# U.S. Coast Guard 180-Foot Buoy Tenders

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*Photos are courtesy of the U.S. Coast Guard Historian's Office unless indicated otherwise.*

*(Cover)* Balsam *underway in an Alaskan Harbor.*

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*Buoy tender crewmembers bring aboard a navigational buoy for servicing.*

# The Need for Aids to Navigation

A few minutes spent along the waterfront in a U.S. port on a pleasant day will reveal boats and ships of all shapes and sizes going about their business. Large oceangoing merchant ships enter and depart with cargoes from around the world. Powerful tugboats push and pull larger vessels in and out of slips. Utilitarian fishing vessels make their way to and from fishing grounds trailed by clouds of hungry gulls. Gleaming cruise ships and their festive passengers share the water with grimy barges laden with sand, stone, or other unremarkable bulk goods. All while recreational vessels from canoes to luxury yachts weave through commercial traffic in pursuit of fun. This activity goes on day in and day out throughout the year; recreational boating peaks in certain months and slackens in bad weather but commercial shipping continues even through ice and snow. For the last sixty years a group of U.S. Coast Guard cutters, built in three sub-classes and commonly known as the WLB-180s, or simply the '180s', has worked to ensure that recreational and commercial vessels are as safe as possible during their time on U.S. waters. These cutters, with their distinctive black hulls, deck gray topsides, and Coast Guard red and blue bow stripes never constituted more than a tiny fraction of vessels in government service but their contribution to the safety of navigation has been immense.

The U.S. Coast Guard ordered the construction of the 180s during the early 1940s but they were part of a developing trend that began centuries earlier. Maritime activity has been a cornerstone of this nation's development from the earliest

European colonial forays to the present. This activity has included exploratory voyages, passenger carriage, freight transport, fishing, and naval endeavors. Maritime platforms have ranged in size and complexity from log rafts to modern supertankers; their voyages have taken them on transoceanic routes and deep into the continental interior. For centuries, boats and ships provided the only effective and economical way to move people and goods over anything but the shortest distances. Even today, long after the construction of extensive rail networks, the advent of air travel, and the completion of interstate highways, ships continue to carry the bulk of commercial cargoes. Vessels of various shapes and sizes literally built this country and remain essential as components of the economy and as elements of the national defense.

The ability of ships to play such an integral role in the development of the United States was dependent on several factors, one of the most important being safe navigation. Well built and manned ships were useless as economic or naval competitors if their masters could not find the destination, or worse, guided the vessels into harm's way. Traditional blue water (oceanic) navigation is dependent on a complex but uniform body of knowledge. The master or mates on an oceangoing vessel must be adept at finding their position and charting their course using concepts and calculations that require devoted study. Once mastered, however, those skills are useful for sailing anywhere on the world's oceans.

Conversely, the coastal or inshore navigator relies not only on universal principles such as the lines of latitude and longitude, but also on detailed and specific local knowledge. The danger to ships on the high seas has traditionally been adverse weather and to a lesser degree, collisions with other ships or floating objects. Closer to shore and on inland waters, the variety and number of threats grows exponentially. Traffic density increases with proximity to ports, making collision more likely. Weather remains a threat, but the presence of land limits a mariner's avenues of escape so running from inclement weather becomes less feasible. Floating objects, whether man-made or natural, abound on coastal and inland waters. Currents and tides enter the equation to a far greater extent than on the open ocean. Finally, and perhaps most significantly, land itself becomes the chief danger. Shoal water in the form of sandbars, submerged reefs, and rocky shores menace passing ships and collision with land becomes the chief threat to those traveling on the water.

The myriad threats endangering mariners are distributed unequally and often remain hidden from view. Thus, detailed local knowledge is the key to safe coastal or inshore navigation. The uses of geometry and trigonometry to divine lines of position from the altitude of celestial bodies, mainstays of traditional blue water navigation, become far less important than knowing about the sandbar around the next bend in the river or hazardous currents at a harbor entrance. Traditionally, the pilot system satisfied this need for local knowledge. In an area covered by a pilot system, small vessels carrying men familiar with the local waters meet ships approaching the coast. These local experts, known as 'pilots', board inbound vessels to provide navigational advice and prevent captains from losing their ships within sight of the destination. Drawbacks of the pilot system are that it requires a pilot for every vessel, it involves slowing to board pilots, and the crossing from pilot boat to ship can be hazardous or even impossible in rough seas.

An alternative or complimentary system makes the hidden dangers, heretofore known only to the pilots, apparent to the average mariner. This system uses aids to navigation (AtoN). These are essentially visual indicators and sound signals that serve to orient mariners and warn them of dangers. Aids to navigation can be floating objects such as buoys. They can be structures embedded in the bottom and topped with a marker, or they can be objects built entirely on land. Whatever form they take, AtoN have a common purpose: their position combined with their shape and markings tells the watchful navigator where he can proceed safely and what areas to avoid. To increase their utility further, many AtoN mount lights that make them visible at night. Most lights exhibit a certain color or flash so that the individual AtoN is not only visible but also uniquely recognizable as a distinct entity. The characteristics of its light make it recognizable as the AtoN marking a specific shoal or channel. The addition of sound signals such as bells, whistles, and gongs, each as distinct as the different lights, serves to make the AtoN's position and identity known in periods of low visibility such as fog and rain.

Humankind's first use of aids to navigation went unrecorded. The first mention of an AtoN in the historical record is the Pharos Lighthouse. This 'wonder of the ancient world' was erected in Alexandria, Egypt, around 279 BC and mariners soon began using the smoke and light produced by its beacon to chart their course.[1]

AtoN were in use along European waterways as early as 1295. As European influence and power spread to the New World so did the use of AtoN. Colonists built a lighthouse on Little Brewster Island in the approaches to Boston Harbor as early as 1716. Shortly after England's colonies broke away to form the United States of America, the fledgling government turned its attention to matters of navigational safety. This was no doubt due to the realization that the United States depended upon waterborne commerce, both foreign and domestic, for its economic survival. On August 7, 1789, Congress federalized existing lighthouses and allocated money for the construction and maintenance of lighthouses and other AtoN. The federal entity placed in charge of AtoN, the Light-House Establishment, took its name from Congress' "Act for the Establishment and Support of Lighthouses, Beacons, Buoys, and Public Piers." The Light-House Establishment was set up as part of the Treasury Department, though there was little in the way of administrative oversight. Most lighthouses were left in the care of the individual hired as the light keeper, who operated with almost complete autonomy provided the light remained operational. Private contractors generally maintained smaller AtoN; these contractors also operated without real government oversight.[2]

*Early buoy tenders were called lighthouse tenders. Here USLHT* Iris *services a lighthouse. Commissioned in 1899, this was the second tender to be named 'Iris'. A 180-foot U.S. Coast Guard cutter was also given that name.*

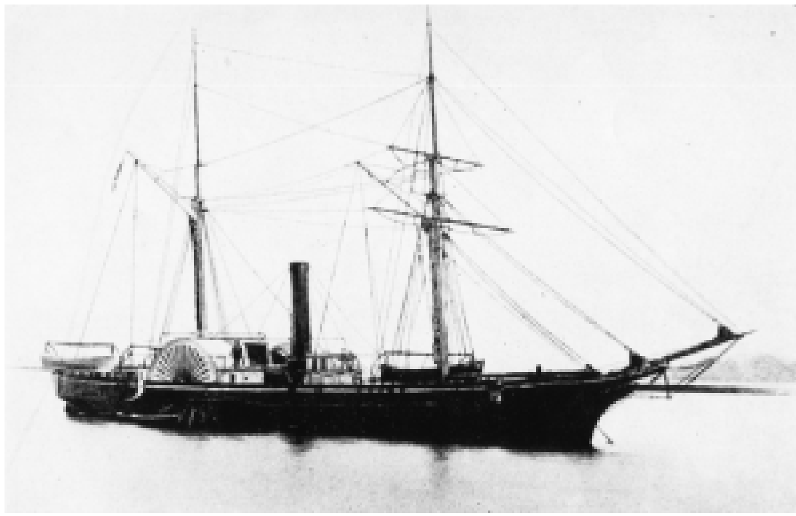
## Early Buoy Tenders

Maintenance issues are important in any discussion of aids to navigation. Choosing the site for an AtoN, building the marker, and placing it on station is a small portion of the work involved. Lights burn out and buoys drift off station. Any sound making apparatus, even one as simple as a bell, requires eventual repair or replacement. The marine environment is harsh. Salt water, ice, and marine organisms take their toll on any man-made structure. Paint wears away over time. Corroded fittings require replacement. Layers of marine growth accrete rapidly and require removal. Environmental changes make it necessary to revisit existing AtoN frequently. As sand bars shift or obstructions move, a formerly clear channel may become dangerous and, conversely, new areas may open to navigation.

Early buoy tenders in U.S. waters clearly reflected the poor administrative system in place to oversee AtoN. They illustrated the lack of administrative controls and an absence of standardization. As with most choices relating to AtoN, the choice of vessels to perform tender work was left to the contractor. This meant tenders were chosen with the contractor's profit margin in mind rather than thought toward the ideal vessel for the task. Not surprisingly, problems abounded in this system. Mariners complained that markers were placed with the contractor's convenience in mind rather than the safety of shipping. Observers noted that many contracted tenders were suitable only for handling smaller buoys and charged that the contractors, therefore, marked sea-lanes with undersized AtoN.

By 1839, dissatisfaction with the contractor system had grown to the point where the federal government was willing to undertake a direct role in maintaining AtoN. The topsail schooner *Richard Rush* was transferred from use as a revenue cutter to the control of the Light-House Establishment. The schooner, built in 1831, measured just over 73' in length. While it would be harsh to call *Richard Rush* a failure, it is fair to say the schooner was not an ideal platform for buoy tending. Naval architects designed revenue cutters to chase down smugglers and other lawbreakers. The same hull shape that gave the Revenue cutter speed under sail made it unstable when attempting to haul buoys and their anchors out of the water. Despite *Richard Rush's* dubious value as an operational prototype it was a very significant vessel. The former revenue cutter was the first government vessel assigned the AtoN mission and was the progenitor of hundreds of vessels that have served in that role under the aegis of several government organizations over the last 160 years. While *Richard Rush* was unsuitable as a buoy tender, other, more suitable vessels followed.[3]

The Light-House Board began experimenting with steam tenders in 1857. That year they built and outfitted *Shubrick* for tending AtoN, at a cost of approximately $60,000. *Shubrick* was unique in its role as the first steam tender but she also claims the honor of being the first major vessel expressly



*USLHT* Shubrick*, the first vessel specifically built by the U.S. Lighthouse Establishment to serve as a tender.*

The first class of tenders, the *Manzanita* or ‘8-tender class’, was commissioned in 1908.

designed and built as a tender. This was a departure from the prior practice of retrofitting an existing vessel for a new career handling buoys and ferrying supplies to manned lights. *Shubrick* also began the practice of painting the hulls of buoy tenders black. Whether the initial intention or not, this practice minimizes the appearance of scuffs and blemishes incurred when a buoy tender handles AtoN alongside and remains the color scheme of U.S. buoy tenders today.[4]

*Shubrick* and the steam tenders that followed were beamier, or wider, than their sailing counterparts. This gave them greater initial stability than a sailing vessel and meant they did not heel as dramatically when working with heavy objects suspended over the side. Equally important was their ability to steam into the face of contrary winds and maneuver to stay on station. The stability of the steam tenders sparked development in the design and construction of the AtoN themselves. As more capable tenders came into service, AtoN designers and builders produced larger, more visible, buoys. A parallel trend was increasing standardization in buoy appearance.

The transition from sailing to steam tenders proceeded rapidly after *Shubrick*'s entry into service. By 1890, the federal fleet was composed of thirty tenders of which twenty-eight were steamers. The fleet of steam tenders had grown to fifty-eight vessels in 1925.[5]

Technological changes relating to buoys and tenders did not occur in a political or administrative vacuum. AtoN administration began under the laissez-faire guidance of the U.S. Light-House Establishment (USLHE). During the 1830s and 1840s the USLHE began assuming some duties that contractors had handled exclusively in the past. The USLHE was replaced in October 1852 by the U.S. Light-House Board. The Light-House Board took responsibility for overseeing all AtoN matters involving the federal government.

In 1908 the Light-House Board commissioned a class of identical tenders. Until this point tenders had been retrofitted naval vessels or vessels built individually for AtoN service, but never part of a class designed for tender work. This first class of tenders was named the *Manzanita* or ‘8-Tender class’. Personnel in the Navy Department designed these 190' vessels and the New York Shipbuilding Company in Camden, New Jersey, built them for just under $200,000 apiece. In general appearance, *Manzanita* tenders exhibited many of the same attributes as modern buoy tenders. Their high superstructure gave a clear view over the bow and sides to ship handlers on the bridge. The bridge itself had wings on either side and a lookout station above. A mast and boom apparatus for handling cargo was mounted forward of the superstructure and just aft of an open well deck suitable for carrying and working buoys. The well deck was accessible by breaks in the bulwarks on either side of the vessel. The tenders carried small craft for AtoN inspections and other errands on davits aft of the bridge.[6]

Control over the AtoN system passed to a new administrative entity, the Bureau of Lighthouses, in 1910, as did control over the estimated forty-seven tenders engaged in AtoN work. The Bureau of Lighthouses and its operational arm, the U.S. Light-House Service (USLHS), controlled the buoy tender fleet until 1939. In 1915 the U.S. Congress had passed an act that served to combine the Life-Saving Service, charged with aiding mariners in distress, with the Revenue Cutter Service, charged with enforcing trade and customs laws in U.S. waters. The new organization responsible for maritime search and rescue and law enforcement was the U.S. Coast Guard (USCG). Twenty-six years after Congress founded the U.S. Coast Guard, President Roosevelt's Reorganization Plan Number 11 joined it with the Bureau of Lighthouses. Under the new arrangement the Bureau was, ". . . transferred to and consolidated with and administered as a part of the Coast Guard. This consolidation made in the interest of efficiency and economy . . ." The newly enlarged Coast Guard continued to be responsible for Search-and-Rescue (SAR) and Law Enforcement (LE) but also assumed responsibility for the approximately 30,000 AtoN maintained by the Bureau's 5,200 employees and sixty-four buoy tenders operating out of thirty AtoN depots and seventeen district offices.[7]


*The design of the 180s was adapted from that of the 177-foot* Juniper *constructed in 1939. Alterations were made based on the requirements of the newly-expanded Coast Guard.* Juniper *is shown here underway in 1949.*

# The U.S. Coast Guard and the 180s

When the U.S. Coast Guard absorbed the Bureau of Lighthouses on July 1, 1939, *Juniper*, a 177' all welded steel buoy tender, was under construction and plans for a successor were on the drawing board. Plans initiated by the Bureau of Lighthouses called for the construction of several identical buoy tenders to replace existing coastal buoy tenders. The preliminary designs generated by the Bureau were for a vessel similar to *Juniper*. When the AtoN system transferred to Coast Guard jurisdiction, USCG planners reviewed the preliminary plans for the new class of buoy tenders and modified them to meet the service's multi-purpose role. To be an effective part of the Coast Guard the new buoy tenders needed to be multipurpose platforms. They had to be capable of conducting Search and Rescue and Law Enforcement missions as well as their primary AtoN mission.

On January 20, 1941, the U.S. Coast Guard contracted Marine Iron and Shipbuilding Company of Duluth, Minnesota, to build the design based on *Juniper* and modified to meet the service's requirements. On March 31, 1941, Marine Iron and Shipbuilding laid the keel for the first vessel of the new buoy tender class. The new vessel measured 180' overall and had a beam of 37' at the extreme. She had a displacement of 935 tons and drew 12'. The new design was similar to *Juniper* in appearance but did exhibit some important differences. Gone was the turtle back forecastle. A notched forefoot, ice-belt at the waterline, and reinforced bow gave the vessel icebreaking capabilities. Extending the superstructure to the ship's sides increased interior volume above the main deck. A single propeller, turned by an electric motor powered by twin diesel generators, replaced the twin-screw arrangement. The 30,000 gallon fuel capacity gave the new design a range of 12,000 miles at a 12-knot cruising speed; at 8.3 knots the cruising range increased to 17,000 miles. Finer lines at the bow and stern increased the new tender's sea keeping ability in rough weather; an increase in draft also promoted seaworthiness. Numerous minor alterations increased the vessel's utility as a SAR platform while deck-mounted guns and depth charge racks supported military duties.[8]

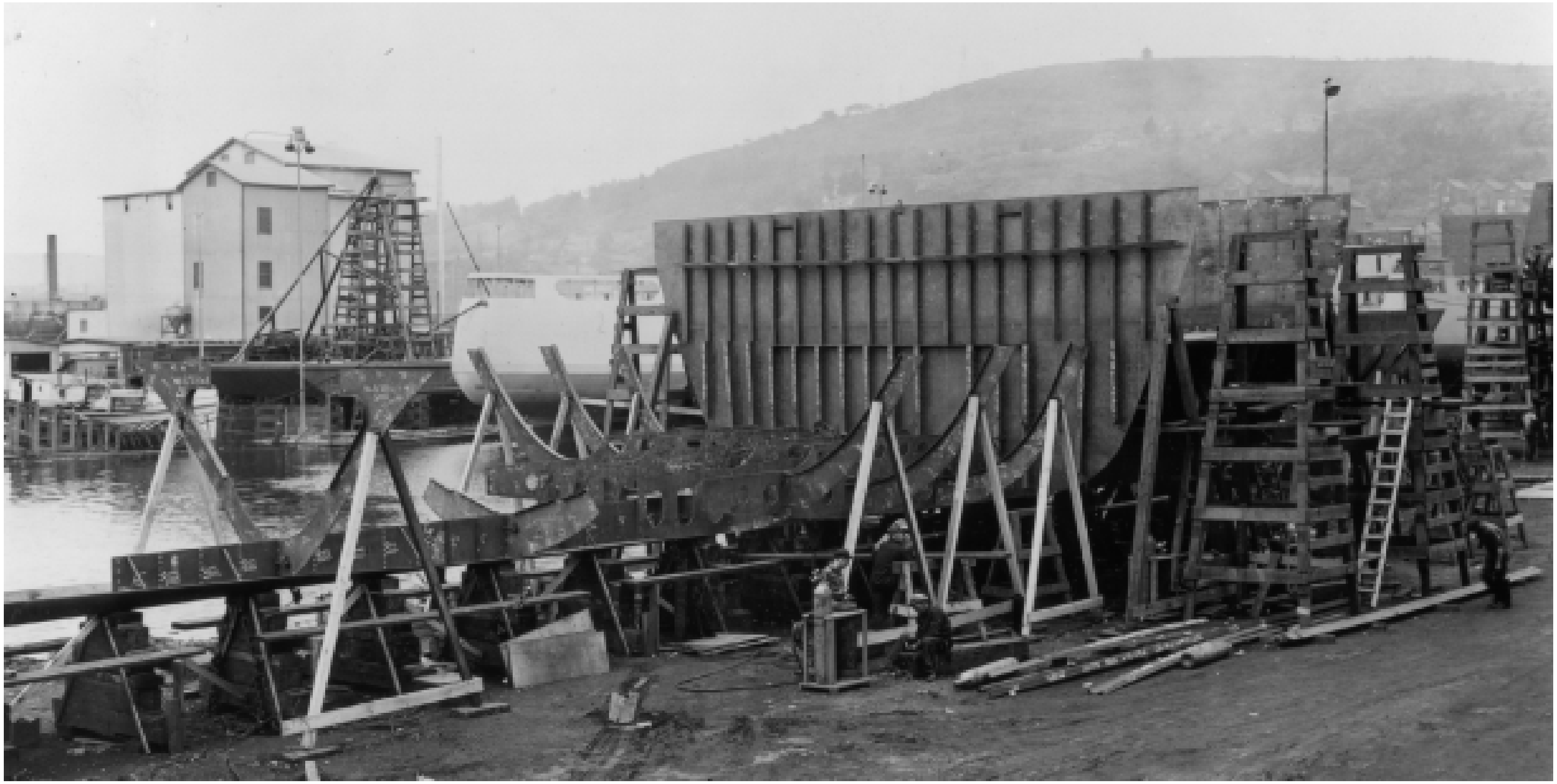
Marine Iron and Shipbuilding launched the prototype vessel on November 25, 1941, even as three more took shape and preparations went forward to begin a fifth vessel. By the time they commissioned the first 180 as *Cactus* on September 1, 1942, twelve vessels were under construction at the Marine Iron shipyard and at the Zenith Dredge Company shipyard, also in Duluth. The initial designation for the new buoy tenders was WAGL, which was a U.S. Navy designation denoting an 'auxiliary vessel, lighthouse tender'. The designation changed from WAGL to WLB in 1965. A few of the 180s have been designated as other types of vessels over the years; three became WMECs (medium endurance cutters), one of those, *Evergreen*, was a WAGO (oceanographic research vessel) before it became a WMEC. *Gentian* was a WMEC for a time and was then designated a WIX (Training Cutter) in 1999. Though designations have changed over time, each vessel's hull number has remained the same since commissioning.


*Two 180s at different stages of construction. Note the series of bulkheads that subdivide the vessel's hull into several smaller compartments. Visible in the left foreground is the assembly that will eventually hold the rudder as well as the collar through which the propeller shaft will pass.*

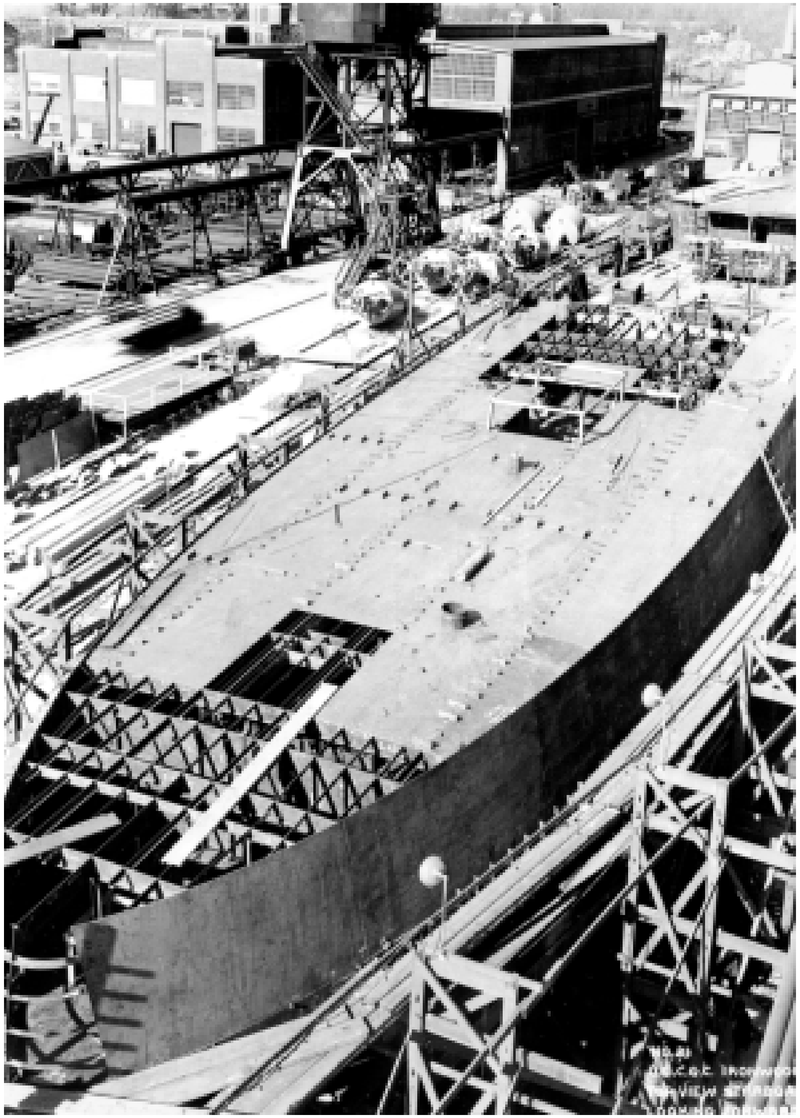
Six "B" or *Mesquite* class tenders followed the initial production run of thirteen vessels in the "A" or *Cactus* class. The first *Mesquite* class tender hit the water on November 14, 1942. Marine Iron and Shipbuilding built all except one of the *Mesquite* class. The USCG built the lone exception, *Ironwood*, at the service's shipyard in Curtis Bay, Maryland. Twenty *Iris* or "C" class vessels followed the *Mesquite* class tenders. The first launch of an *Iris* class vessel took place on June 18, 1943, and the final addition to the class slipped off the ways on May 18, 1944.

