airplane (FW 200). On the 17th, two FW 200s attacked a single B–24. With two engines knocked out and a wing aflame, the Liberator had to ditch, but not before destroying one enemy aircraft and badly damaging the other. Seven U.S. crew members were rescued at sea. Overall, the 480th's record against German aircraft can be counted a limited success: three aircraft lost versus five enemy FW 200s downed from August through October 1943.

During its peak effort, between March and August 1943, the 480th Antisubmarine Group flew 8,832 combat hours, including 5,742 on antisubmarine patrols, searching for surfaced U-boats. The remaining 3,090 hours were spent escorting convoys approaching the Straits of Gibraltar from four hundred to eight hundred miles out in the mid-Atlantic, beyond the range of U.S. Navy Catalinas.

As the submarine threat decreased in the mid-Atlantic and the approaches to Gibraltar, the Allies redeployed some of their antisubmarine forces to support landings in Italy. Thus, on September 23, the 1st Antisubmarine Squadron moved with ten B–24s from Port Lyautey to Protville, Tunisia. This base was located between Tunis, on the east coast, and Bizerte, on the north coast about thirty-five miles northwest of Tunis. For the first fourteen days, the 1st Squadron operated under the Northwest



The Focke-Wulf 200 Kondor was a long-range maritime patrol airplane that the Germans used in the Moroccan Sea Frontier.

African Coastal Air Force. On September 4, the B–24s began searching for enemy submarines and shipping between Sicily and Naples. The squadron covered this area twenty-four hours a day until the landing of the U.S. Fifth Army at Salerno, Italy, on September 9, when it extended antisubmarine patrols to cover the sea west of Sardinia and Corsica. One B–24 destroyed three German flying boats northwest of Sardinia. In addition to the antisubmarine patrols, the 1st Squadron flew escort for several Allied convoys and covered the escape of Italian naval vessels from Genoa and Spezia to Malta following Italy's surrender. After returning to Port Lyautey on September 18, the 1st Squadron operated in the Moroccan Sea Frontier until it moved to the United States in November 1943.

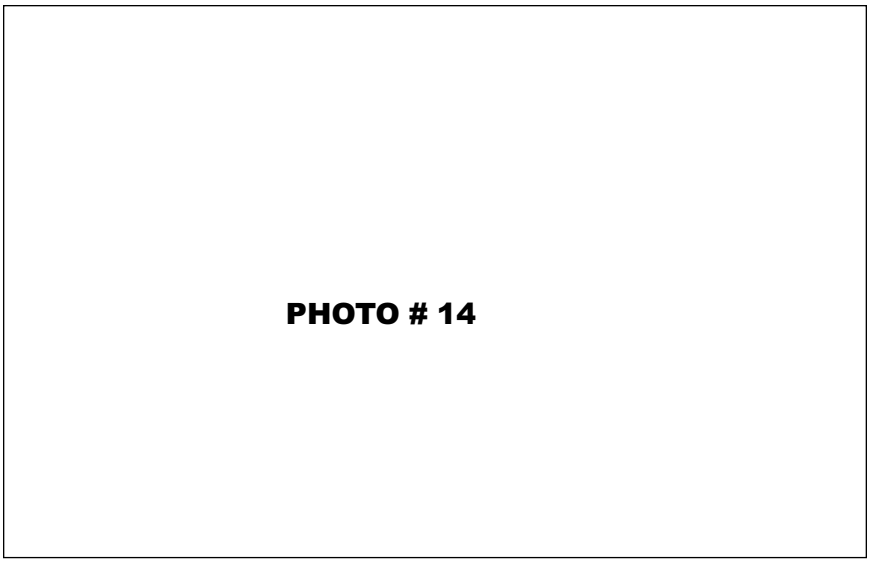
That return to the United States marked the final stage in the AAF's withdrawal from its antisubmarine mission. On July 9, 1943, the U.S. Army and the U.S. Navy had agreed that the AAF would withdraw from antisubmarine operations. On August 31, the AAF disbanded the Antisubmarine Command, although the 479th Antisubmarine Group in Great Britain and the 480th Antisubmarine Group in Morocco continued operations through October 1943. The 479th was dissolved on November 11, and its personnel and equipment went to the Eighth Air Force. The 480th returned to the United States in November, to be disbanded on January 29, 1944.

