BUILD A SEAGOING U.S. COAST GUARD BUOY TENDER

(PART 1)
SCALE SHIP MODELER is proud to present this first part of a two-part article on building one of the finest R/C models of a Coast Guard vessel ever to appear in these pages.

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The author's highly detailed miniature buoy tender is seen here afloat. This model has won several prestigious awards including third place in the Mariners Museum ship model contest.
One of the least known and understood responsibilities of the U.S. Coast Guard is the administration, operation and maintenance of the Federal Aids to Navigation System. The USCG inherited this duty when the U.S. Light House Service was merged into it on July 1, 1939.

What is an aid to navigation?

According to the Federal Code it is, "any device, external to a vessel intended to assist a navigator in determining his position or safe course, or to warn him of dangers and obstructions to navigation. The device may be moored such as a buoy or fixed to the bottom such as a range or a light structure. It may be located ashore on the mainland or an island such as a radio beacon station, lighthouse or a loran chain of stations."

It is not equipment mounted or carried aboard a vessel.

The Coast Guard carries out the maintenance portion of its responsibility with a fleet (the Black Fleet as it is affectionately known in the Guard because all the vessels are painted black) of buoy boats and tenders. To service all the possible aids, this fleet is varied in size and capabilities. Buoy boats (numbered only) are less than 65' in length and the tenders (all named) range in size from the 65' small river type to the 180' seagoing type.

The latter is the subject of my model. The design of the 180' tender was begun by the USLHS prior to its amalgamation into the USCG. It was designed to work in severe weather under adverse conditions. It has a boom that can handle up to 20 tons, and may remain away from base for extended periods. Normal berthing accommodates a complement of five officers and 44 crew. These cutters are diesel powered, have a single screw and rudder and can handle buoys up to 10' x 39'. The cutaway forefoot bow is reinforced for light icebreaking. The Coast Guard also added search and rescue capabilities to this design.

There were 39 180-footers built in three classes (A, B and C) from 1941-44 and most are still in service. All were built in Duluth, Minnesota by two private shipyards except for USCGC Ironwood which was built at the Coast Guard Yard at Curtis Bay in Baltimore, Maryland.

Details of a buoy repair operation being conducted aboard the HORNBEAM.
U.S. Coast Guard Technicians are capable of a very extensive reconditioning of these navigational aids in the space of only one hour, no small achievement!

Because they were built during World War Two all were armed and some saw action in escort and other duties. The armaments have since been removed with the exception of two .50 caliber machine guns which can be mounted forward or aft.

I am enclosing with permission of the publisher, excerpts from U.S. Coast Guard Cutters and Craft of World War II by Robert L. Scheina, Naval Institute Press.

Mr. Scheina is the official Coast Guard historian.

One of the 180-footers, USCGC Evergreen (WAG-295), has been extensively renovated, painted white and serves the Guard as an oceanographic research vessel.
Another, USCGC Citrus (WMEC-300), is painted white and serves as a medium endurance cutter.

My first contact with buoy tenders and my first scratchbuilt ship model came from a six-part article which appeared in Ships and the Sea magazine in 1953. The magazine was a Kalmbach publication which has been out of print for many years. It had a section devoted to model shipbuilding called "The Model Shipwright." Beginning with the April issue and continuing through September, H. O. Williams details in his article, "Build a Coast Guard Cutter," the construction of a 1 1/8" = 1' display model of the Sundew, an Iris Class "C" 180' buoy tender. The plans (which I have included in this article) printed in the first installment were adapted from official Coast Guard plans by Gordon Odegard. In 1/16" = 1' scale, being only 14 at the time, it was easiest to build my model in the same scale as the plans.

Construction in Williams' article was "bread and butter" with 1/8" pine lifts. I made my 1/8" lifts by laminating three 3/8" balsa sheets together.

This made 15 horizontal glue joints which are clearly visible on my model which is only 11 1/4" long.

I lived in suburban New York City then and one of my fondest memories was a trip to Polk's Hobbies on 5th Avenue to purchase fittings. I could not believe they devoted a whole floor to model ships!

I built a case for my model and have enjoyed looking at its distinctive shape and graceful lines for 31 years. I am sure it is responsible for my latest R/C effort in 1/4" scale.

As some of Scale Ship Modeler's readers may be aware, I am a Coast Guard enthusiast and have scratchbuilt three other USCG vessels in 1/4" scale for R/C—a 38' Picket Boat and both the 35' 8" and 52' Motor Lifeboats.