Differences among the three classes were minimal. Their basic dimensions, length and beam were the same and draft varied based on loading. All were built of welded steel along the same framing pattern and with very similar internal and external layouts. All three classes could steam 8,000 miles at 13 knots, 12,000 miles at 12 knots, and 17,000 miles at 8.3 knots; though the “B” and “C” class vessels had engines with 20 percent more power than the “A” class. The “A” class vessels could carry the most fuel with a tank capacity of 30,000 gallons. The “C” class carried 29,335 gallons and the “B” class about 700 gallons less.[9]

The layout of the Commanding Officer’s cabin and the radio room was slightly different in the “A” class vessels. The bridge wing door on the “B” and “C” vessels opened to the side while the doors on the “A” vessels opened forward. The cargo holds



*A 180 takes shape in Duluth. The keel is clearly visible in this view as are a number of frames and two of the bulkheads. The stern of another 180 can be seen across the slip.*



Ironwood *under construction at the U.S. Coast Guard shipyard at Curtis Bay, Maryland.* Ironwood *was the only 180 constructed by the U.S. Coast Guard and not built under contract in Duluth, Minnesota.*

as originally laid out in the “C” were larger, by a nominal amount, than those in the other vessels.[10]

To hoist buoys and cargo, the “A” vessels carried an A-frame structure that straddled the superstructure and supported the cargo boom. The other two classes were fitted with power vangs that attached to the bridge wings and manipulated the cargo boom. The “A” vessels were originally fitted with manilla line as part of the cargo handling system while the second and third generation vessels used wire rope.[11]

From the outside, other than the A-frame used in the first production run, the three classes were almost indistinguishable. Over the years their internal differences and variation in equipment were minimized by successive overhauls and improvements. Moreover, it does not appear that any one of the three classes was superior to the other two in the eyes of the U.S. Coast Guard administration or the men who manned the buoy tender fleet. Tenders from each of the three classes remained in use past the turn of the century.

It usually took from two to four months between the time shipyard workers laid a keel and the day the vessel slipped off the ways. Once launched, however, the tenders were far from ready for service. The practice was to build the superstructure, finish the interior, and complete the machinery installation while the vessel was floating. Hence, on launch day the tenders were little more than finished hulls. As the shipyard workers neared the end of the building process, the U.S. Coast Guard would begin assigning officers and men to the vessels. Once each vessel was complete and ready to enter active service, the

U.S. Coast Guard commissioned her as part of the fleet. Often the commissioning ceremonies took place after the tender had departed from Duluth and arrived at an initial duty station. For the 180s as a whole it took an average period of 308 days to go from the beginning of construction to commissioning. Divided according to sub-class, elapsed time from keel laying to commissioning averaged 360 days for the *Cactus* class, 323 days for the *Mesquite* class, and 269 days for the *Iris* class. The building process entailed an average of 192,018 hours of labor per vessel.[12]

All of the 180s were named after trees, shrubs, or flowers. This was a continuation of the longstanding Light-House Service practice of naming tenders after foliage found in the tender's intended area of operations. For the 180s, however, there was no particular area of operations envisioned for individual vessels.[13]

*The finished hull of a 180 is launched in Duluth, Minnesota. Note the men holding onto the rail and riding the vessel during its launch.*

## The 180s go to War

Though the design work for the 180s was completed before U.S. entry in World War II, indeed several vessels were already under construction when the Japanese attacked Pearl Harbor, the tenders were very much a product of WWII. The number of tenders built and the rapidity with which the shipyards turned them out is indicative of this nation's massive industrial output during the war years. Before the war, no group of thirty-nine steel ships had been produced in three years. Yet, during the period 1941-1944 the entire production run of the class went from blueprints to completed ships during a time when the U.S. was producing thousands of other ships at yards around the country.

With the lone exception of the tender built by the Coast Guard in Baltimore, two commercial shipyards in Duluth, Minnesota, built all the 180s. Duluth's contributions to the wartime industrial effort were significant. Workers shifted much of the iron ore mined in Minnesota from rail cars to cargo ships in Duluth. Those ships carried the ore to steel mills throughout the Great Lakes region. The mills transformed the raw ore into steel and sent it on to become ships, tanks, and other weapons of war. Beyond its role as a transshipment center, Duluth became an important production center in its own right. Duluth's seven commercial shipyards produced 191 steel ships with an estimated value of $200 million during the war years. Besides the ships, Duluth produced hundreds of smaller vessels such as barges and lifeboats.[14]

To achieve this level of production, even as much of the prewar workforce volunteered or was drafted for military service, the shipyards turned to a new source of labor. The Duluth shipyards, like industrial operations nationwide, began to recruit women. As Duluth's men filed off to war as soldiers, sailors, airmen, and marines, Duluth's women filed into the shipyards to become welders, machinists, and electricians. By the end of the war Duluth's 'welderettes' numbered 3,500 of the 14,000 persons laboring through the cold Minnesota winters to turn out ships for the war effort. The total number of civilian shipyard workers employed by Marine Iron and Zenith Dredge peaked at 1,200 and 1,500 respectively.[15]

Thus, the U.S. Coast Guard 180s are historically significant not only as the first class of modern buoy tenders and as part of an unprecedented military build-up but also as milestones in labor history. American women helped build the 180s during the period when women first began to enter the industrial workforce.

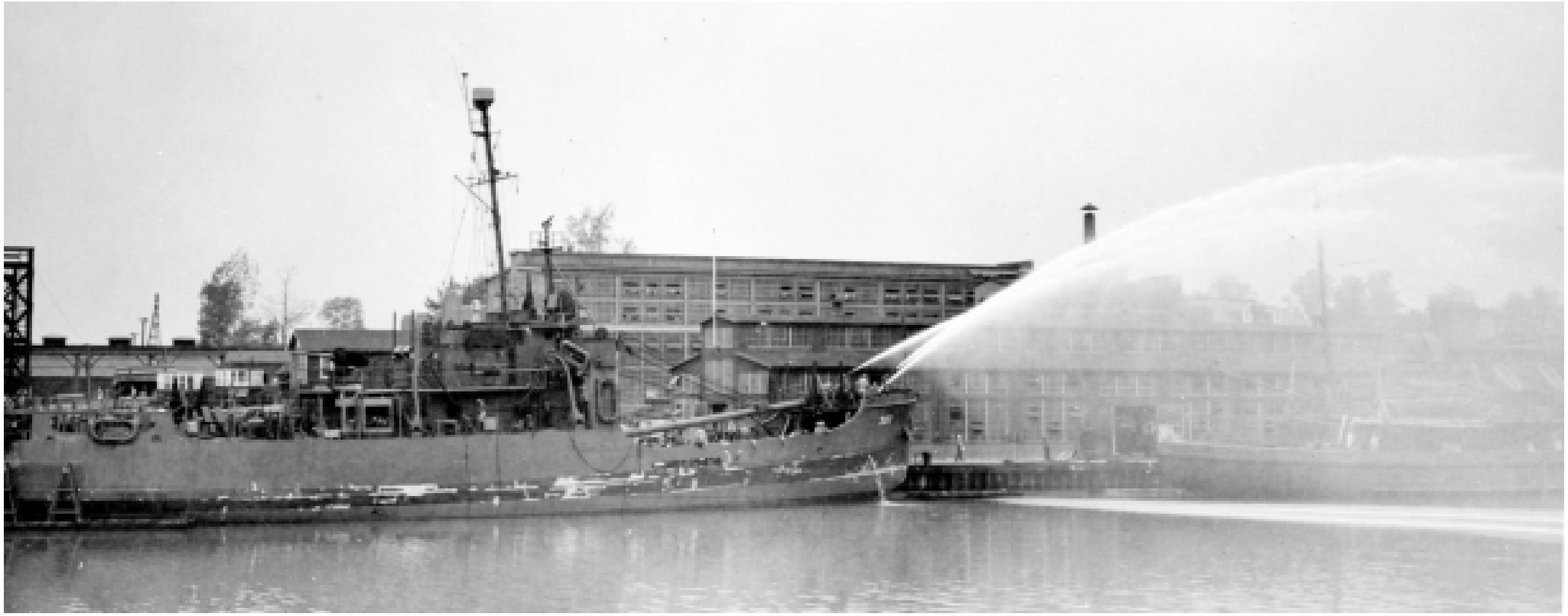
Even after commissioning most vessels did not immediately enter regular service. Instead the tenders embarked on shakedown cruises to test the various mechanical, electrical, and hydraulic systems. The shakedown cruises also offered an opportunity for crew orientation and training. It was rare that the shakedown cruise did not reveal some defective system and most vessels returned to a shipyard to have any glitches repaired. Occasionally the return to the shipyard meant going back to Zenith Dredge or Marine Iron and Shipbuilding in Duluth. Other vessels went east and entered the USCG yard at Curtis

Basswood *underway during World War II. Depth charge launchers are clearly visible in the stern section.*

Bay for the final repairs before they deployed to their duty stations. Visits to the Curtis Bay facility also provided an opportunity to outfit the vessels with any additional equipment or carry out any modifications needed at their new duty station.

The work done by the men and women of Duluth produced finished buoy tenders but not warships. It would be up to military technicians to make the 180s part of the U.S. war machine. Many of the buoy tenders were destined to operate far from

Cowslip *labors through rough seas on the open ocean.*



*Planetree's crew conduct a test of the vessel's fire-fighting capabilities while at the U.S. Coast Guard shipyard in June 1944.*

home in a variety of war zones as part of a navy locked in a two-ocean war, and they needed the tools of the trade. To defend themselves against air attack the tenders were fitted with 20mm guns, usually four of them, mounted high on the superstructure and on the aft portions of the main deck. Armorers outfitted the 180s with a single 3" cannon mounted aft of the stack to defend against aircraft and engage small surface or shore targets. They installed depth charge racks as well as K- and Y-type launchers on the stern to deploy depth charges in case the vessels ever encountered enemy submarines. Some 180s were also fitted with a device known as a 'mousetrap'. This weapon system launched rocket-propelled explosive charges that would explode on contact with a submarine's hull. The mousetrap system was generally mounted on the bow so the launchers could fire ahead of the vessel. Besides the heavier weapons systems, the tenders carried assorted small arms. Technicians installed radar and sonar systems to guide the 180s through dangerous waters and to help them find targets or avoid enemy units. The U.S. Coast Guard shipyard at Curtis Bay, Maryland carried out the bulk of the work that prepared the buoy tenders for duty in overseas war zones.[16]

Besides the installation of weapons and sensors, common additions and modifications to war-zone bound 180s included:

the addition of diving gear, welding machinery, extra firefighting pumps, and extra salvage pumps.[17]

From Duluth and Curtis Bay the tenders fanned out across the globe to assignments within Coast Guard districts and with U.S. Navy units. Most departed for their first assignments with loaded weapons and the orders to: "Attack and destroy enemy vessels encountered. Make report of any contact with the enemy immediately if doing so will not jeopardize the possibility of a successful attack." The official orders also warned the commanding officers to be alert for mines and enemy vessels disguised as neutral or friendly forces.[18]

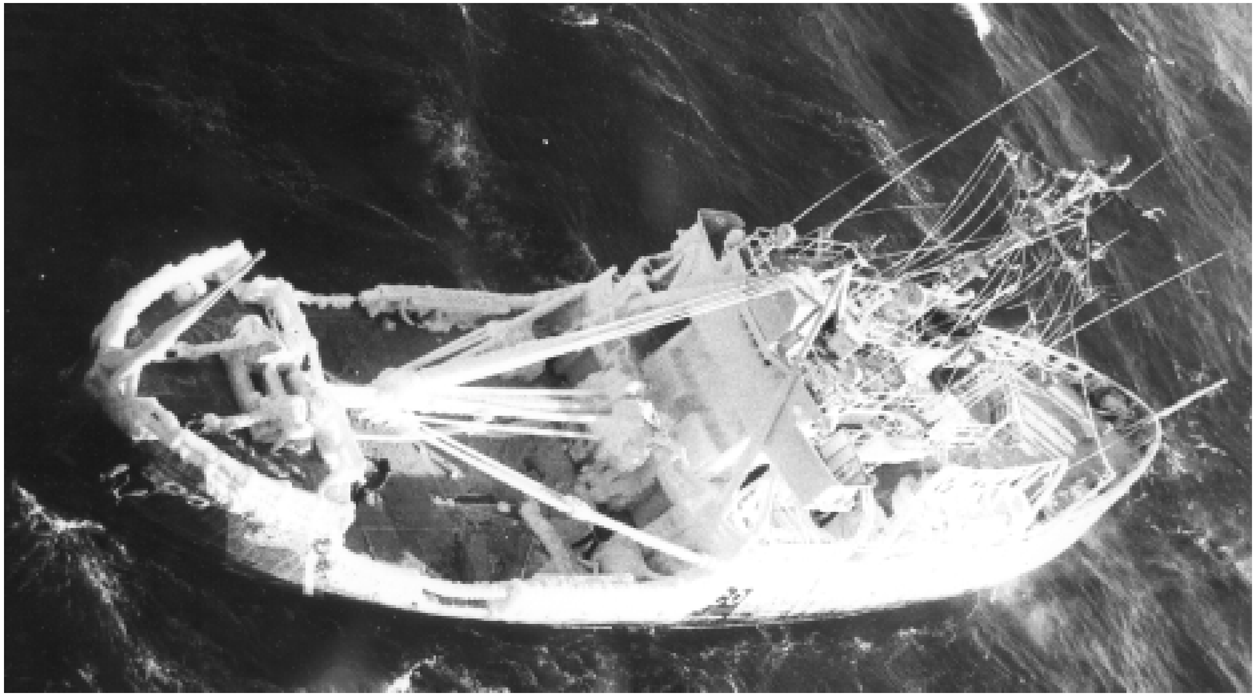
The 180s that steamed off to war were, of course, not just machines reflecting burgeoning U.S. industrial might. They were


Ironwood *salvages a Japanese midget submarine in the South Pacific during World War II. The heavy lift capacity of buoy tenders was regularly used in salvage operations throughout their careers.*

also a human microcosm of the American war effort. Like the other armed services, the Coast Guard faced the need to expand its size many times over to meet the demands of wartime. Activated reservists and hastily trained new recruits, volunteers or draftees, soon outnumbered the relatively small number of professional Coast Guardsmen. Perhaps if the emergency had been somehow limited to a maritime defense problem the Coast Guard could have drawn the bulk of its new members from suitable civilian maritime trades. It was, however, a global war requiring a greatly expanded navy and merchant marine. Even the U.S. Army built a vast fleet of small and medium size vessels, each requiring crew. In the face of expansion and competition for experienced mariners the Coast Guard, as well as the other services, had to make do with whatever human resources they could acquire.

Coast Guard cutters steamed off to war, not with crews of grizzled fishermen and well-traveled merchant mariners but with a handful of professional Coast Guardsmen, most newly promoted as the service expanded, a few men drawn from civilian maritime fields, and a majority of recent civilians from all walks of life. One sailor who served on a 180 recalled the crew on his vessel:

> Her skipper was Frank Rados, a chief boatswain with the temporary rank of lieutenant. Her crew included a cadre of regulars augmented by typical wartime Reserves—among whom were salesmen, a railroad brakeman, a production director in an advertising agency, a newspaperman and a red-headed ship's cook whose civilian forte was playing jazz music in Detroit night-clubs.[19]



*A 180 sporting a frozen coat. The work carried out by the 180s took them to the coldest regions of the Atlantic and Pacific Oceans.*

Buoy tenders from the 180 classes operating in the Atlantic Theater saw service from the frigid waters around Greenland to the tropical coast of Brazil. They worked at tending buoys, breaking ice, and going to the aid of other vessels. They also served as the armed escorts for merchant convoys, hunted U-boats, and carried supplies to far-flung installations. The 180s were not limited to coastal duty. Several vessels in the class were dispatched thousands of miles out into the Atlantic to collect important meteorological data that allowed military planners to schedule and route aircraft flights to Europe.

In the Pacific Theater, the 180s covered thousands of miles of open ocean in pursuit of their varied duties. Several vessels worked to establish LORAN station chains in the South Pacific while others conducted similar operations in the Bering Sea. Navy commanders regularly dispatched 180s to carry supplies and personnel between installations throughout the war zone. The lift capacity and towing features of the tenders helped them carry out salvage work. The 180s fought shipboard fires and rescued Allied personnel from damaged vessels. Besides this range of duties, all the tenders fulfilled their design function on a regular basis. They serviced AtoN along the West Coast, in the waters of the Bering Sea, and across the Pacific. They

*An "A" class bouy tender loads cargo alongside a dock. The cargo-carrying capacity of the 180s made them useful in supplying out-of-the-way settlements and installations. Note the A-frame support for the cargo boom. This system was found only on "A" class tenders.*

also set and serviced moorings and mooring buoys for naval and merchant vessels throughout the war zone. Their AtoN work was especially important since many of the areas in which U.S. forces operated were very poorly charted or uncharted altogether. The work done by the 180s allowed thousands of Allied ships to operate along routes and in harbors far removed from prewar shipping lanes. The buoy tenders never received the acclaim afforded larger warships but their efforts did not go unnoticed. In the words of a contemporary observer:

> As the battleships and assault troop and cargo ships do the heavy work, the Coast Guard tenders scurry alongside, paving the broken way for the miracle of supply which follows. They'll lay cables in the ocean bed, fight fires and perform rescue and salvage chores. A tender may moor an anchor for battleships or tow a Navy seaplane caught on a reef,—it's all in a day's work.[20]

None of the 180s were lost to enemy action during the war. Those in the Atlantic Theater operated under the threat of attack by German U-boats but the few encounters saw the cutters dropping depth charges on the suspected positions of submerged U-boats and receiving no return fire. A German U-boat sank one U.S. Coast Guard buoy tender from another class, *Acacia* (WAGL-200), while she operated in the Caribbean Sea. *Acacia* was one of the ex-Army mine-planters acquired by the Light-House Bureau after WWI. The USCG named a "C" class 180 in honor of the sunken vessel.

Though the 180s serving in the Pacific came under enemy air attack on many occasions, no severe damage resulted from these attacks. The 180s contributed to the screen of anti-aircraft fire around the fleet during air raids and shot down several enemy aircraft while contributing to the destruction of others. One tender suffered significant damage from an explosion attributed to a floating Japanese mine. There were no encounters between the buoy tenders and Japanese submarines or surface units.

Weather was an adversary as formidable as the Axis forces. Tenders operating in the northern reaches of both oceans frequently battled ice and snow as they went about their work. Tenders in the Atlantic Theater were subjected to dangerously high winds and waves during storms, especially during winter storms on the North Atlantic. They also had to dodge hurricanes sweeping up from the tropics during the summer and fall months. The Pacific 180s, besides normal ocean storms, were subjected to the fury of powerful typhoons that regularly sank large ships. Heat was a problem in both theaters and, while never a grave threat to the vessels, it made life unpleasant for crews operating near the equator in the days before air conditioning.

The 180s survived enemy action and the dangers of operating in the maritime environment in any weather. Every vessel survived the conflict and the class provided valuable service in the war effort. Their endeavors made possible the safe navigation of thousands of warships and merchantmen as the Allied powers dispatched convoys, battle groups, and invasion fleets to the far reaches of the Pacific and set up a floating conveyor belt carrying millions of tons of war materiel across the Atlantic.

## Peacetime Missions

Most of the class returned stateside after the war as the United States pulled the bulk of its military forces back and discharged the millions of men and women that had donned uniforms. A few vessels assigned to the Pacific during the war were left overseas to repair and improve AtoN systems in the various island groups. But most of the 180s returned to the United States where their wartime crews returned to civilian life. The drop in military manning levels was so precipitous that the U.S. Coast Guard had to decommission several 180s temporarily, simply because there were no crews available.

Coast Guardsmen returning to civilian life were not the only ones shedding their wartime accouterments; the buoy tenders themselves underwent a radical change in appearance. Black hulls and gleaming white topsides replaced the haze gray and oceanic camouflage schemes that helped to hide the tenders from enemy eyes during the war years. Shipyard workers stripped depth charge racks and mousetrap launchers from the vessels. Cutters reassigned to the Great Lakes had their 3" and 20mm guns removed as well. Those remaining overseas or assigned to coastal districts kept some of their armaments but the guns spent most of their time concealed beneath canvas covers.

Service on the buoy tenders was more mundane in the wake of World War II. Postwar operations did not include the threat of submarine attack or require manning of anti-aircraft weapons at a moments notice. Instead of operating as part of vast naval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fleets and anchoring in the company of battleships, the 180s went about their prescribed missions alone. For the most part they spent their time tending buoys and other AtoN. This was an especially important part of returning American maritime commerce to a peacetime footing as some AtoN were neglected during the war while others were purposely disestablished to prevent their use by enemy forces. Similarly, many AtoN established during the war required removal, as they were nonessential to normal maritime commerce. Most buoy tenders returning stateside quickly joined their domestic counterparts in an unending routine of hauling buoys, carrying out maintenance on various AtoN, and delivering supplies to out-of-the-way navigational installations.

The process of tending or servicing buoys has been the basic mission of the 180s throughout their careers. It is a process that has evolved through several important technological changes but one that remains fundamentally the same. Tending an AtoN begins with traveling to its location and making contact. Once on scene, the conning officer maneuvers the vessel alongside the buoy so the deck force can snag it with reaching poles. Approaching a buoy is often a tricky and hazardous proposition since the marker's very purpose is often to mark shallow water or other hazards to navigation. The difficult nature of the task is reflected in the records of frequent groundings by the buoy tender fleet. The 180s original design, specifically single screw propulsion, meant they were not the most maneuverable platforms and required a skilled ship handler to bring them alongside an AtoN. The addition of bow thrusters during later renovations made them more nimble during close quarters maneuvering.

*(Facing page) A buoy is loaded onto* Buttonwood *in preparation for a bouy tending mission. Note the bridge-mounted vang system for the boom and the post-war color scheme. HABS/HAER photo by Jet Lowe. (Above) An outboard view of a sinker suspended over a bouy's side through a chain stopper.*

Once alongside a buoy the deck crew snags it and then attaches the hook from the cargo boom to a lifting eye on the marker. Then the boom operator lifts the buoy out of the water and deposits it on the open well deck in front of the superstructure where it is secured using several tie downs. The process of recovering the buoy has not changed in any appreciable way over the years.

Bringing the buoy on board is less than half the recovery process. A concrete block or 'sinker' weighing many thousands of pounds anchors each buoy. Heavy steel chain links the anchor block to the floating buoy. In order to conduct a thorough inspection of the whole system, the chain and sinker must be brought up. The mooring chain is led through a chain stopper on the edge of the well deck. The chain stopper is a mechanical device that prevents chain from slipping back overboard, so it is essentially a one-way valve for chain. After the chain is secure in the chain stopper the boom operator reaches as far down the chain as possible and snags a length of chain, which is pulled up, laid in the chain stopper, and secured on deck with quick-releasing pelican clamps as a safety mechanism. Once the chain is secure, the boom snags another length and hauls it up. In this hand over hand fashion the boom operator hauls up the entire mooring. Often the sinker is left hanging overboard on the outside of the chain stopper. This part of the recovery process has changed since the 180s entered service. Initially, the vessels did not have a chain stopper mechanism, and chain was secured only by tie downs when the boom released one length to grab another. The crew of *Tupelo* is credited with inventing and demonstrating the value of a prototype chain stopper in 1948.[21]

With buoy, chain, and sinker resting on the buoy deck, or secured in the chain stopper, the deck force can begin working. This is the opportunity to inspect the whole system and do any needed painting, repair any structural damage, and check the batteries if it is a lighted AtoN. The biggest change in this area over the years has been the shift from gas to electric lights, followed by the addition of solar panels to lighted buoys. The panels greatly extend battery life, thereby making battery replacement a less common chore. *Sweetgum* conducted the first at-sea 'solarization' of a lighted buoy. At present all lighted buoys mount solar panels to extend battery life and improve the reliability of the light.[22]

Once serviced, the buoy must be returned to its charted position. Similarly, new or replacement buoys must be placed exactly on station. To accomplish this task navigators feed information from the ship's satellite navigation system to the conning officer who guides the vessel to the correct place over the sea bottom. Once on station the bridge tells the deck force to release the sinker. This is done by tripping the chain stopper's release mechanism with a sledgehammer. This release sends the sinker plummeting toward the bottom. The deck crew cuts or releases any tie downs securing the chain to the deck. The process of finding the exact position where the sinker belongs has changed dramatically over time. Prior to the introduction of Global Positioning Systems (GPS) the conning officer was directed to the correct spot by a team of at least three

*Two members of a buoy tender's deck force service a light on a navigational buoy.*

crewmembers using survey sextants to measure horizontal angles to known landmarks visible from the vessel. This process, while accurate when done by experienced navigators, was time consuming and entailed more chance for error than today's use of computerized navigation systems. The shift from sextants to differential GPS has improved the efficiency of repositioning AtoN.[23]

Not all buoy stations are within sight of land and sextant angles require fixed landmarks. In the days before GPS the Coast Guard used LORAN or radar ranges to position these offshore markers. GPS is more accurate than these older navigational tools and has increased the accuracy of placement for offshore buoys.

Any discussion of buoy tenders and their activities would be incomplete without at least a brief mention of their charges, the buoys. The earliest buoys in America were floating wooden casks anchored to the ocean floor. Spar buoys, essentially poles that stuck upright out of the water, joined cask buoys in marking U.S. waterways during the early part of the nineteenth century. Buoys fashioned from riveted iron began to replace their wooden forerunners in the middle of the nineteenth century. Until the 1880s, buoys were silent and unlit, but that decade saw the introduction of gas and electrical lights as well as sound making devices, all of which made buoys of more use to mariners. Throughout the twentieth century buoys continued to evolve in complexity and grow in size. Steel joined iron as a common construction material in the early years of the century and wooden buoys began to disappear. More efficient, not to mention safer, electrical lighting systems relying upon batteries started to supplant the standard acetylene gas powered lights in the 1950s. Battery powered lights benefitted from the addition of solar panels beginning in the 1980s. Two trends paralleled the evolving design of navigational buoys, an increase in their size and an increase in their numbers. Eighteenth century buoys were small structures; their size was limited to what a few men on a sailing tender could handle using block and tackle. The adaptation of steam tenders and powered lifting devices meant buoys could grow in size and thereby become more visible, a plus for mariners. The trend continued throughout the nineteenth and twentieth centuries, especially as large unmanned buoys replaced lightships. As the buoys grew in size, AtoN of all types grew in number to accommodate the ever-increasing levels of maritime commerce. The estimated seventeen markers watching over America's waterways when Congress formed for its first session grew to more than 30,000 AtoN by the time the 180s took shape on a designer's drawing board. By 1999 the U.S. Coast Guard was responsible for maintaining over 50,000 AtoN.