Bombing German Submarine Pens: October 1942–April 1945

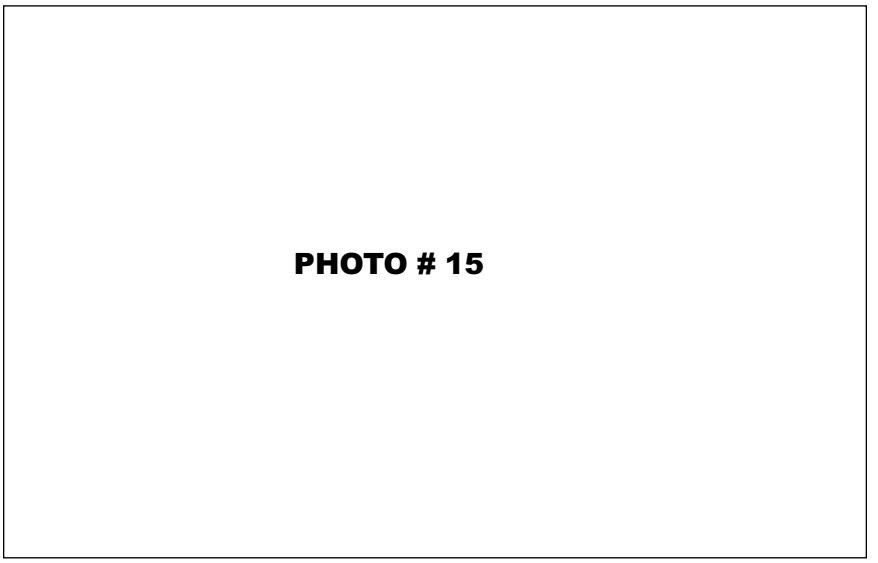
The AAF's strategic bombardment of enemy ports and harbors also contributed to the destruction of the German U-boat fleet, although such operations were not part of the official Antisubmarine Command. From October 1942 through July 1943, U.S. strategic forces bombed German submarine pens in France with little effect. From March 1944 to April 1945, they proved far more successful in destroying U-boats anchored in harbors on the Mediterranean, North, and Baltic Seas.

After the fall of France in 1940, Germany built facilities at five ports—Brest, Lorient, St. Nazaire, La Pallice (or La Rochelle), and Bordeaux—to accommodate its submarine fleet. U-boats returning to port were serviced within bombproof concrete pens. The surrounding towns provided workers, hotels, and recreation for the crews. Until the Allied landing on the continent in 1944, those facilities berthed most of the U-boat fleet.

In early 1942, when the Allies gave top priority to the war against the German submarines, they targeted the submarine manufacturing plants in Germany and the submarine pens in France for strategic bombardment. A successful intensive bombing effort would decrease the production rate for submarines, reduce the number of U-boats at sea, and disrupt the refitting of operational submarines. In a directive issued on October 20, the Allied



Above: **In an underground submarine pen in Hamburg, Germany, two U-boats were destroyed by the blast of an Allied bomb that punctured the pen's twelve-foot-thick concrete roof.** ***Below:*** **U.S. Eighth Air Force officer Maj. Milton Stahl peers from ground level into the hole in the pen's roof.**



commander-in-chief, Gen. Dwight D. Eisenhower, gave the submarine pens and production facilities first and second priority, respectively. Over the next ten months, the Eighth Air Force, the AAF's strategic bombing

organization in Great Britain, concentrated on bombing submarine bases in France.

Ninety bombers—B–17s and B–24s—attacked the U-boat base at Lorient on October 21. Because of bad weather, only fifteen aircraft managed to drop thirty high-explosive, one-ton bombs. Five bombs reportedly hit the submarine pen, but failed to penetrate its reinforced concrete. The rest fell in the general area, damaging two submarines not in the pen and destroying several buildings, docks, and other facilities. The raid inflicted about 150 civilian casualties, mostly among German workers. The AAF bombers encountered very little antiaircraft fire, but lost three aircraft to enemy fighters.