Though the missions of the 180s became more mundane after World War II, they were not without the possibility of excitement and danger. The U.S. Coast Guard had designed the 180s as functional SAR platforms and that capability, proven by rescues during the war, allowed them to respond to emergency calls throughout U.S. waters. As the buoy tenders went about their AtoN work, they were always on standby for dispatch to the aid of nearby mariners in distress. Dovetailing nicely with other SAR features was their ability to break ice on frozen waterways. This meant they could not only clear shipping lanes for routine commerce, but also go to the aid of other vessels trapped in the ice. Hence, they could carry out rescues that were impossible for most cutters and patrol boats. Beyond their seaworthiness and icebreaking capabilities, the buoy tender's SAR value was augmented by equipment for towing other vessels and the ability to fight fires on ships or along the shore.


*Officers from* Evergreen *drill a hole in an iceberg. They later placed explosives in the hole and detonated the charge as part of experiments to determine the effect exploisves would have on icebergs.*


Madrona *opens a shipping lane for commercial vessel traffic on the frozen Chesapeake Bay.*

## New Roles for the 180s

By the late 1940s all the temporarily decommissioned buoy tenders had returned to service as manpower levels stabilized. All thirty-nine members of the type were engaged in AtoN, SAR, and, depending on their location, icebreaking duties. Their combined operations covered the entire shoreline of the continental U.S., the waters around Hawaii and Alaska, and large portions of the Pacific Ocean.

*Redbud* was transferred to the U.S. Navy in 1949. It entered service as a light cargo vessel and continued operating as such under naval and, later, Military Sea Transport Service (MSTS) control until the early 1970s. Another tender, *Evergreen,* began conducting increasing amounts of oceanographic research in the North Atlantic, and by the 1950s spent most of her time underway collecting scientific data. In 1964 the tender was officially designated the service's first oceanographic research vessel. Other than these two exceptions, the 180s continued to pursue their traditional missions throughout the 1950s and 1960s.

During the postwar years the 180s were also increasingly involved in law enforcement activities. These efforts centered on two disparate pursuits. The buoy tenders helped enforce various federal fishing laws and regulations, with particular focus on fishing in the Bering Sea and Gulf of Alaska. The efforts emphasized keeping foreign fishing vessels out of U.S. waters

*Firefighting drill aboard* Sundew. *HABS/HAER photo by Jet Lowe.*

and enforcement of international agreements on the high seas. Tenders stationed farther south along the California coast and those in the Southeastern United States were concerned with drug smuggling more than illegal fishing. As the flow of illicit drugs entering the U.S. increased, many cutters, 180s included, went out to sea to meet vessels headed for American ports, not to provide aid or check their fishing catch but to search them for cargoes of contraband. The efforts to interdict drug smugglers increased throughout the latter half of the century as the volume of smuggling increased. In the 1980s and 1990s, preventing undocumented immigrants from entering the U.S. by sea was added to the list of maritime law enforcement activities pursued by the 180s.

## Continuing Military Service

The 180s saw limited duty in the Korean War and significant action in Vietnam. Five of the buoy tenders served in the waters around South Vietnam. None took up permanent station in the theater; instead, they rotated through short tours from homeports in the Philippines and elsewhere in the Pacific. The vessels spent most of their time placing and maintaining AtoN marking coastal and inland waterways. Simultaneously, they conducted extensive training of Vietnamese nationals in preparation for the day when the AtoN system passed into Vietnamese hands. This transfer was completed in 1972. Other missions carried out by the 180s serving in the war zone included cargo transport, survey work, and support of efforts to interdict enemy supply lines.

Most of the 180s did not see wartime action after their service in World War II. This does not mean, however, that military training was not part of the buoy tender's overall mission. The U.S. Coast Guard has always occupied a unique position within the U.S. government. In peacetime a civilian agency administers it, at first it was the Treasury Department followed by the Department of Transportation. In wartime, the service passes to the operational control of the U.S. Navy. This potential military role combined with the Coast Guard's mandate to contribute to the defense of American waters means USCG units participate in periodic military exercises and operations with the U.S. Navy and allied maritime forces. As part of the U.S. Coast Guard, the buoy tenders regularly drilled to improve their ability to find enemy forces, engage potential targets, survive battle damage, and work in concert with naval units. These maritime defense activities have been ongoing throughout the class' history and continue today.

## The Fleet Shrinks

By the early 1970s the 180s had reached their thirtieth anniversaries as U.S. Coast Guard cutters. It was during this decade that the inventory of these buoy tenders began to shrink. Appropriately enough, the first to go was *Cactus,* the first built. *Cactus* ran hard aground in 1971 and the damage was so extensive that the government decided to decommission the vessel rather than repair her. The USCG decommissioned the first of the 180s two days shy of the thirtieth anniversary of her launch. Two more 180s left active duty, albeit less traumatically and according to longstanding plans, the following year. A fourth vessel left service in 1973 and two more followed in 1975. These vessels, even *Cactus*, went on to second careers in the hands of foreign governments or private owners.

Only one buoy tender was decommissioned by design in the 1980s; *Sagebrush* left active duty in April 1988, more than forty-four years after her commissioning. It was, however, a hard decade on the 180 fleet. On January 28, 1980, *Blackthorn* collided with a commercial tanker in Tampa Bay, Florida. The collision holed and capsized the buoy tender and it sank quickly, killing twenty-three members of the crew. In December 1989,

Mesquite*'s hull is lowered to its final resting place in Lake Superior. The tender ran aground on rocks several months earlier and was battered by winter storms. The wrecked vessel became part of an underwater preserve and is regularly visited by recreational divers.*

*Mesquite* grounded on a rock pinnacle jutting from the bottom of Lake Superior. The cutter's crew safely abandoned ship in lifeboats but the vessel suffered severe damage after pounding against the rocks during winter storms. USCG planners decided to decommission *Mesquite* soon after the accident and she was scuttled by a commercial salvage company in 1990.

Three of the buoy tenders became Medium Endurance cutters (WMEC) during the 1980s. These conversions entailed the removal of the buoy handling gear and reassignment to predominately LE and SAR patrol duties.

The U.S. Coast Guard decommissioned fourteen buoy tenders in the 1990s and seven more in the early years of the next decade. In early 2002, eight of the thirty-nine 180s remained in service as USCG buoy tenders. One other 180 remained in commission as a cutter but operated in the role of a training and support vessel. Few of the decommissioned cutters have actually been destroyed or dismantled. Instead, they can be found throughout the world. A number were transferred overseas under the Foreign Military Sales Program and serve the navies of countries friendly to the United States. Two have embarked on careers as fishing vessels. One serves as a mobile


*Aerial view of* Citrus *underway. This photo was taken after her conversion to a medium-endurance cutter. Note the white hull and absence of buoy handling equipment.*

base and supply ship for a missionary group working in the Pacific. Even *Cactus*, first of the 180s built, first wrecked, and first decommissioned, still exists. The remains of the tender built in 1941 serve as a barge in the Pacific Northwest. The 180s that have passed out of use entirely were sunk as reefs or ended their lives as targets for naval munitions tests.

## Maintenance, Repair, and Overhaul

The design of the 180s, drawn up before WWII and built in the early 1940s, has demonstrated remarkable longevity. The U.S. Coast Guard decommissioned the bulk of the class only within the last decade and nine vessels continue to serve on active duty, sixty years after they were built and well past the projected life span of any military vessel. This is not to say that the 180s simply steamed out of the shipyard after their completion and were so well built that they lasted for five or six decades. An axiom regarding boats and ships holds that the process of replacing parts of the vessel begins the moment it takes to the water. The 180s were no exception to this rule.

To keep these buoy tenders on active duty the U.S. Coast Guard has expended millions of dollars not to mention countless hours of labor by Coast Guard personnel and private contractors. The efforts that kept the 180s operating into the twenty-first century began in the early 1940s. Even as they went about their duties in the midst of war, maintenance remained a regular part of every tender's routine. Maintenance carried out by the tender crews as part of the everyday routine was interspersed with 'availability' periods. During these periods, scheduled at the request of the tender's captain or by orders sent down the chain of command, the individual tenders temporarily left service while the regular crew, often augmented by ship repair specialists, addressed maintenance issues too complex to handle while the vessel pursued its regular mission. The availability periods took many forms. In the simplest incarnation, the tender would anchor out of the way or tie up alongside a dock after a long voyage or operation and the whole crew would devote a few days to putting everything in order. In instances where the vessels required extensive work, the tenders visited shipyards in the U.S. or at naval bases overseas. A visit to a

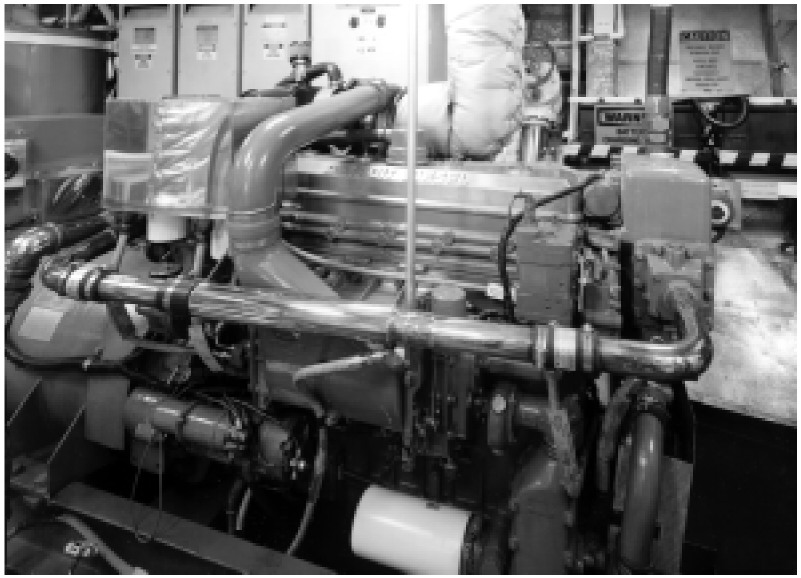
Woodbine *in drydock at the U.S. Coast Guard shipyard. This views shows the notched or cutaway forefoot that made the 180s suitable for icebreaking.*

Cowslip *rests in a drydock as shipyard workers install a bowthruster. The addition of bowthrusters made the single-screw buoy tenders more maneuverable.*

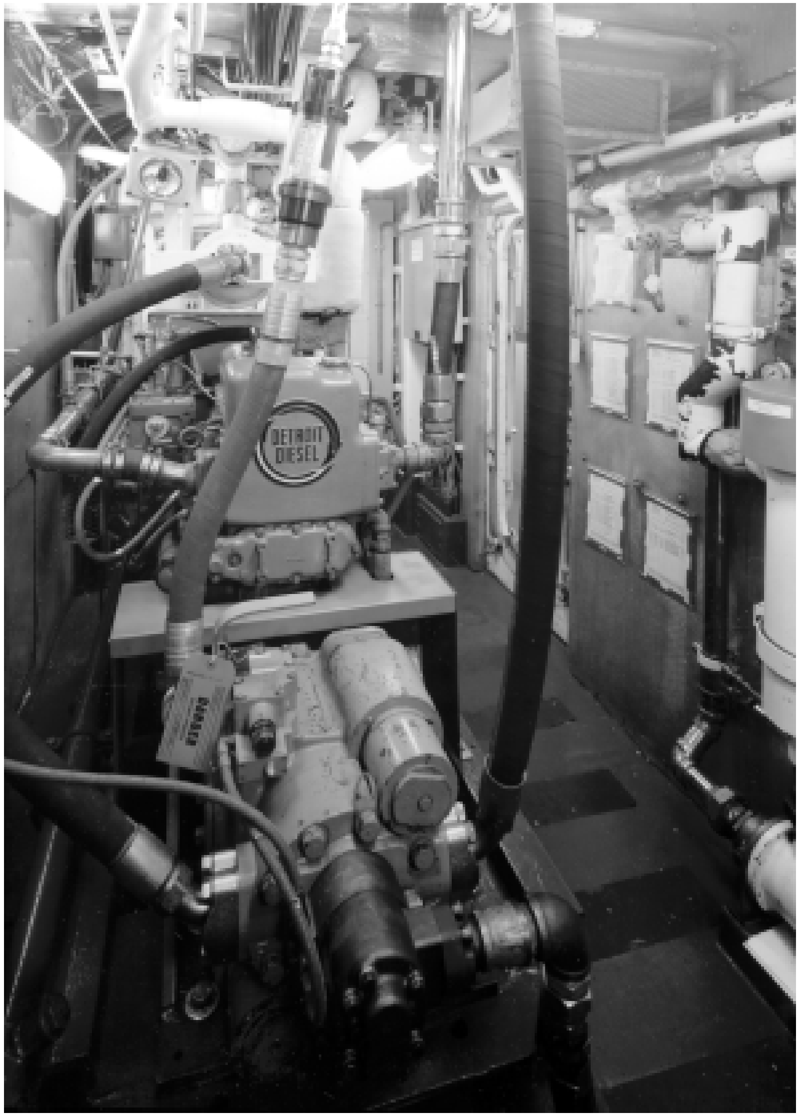
shipyard entailed any number of repairs including time in a dry-dock for work on the hull and exterior propulsion equipment.

After the war the 180s were placed on a cyclical maintenance schedule. Exact timetables varied from ship to ship and according to the service's needs, but on average, each cutter visited a shipyard for a yard period or 'availability' on a biannual basis. Time in the yard allowed for the undertaking of major repairs and improvements as well as routine maintenance chores like painting the hull. Some of these yard periods took place at the U.S. Coast Guard's yard in Curtis Bay but most occurred at commercial shipyards near the individual tender's homeport. Buoy tenders were, of course, sent to the nearest yard equipped to handle the problem after groundings or other mishaps. In a few instances the Curtis Bay yard carried out special work to prepare vessels for unique projects. This was the case when *Spar* and *Bramble* were readied for a trip through the Northwest Passage and *Evergreen* underwent conversion to become an oceanographic research vessel.

Cyclical yard periods and the efforts of personnel stationed on the buoy tenders kept them in proper shape for many years. Nevertheless, by the 1970s the vessels had reached the end of their projected thirty-year life spans and many were in need of substantial overhauls if their service careers were to continue. The first round of overhauls to affect the 180 fleet, known as 'AUSTERE Renovations', began in 1974.



*Ship's generator aboard* Sundew. *HABS/HAER photo by Jet Lowe.*




*Diesel engine that powers the hydraulics for boom on* Bramble*. HABS/ HAER photo by Jet Lowe.*

Improvements carried out as part of the AUSTERE Renovation program consisted of habitability improvements, engineering improvements, and equipment upgrades. The habitability improvements included modernization of the WWII-era crew quarters and sanitary facilities, installation of a crew lounge, remodeling of the dispensary area, and improved climate control systems. Work in the engineering spaces centered on the overhaul of the propulsion systems and a general modernization of the engineering plant. Equipment upgrades elsewhere included installation of modern electronics and replacement of aging deck machinery. Four buoy tenders went through the AUSTERE Renovation program.[24]

At about the same time the AUSTERE renovations commenced, the U.S. Coast Guard began rotating other 180s through shipyards for more extensive improvements as part of the 'Major Renovation' (MAJREN) program. Under the MAJREN program, vessels received new diesel engines while the main electrical motor and its control systems underwent a thorough overhaul. New electrical wiring and switchboards were installed, as were entirely new water piping and sewage handling systems. Each vessel received a bow thruster to improve its maneuverability in close quarters. Future crews benefitted from the replacement and modernization of all furnishings in the living areas. Decreasing the size of the forward hold allowed the expansion of the living area itself. Fourteen 180s went through the MAJREN program. These repairs and improvements extended each vessels service life by an estimated ten to fifteen years.[25]


*Damage control shop which was added aboard* Sundew *during renovations. HABS/HAER photo by Jet Lowe.*

The third renovation program to affect members of the 180 classes was the Service Life Extension Program (SLEP). This program began in 1983 and culminated a decade later. These renovations all took place at the Curtis Bay yard in Maryland and involved vessels that previously went through the MAJREN program. Whereas, AUSTERE and MAJREN had entailed significant overhaul, the SLEP was the most extensive effort to extend the class' life span. During the yard periods new main engines and generators replaced the aging power plants. Upgrades and replacement components served to modernize the electrical systems. Shipyard technicians installed new navigational systems and computer controls for the engineering systems. SLEP work was far more than the replacement or upgrade of various systems or simply the addition of new equipment; it also entailed significant structural changes. Shipyard workers sandblasted each vessel throughout to remove all paint and expose the underlying steel for careful inspection. Shipyard workers tore away the existing deckhouse and replaced it with a new structure that included an expanded pilothouse, ship's office, and radio room. Internal changes included the installation of smaller forward tanks and the conversion of the forward cargo hold to make room for the installation of more berthing space, including bunks and heads for female sailors, and a crew lounge. The reconfigured space also included bosun, electrical, damage control, and electronics workshops. Work was done in the internal spaces to improve the watertight integrity of the vessel. Up on deck, a hydraulic system replaced the electric weight handling gear and the boom operator's booth was relocated. For *Cactus* class vessels SLEP included removal of the A-frame and reconfiguring the cargo handling system so the boom attached to the bridge wings. Hydraulic weight handling systems were also added to the boat davits on either side of the superstructure.[26]

The SLEP overhauls were extensive and they were also time consuming and costly. The average cost for a single tender to pass through the SLEP was $11 million. Time spent in the yard averaged eighteen months or, according to the analysis of two representative overhauls, 210,000-215,000 man-hours by shipyard workers.[27]

Like the earlier programs, the SLEP helped to extend the service life span of the aging buoy tenders. Coast Guard projections during the period estimated the SLEP would extend


Mariposa *motto and logo aboard boomshack. Photo courtesy of U.S. Coast Guard.*

vessel life spans by fifteen to twenty years. Three SLEP vessels remain in service as of 2002. All other 180s that went through the SLEP program left service beginning in 1999.[28]

## The Replacements

Renovating and improving the 180s bought time but it did not ameliorate a basic problem facing the service. The U.S. Coast Guard would eventually need replacements for the 180s. A steel vessel can, barring any catastrophes, be kept functioning almost perpetually. The cost of doing so, however, grows over time and eventually reaches a point where replacing a vessel or class is cheaper than continuing to use the older platform. The savings can be measured in monetary terms with regards to maintenance costs. They can also be measured in improved efficiency resulting from fewer breakdowns, less frequent yard periods, and the use of more advanced technologies.

By the 1990s it was time to begin the lengthy process of creating a successor for the vessels one authority called, ". . . quite possibly the most versatile and useful cutter ever built for the Coast Guard," and, ". . . clearly the most multi-mission capable ship in the Black Fleet." An initial planning and consultation period ended in January 1993 when the USCG awarded a contract to Marinette Shipbuilding for the production of a new class of seagoing buoy tenders. Marinette Shipbuilding won a second contract in June 1993 for the construction of a new class of coastal buoy tender. The new seagoing tender class took the name of the prototype vessel: *Juniper*. The coastal tenders became the *Keeper* class, each named for a well-known lighthouse keeper from the past.[29]

The *Juniper* class vessels measure 225' in length, 46' in beam, and are propelled by two diesel engines driving a single reduction gear and a Controllable Pitch Propeller (CPP). Marinette builds them with both a bow and stern thruster, which combined with the CPP makes for a maneuverable platform. Like the 180s, they can handle limited icebreaking duties. The new seagoing tender incorporates many advances in maritime technology that allow the tenders, though larger than their predecessors, to operate effectively with a smaller crew. Perhaps the most significant advance is the use of a dynamic positioning system (DPS) to help keep the tender on station.


*Launch of* Ida Lewis*, first vessel of the* Keeper *class of buoys tenders.*

The DPS involves computerization of the systems that maneuver the vessel, namely propulsion and steering, combined with the latest in satellite navigation technology. This system allows the *Juniper* class vessels to maintain position within a 10-meter radius in 30-knot winds and 8' seas. *Juniper* passed from Marinette Shipbuilding to the USCG in 1996. Projections call for a total of sixteen *Juniper* class tenders.[30]

*Keeper* class tenders measure 175' in length and have a beam of 36'. They are the first USCG cutters propelled by a twin Z-Drive. This propulsion system is essentially a propeller installed within a nozzle that can rotate 360 degrees. This means thrust, in any amount manageable by the vessel's diesel engine, can be applied in any direction. The Z-Drive system, popular with many newer tugboats, combined with a bow thruster ensures the *Keeper* class tenders have excellent maneuverability and station-keeping qualities. Each vessel also carries dynamic positioning systems, honing the vessel's ability to hover on station even further. As of 2002 the USCG has fourteen *Keeper* class tenders in service.

As the new seagoing and coastal tenders have entered service, the U.S. Coast Guard has decommissioned the older 180s. At the beginning of 2002 there were nine of the old buoy tenders still in commission. They will phase out slowly and tentative plans call for *Acacia* to be the last in service with a decommissioning date sometime in 2006.[31]


Buttonwood *crewmember carrying out routine maintenance on bow. Photo courtesy U.S. Coast Guard.*

## A Great Design

The 180' buoy-tending cutters built for the U.S. Coast Guard during the early 1940s are remarkable in terms of their longevity. Except the U.S. Coast Guard's *Storis*, no other military vessels on active duty today served in World War II. Not one of the mighty battleships or carriers that cost millions of dollars remains part of the U.S. Navy. None of the largest USCG cutters that hunted submarines and rescued drowning sailors during the war remains on patrol. The 180s longevity is not a case of superior construction, though they were undoubtedly built quite solidly. The methods and materials used by their builders were substantially the same as any used at the time and the 180s have required as much maintenance and repair as any other steel work vessel.

Sixty plus years of service performed by the class is a function of their design rather than their construction. The 180s were extremely versatile and perfectly suited for their multifaceted role. They could break ice, replace a buoy, and save a sinking ship all in the course of a day's work. Moreover, they could complete these missions within sight of their homeport or steam across thousands of miles of open ocean to complete an assigned task. They did not become outmoded until computers, satellites, and automation changed the way ships are built and equipped. The U.S. Coast Guard spent time and money keeping the 180s in service long beyond their projected life span because that was the best option until very recently. These ships that fought U-boats more than half a century ago have spent millions of hours making the world's waterways a safer place for science, commerce, and recreation since there was no need to replace them because their design worked. Obsolescence crept up on the 180s very slowly, granting them tenure unmatched in twentieth-century American naval history.

The 180' buoy tenders proved to be extremely versatile vessels during their long-lived careers. Though all spent some portion of their time afloat servicing buoys, they served in many other pursuits as well. Many of these alternate activities revolved around the vessel's intended secondary missions, search and rescue, law enforcement, and icebreaking. Often, however, the tenders carried out missions never envisioned by their designers, ranging from transporting rare tropical fish to landing scientific parties on drifting icebergs. This plethora of pursuits when combined with the wide geographic distribution of the 180s makes it difficult to describe a typical or generic career for a 180. The oceangoing buoy tenders built for the U.S. Coast Guard in the early 1940s served around the world and fulfilled the service's requirement for a true multi-mission capable platform.

## Sample Histories

The best way to chronicle the diverse experiences of the 180s is to examine each vessel's career. Included are brief operational histories for three individual buoy tenders, one from each of the sub-classes.[32] These histories address the highlights of each vessel's service; they are chosen to emphasize the class' key missions, AtoN work, SAR, national defense, icebreaking, and law enforcement. They also show the wide geographic distribution of the 180s and serve to give a glimpse of the unique experiences of individual vessels. Information for other vessels may found in the HABS/HAER collections at the Library of Congress.

### *Balsam—Cactus* Class

When Zenith Dredge Company laid *Balsam*'s keel on October 25, 1941, war had engulfed Europe and East Asia but the threat of armed hostilities remained a distant threat for most Americans; the United States seemed safe behind twin oceanic

*Stern view of* Balsam *underway.*

shields and able to choose when and how it would participate in the growing conflict. By the time *Balsam* slid off the ways on April 15, 1942, the U.S. had been stunned at Pearl Harbor, dragged into war, and was on the retreat throughout the Pacific Theater. When the U.S. Coast Guard commissioned *Balsam* on October 14, 1942, the United States had begun to marshal its military and industrial strength for an unprecedented naval offensive that would play out over the largest battlefield on earth. *Balsam* and her sister ships would play an important role in that offensive.

The diminutive buoy tender was never intended to be the sharp edge of the navy's sword. While she did mount weapons, they paled in comparison to the firepower wielded by all but the smallest Japanese naval unit. *Balsam*'s role was not to sink enemy ships, blast aircraft from the sky, or reduce fortifications on shore. Instead, *Balsam* deployed to help guide the edge of the sword, the carrier task forces and invasion fleets, to the enemy and, of equal importance, to guide the thousands of ships that supplied the combat units with their food, fuel, and ordinance.

*Balsam* steamed to the South Pacific soon after her commissioning. There, she serviced the myriad AtoN that U.S. forces deployed to guide naval and merchant vessels toward their far-flung destinations across the Pacific Theater. Many of the AtoN were traditional buoys and shore-based lights, perhaps made of modern materials but little different in form and function from their counterparts of a century before. Other AtoN were of a revolutionary design and their top secret design was unlike anything seen in the past.

During WWII the Allies began deploying a navigational system known as LORAN (LOng RAnge Navigation), a collaborative effort of American and British scientists and engineers. This highly classified system consisted of shore-based installations spread across the coverage area. The shore-based installations were arranged in chains of stations consisting of a 'master' and one or more 'slave' stations. The 'master' station would transmit a unique radio wave at a prescribed time and once that signal was received by the 'slave' stations, they would transmit their own unique radio wave. These short transmissions or pulses were repeated continuously at a prescribed rate. The speed at which radio waves travel is a known quantity and the distance between stations in a LORAN chain was known. Therefore, by measuring the time difference between the arrival of pulses, shipboard navigators could formulate lines of positions (LOP) and determine their location on the earth's surface.[33]

Before the advent of LORAN, navigation was limited to celestial navigation, coastal piloting, and the use of radio direction finders (RDF). Celestial navigation yielded accurate position fixes if the navigator performed every step of measuring sextant angles and refining them through a series of mathematical calculations without error. An error at any step would ruin the fix. Moreover, celestial navigation required a clear view of one or more celestial body. Thus, celestial navigation was useless on overcast days or in the dead of night. Coastal piloting, which entails navigating using visual landmarks, is relatively simple and accurate but is useful only within sight of land. This made it unsuitable for much of the Pacific Theater where distances between islands often reach thousands of miles. Radio direction finding gave navigators a precise direction to a known transmitter on land. This yielded a single line of position and told a navigator that he was somewhere on that line, but where on the line remained a mystery. Shipboard navigators could combine LOPs obtained from radio direction finding to triangulate a fix but the effective range was less than 250 miles from the transmitting stations, not ideal for the Pacific.[34]

LORAN overcame many of the problems associated with other forms of navigation. It worked at night or under overcast skies. It was effective up to 1,400 miles offshore and it produced intersecting LOPs that resulted in an accurate fix. The LORAN system was a powerful navigational tool and it was one that only the Allies possessed. LORAN was kept out of Axis hands throughout the war and provided Allied forces with a valuable advantage in Atlantic and Pacific operations.

*Balsam* helped to build and service the LORAN stations that covered the waters of the South Pacific. While ferrying construction workers, technicians, and supplies to LORAN sites, *Balsam* crossed the equator fifty times in a nineteen month period. The LORAN system was one of *Balsam'*s most important projects but it did not consume all her time. LORAN did have certain drawbacks. As with any electronic system, it could temporarily fail. LORAN navigation was not precise enough for negotiating dangerous passages such as harbor entrances. Finally, not all Allied vessels carried equipment to receive and process LORAN signals. The weaknesses in the LORAN system meant traditional AtoN remained an important resource for Allied ships; therefore, tending traditional AtoN remained part of *Balsam's* mission.

*A member of a buoy tender's deck force prepares to trip the chain stopper. This will release the buoy's anchor for the plunge to the sea-floor.*

In June 1945 *Balsam* traveled to Okinawa to conduct general AtoN work in support of the invasion. This period coincided with some of the fiercest Japanese kamikaze attacks of the war and on July 21 *Balsam* used her firefighting capabilities to aid the U.S.S. *Rawlins* after a kamikaze pilot crashed his plane into the ship and set it ablaze.

*Balsam* remained stationed in the South Pacific for two years after the Japanese surrender. During this time she continued to service AtoN and provide general logistical support to American installations. In October 1947 the U.S. Coast Guard reassigned *Balsam* to Oregon for AtoN duties. *Balsam* spent just under six years based in Astoria. These appear to have been busy times for the tender. Besides AtoN work, *Balsam* often carried out SAR activities along the treacherous coasts of the Pacific Northwest. The tender also patrolled the salmon and tuna fisheries and even spent some time patrolling sailing regattas. Most of *Balsam's* activities during this period were normal peacetime pursuits. Reminders of the recent war, however, had not yet disappeared. On May 23, 1948, the tender sunk a floating mine discovered near Astoria.

The tender's homeport changed to Eureka, California, in August 1953. *Balsam* spent the next three years operating out of Eureka in much the same role as when she worked out of Astoria. Buoy tending was the vessel's primary occupation but emergency calls occasionally sent *Balsam* to tow or otherwise assist a vessel aground or in distress. A trip north broke the routine during the summer of 1956. Like all 180s *Balsam* could carry cargo in forward holds. This cargo-carrying capacity proved valuable when the tender headed for Alaska to re-supply the Defensive Early Warning (DEW) line. The DEW line consisted of a series of radar installations that provided sensor coverage of the Arctic, thereby lessening the chances of a successful sneak attack by Soviet forces using a polar route.

Shortly after her visits to the DEW line, the U.S. Coast Guard reassigned *Balsam* to Honolulu, Hawaii. From her Hawaiian base *Balsam* tended local aids to navigation and sortied to help vessels in distress and in one case to search for a missing commercial airliner. *Balsam* made another re-supply trip to the DEW line during the summer of 1957.

The trips to the DEW line proved a foreshadowing of the future. In June 1958 *Balsam* was transferred to Alaska on a permanent basis. Her initial Alaskan base was Ketchikan where she was stationed for six years before moving to Adak in 1964. *Balsam*'s Alaskan missions were a combination of her typical AtoN role, service as a SAR platform, and patrolling the Cold War's frontline between Alaska and Siberia. Once, the buoy tender escorted a Soviet ship that crossed into U.S. territorial waters to make emergency repairs.

By the mid 1970s *Balsam*'s career had come to an end. On March 6, 1975, the vessel's decommissioning ceremony marked the end of her use as a U.S. Coast Guard cutter. The U.S. government sold the retired buoy tender in September 1977, just short of thirty-five years after she entered service. When the General Services Administration (GSA) sold *Balsam* she went to a private owner for $53,687. That owner subsequently sold the vessel to an Alaskan fishing concern for $10.00 and "other valuable considerations" in 1979. The new owners spent almost a year converting the former buoy tender into a catcher-processor vessel for the Alaskan crab fishery. The conversion was extensive and included replacement of the entire superstructure and installation of a new power plant. It also included installation of fishing gear. When not busy with crabbing, the vessel functioned as a floating processor for the Pacific Salmon fishery. *Tupelo*, another 180, went through the sale and conversion process simultaneously. The new owners renamed the two former cutters *Baranof* and *Courageous*.[35]

## *Planetree—Mesquite* Class

Marine Iron and Shipbuilding built *Planetree* at a cost of $872,876. Her keel was laid on December 4, 1942, and she was launched on March 20, of the following year. The tender officially entered service after her commissioning on November 4, 1943.

*Planetree* stayed on the Great Lakes as an AtoN tender and icebreaker until April 1944 when she transferred to the Thirteenth District and left for her new homeport in Seattle, Washington. *Planetree* spent the next six months of the war servicing AtoN and helping to build LORAN stations on offshore islands as far away as the Aleutians. In June 1944 *Planetree* was reassigned to Pearl Harbor, Hawaii and engaged in AtoN work. She remained based in Hawaii until 1947 when postwar military personnel shortages led to her temporary decommissioning.

On September 1, 1949, *Planetree* returned to active duty and departed for Guam. From Guam the tender serviced AtoN spread from Okinawa to Saipan to Eniwetok. In October 1954 *Planetree* returned to Honolulu, Hawaii. For the next two decades *Planetree* did AtoN work, carried out re-supply missions throughout the South Pacific on a regular basis, and swung into action as a SAR platform when the need arose.

*View of buoy deck and forecastle on* Planetree. *HABS/HAER photo by Jet Lowe.*

The tender had the distinction of being the first U.S. Coast Guard buoy tender to serve in Vietnam. In early 1966 the military command in charge of U.S. operations in South Vietnam requested the support of a buoy tender; *Planetree* was dispatched later that spring. She was ordered to set buoys used during the offloading of petroleum by tankers. The buoy tender set sixteen of these buoys in four different ports. Her success with the buoys stimulated requests for other AtoN missions and soon *Planetree*'s crew had their hands full marking channels, setting mooring buoys, and placing buoys on hazards to navigation. The military command soon requested a permanent buoy tender presence in Vietnamese waters. The request was denied but the U.S. Coast Guard agreed to rotate buoy tenders through the theater on a regular basis and began staging 180s out of the Philippines for missions to South Vietnam.[36]

U.S. Coast Guard buoy tenders worked in the waters of South Vietnam on a rotating basis until the spring of 1972. During their deployments the tenders worked on AtoN, helped conduct surveys, and carried cargo between installations. They also came under enemy fire on a regular basis, though no buoy tender was seriously damaged by hostile fire. The tenders worked hard while on their Vietnam deployments but the ultimate goal was not to maintain South Vietnam's AtoN in perpetuity but to train the Vietnamese to eventually take over these duties. Therefore, buoy tender deployments also tended to be training cruises. Personnel from the Directorate of Navigation, the South Vietnamese agency charged with matters relating to marine navigation, would board the USCG cutters when the buoy tenders arrived in South Vietnam. They would then serve as apprentices to the U.S. crew as the cutter went about its mission. The transfer of responsibilities for AtoN from the USCG to the Directorate of Navigation began early in 1972 and was officially completed by December of that year.[37]

The tender's homeport changed to Juneau, Alaska in August 1974. *Planetree* continued her AtoN and SAR work in Alaskan waters until 1999 when decommissioning ended the cutter's career.

*Planetree* survived thousands of miles of blue water crossings in the Pacific and service in the rough waters off Alaska but her career was not without mishap or close calls. The buoy tender was twice in serious danger. The first time came in January 1983 when the vessel was en route from Alaska to Hawaii to participate in refresher training. A severe storm overtook *Planetree* about 1,100 miles west of San Francisco. The storm's waves, driven by wind gusts as high as 100 miles per hour, reached as high as five stories and opened three holes in the tender's hull. *Planetree*'s crew eventually managed to patch the holes and stem the inflow from fifty gallons per hour to a more manageable five gallons per hour. During the storm the tender also began to leak propeller shaft lubricant which threatened her ability to maneuver and avoid the largest of the storm driven waves. Fortunately for the crew, the supply of lubricant lasted until a fresh supply arrived on the United States Coast Guard Cutter (USCGC) *Munro* and the tender's pumps kept pace with the leaks in the hull throughout the storm.[38]

*View of* Bramble*'s bow. HABS/HAER photo by Jet Lowe.*

*Planetree's* next encounter with near disaster came on January 25, 1990, when the tender ran aground in Wrangell Narrows near Deception Point, Alaska. The grounding opened two holes in the hull; one measured 1' x 2' and the other was 6" x 1". The in-rushing water, estimated at 400 to 500 gallons per minute was contained by the use of six pumps. *Planetree*'s crew, aided by personnel from the U.S. Coast Guard cutters *Firebush* and *Anacapa*, pumped an estimated 3.2 million gallons of water out of the holed vessel in the first twenty-four hours. *Planetree* eventually managed to reach a commercial dry-dock under her own power.[39]

*Planetree* went through an AUSTERE renovation in 1991. She was decommissioned in March 1999 and the federal government placed her in the ready reserve fleet. As of January 2002 she remains in the mothball fleet at Suisun Bay, California.[40]

## *Bramble—Iris* Class

*Bramble* was built by the Zenith Dredge Company. The keel laying took place on August 2, 1943, and the launch followed on October 23, 1943. The commissioning ceremony was six months later, on April 22, 1944. The federal government paid $925,464 for *Bramble*.

Initially, *Bramble* was stationed on the Great Lakes as an icebreaker and buoy tender. This first tour of duty was brief and by mid-1944 *Bramble*, under new orders, left for San Pedro, California. *Bramble* operated out of San Pedro until March 1945 when she received orders sending her to Juneau, Alaska. In February 1946 *Bramble* left Juneau for San Francisco, California.

While based in California *Bramble* traveled to Bikini Atoll in the Marshall Island to participate in Operation Crossroads. Bikini was the site of U.S. atomic bomb tests. *Bramble* took over responsibility for the maintenance of AtoN in Bikini's lagoon from her sister ship *Redbud,* which had helped prepare the target area for the first round of tests. After several weeks of refurbishing AtoN, marking channels into the lagoon, and working on the moorings for ships used as target vessels during the tests, *Bramble* left Bikini. *Bramble* paused about fifteen miles from the atoll to watch the detonation of an atomic bomb over the target area before setting a course for Hawaii.[41]

*Bramble* moved again in August 1946, this time to Honolulu, Hawaii. She left Hawaii in July 1947 and took up station in San Francisco. She worked out of San Francisco for exactly two years and then moved to San Juan, Puerto Rico. Throughout her wanderings in the Pacific from 1944-1949 *Bramble* served as an AtoN tender.

*Bramble* spent four years operating out of San Juan. During this period she was engaged in AtoN work but was also very busy conducting SAR operations. These SAR operations had *Bramble* assisting vessels ranging from sailing schooners to oil tankers. Her assistance was not limited to mariners; in April 1952 she went to the aid of ten survivors from a plane crash.

In July 1953 *Bramble* moved once again to a new homeport, this time it was Miami Beach, Florida. *Bramble* continued her

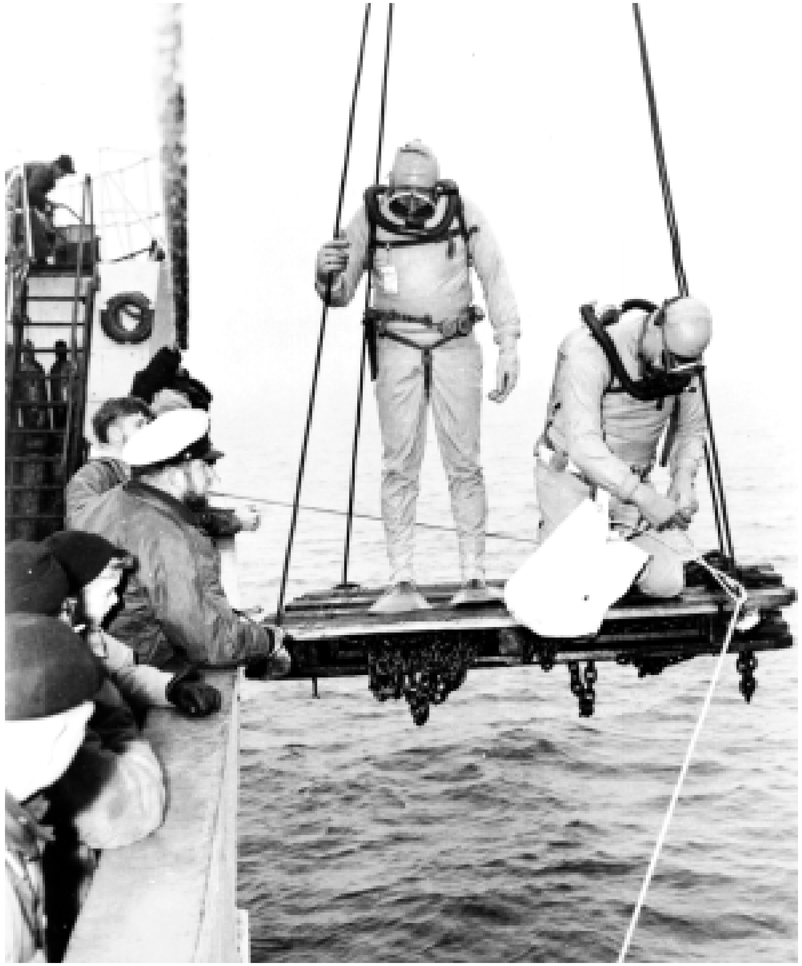

Bramble *underway in the Great Lakes. HABS/HAER photo by Jet Lowe.*

AtoN and SAR work from Miami Beach. She also made goodwill visits on behalf of the United States to ports in Ecuador and Colombia.

While based at Miami Beach *Bramble* participated in an historic operation that took her far from the palm fringed shores of South Florida. On May 26, 1957, *Bramble* departed on a special mission. In the company of the larger cutter *Storis* and her sister ship *Spar,* the tender circumnavigated the North American continent. The Coast Guard convoy, known as Task Force Five, formed in Seattle, Washington, and headed north and west toward Alaska. They eventually reached Point Barrow and turned back east. By carefully working their way through the Northwest Passage, making preliminary charts as they went, the trio reached Baffin Bay and then the Labrador Sea. From the Labrador Sea they entered the Atlantic Ocean and steamed south to the East Coast of the United States. The three cutters were the first U.S. vessels to complete a circumnavigation of the continent.[42]

The long journey included 4,525 miles in the barely charted waters north of the Arctic Circle. At one point while transiting the Franklin Strait all three vessels became trapped in ice for several days until *Spar* battered her way free of the ice and cleared a path to open water. Had *Spar*'s efforts been unsuccessful, the U.S. Coast Guard would have abandoned the three cutters in the ice for the winter and evacuated their crews. Spar's efforts did cause some damage to the cutter and divers had to brave frigid waters to conduct repairs.[43]

The purpose of the voyage was to find out if the Northwest Passage was a feasible supply route between the Atlantic and Pacific, one that the U.S. military could use in times of war when enemy action might close other shipping routes. Military planners had especially high hopes for the Northwest Passage as a resupply route for the Defensive Early Warning (DEW) line. This line of radar stations guarded against surprise Soviet attack via the Arctic. Though Task Force Five completed the voyage without serious mishap, the difficulty of the journey and the conditions encountered by the vessels led military planners to abandon the idea of establishing shipping lanes across the top of the continent.



*Divers prepare to brave frigid Arctic waters to inspect damage done to* Spar*'s propeller. The tender sustained the damage in her successful effort to break free from entrapment in ice. After freeing herself,* Spar *freed* Storis *and* Bramble*.*

After Task Force Five completed its mission *Bramble* returned to Miami to take up her duties as an AtoN tender and SAR platform. These duties included assisting in the evacuations of Charleston, South Carolina, and Savannah, Georgia, under the threat of Hurricane Gracie.

In August 1962 the well-traveled buoy tender, with service in the Pacific Ocean, Atlantic Ocean, Arctic Ocean, and Caribbean Sea, returned home to the Great Lakes. She took up station in Detroit, Michigan, and went to work as an AtoN tender and icebreaker.

*A 180 carrying a deckload of buoys and sinkers pushes her way through ice.*

The Duluth shipyards originally built the 180s to carry out icebreaking duties. Their reinforced hulls and notched bows allowed them to power through ice up to several inches thick. On occasion, however, the ice was not the danger; instead it was the vessel they were helping that posed a threat. *Bramble* was breaking ice for the commercial vessel *Robert S. McNamara* when the following vessel got too close and collided with *Bramble*'s stern. The buoy tender survived without serious damage and it appears this was the only collision in which *Bramble* was involved.

*Bramble* underwent a Major Renovation at the Curtis Bay yard in 1974. The repairs included an overhaul of her engines, installation of a new hydraulic boom, and habitability improvements.

After the yard period *Bramble* was assigned to Port Huron, Michigan. *Bramble* has operated out of Port Huron for the last seventeen years except for patrols in the Caribbean during the winters of 1986-1987 and 1997. During the 1997 trip to the Caribbean *Bramble* participated in training programs involving the marine police of ten island nations and joint operations with Venezuelan maritime forces.

One of the last 180s in U.S. service as a buoy tender, *Bramble* was decommissioned on May 22, 2003. Plans are for her to remain in her home waters at the Port Huron Museum.[44]

Buttonwood*'s buoy deck with mooring chains laid out. HABS/HAER photo by Jet Lowe.*

# Appendix A – Terms and Abbreviations

*AtoN*—Aid(s)-to-Navigation—Any marker or signal that imparts navigational information to mariners or aviators.

*Bridge*—The compartment or area from which a vessel is navigated. Usually contains a wheel and electronic equipment such as radar, radios, and navigational computers. The bridge is typically located high on the forward end of the superstructure as this is the best vantage point.

*Galley*—Kitchen facilities on a ship.

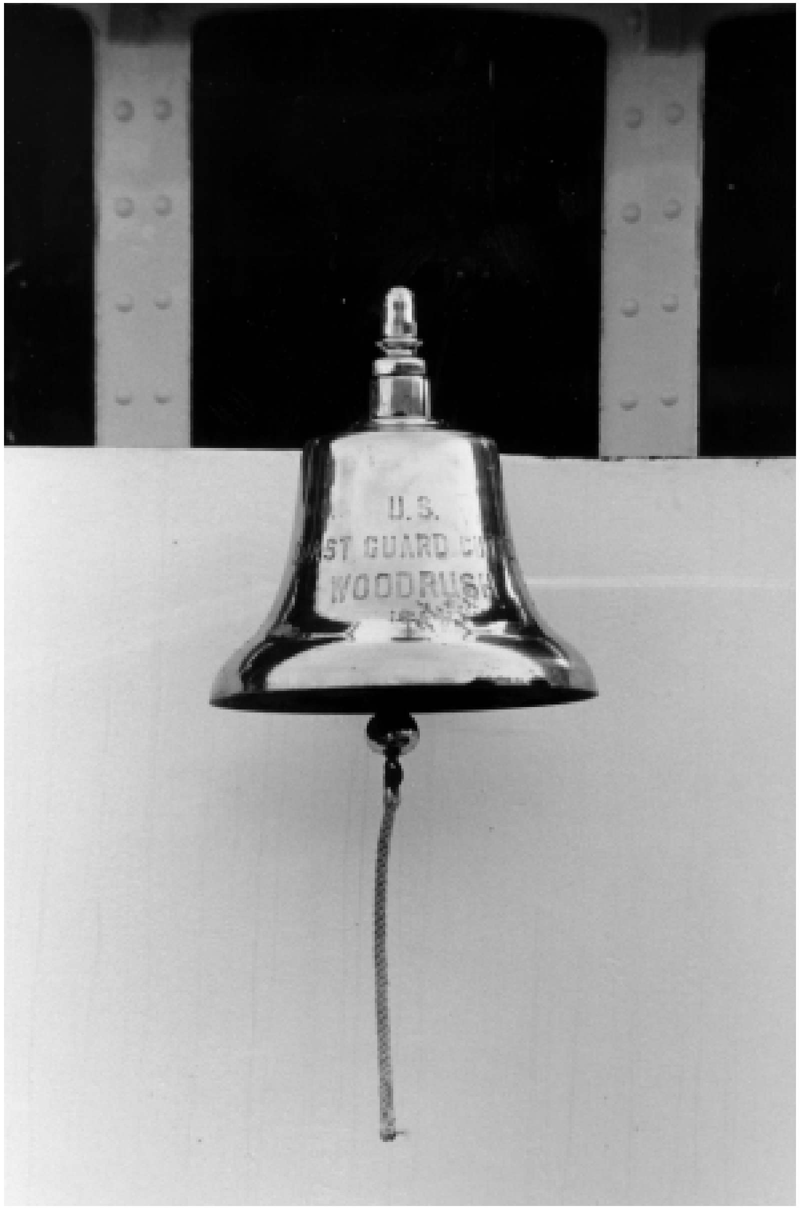
*Bulkhead*—Transverse partition that divides a vessel's hull into sections. If the bulkheads are watertight, the vessel's ability to survive damage is significantly improved as flooding will only affect the area immediately adjacent to the damage instead of spreading to fill the entire vessel.

*Coast Guard District*—This is an administrative division of the U.S. Coast Guard. As of 2002 the United States is divided into nine Coast Guard Districts. During World War II there were fifteen Coast Guard Districts.

*Curtis Bay*—The location of the U.S. Coast Guard's primary shipyard. This Maryland facility handled most major repair and renovation tasks associated with the 180s. This is also where *Ironwood* was built.

*DEW Line*—Defensive Early Warning—Line of radar installations deployed across the northern reaches of North America. This system was installed during the Cold War to warn American leaders of any surprise raid by Soviet forces by way of the Arctic.

*GPS*—Global Positioning System—Electronic navigation system utilizing satellites in geo-synchronous orbit. Shipboard



*Bell on* Woodrush. *Photo courtesy U.S. Coast Guard*

receivers measure the direction to several satellites. Each measurement yields a line of position and the intersection of several lines results in a position fix. The position information yielded by GPS can be accurate within a few feet. GPS receivers can display position information as coordinates or as part of a graphic display. GPS has become the electronic navigation system of choice for most maritime operations and has largely supplanted the older, less accurate LORAN system.

*Head*—Toilet.

*Helm*—Wheel or other control device used to steer.

*Hold*—Cargo storage area on a ship.

*Keel*—Primary structural member in modern ship construction using wood, iron, or steel. The keel runs longitudinally and is located at the lowest point in the hull. It usually takes the form of a large wood or metal beam.

*LOP*—Line of Position—This is a navigational term that describes an imaginary line on the earth's surface; the vessel is somewhere on the line. A single LOP is of limited use to a navigator but two or more intersecting LOPs yield the navigator's current position. LOPs can be derived from bearings or distances to objects on shore or calculated from the position of a celestial body.

*LORAN*—Long Range Navigation—Electronic navigation system that was introduced during World War II. The LORAN system is organized in chains of broadcasting stations located at fixed and known points on the earth's surface. Each chain consists of a 'master' station and one or more 'slave' stations. The 'master' broadcasts a radio signal at prescribed times, each slave transmits it own signal after receiving the 'master' signal. Since the speed at which radio waves travel is a known constant, shipboard navigators can fix their position by measuring the time at which various signals are received as

*Wheelhouse on* Pawpaw *prior to overhauls. Photo courtesy U.S. Coast Guard.*

compared to the time they were transmitted. In recent years LORAN has given way to GPS systems for most marine applications.