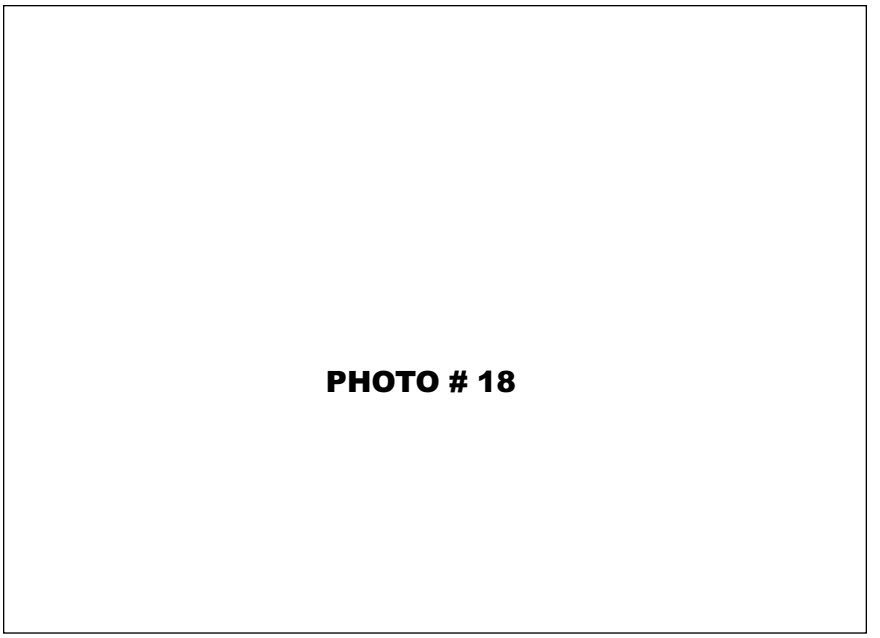
The Lorient mission foreshadowed the difficulties that the Eighth Air Force would have in attacking submarine pens. Protecting not only the submarines but most necessary repair and maintenance facilities, the pens were virtually impervious to all but the heaviest bombs. Destroying nearby structures had little effect on the enemy's ability to refit operational submarines. Unfortunately, the AAF raids caused only some temporary dislocations and harassed the enemy by destroying auxiliary facilities and neighboring railway

PHOTO # 16

Gen. Dwight D. Eisenhower

PHOTO # 17

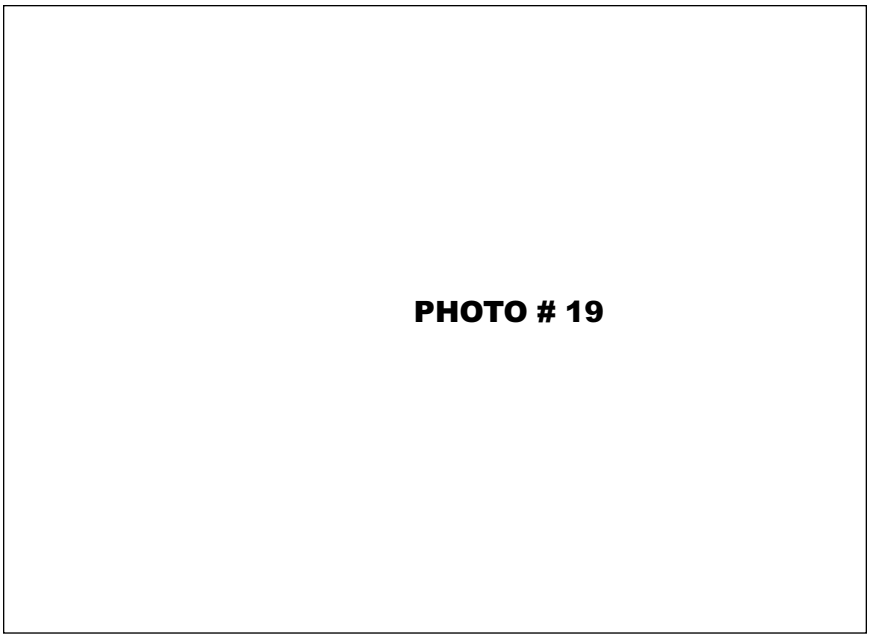
Allied bombs fall toward the German submarine base at Lorient, France.



The long siege of Brest, France, destroyed or damaged virtually every building and enemy military installation in the city.

yards. Even the final AAF raid by 158 heavy bombers against the St. Nazaire submarine pens on June 28, 1943, failed to yield significant results. U-boat operations continued from the French ports as Allied forces overran France. Four months after D-Day, on September 23, 1944, the last U-boat sailed from St. Nazaire and marked the end of German operations from protected submarine pens.