*Marine Iron and Shipbuilding*—A commercial shipyard located in Duluth, Minnesota. This company produced twenty-one of the thirty-nine 180s.

*Mess*—Dining area on a ship.

*OOD*—Officer of the Deck—The officer in charge of a vessel's safe operation. This term denotes who is on watch, or on-duty, on the bridge rather than indicating absolute rank. Hence, a junior officer can be the OOD and nominally in charge of a vessel even though more senior officers are aboard.

*Radar*—Radio Detection and Ranging—Electronic instrument that consists of a transmitter and receiver. The transmitter sends out radio waves and the receiver measures the return or echo of those waves after they bounce off objects. Analysis of the return can provide information about distant objects, including: size, location, speed, and number.

*SAR*—Search and Rescue—One of the primary functions of the U.S. Coast Guard; entails finding and assisting persons in trouble on the water.

*Sextant*—Precision navigational instrument used to measure angles. Most applications involve using sextants to measure the altitude of celestial bodies in order to determine position on the high seas. Sextants can also be used to measure angles from a vessel to landmarks on shore; if three or more known landmarks are used this will yield a position fix. Buoy tender crews used this method to determine where to drop buoys in the days before electronic navigational systems.

*SLEP*—Service Life Extension Program—Program of modernization intended to extend the careers of selected 180s.

*Galley (above) and cress mess (below) aboard* Buttonwood. *HABS/HAER photos by Jet Lowe.*

These extensive overhauls were done at the U.S. Coast Guard's shipyard in Curtis Bay, Maryland.

*Sonar*—Sound Navigation and Ranging—Acoustic device used by submarines and surface vessels to detect other vessels and to navigate. Sonar systems operate by emitting a pulse of sound and measuring the return or echo. Analysis of the return can provide information about distant objects, including: size, location, speed, and number. Sonar information is also useful in mapping undersea topographical features. Sonar can also refer to 'Passive Sonar', this is simply the analysis of underwater sounds using microphones and audio filtering systems.

*Superstructure*—Portion of a vessel above the main deck.

*Typhoon*—Large anti-cyclonic storm occurring in the Pacific Ocean. This weather phenomenon is analogous to a hurricane in the Atlantic and is characterized by winds in excess of seventy-four miles per hour.

*Weather stations*—During World War II Allied vessels were often assigned to take up patrol stations at selected locations in the North Atlantic; from these stations they transmitted meteorological data back to headquarters. This data allowed military leaders to pick optimal times for launching trans-Atlantic flights and improved the chances of aircraft making the long over-water journey.

*Yard*—A shipyard or installation where extensive repair or construction work can be carried out on a ship. In referring to the 180s this means the U.S. Coast Guard Shipyard at Curtis Bay, Maryland, unless otherwise noted.

*Zenith Dredge Company*—A commercial shipyard located in Duluth, Minnesota. This company produced seventeen of the thirty-nine 180s.

# Appendix B – The 180s

| Vessel | Builder | Hull number | Days to build | Class | Keel laid | Launched | Com-missioned | De-com-missioned | Renovations | Cost $ |
|---|---|---|---|---|---|---|---|---|---|---|
| *Cactus* | Marine Iron | 270 | 519 | Cactus (A) | 03/31/41 | 11/25/41 | 09/01/42 | 1971 | | 782,381 |
| *Cowslip* | Marine Iron | 277 | 396 | Cactus (A) | 09/16/41 | 04/11/42 | 10/17/42 | 2002 | 1984 SLEP | 918,873 |
| *Balsam* | Zenith Dredge | 62 | 354 | Cactus (A) | 10/25/41 | 04/15/42 | 10/14/42 | 1975 | | 916,109 |
| *Clover* | Marine Iron | 292 | 340 | Cactus (A) | 12/03/41 | 04/25/42 | 11/08/42 | 1990 | | 907,240 |
| *Gentian* | Zenith Dredge | 290 | 396 | Cactus (A) | 10/03/41 | 05/23/42 | 11/03/42 | 1998 | 1983 SLEP | 911,968 |
| *Woodbine* | Zenith Dredge | 289 | 288 | Cactus (A) | 02/02/42 | 07/03/42 | 11/17/42 | 1972 | | 906,698 |
| *Evergreen* | Marine Iron | 295 | 380 | Cactus (A) | 04/15/42 | 07/03/42 | 04/30/43 | 1990 | | 871,946 |
| *Laurel* | Zenith Dredge | 291 | 221 | Cactus (A) | 04/17/42 | 08/04/42 | 11/24/42 | 1999 | 1990 SLEP | 902,656 |
| *Citrus* | Marine Iron | 300 | 396 | Cactus (A) | 04/29/42 | 08/15/42 | 05/30/43 | 1994 | | 853,987 |
| *Sorrel* | Zenith Dredge | 296 | 324 | Cactus (A) | 05/26/42 | 09/28/42 | 04/15/43 | 1996 | 1983 SLEP | 952,103 |
| *Conifer* | Marine Iron | 301 | 360 | Cactus (A) | 07/06/42 | 11/03/42 | 07/01/43 | 2000 | 1986 SLEP | 854,003 |
| *Madrona* | Zenith Dredge | 302 | 328 | Cactus (A) | 07/06/42 | 11/11/42 | 05/30/43 | 2002 | 1989 SLEP | 949,144 |
| *Mesquite* | Marine Iron | 305 | 372 | Mesquite (B) | 08/20/42 | 11/14/42 | 08/27/43 | 1989 (stranded) | | 894,798 |
| *Tupelo* | Zenith Dredge | 303 | 380 | Cactus (A) | 08/15/42 | 11/28/42 | 08/30/43 | 1975 | | 948,887 |
| *Buttonwood* | Marine Iron | 306 | 354 | Mesquite (B) | 10/05/42 | 11/30/42 | 09/24/43 | 2001 | 1993 SLEP | 880,018 |
| *Pawpaw* | Marine Iron | 308 | 330 | Mesquite (B) | 11/16/42 | 02/19/43 | 10/12/43 | 1999 | 1991 SLEP | 870,836 |
| *Ironwood* | USCG Curtis Bay | 297 | 275 | Mesquite (B) | 11/02/42 | 03/16/43 | 08/04/43 | 2000 | 1974 Major Renovation | 1,388,227 |
| *Planetree* | Marine Iron | 307 | 335 | Mesquite (B) | 12/04/42 | 03/20/43 | 11/04/43 | 1999 | 1991 Austere | 872,876 |
| *Sweetgum* | Marine Iron | 309 | 272 | Mesquite (B) | 02/21/43 | 04/15/43 | 11/20/43 | 2002 | 1992 SLEP | 871,619 |

| Vessel | Builder | Hull number | Days to build | Class | Keel laid | Launched | Com-missioned | De-com-missioned | Renovations | Cost $ |
|---|---|---|---|---|---|---|---|---|---|---|
| *Basswood* | Marine Iron | 388 | 297 | Iris (C) | 03/21/43 | 05/20/43 | 01/12/44 | 1998 | 1974 Austere and new engines | 896,402 |
| *Blackhaw* | Marine Iron | 390 | 307 | Iris (C) | 04/16/43 | 06/18/43 | 02/17/44 | 1993 | 1992 SLEP | 871,771 |
| *Blackthorn* | Marine Iron | 391 | 311 | Iris (C) | 05/21/43 | 07/20/43 | 03/27/44 | 1980 (sunk) | | 876,403 |
| *Hornbeam* | Marine Iron | 394 | 300 | Iris (C) | 06/19/43 | 08/14/43 | 04/14/44 | 1999 | 1977 Major Renovation | 864,296 |
| *Bramble* | Zenith Dredge | 392 | 264 | Iris (C) | 08/02/43 | 10/23/43 | 4/22/44 | 2003 | 1975 Major Renovation | 925,464 |
| *Redbud* | Marine Iron | 398 | 286 | Iris (C) | 07/21/43 | 09/11/43 | 05/02/44 | 1972 | | 926,926 |
| *Salvia* | Zenith Dredge | 400 | 240 | Iris (C) | 06/24/43 | 09/15/43 | 02/19/44 | 1991 | 1991 SLEP | 923,995 |
| *Sagebrush* | Zenith Dredge | 399 | 261 | Iris (C) | 07/15/43 | 09/30/43 | 04/01/44 | 1988 | 1990 SLEP | 925,134 |
| *Sassafras* | Marine Iron | 401 | 281 | Iris (C) | 08/16/43 | 10/05/43 | 05/23/44 | Active | 1978 Major Renovation | 864,032 |
| *Spar* | Marine Iron | 403 | 273 | Iris (C) | 09/13/43 | 11/02/43 | 06/12/44 | 1997 | 1977 Major Renovation | 865,941 |
| *Bittersweet* | Zenith Dredge | 389 | 238 | Iris (C) | 09/16/43 | 11/11/43 | 05/11/44 | 1997 | | 926,769 |
| *Sedge* | Marine Iron | 402 | 273 | Iris (C) | 10/06/43 | 11/27/43 | 07/05/44 | 2002 | 1974 Major Renovation | 865,411 |
| *Mallow* | Zenith Dredge | 396 | 240 | Iris (C) | 10/10/43 | 12/09/43 | 06/06/44 | 1997 | 1975 Austere/1993 SLEP | 926,926 |
| *Sweetbrier* | Marine Iron | 405 | 266 | Iris (C) | 11/03/43 | 12/30/43 | 07/26/44 | 2001 | 1976 Major Renovation | 865,531 |
| *Mariposa* | Zenith Dredge | 397 | 250 | Iris (C) | 10/25/43 | 01/14/44 | 07/01/44 | 2000 | 1975 Major Renovation | 926,446 |
| *Firebush* | Zenith Dredge | 393 | 251 | Iris (C) | 11/12/43 | 02/03/44 | 07/20/44 | 2003 | 1979 Major Renovation | 926,446 |
| *Sundew* | Marine Iron | 404 | 269 | Iris (C) | 11/29/43 | 02/08/44 | 08/24/44 | Active | 1978 Major Renovation | 861,589 |
| *Acacia* | Zenith Dredge | 406 | 229 | Iris (C) | 01/16/44 | 04/07/44 | 09/01/44 | Active | 1976 Major Renovation | 927,156 |
| *Woodrush* | Zenith Dredge | 407 | 292 | Iris (C) | 02/04/44 | 04/28/44 | 11/22/44 | 2001 | 1979 Major Renovation | 926,156 |
| *Iris* | Zenith Dredge | 395 | 245 | Iris (C) | 12/10/43 | 05/18/44 | 08/11/44 | 1995 | 1974 Austere | 926,446 |

# ENDNOTES

[1]Amy K. Marshall, “Frequently Close to the Point of Peril: A History of Buoys and Tenders in U.S. Coastal Waters, 1789-1939” (Masters Thesis, East Carolina University, 1998), 1,5.; Robert Hendrickson, *The Ocean Almanac* (New York: Doubleday, 1984), 332-333.

[2]Marshall, “Frequently Close to the Point of Peril,” 8; Amy K. Marshall, *History of Buoys and Tenders* (Washington: U.S. Coast Guard Historians Office, 1995), 2.

[3]Marshall, “Frequently Close to the Point of Peril,” 31.

[4]Ibid., 31, 55.

[5]Ibid., 90; Douglas Peterson, *U.S. Lighthouse Service Tenders, 1840-1939* (Annapolis, Maryland: Eastwind Publishing, 2000), 20.

[6]Robert L Scheina, *U.S. Coast Guard Cutter and Craft of World War II* (Annapolis, Maryland: Naval Institute Press, 1982), 140-141.

[7]U.S. Coast Guard History Center <www.laesser.org>

[8]Scheina, *U.S. Coast Guard Cutters and Craft of World War II,* 92-100.

[9]Ibid., 92-99.

[10]D.R. Peterson, “Black Hulls and Blue Water.” *Pacific Shield* (January-March 1984): 4.

[11]RADM John L. Linnon, On-line interview response form, 21 August 2001,

[12]Marine Iron and Shipbuilding File, University of Wisconsin (Duluth-Superior) Library Maritime Collection; Scheina, *U.S. Coast Guard Cutter and Craft of World War II*, 92-99.

[13]Peterson, 2.

[14]Larry Oakes, “Welderettes of Duluth.” *Minneapolis Star Tribune* 7 December 1999, R9.

[15]Ibid.; Roger Losey, “Pride of the Coast Guard—The 180s From Duluth.” *The Nor’Easter, Journal of the Lake Superior Marine Museum Association* 10, no. 4 (1985): 2.

[16]*Clover* Decommissioning Pamphlet, *Clover* Cutter File, U.S. Coast Guard Historian’s Office.

[17]“Versatile is the Word for Buoy Tenders.” *Coast Guard Magazine* (June 1945): 35-36.

[18]Orders to CO of *Mesquite*—1 October 1943, *Mesquite* Cutter File, U.S. Coast Guard Historian’s Office.

*Executive officer’s stateroom aboard* Sundew. *HABS/HAER photo by Jet Lowe.*

[19]"'*Sweetgum*' Fought 'Battle of Coco Solo'." *U.S. Coast Guard Magazine* (July 1956): 34.

[20]"Versatile is the Word for Buoy Tenders," 35.

[21]"Cutter Tupelo Experiments with New Method of Handling Buoys." *Coast Guard Magazine* (January 1950): 12.

[22]Stafford Campbell, "Maintaining the Reliability of U.S. Navaids." *The Practical Navigator* (1995), unpaginated proof copy.

[23]Benjamin Ramsey, "Down East with the Hornbeam: U.S. Coast Guard Magazine Visits a Cape Cod Buoy Tender." *Coast Guard Magazine* (March 1955): 14-15; Thomas Rau, "Buoy Tending: Underway with CGC Acacia's Deck Warriors." *Coast Guard Reservist* (April 1997): 4-5.

[24]USCG Memorandum #5752 From Chief Short Range AtoN Branch to Chief Asset Management Branch, 1 January 1995, 4; *Clover* Decommissioning Pamphlet; R. J. Papp, Jr. "Coast Guard Buoy Tenders: Asset, Or Anachronistic Liability?" (Newport, Rhode Island: Naval War College, 1990),17; Dana V. O'Hara, "180' WLB Service Life Extension Program." *Coast Guard Engineers Digest* 24-227 (Summer 1985): 33-35.

[25]O'Hara, 33-35; Papp, 18.

[26]*Jane's Fighting Ships 1987-1988* (New York: Jane's Publishing Company, 1988), 805; "Coast Guard Yard Renovates CGC *Gentian*." *Coast Guard News* (10 August 1983):1; "Coast Guard Yard Renovates CGC *Cowslip*." *Coast Guard News* (11 July 1984), 1; R. J. Papp, Jr., 17-18; "Renovation of CGC *Sorrel* Completed: First Vessel to be Finished Under SLEP." *Coast Guard Engineers Digest* 22-218 (Spring, 1983): 14-15; O'Hara, 33.

[27]*Jane's Fighting Ships 1987-1988*, 805; "Coast Guard Yard Renovates CGC *Gentian,*" 1; "Coast Guard Yard Renovates CGC *Cowslip*," 1.

[28]O'Hara, 33.

[29]Papp, 3, 14.

[30]Harry Benford ED., *A Half Century of Maritime Technology, 1943-1993* (Jersey City, New Jersey: The Society of Naval Architects and Marine Engineers, 1993), 443; Marshall, *History of Buoys and Tenders*, 13.

[31]Jeff Beach, Interview by author. Washington, D.C., 10 February 2002.

[32]Unless otherwise cited, information in this section is drawn from two books authored by the former chief historian of the U.S. Coast Guard, Dr. Robert Scheina. Dr. Scheina's books, *U.S. Coast Guard Cutters and Craft of World War II* and *U.S. Coast Guard Cutters and Craft, 1946-1990*, provide brief outlines of each vessel's construction and career. A variety of primary and secondary sources, namely U.S. Coast Guard documents, photographs, news clippings, and reports prepared for the federal government provide the details used to complete the histories. The bulk of this material is located in the U.S. Coast Guard's Office of the Historian, located at U.S. Coast Guard Headquarters in Washington, D.C. Information held by that office is filed under each vessel's name in a 'Cutter File'.

[33]Malcom F. Willoughby, *The U.S. Coast Guard in World War II (*Annapolis, Maryland: Naval Institute Press, 1957), 150.

[34]United States Coast Guard, Statistical Division/Historical Section. *The Coast Guard At War*, Vol. XV "Aids to Navigation." (Washington: Public Information Division, U.S. Coast Guard Headquarters, 1949), 7.

[35]"New lives for old buoy tenders." *The Fishermen's News* (June 1979), 29.

[36]Eugene N. Tulich, *The United States Coast Guard in South East Asia During the Vietnam Conflict* (Washington: U.S. Coast Guard Public Affairs Division, 1975), 19-21.

[37]Tulich, 21-22.

[38]"Ailing Coast Guard vessel battling high Pacific waves." *Tribune* (Alameda, CA), 27 January 1983.

[39]"Damaged Buoy Tender to be Escorted to Ketchikan." *Coast Guard News* (26 January 1990): 1; "Holed Coast Guard Buoy Tender Gains on Flooding." *Coast Guard News* (26 January 1990): 1.

[40]Wes Hall, *Historical Context and Statement of Significance: Cactus, Mesquite, and Basswood Classes, United States Coast Guard 180-foot Buoy Tenders (WLBs)* (Castle Hayne, North Carolina: Mid-Atlantic Technology and Environmental Research, 1997), 8.

[41]"The Mighty 'B' [Bramble] Puts to Sea, or, with the Atom Bomb at Bikini." *Coast Guard Magazine* (Jan 1947): 28-29.

[42]*Bramble* Welcome Aboard Pamphlet, *Bramble* Cutter File, U.S. Coast Guard Historian's Office; Hall,11.

[43]Hall, 11.

[44]Jeff Beach, email communication. Washington, D.C., 6 May 2003.

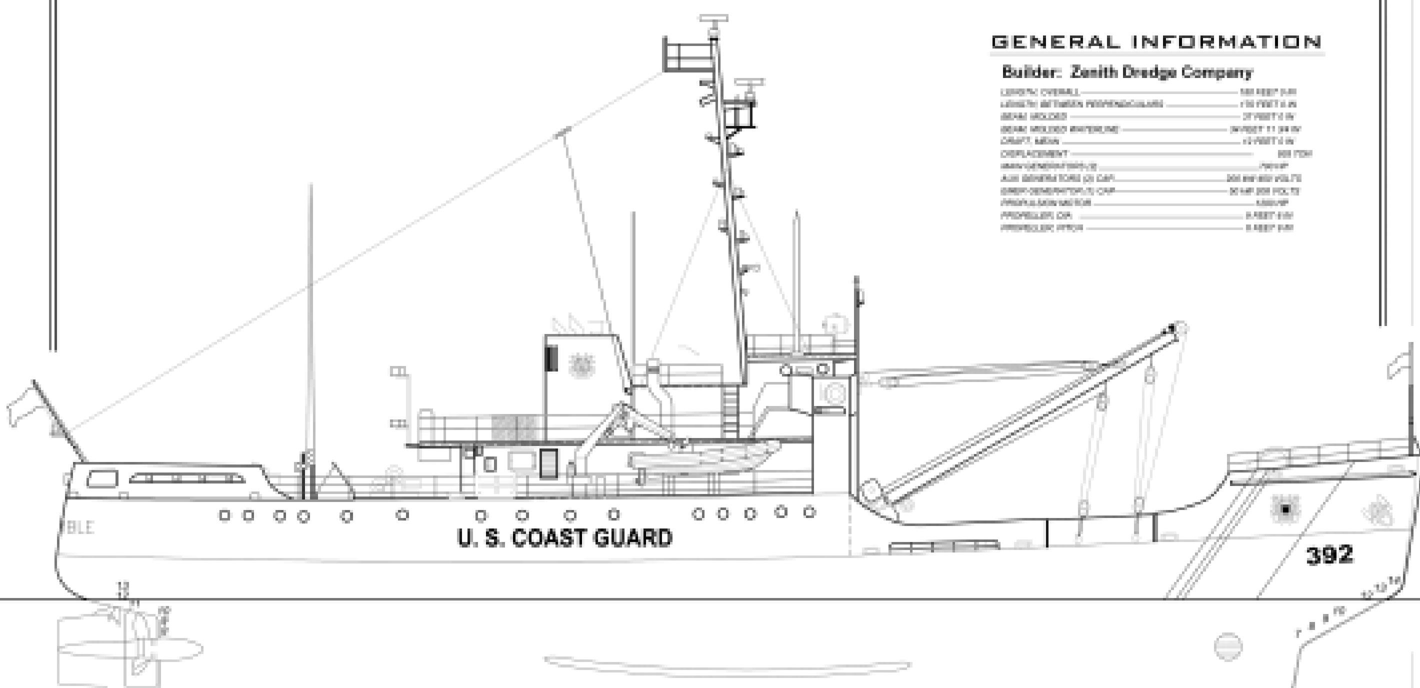
# USCGC BRAMBLE

## WLB-392 1944 (Iris Class)

Commissioned

### GENERAL INFORMATION

**Builder: Zenith Dredge Company**

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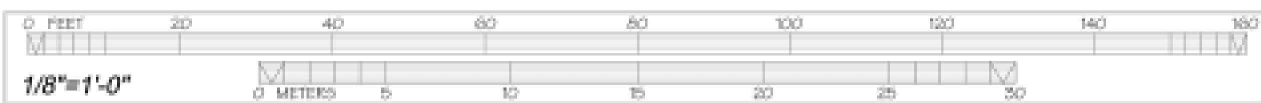
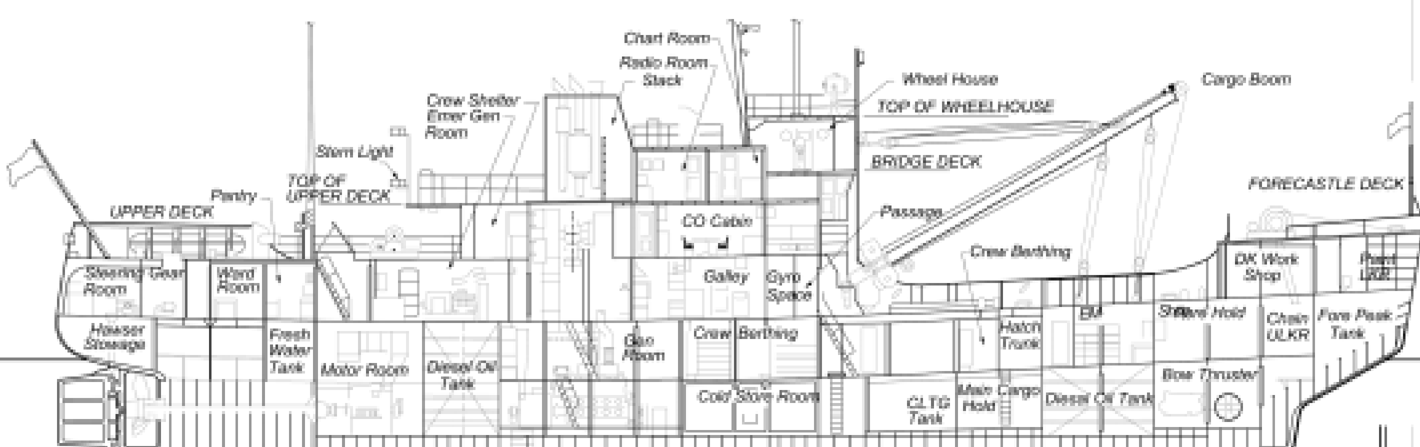



**NOTE:** *This drawing was traced from original design drawings of the USCG Cutter BRAMBLE. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information. THESE DRAWINGS REPRESENT THE VESSEL'S CONTEMPORARY APPEARANCE AND NOT AS ORIGINALLY OUTFITTED.*



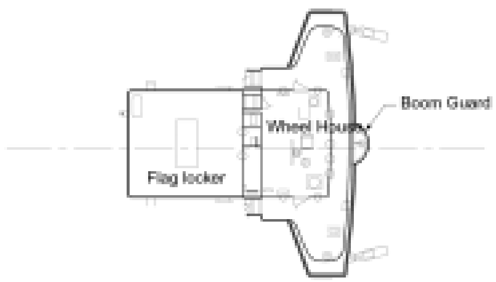

## INBOARD PROFILE

DELINEATED BY: *edited from USCG drawings*

| | | | | |
|---|---|---|---|---|
| HAER MARITIME RECORDING PROGRAM | U.S. COAST GUARD CUTTER "BRAMBLE"- 1944<br>WATERFRONT AT LINCOLN AVE.<br>PORT HURON VIC. ST. CLAIR COUNTY MICHIGAN | SHEET 1 of 6 | HISTORIC AMERICAN ENGINEERING RECORD<br>MI-323 | |

# USCGC BRAMBLE-DECK PLANS

**NOTE:** *This drawing was traced from original design drawings of the USCG Cutter BRAMBLE. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information.*

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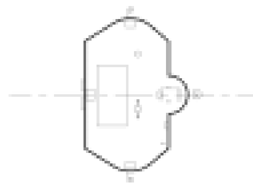
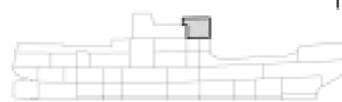
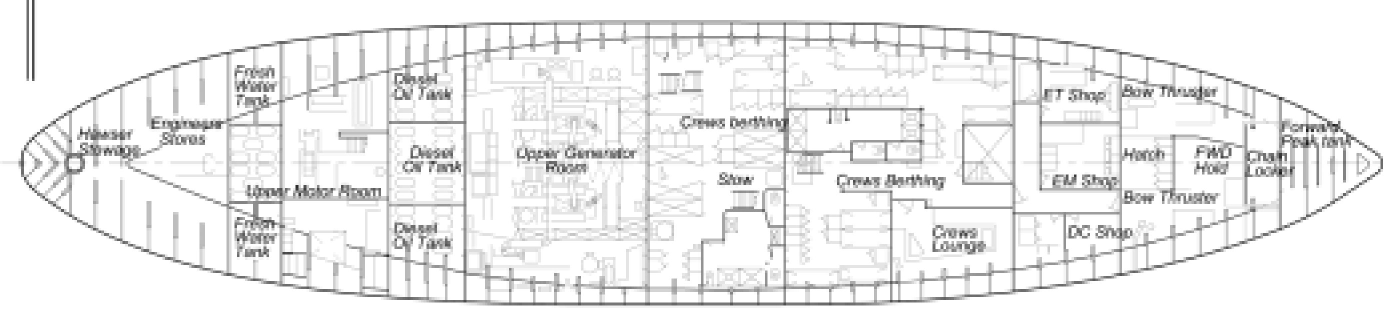


## PLAN AT TOP OF WHEELHOUSE



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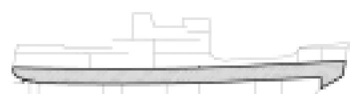
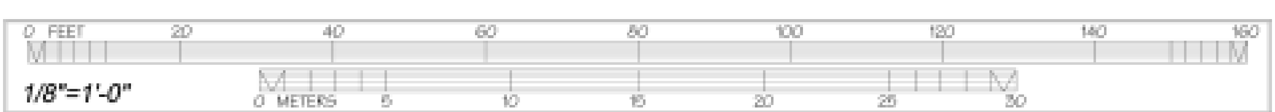



## HOLD LEVEL PLAN

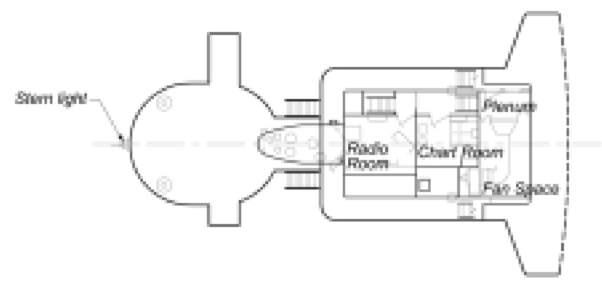



DELINEATED BY: edited from USCG drawings

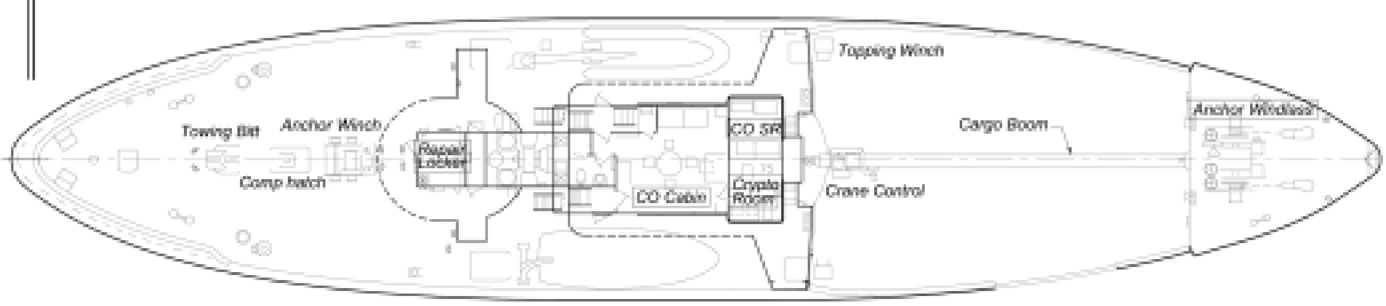
| UNITED STATES COAST GUARD RECORDING PROGRAM | U.S. COAST GUARD CUTTER "BRAMBLE"- 1944<br>WATERFRONT AT LINCOLN AVE.<br>PORT HURON VIC. ST. CLAIR COUNTY MICHIGAN | 2 - 6 | HISTORIC AMERICAN ENGINEERING RECORD<br>MI-323 |
|---|---|---|---|

# USCGC BRAMBLE-DECK PLANS

**NOTE:** *This drawing was traced from original design drawings of the USCG Cutter BRAMBLE. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information.*

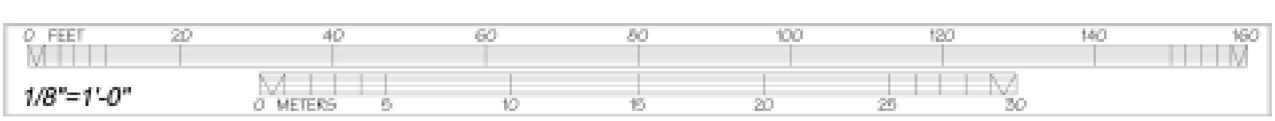



## PLAN AT TOP OF UPPER DECK HOUSE




## PLAN OF UPPER & FORECASTLE DECKS


## MAIN DECK PLAN




DELINEATED BY: edited from USCG drawings

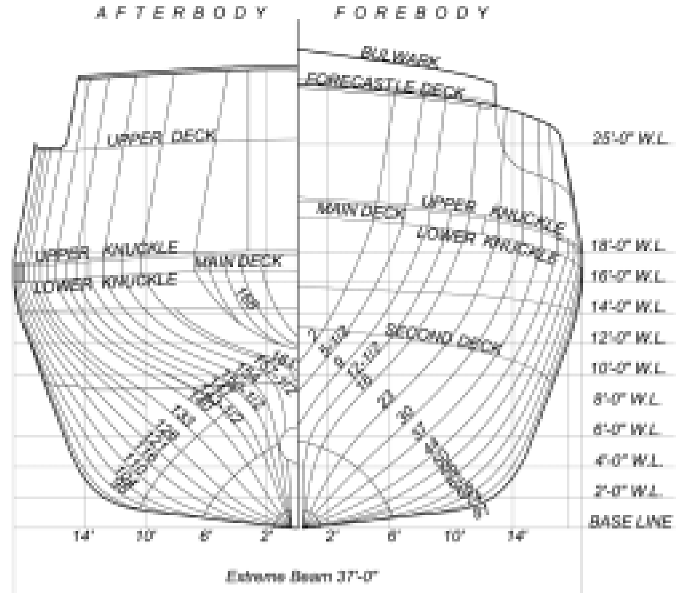
| | | | |
|---|---|---|---|
| UNITED STATES COAST GUARD RECORDING PROGRAM | U.S. COAST GUARD CUTTER "BRAMBLE"- 1944<br>WATERFRONT AT LINCOLN AVE.<br>PORT HURON VIC. ST. CLAIR COUNTY MICHIGAN | 3 - 6 | HISTORIC AMERICAN ENGINEERING RECORD MI-323 |

# USCGC BRAMBLE - BODY PLAN

## TABLE OF OFFSETS

| | | FOREBODY STATIONS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 | 5 ½ | 9 | 12 ½ | 16 | 23 | 30 | 37 | 44 | 50 | 56 | 62 | 68 | 74 | 81 |
| HALF-BREADTHS | 2' W.L. | | | | 0-6-0 | 0-7-4 | 1-9-2 | 2-1-4 | 3-3-3 | 4-9-7 | 6-6-5 | 7-11-5 | 9-5-5 | 10-9-4 | 11-9-5 | 12-7-2 |
| | 4' W.L. | | | | 0-5-1 | 1-0-7 | 2-5-2 | 4-0-1 | 5-10-7 | 7-9-6 | 9-4-6 | 10-10-2 | 12-1-5 | 13-2-0 | 13-11-1 | 14-5-3 |
| | 6' W.L. | | | | 0-10-6 | 1-11-4 | 3-11-6 | 6-1-4 | 8-2-6 | 10-1-2 | 11-6-5 | 12-9-3 | 13-9-1 | 14-5-6 | 14-11-6 | 15-3-2 |
| | 8' W.L. | | -- | 0-10-4 | 2-2-1 | 3-5-5 | 5-11-2 | 8-2-7 | 10-3-1 | 11-11-4 | 13-1-7 | 14-1-3 | 14-10-4 | 15-5-0 | 15-9-4 | 16-0-2 |
| | 10' W.L. | | 1-0-1 | 2-6-2 | 3-11-6 | 5-4-2 | 7-11-0 | 10-1-1 | 11-11-1 | 13-4-6 | 14-4-5 | 15-2-1 | 15-9-5 | 16-2-0 | 16-6-6 | 16-9-1 |
| | 12' W.L. | 1-0-2 | 2-7-5 | 4-2-7 | 5-9-0 | 7-1-6 | 9-7-5 | 11-8-0 | 13-2-5 | 14-6-7 | 15-4-7 | 16-1-0 | 16-7-3 | 17-0-1 | 17-3-5 | 17-5-7 |
| | 14' W.L. | 2-3-7 | 4-0-7 | 5-5-1 | 7-1-7 | 8-6-2 | 10-11-0 | 12-10-0 | 14-4-0 | 15-5-6 | 16-2-6 | 16-10-2 | 17-4-1 | 17-8-2 | 17-11-2 | 18-2-1 |
| | 16' W.L. | 3-3-6 | 5-2-1 | 6-9-6 | 8-3-0 | 9-7-0 | 11-10-1 | 13-9-2 | 15-1-0 | 16-2-2 | 16-11-0 | 17-6-2 | 17-11-6 | 18-2-6 | 18-4-5 | 18-5-5 |
| | 22' W.L. | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | 25' W.L. | 5-10-1 | 7-9-4 | 9-2-4 | 10-5-4 | 11-6-3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| HEIGHTS above base | 2' BUTT. | 13-5-1 | 11-2-4 | 9-4-7 | 7-9-2 | 6-0-7 | 3-2-6 | 1-10-3 | 1-1-1 | 0-7-7 | 0-4-4 | 0-2-4 | 0-2-2 | 0-2-2 | 0-2-2 | 0-2-2 |
| | 6' BUTT. | -- | 17-7-7 | 14-6-2 | 12-3-5 | 10-8-3 | 8-0-6 | 5-10-5 | 4-1-0 | 2-8-4 | 1-9-4 | 1-1-3 | 0-9-0 | 0-7-6 | 0-7-6 | 0-7-6 |
| | 10' BUTT. | -- | -- | -- | 20-10-1 | 16-11-0 | 12-5-7 | 9-10-6 | 7-8-5 | 5-10-6 | 4-6-0 | 3-3-5 | 2-3-6 | 1-7-2 | 1-2-5 | 1-1-3 |
| | 14' BUTT. | -- | -- | -- | -- | -- | -- | 16-10-5 | 13-2-0 | 10-11-7 | 9-4-0 | 7-9-6 | 6-4-4 | 5-2-0 | 4-1-2 | 3-4-1 |

| | | AFTERBODY STATIONS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 98 | 104 | 110 | 116 | 121 | 126 | 133 | 140 | 143 ½ | 147 | 150 ½ | 154 | 157 ½ | 161 | 168 |
| HALF-BREADTHS | 2' W.L. | 11-2-3 | 9-11-7 | 8-5-3 | 6-9-5 | 5-5-7 | 4-3-1 | 2-10-3 | 1-10-2 | 1-6-0 | 1-2-2 | 0-11-2 | 0-8-4 | 0-5-6 | 0-0-0 | -- |
| | 4' W.L. | 13-4-6 | 12-4-3 | 11-0-3 | 9-5-6 | 8-0-4 | 6-7-0 | 4-8-4 | 3-2-1 | 2-5-7 | 1-11-0 | 1-6-4 | 1-0-3 | 0-7-3 | 0-0-0 | -- |
| | 6' W.L. | 14-7-3 | 13-10-3 | 12-10-2 | 11-6-5 | 10-3-0 | 8-9-2 | 6-7-2 | 4-7-3 | 3-7-7 | 2-9-2 | 2-0-1 | 1-4-2 | 0-9-0 | 0-0-0 | -- |
| | 8' W.L. | 15-7-0 | 15-1-0 | 14-4-1 | 13-4-2 | 12-3-3 | 11-0-2 | 9-11-3 | 6-7-2 | 5-6-4 | 4-2-0 | 2-11-7 | 1-10-6 | 0-11-3 | 0-0-0 | -- |
| | 10' W.L. | 16-6-0 | 16-2-0 | 15-7-7 | 14-11-4 | 14-2-3 | 13-3-2 | 11-8-7 | 9-8-7 | 8-5-7 | 7-0-7 | 5-6-7 | 3-10-7 | 2-0-4 | 0-2-3 | |
| | 12' W.L. | 17-4-3 | 17-1-6 | 16-8-7 | 16-4-2 | 15-10-6 | 15-3-6 | 14-3-0 | 12-10-5 | 12-0-4 | 11-0-4 | 9-10-2 | 8-5-4 | 6-10-3 | 5-1-2 | 1-2-2 |
| | 14' W.L. | 18-1-2 | 17-11-7 | 17-9-1 | 17-5-5 | 17-1-3 | 16-6-1 | 15-10-3 | 14-9-2 | 14-0-6 | 13-2-7 | 12-3-3 | 11-1-7 | 9-8-7 | 8-3-5 | 4-7-0 |
| | 16' W.L. | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| | 22' W.L. | 17-7-6 | 17-7-2 | 17-5-5 | 17-2-7 | 16-11-7 | 16-7-6 | 15-11-4 | 15-0-0 | 14-5-0 | 13-8-5 | 12-10-6 | 11-11-1 | 10-9-3 | 9-5-2 | 6-0-7 |
| | 25' W.L. | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| HEIGHTS above base | 2' BUTT. | 0-2-2 | 0-2-2 | 0-2-2 | 0-2-6 | 0-4-4 | 0-7-6 | 1-2-5 | 2-2-2 | 2-11-6 | 4-2-4 | 5-11-4 | 8-2-5 | 9-11-5 | 10-11-0 | 12-3-7 |
| | 6' BUTT. | 0-7-6 | 0-9-0 | 0-11-0 | 1-6-2 | 2-4-2 | 3-5-6 | 5-4-6 | 7-5-6 | 8-6-2 | 9-5-0 | 10-2-3 | 10-11-0 | 11-7-6 | 12-5-0 | 15-7-2 |
| | 10' BUTT. | 1-4-7 | 2-0-0 | 3-1-0 | 4-5-5 | 5-9-1 | 7-1-2 | 8-8-3 | 10-1-6 | 10-8-2 | 11-4-6 | 12-1-0 | 12-11-0 | 14-2-2 | 16-1-6 | -- |
| | 14' BUTT. | 4-10-6 | 6-2-4 | 7-6-2 | 8-9-2 | 9-9-4 | 10-9-1 | 11-9-1 | 13-0-3 | 12-11-0 | 15-2-0 | -- | -- | -- | -- | -- |




| 0 | 10 | 20 | FEET 30 |
|---|---|---|---|
| 0 | 5 | METERS | 10 |

**SCALE: 1" = 2½'**

## NOTE

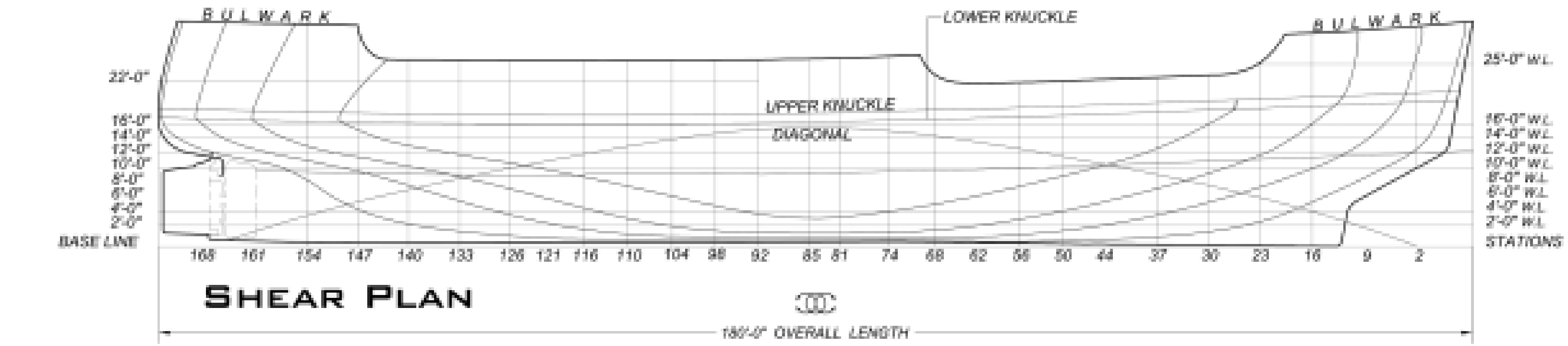
*This drawing was traced from historic drawings of the USCG Cutter BRAMBLE. HAER did not field check dimensions or arrangement of features. For more information, see HAER Field Notebooks.*

edited from USCG drawings

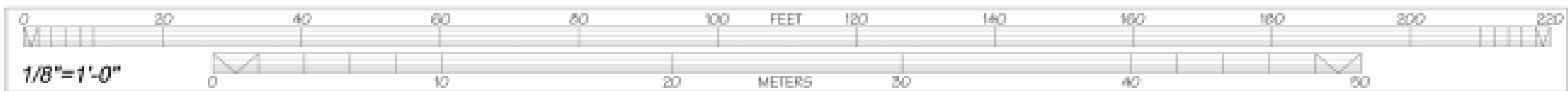
U.S. COAST GUARD CUTTER "BRAMBLE", 1944
WATERFRONT AT LINCOLN AVE
ST. CLAIR COUNTY
PORT HURON VIC.
MICHIGAN
UNITED STATES COAST GUARD RECORDING PROGRAM
HISTORIC AMERICAN ENGINEERING RECORD

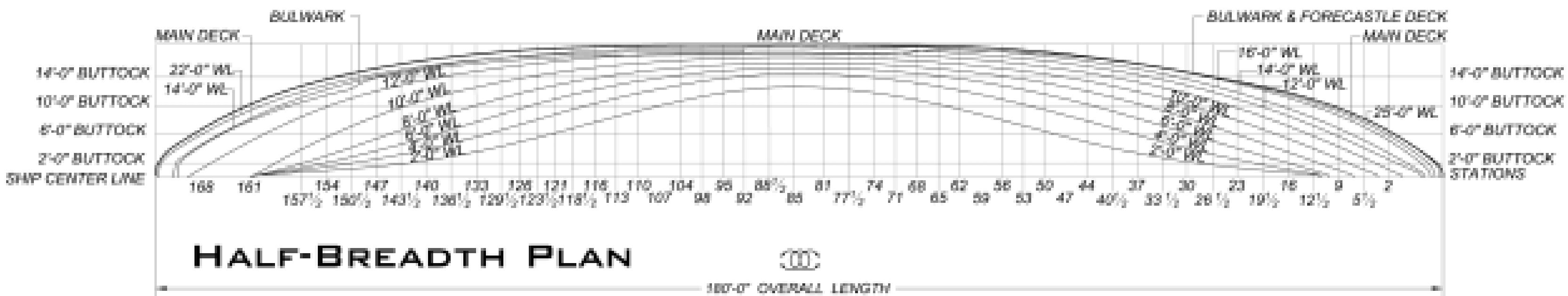
# USCGC BRAMBLE
## Half-Breadth & Shear Plans

**NOTE:** *This drawing was traced from original design drawings of the USCG Cutter BRAMBLE. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information.*




## Shear Plan




## Half-Breadth Plan

edited from USCG drawings

UNITED STATES COAST GUARD RECORDING PROGRAM

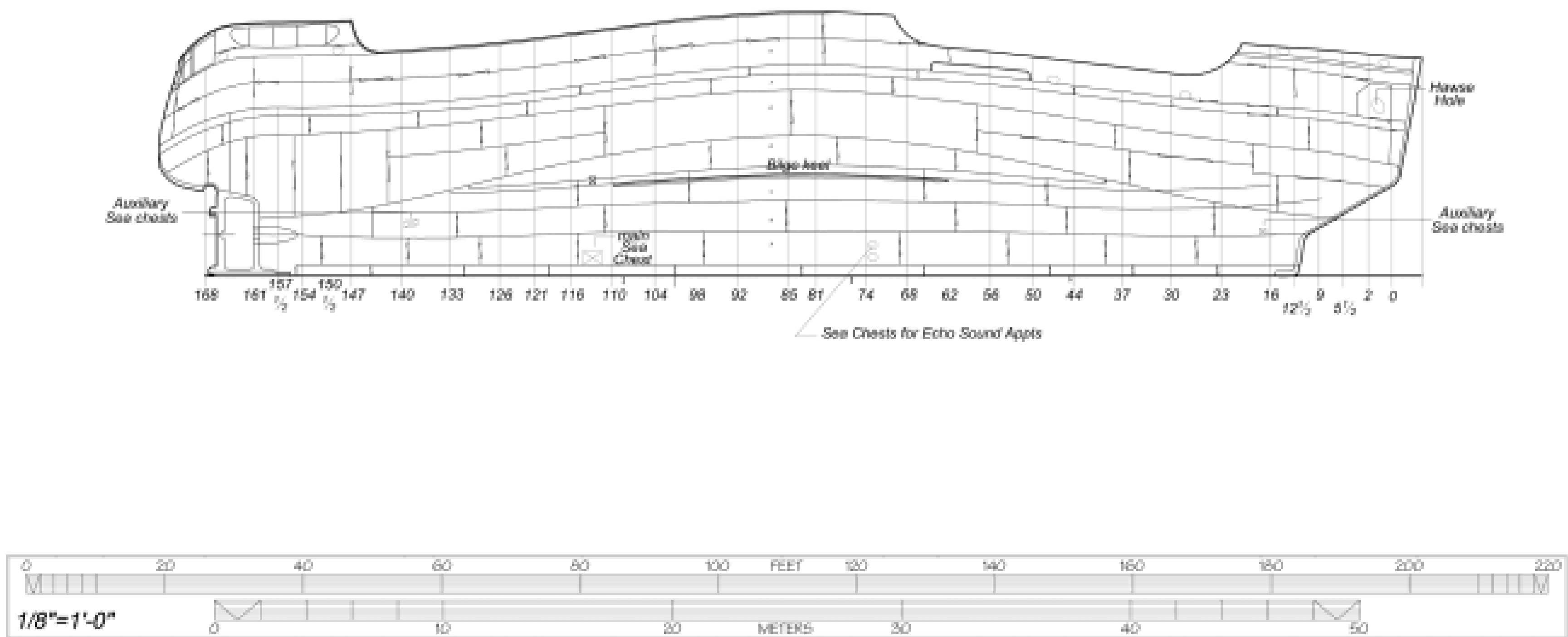
PORT HURON VIC.

U.S. COAST GUARD CUTTER "BRAMBLE", 1944
WATERFRONT AT LINCOLN AVE
ST. CLAIR COUNTY

MICHIGAN

# USCGC BRAMBLE
## Shell Expansion Plan

***NOTE:*** *This drawing was traced from original design drawings of the USCG Cutter BRAMBLE. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information.*




*edited from USCG drawings*

UNITED STATES COAST GUARD RECORDING PROGRAM

U.S. COAST GUARD CUTTER "BRAMBLE" 1944

PORT HURON VIC. ST. CLAIR COUNTY MICHIGAN

HISTORIC AMERICAN ENGINEERING RECORD

# CACTUS CLASS

## (180-Foot Buoy Tender)

### BOOKLET OF GENERAL PLANS
### U. S. COAST GUARD CUTTERS

| | | |
|---|---|---|
| 76–CACTUS | EVERGREEN-102 | LAUREL-92 |
| 91–COWSLIP | SORREL——103 | BALSAM-88 |
| 130-CITRUS | GENTIAN——90 | TUPELO-133 |
| 131–CONIFER | MADRONA—132 | CLOVER-93 |
| | WOODBINE——89 | |

GENERAL INFORMATION

| | |
|---|---|
| LENGTH, OVERALL | 180 FEET 0 IN. |
| LENGTH, BETWEEN PERPENDICULARS | 170 FEET 0 IN. |
| BEAM, MOULDED | 37 FEET 0 IN. |
| BEAM, MOULDED WATERLINE | 34 FEET 6 IN. |
| DRAFT, MEAN | 12 FEET 0 IN. |
| DISPLACEMENT | 935 TON. |
| MAIN GENERATORS (2), HP | 600 HP. |
| AUX. GENERATORS (2) CAPA. | 40 KW-208 VOLTS. |
| EMERG. GENERATOR, CAPA. | 40 KW-208 VOLTS. |
| PROPULSION MOTOR, HP | 1000 HP. |
| PROPELLER, DIAM. | 9 FEET 6 IN. |
| PROPELLER, PITCH | 8 FEET 8 IN. |

MARINE IRON AND SHIPBUILDING COMPANY.
DULUTH, MINNESOTA

U.S. COAST GUARD CUTTER
CACTUS

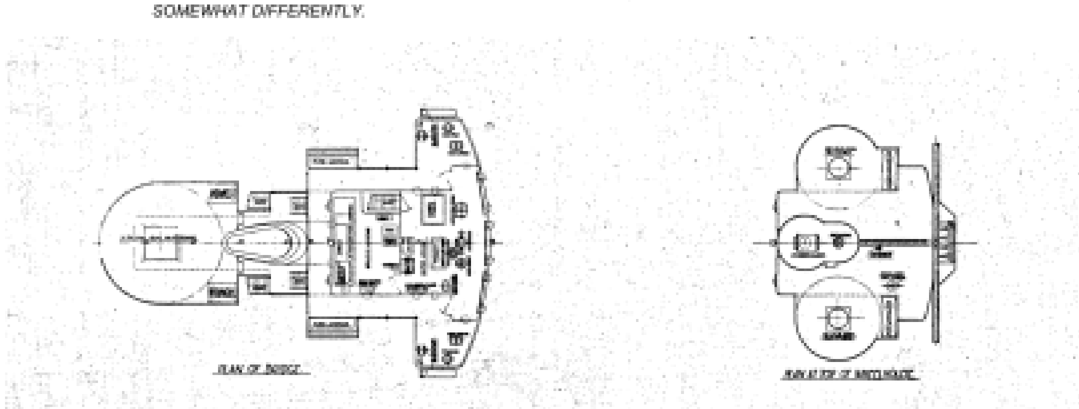
GENERAL ARRANGEMENT OF
BRIDGE & TOP OF WHEELHOUSE.