It was a different story, however, when the U-boats sought refuge in ports with no concrete pens. AAF heavy bombers found them easy prey, particularly in the Mediterranean, North, or Baltic Seas. On March 11, 1944, the AAF destroyed two German submarines in the harbor of Toulon, France, on the Mediterranean. The bombers returned to Toulon on April 28, July 5, and August 6, and wrecked six U-boats. A raid on Salamis, Cyprus, on September 24, resulted in two more kills. With the last enemy submarine destroyed in the Mediterranean, the Eighth Air Force found good hunting in German ports on the North and Baltic Seas. In December 1944 and January 1945, the AAF bombers destroyed six U-boats at Hamburg on the North Sea. In the next two months, they destroyed five more at Hamburg, six at Bremen, and three at Wilhelmshaven, all on the North Sea. During April, AAF bombers destroyed eight at Kiel on the Baltic Sea, and three more at Hamburg. In all, the strategic bombing missions claimed forty-one German submarines.



The shipbuilding yards at Wilhelmshaven, Germany, were the first and one of the last targets hit by the U.S. Eighth Air Force in strategic assaults intended to cripple the enemy. Ships partly sunk, damaged cranes, and bombed railway tracks offer evidence of the broken German war machine.

Defeating the U-boat Menace

By the time the AAF disbanded its Antisubmarine Command in August 1943, the German submarine threat had been reduced to little more than a nuisance. In the Atlantic Ocean between September 1943 and the end of the war, German submarines sank fewer than twenty ships. Although attacks became increasingly rare, the U-boats did tie down large numbers of Allied naval and air forces.

Statistics underscore the menace of the enemy submarine offensive. Germany began 1942 with 91 operational submarines; by 1943, it had reached a peak strength of 212. It built 1,162 submarines, of which 785 were sunk, 156 surrendered at the end of the war, and the rest were scuttled or otherwise destroyed. Despite these astounding losses, the U-boats sank over 2,600 Allied ships, totaling about fifteen million tons of cargo. Between September 1939 and May 1945, German submarines operated over an extremely large area: in the North and South Atlantic Oceans, Caribbean Sea, Gulf of St. Lawrence, Mediterranean Sea, Indian Ocean, Kola Inlet in north Russia; off the east coast of the United States; around the Cape of Good Hope; and along the coasts of Australia and Brazil.

The critical battle of the antisubmarine war took place in the North Atlantic between August 1942 and May 1943, when German submarines sought to drive Allied shipping from the transatlantic sea lanes. In August 1942, the submarines were sinking more merchant ships than the Allies could replace, but by May 1943 the U-boats were sinking too few ships to justify their own losses from antisubmarine forces. Thereafter, the German submarines dispersed to scattered patrol areas.

AAF units from the EAME theater participating in the critical Battle of the Atlantic comprised two independent flights operating from Greenland. Elsewhere in the theater, AAF antisubmarine units concentrated on patrolling the key routes at the Bay of Biscay and protecting Allied shipping approaching the Straits of Gibraltar. Despite these important missions, at no time did the number of AAF antisubmarine units active in the EAME theater ever exceed six squadrons.

With their advanced technology and long-range capabilities, AAF forces helped tip the balance of the war against the U-boats in favor of the Allies. Although AAF B–24s destroyed only eight submarines, their extended patrols forced U-boats to submerge and remain ineffective for prolonged periods, allowing essential Allied shipping to escape attack. The key measure of success in antisubmarine warfare is the number of ships not sunk, rather than the number of submarines destroyed. After the war, Dönitz cited the Allies' use of aerial reconnaissance and attack as decisive factors in the defeat of the German submarines.

On the other hand, strategic bombing proved less effective against German submarine production or basing than Allied leaders expected in 1942. The bombing attacks on production facilities resulted in some destruction, but until February 1944 the Germans managed to compensate for the damage done. The number of U-boats commissioned reached its peak of seventy-eight per quarter in January 1944 and did not decline below forty-nine per quarter until April 1945. The bombers were also unable to destroy U-boats berthed at their bases until the defeat of the submarines in the deep ocean and the capture of the protected submarine facilities on the French coast. Forced to shelter immobile in unprotected harbors along the Baltic, Mediterranean, and North Seas, the U-boats eventually became easy prey to U.S. strategic bombers, and the threat to Allied shipping and troop movements ended.

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