DATE: NOV. 3, 1942. SCALE: 1/8" = 1 FOOT
DR. BY: APPROVED DRAWING NO.
TR:
CH:
H 70-149

U.S.C.G.
76-TE01034
SHEET 1

0 FEET 20 40 60 80 100 120 140 160
1/8"=1'-0"
0 METERS 5 10 15 20 25 30

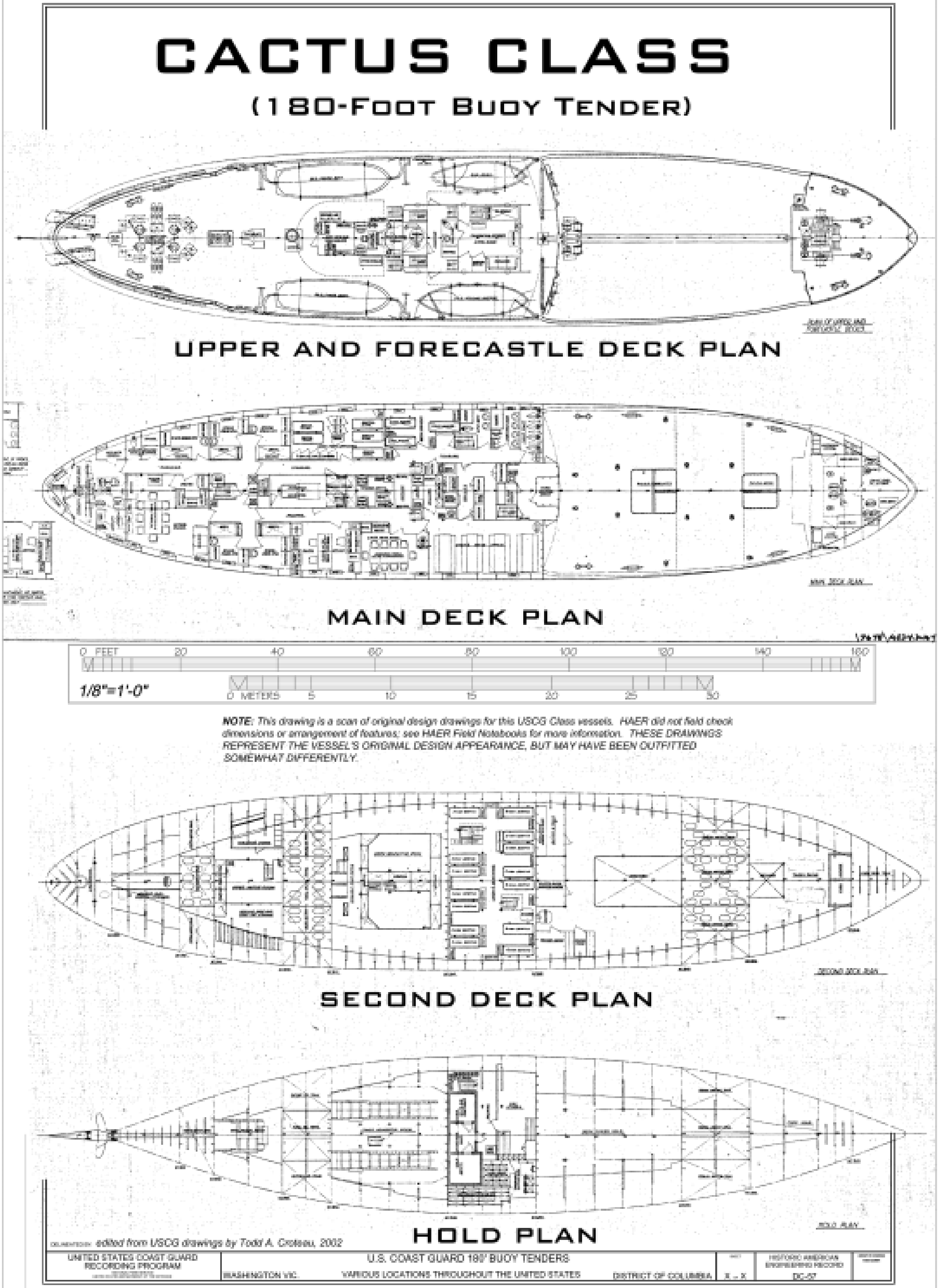
***NOTE:*** *This drawing is a scan of original design drawings for this USCG Class vessels. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information. THESE DRAWINGS REPRESENT THE VESSEL'S ORIGINAL DESIGN APPEARANCE, BUT MAY HAVE BEEN OUTFITTED SOMEWHAT DIFFERENTLY.*




## UPPER DECK PLANS
### ( BRIDGE / WHEELHOUSE )

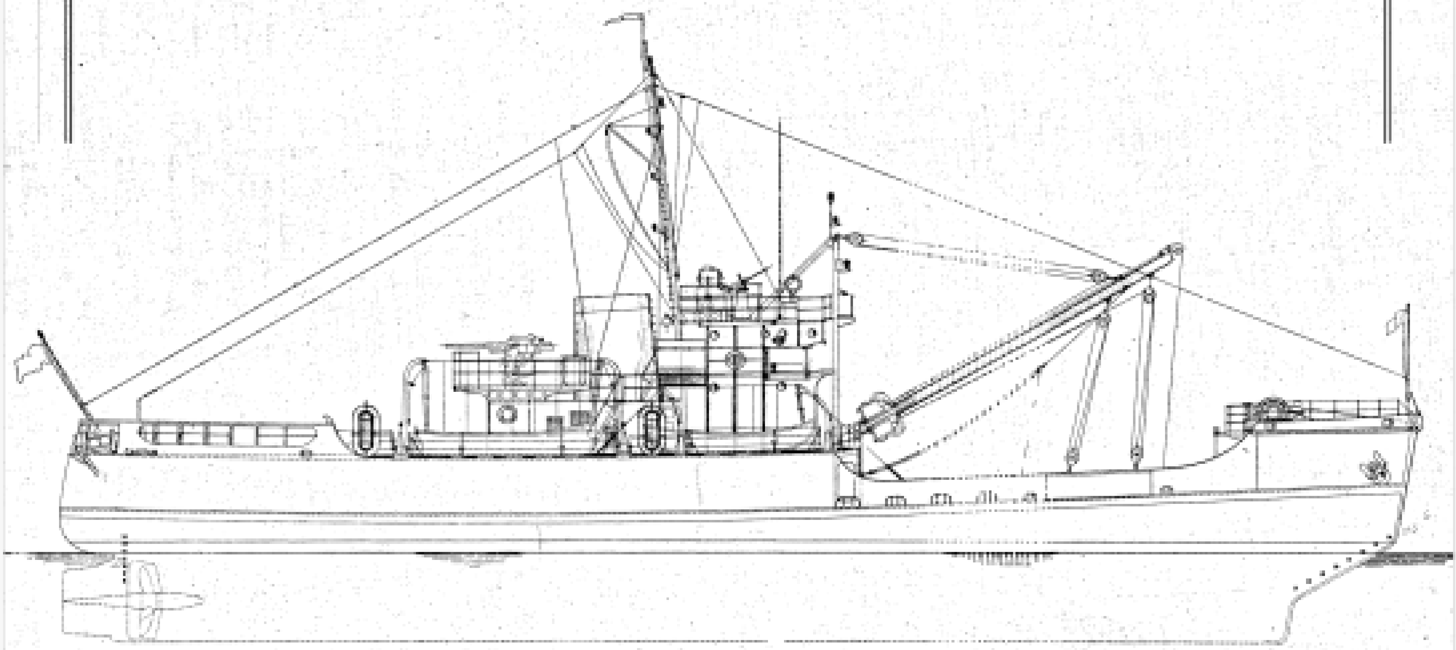
DELINEATED BY: *edited from USCG drawings by Todd A. Croteau, 2002*

| | | | | | |
|---|---|---|---|---|---|
| UNITED STATES COAST GUARD RECORDING PROGRAM | U.S. COAST GUARD 180' BUOY TENDERS | | SHEET | HISTORIC AMERICAN ENGINEERING RECORD | |
| | WASHINGTON VIC. VARIOUS LOCATIONS THROUGHOUT THE UNITED STATES | DISTRICT OF COLUMBIA | 1 of X | DC-57 | |

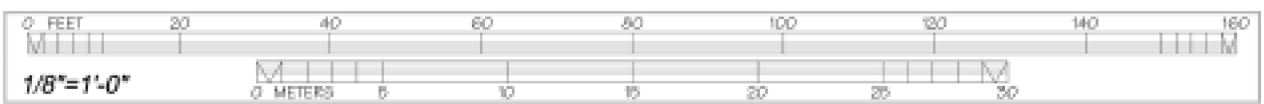

CACTUS CLASS
(180-FOOT BUOY TENDER)
UPPER AND FORECASTLE DECK PLAN
MAIN DECK PLAN
0 FEET 20 40 60 80 100 120 140 160
1/8"=1'-0"
0 METERS 5 10 15 20 25 30
NOTE: This drawing is a scan of original design drawings for this USCG Class vessels. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information. THESE DRAWINGS REPRESENT THE VESSEL'S ORIGINAL DESIGN APPEARANCE, BUT MAY HAVE BEEN OUTFITTED SOMEWHAT DIFFERENTLY.
SECOND DECK PLAN
HOLD PLAN
edited from USCG drawings by Todd A. Croteau, 2002
UNITED STATES COAST GUARD RECORDING PROGRAM
U.S. COAST GUARD 180' BUOY TENDERS
WASHINGTON VIC.
VARIOUS LOCATIONS THROUGHOUT THE UNITED STATES
DISTRICT OF COLUMBIA
HISTORIC AMERICAN ENGINEERING RECORD
DC-57

# CACTUS CLASS

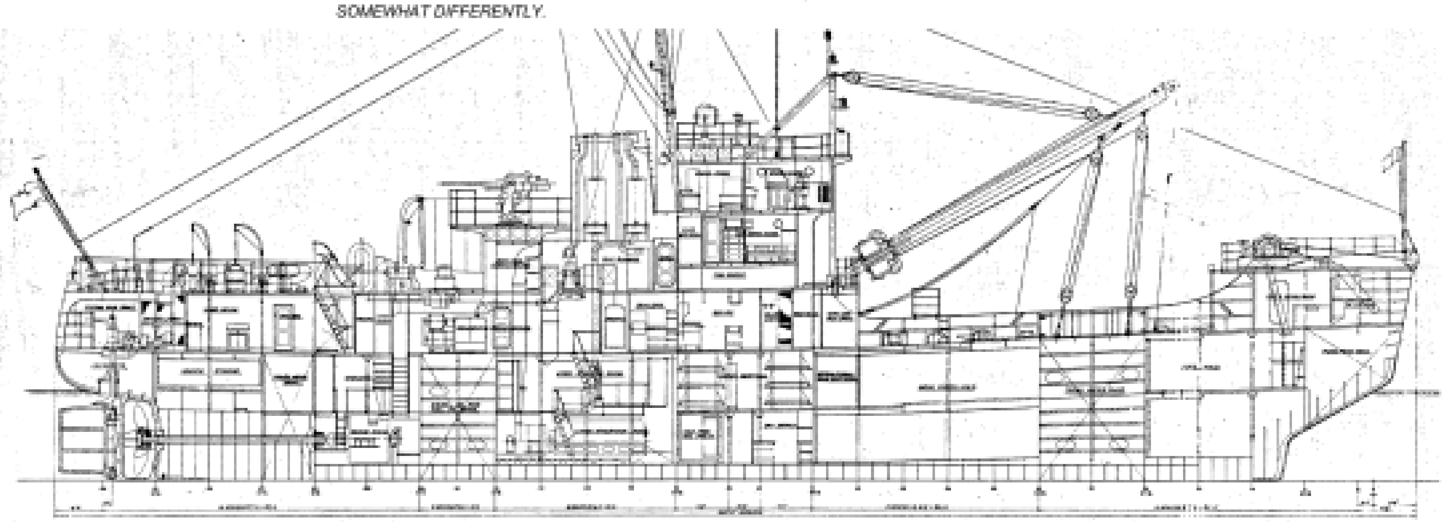
## (180-Foot Buoy Tender)



OUTBOARD PROFILE




**NOTE:** *This drawing is a scan of original design drawings for this USCG Class vessels. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information. THESE DRAWINGS REPRESENT THE VESSEL'S ORIGINAL DESIGN APPEARANCE, BUT MAY HAVE BEEN OUTFITTED SOMEWHAT DIFFERENTLY.*



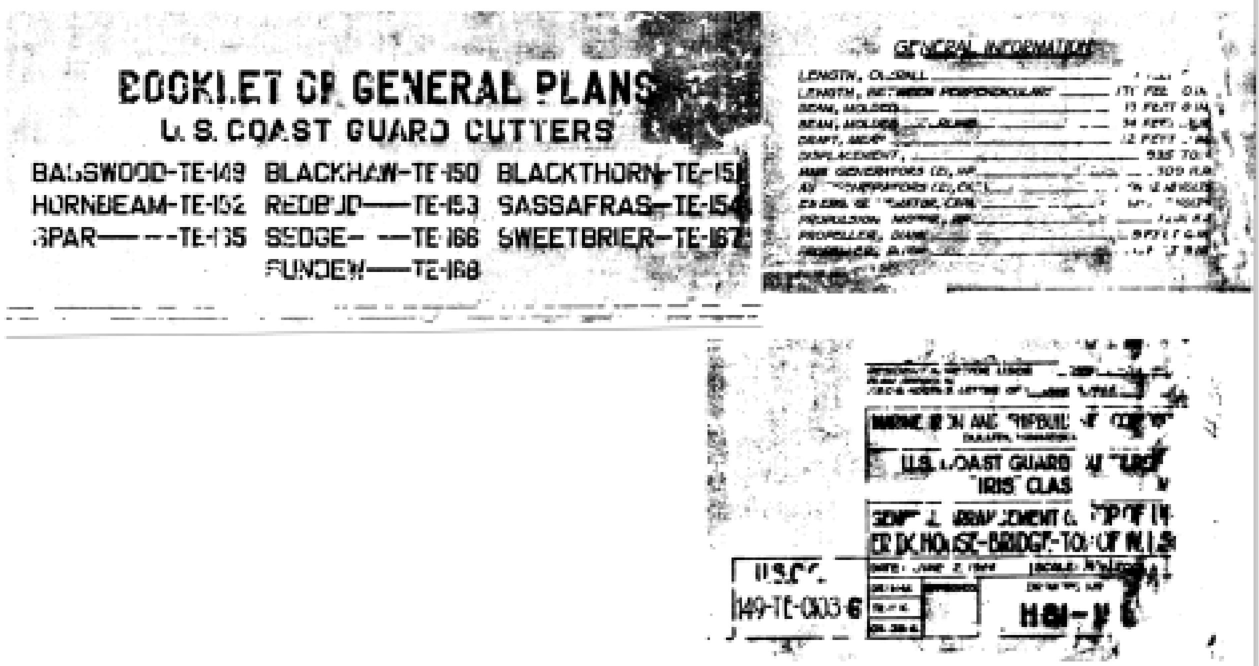
INBOARD PROFILE

*edited from USCG drawings by Todd A. Croteau, 2002*

| | | | | |
|---|---|---|---|---|
| UNITED STATES COAST GUARD RECORDING PROGRAM | U.S. COAST GUARD 180' BUOY TENDERS | | | HISTORIC AMERICAN ENGINEERING RECORD |
| | WASHINGTON VIC. | VARIOUS LOCATIONS THROUGHOUT THE UNITED STATES | DISTRICT OF COLUMBIA | X of X | DC-57 |

# IRIS CLASS

## (180-Foot Buoy Tender)


BOOKLET OF GENERAL PLANS
U. S. COAST GUARD CUTTERS
BASSWOOD-TE-149 BLACKHAW-TE-150 BLACKTHORN-TE-151
HORNBEAM-TE-152 REDBUD—TE-153 SASSAFRAS—TE-154
SPAR—TE-135 SEDGE—TE-166 SWEETBRIER—TE-167
FUNDEW—TE-168

GENERAL INFORMATION
LENGTH, OVERALL
LENGTH, BETWEEN PERPENDICULARS
BEAM, MOLDED
DRAFT, MEAN
DISPLACEMENT

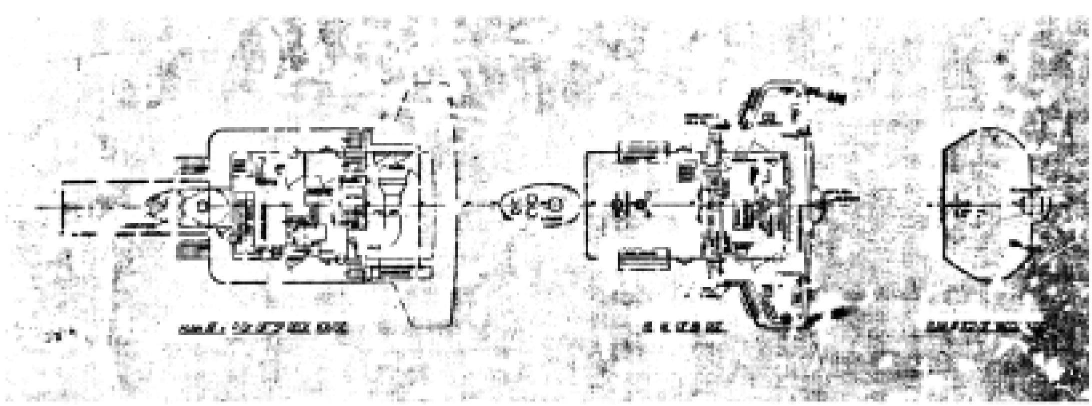
U.S. COAST GUARD
"IRIS" CLASS
149-TE-003-6

1/8"=1'-0"

0 FEET 20 40 60 80 100 120 140 160

0 METERS 5 10 15 20 25 30

***NOTE:*** *This drawing is a scan of original design drawings for this USCG Class vessels. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information. THESE DRAWINGS REPRESENT THE VESSEL'S ORIGINAL DESIGN APPEARANCE, BUT MAY HAVE BEEN OUTFITTED SOMEWHAT DIFFERENTLY.*



## UPPER DECK PLANS

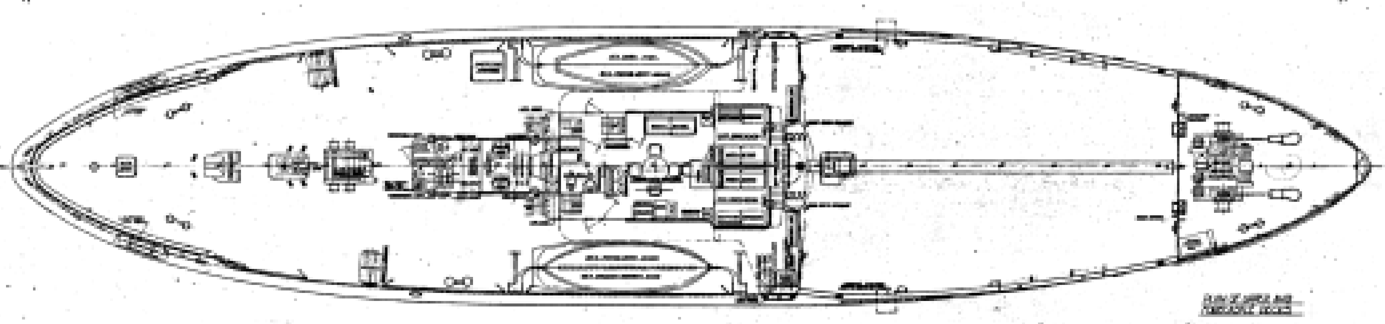
### ( Bridge / Wheelhouse )

*edited from USCG drawings by Todd A. Croteau, 2002*

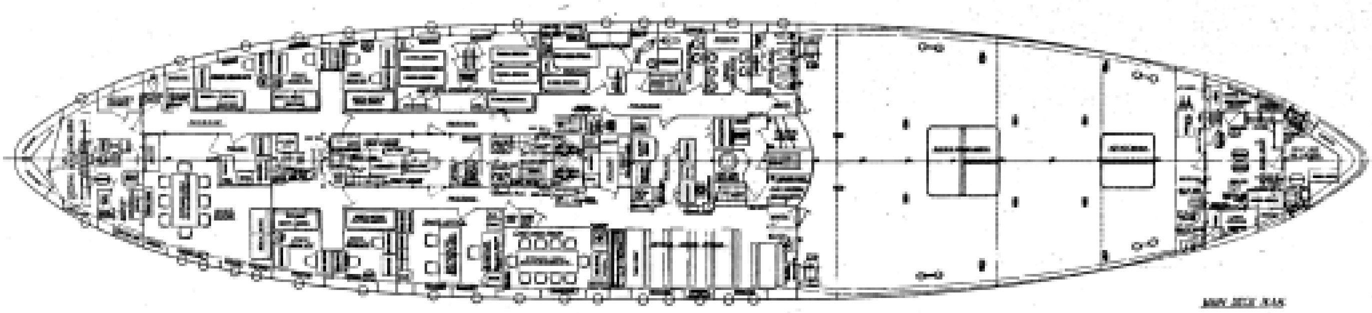
| | | | |
|---|---|---|---|
| UNITED STATES COAST GUARD RECORDING PROGRAM | U.S. COAST GUARD 180' BUOY TENDERS | | HISTORIC AMERICAN ENGINEERING RECORD |
| WASHINGTON VIC. | VARIOUS LOCATIONS THROUGHOUT THE UNITED STATES | DISTRICT OF COLUMBIA | 1 – X | DC-57 |

# IRIS CLASS

## (180-Foot Buoy Tender)



UPPER AND FORECASTLE DECK PLAN



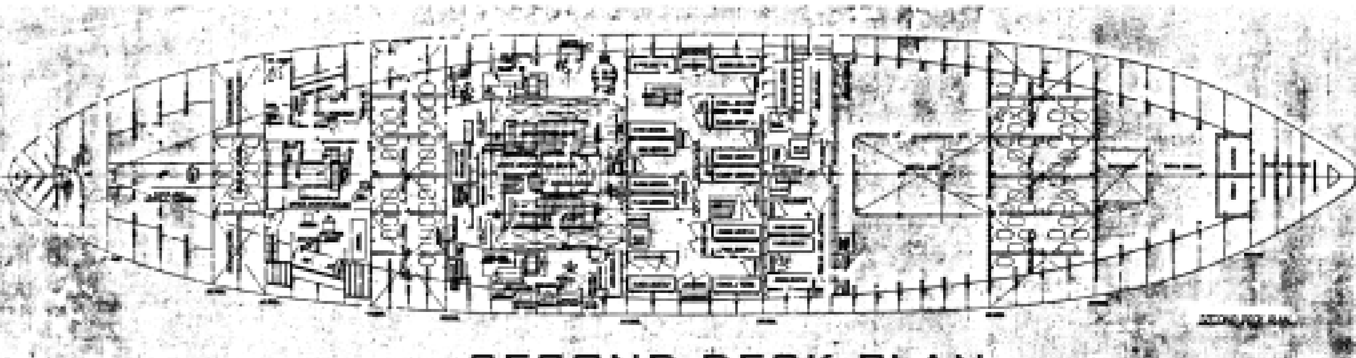
MAIN DECK PLAN

0 FEET 20 40 60 80 100 120 140 160

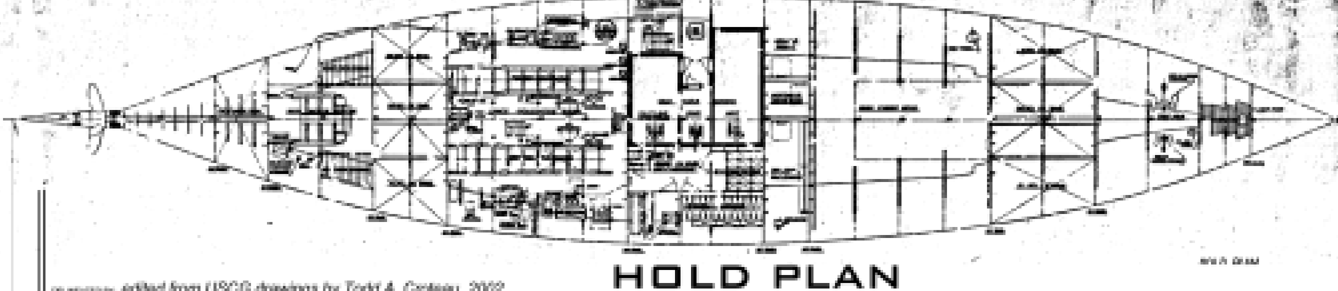
1/8"=1'-0"

0 METERS 5 10 15 20 25 30

***NOTE:*** *This drawing is a scan of original design drawings for this USCG Class vessels. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information. THESE DRAWINGS REPRESENT THE VESSEL'S ORIGINAL DESIGN APPEARANCE, BUT MAY HAVE BEEN OUTFITTED SOMEWHAT DIFFERENTLY.*



SECOND DECK PLAN



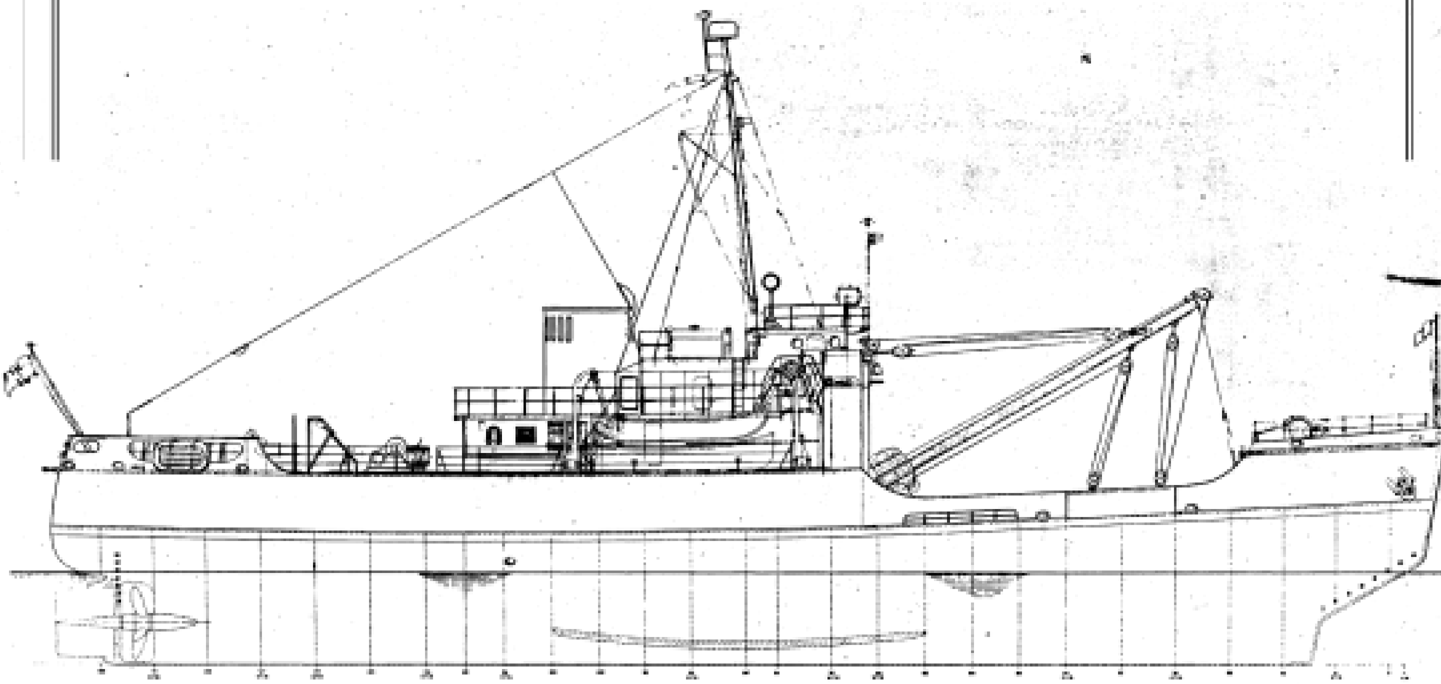
HOLD PLAN

DELINEATED BY: *edited from USCG drawings by Todd A. Croteau, 2002*

| UNITED STATES COAST GUARD RECORDING PROGRAM | U.S. COAST GUARD 180' BUOY TENDERS | | | | HISTORIC AMERICAN ENGINEERING RECORD DC-57 |
|---|---|---|---|---|---|
| | WASHINGTON VIC. | VARIOUS LOCATIONS THROUGHOUT THE UNITED STATES | DISTRICT OF COLUMBIA | X of X | |

# IRIS CLASS

## (180-Foot Buoy Tender)

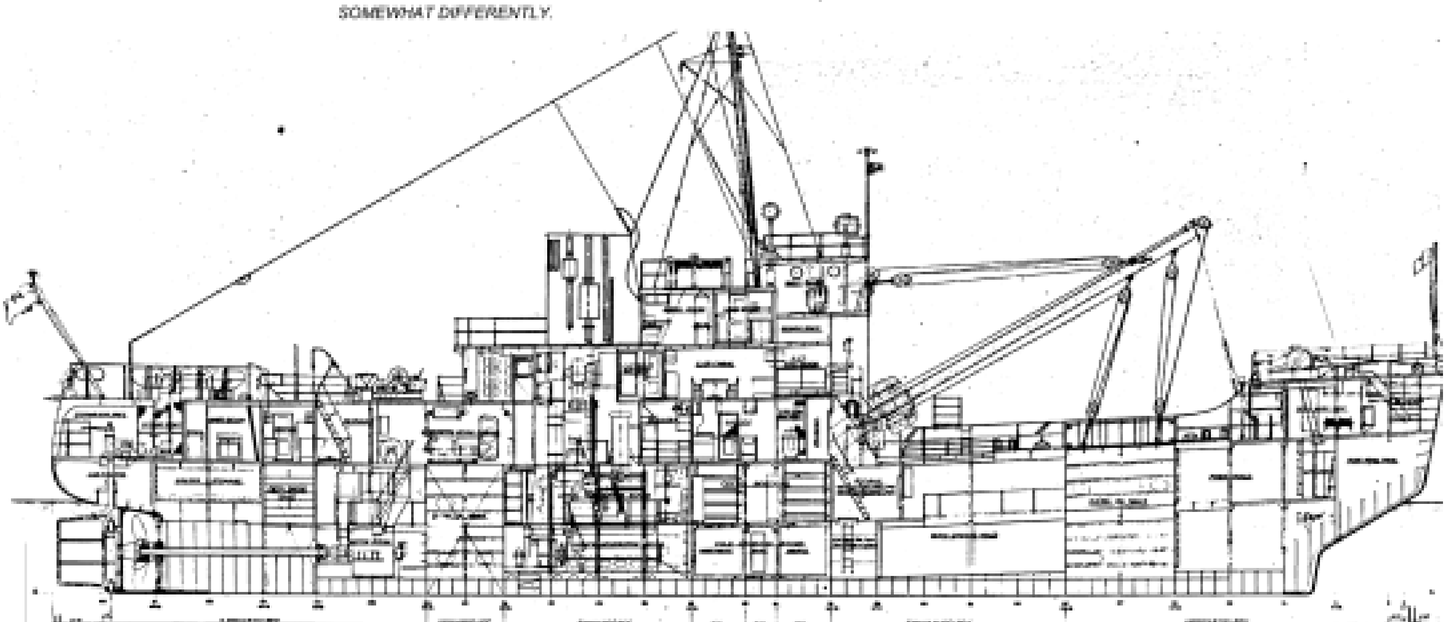


OUTBOARD PROFILE

| 0 FEET | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
|---|---|---|---|---|---|---|---|---|
| 0 METERS | 5 | 10 | 15 | 20 | 25 | 30 | | |

1/8"=1'-0"

***NOTE:*** *This drawing is a scan of original design drawings for this USCG Class vessels. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information. THESE DRAWINGS REPRESENT THE VESSEL'S ORIGINAL DESIGN APPEARANCE, BUT MAY HAVE BEEN OUTFITTED SOMEWHAT DIFFERENTLY.*



INBOARD PROFILE

*edited from USCG drawings by Todd A. Croteau, 2002*

| UNITED STATES COAST GUARD RECORDING PROGRAM | U.S. COAST GUARD 180' BUOY TENDERS | | | X - X | HISTORIC AMERICAN ENGINEERING RECORD DC-57 |
|---|---|---|---|---|---|
| | WASHINGTON VIC. | VARIOUS LOCATIONS THROUGHOUT THE UNITED STATES | DISTRICT OF COLUMBIA | | |

# MESQUITE CLASS

## (180-Foot Buoy Tender)

## BOOKLET OF GENERAL PLANS

### U. S. COAST GUARD CUTTERS

| | |
|---|---|
| MESQUITE—— 138 | PLANETREE- 140 |
| BUTTONWOOD- 139 | SWEETGUM— 142 |
| PAPAW——— 141 | IRONWOOD—— 104 |

GENERAL INFORMATION

| | |
|---|---|
| LENGTH, OVERALL | 180 FEET 0 IN. |
| LENGTH, BETWEEN PERPENDICULARS | 170 FEET 0 IN. |
| BEAM, MOLDED | 37 FEET 0 IN. |
| BEAM, MOLDED WATERLINE | 34 FEET 1¾ IN. |
| DRAFT, MEAN | 11 FEET 0 IN. |
| DISPLACEMENT | 935 TON |
| MAIN GENERATORS (2), HP | 700 HP. |
| AUX. GENERATORS (2), CAPA. | 40 KW-208 VOLTS |
| EMERG. GENERATOR, CAPA. | 40 KW-208 VOLTS |
| PROPULSION MOTOR, HP | 1200 HP. |
| PROPELLER, DIAM. | 8 FEET 6 IN. |
| PROPELLER, PITCH. | 6 FEET 9 IN. |

APPROVAL:
RESIDENT INSPECTOR USCG
PLAN APPROVAL
USCG HDQTRS LETTER OF
DATE: 9-24-43

MARINE IRON AND SHIPBUILDING COMPANY
DULUTH, MINNESOTA.

U.S. COAST GUARD CUTTERS.
"MESQUITE" CLASS.

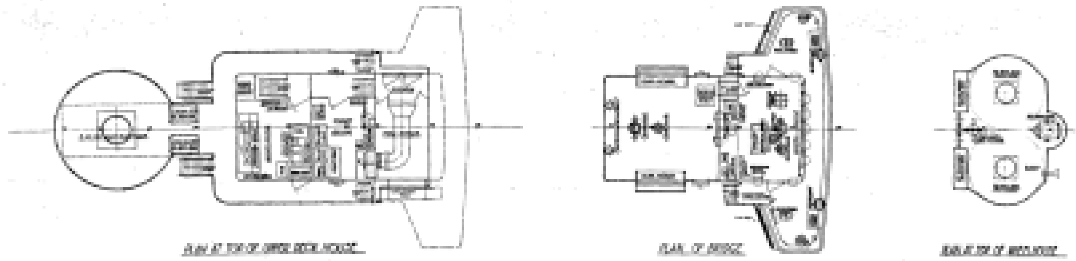
GENERAL ARRANGEMENT OF TOP OF UPPER DK. HOUSE-BRIDGE-TOP OF W. HSE.

DATE: SEPT. 3, 1943 SCALE: ⅛" = 1 FOOT
DR: MM APPROVED
TR: MM DRAWING NO.
CH: JBG H 76-307

U.S.C.G.
~~104T20103-6~~

0 FEET 20 40 60 80 100 120 140 160
1/8"=1'-0"
0 METERS 5 10 15 20 25 30

**NOTE:** *This drawing is a scan of original design drawings for this USCG Class vessels. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information. THESE DRAWINGS REPRESENT THE VESSEL'S ORIGINAL DESIGN APPEARANCE, BUT MAY HAVE BEEN OUTFITTED SOMEWHAT DIFFERENTLY.*



## UPPER DECK PLANS

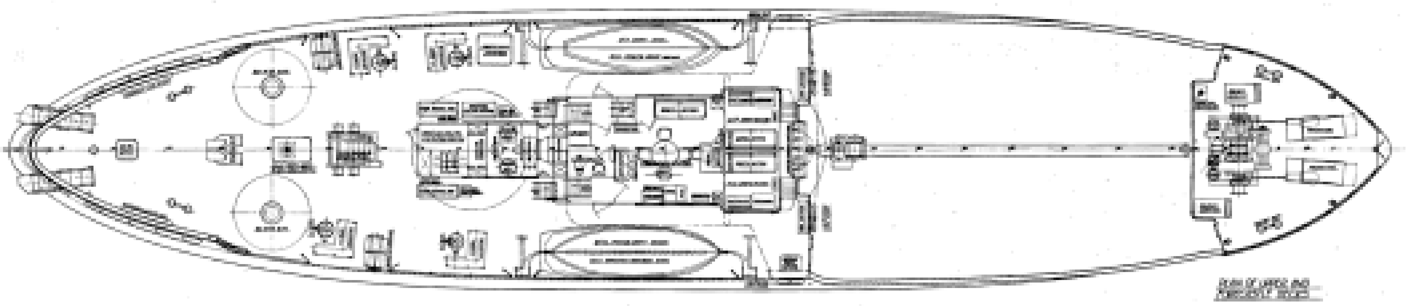
### ( Upper Deck House / Bridge / Wheelhouse )

DELINEATED BY: *edited from USCG drawings by Todd A. Croteau*

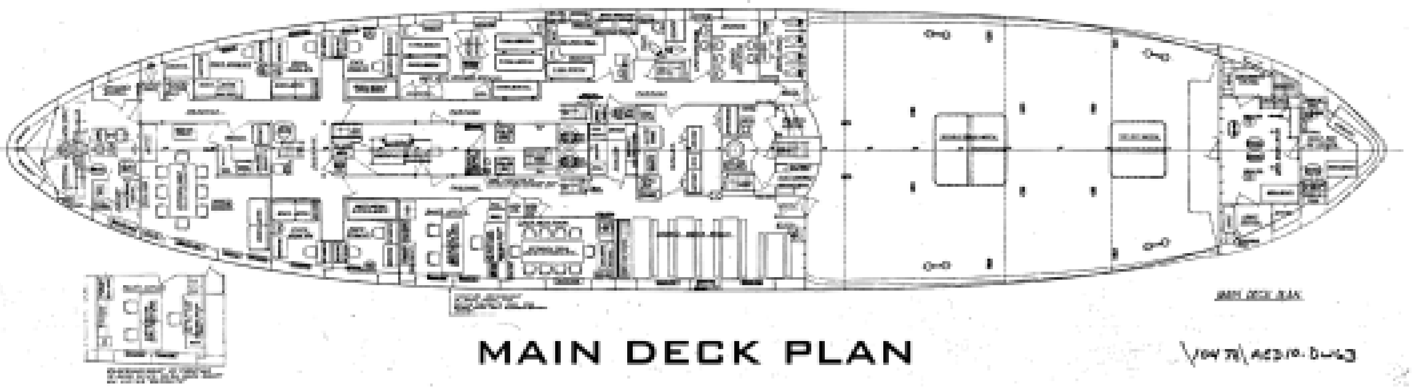
| | | | | |
|---|---|---|---|---|
| UNITED STATES COAST GUARD RECORDING PROGRAM | U.S. COAST GUARD 180' BUOY TENDERS<br>WASHINGTON VIC. VARIOUS LOCATIONS THROUGHOUT THE UNITED STATES DISTRICT OF COLUMBIA | 1 x X | HISTORIC AMERICAN ENGINEERING RECORD DC-57 | |

# MESQUITE CLASS

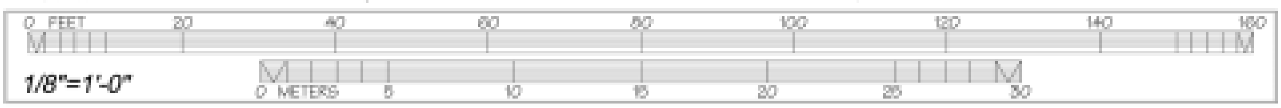
## (180-Foot Buoy Tender)



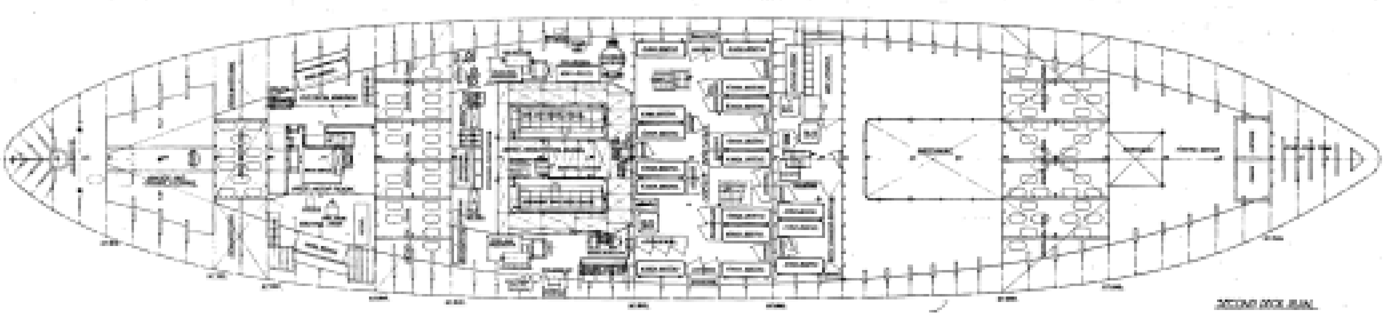
UPPER AND FORECASTLE DECK PLAN



MAIN DECK PLAN




**NOTE:** *This drawing is a scan of original design drawings for this USCG Class vessels. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information. THESE DRAWINGS REPRESENT THE VESSEL'S ORIGINAL DESIGN APPEARANCE, BUT MAY HAVE BEEN OUTFITTED SOMEWHAT DIFFERENTLY.*



SECOND DECK PLAN

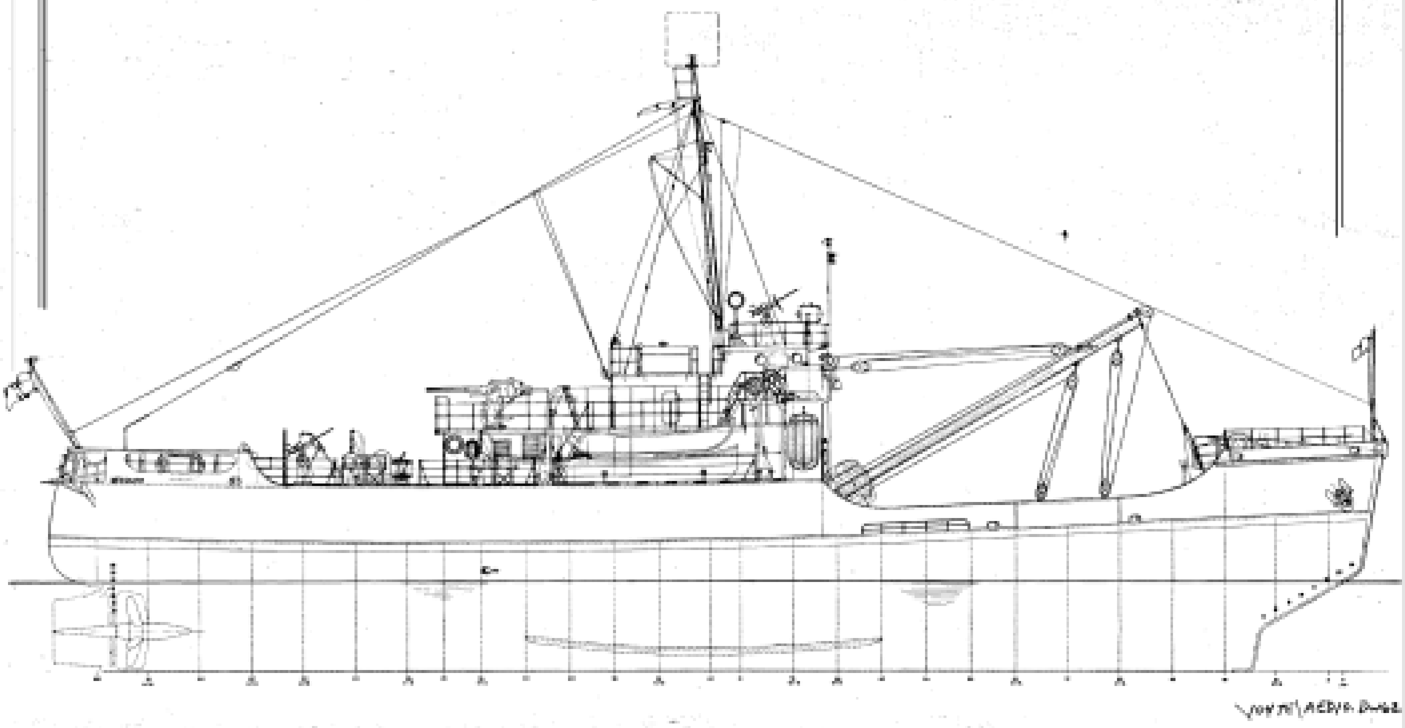
HOLD PLAN

*edited from USCG drawings by Todd A. Croteau*

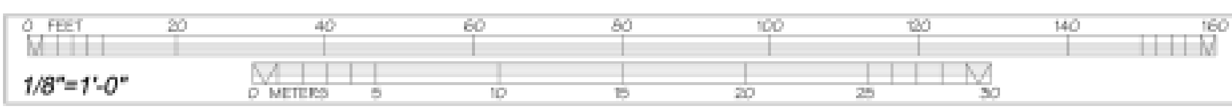
| | | | |
|---|---|---|---|
| UNITED STATES COAST GUARD RECORDING PROGRAM | U.S. COAST GUARD 180' BUOY TENDERS | X - X | HISTORIC AMERICAN ENGINEERING RECORD |
| WASHINGTON VIC. | VARIOUS LOCATIONS THROUGHOUT THE UNITED STATES | DISTRICT OF COLUMBIA | DC-57 |

# MESQUITE CLASS

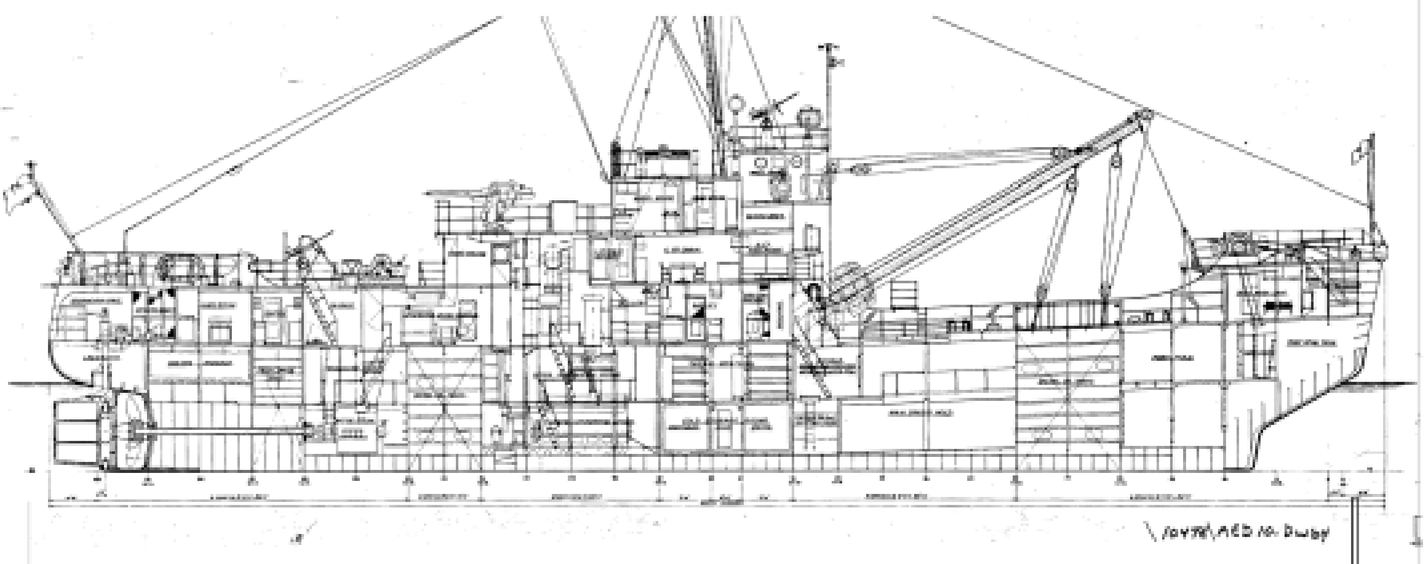
## (180-Foot Buoy Tender)



OUTBOARD PROFILE




**NOTE:** *This drawing is a scan of original design drawings for this USCG Class vessels. HAER did not field check dimensions or arrangement of features; see HAER Field Notebooks for more information. THESE DRAWINGS REPRESENT THE VESSEL'S ORIGINAL DESIGN APPEARANCE, BUT MAY HAVE BEEN OUTFITTED SOMEWHAT DIFFERENTLY.*



INBOARD PROFILE

*edited from USCG drawings by Todd A. Croteau*

| UNITED STATES COAST GUARD RECORDING PROGRAM | U.S. COAST GUARD 180' BUOY TENDERS | | | | HISTORIC AMERICAN ENGINEERING RECORD |
|---|---|---|---|---|---|
| | WASHINGTON VIC. | VARIOUS LOCATIONS THROUGHOUT THE UNITED STATES | DISTRICT OF COLUMBIA | X - X | DC-57 |