Research for my second buoy tender began with a request for plans from the Coast Guard Engineering Office in Washington, D.C. A set of general arrangement and profile plans dated June 1974 came back for USCGC Iris (WLB-355), a Class "C" 180' footed drawn to 1/8" = 1'. In addition a half-breadth and sheer plan came drawn to 1/8" = 1', but there was no body plan and a second request for that important drawing went unanswered.

About that time I joined the Great Lakes Society of Model Shipwrights. Because all but one of the 180' class were built in Duluth and some were stationed in Great Lakes' ports, I hoped that through the Society I would be able to secure a body plan. Sure enough, they came through with one drawn to 1/4" = 1'. Many thanks to Chris Hoffner.

Additional research included several visits to the Coast Guard base in Cape May, New Jersey, where USCGC Hornbeam (WLB-394), an Iris Class "C" 180' footed is assigned with the 3rd Coast Guard District to A/N duty. I was welcomed aboard to take as many pictures and measurements as I wished and given a complete tour of the ship.

Conversations with her officers and crew revealed that she had been retrofitted with a tunnel bowthruster and carried a five-bladed main prop. The bowthruster gives the single-screwed vessels much more maneuverability when working in shallow and/or restricted waters or adverse wind and sea conditions.

Although not on my plans, one of the officers gave me the diameter of
the tunnel (42°), its four-bladed prop (38°) and the coordinates of the tunnel's center (frame #20 at the 6' waterline).

I now had a full set of plans drawn to three different scales and I had to decide on the size and scale of my model. The discovery of the bow-thruster became the critical piece in the decision-making process. It was an interesting feature that I wanted to incorporate in my model. In scouring my catalogs I found only one source—Dynamic Models of Port Jefferson, New York. I called to get the dimensions of the tunnel. These were critical in two ways. First, the diameter should be as close to scale as possible. Secondly, because the model product has two propellers mounted back to back on its shaft (rather than one on the prototype), the width at the waterline would determine how far forward and how deep in the model the unit could be mounted and still have both props contained in the tunnel. This was important to get maximum thrust, "barrel" effect, and eliminate any protrusions from the hull below the waterline that would slow forward progress. The bow of these tenders is very fine below the waterline because of the cutaway forefoot.

The inside of the tunnel was 1', which, in 1/4" scale, closely approached the prototype and the unit's width would permit it to be mounted exactly on the sheer plan coordinates without the blades of the props ever being exposed outside of the tunnel.

The decision about scale was thus made—1/4" = 1'. It would produce a model 45" long which I felt was small enough to carry around and to launch by myself, and large enough to house the electronics and batteries necessary as well as the detailing I wanted to do.

The most critical drawing was the body plan from which the model's frames would be shaped. My plan in 1/4" = 1' scale with a myriad of lines representing all 180 frames, or so it seemed. From the sheer plan I selected the frames that corresponded to the station lines on H. O. Williams' plans. There were 16 of these. I carefully drew over these frames on the body plan so that they would stand out. Then I had the plan reduced to 1/4" scale by a local Xerox Reproduction Center at nominal cost. Satisfied that the reduced body plan was "in scale," I made 16 copies so I could fold each down the center line and cut out a full-sized paper station for tracing onto 3/16" plywood sheet. For details of this process see my article in the September 1983 issue of Scale Ship Modeler, which I hope is still available. To make the keel I began with a 1'x4'

Locating a five-bladed propeller was no problem thanks to the excellent products of Exact Miniatures of Oxford, Maryland.

This overhead view of the buoy deck shows the exceptional attention to detail paid by the author to the little touches that make a model a world-class winner.
to be hollowed to accept the horn of the rudder post as it is activated by its servo.

Before assembling the keel and frames by the method described in my aforementioned article, the prop shaft and rudder post stuffing boxes must be installed. I elected to use a 3/16" brass rod for the prop shaft because the 2 1/4" five-bladed prop was relatively heavy. This necessitated a 7/32" tube be inset into the 8/32" keel. With a steel straight edge and a sharp knife I made deep cuts parallel to the shaft centerline 7/32" apart. With a 1/2" round gouge I removed the material between the cuts. Final fitting was accomplished with sandpaper wrapped around a rod of smaller diameter so that the stuffing box would lie flat in the groove without penetrating the far side of the "keel" and so that it could be covered on the open side by material fitting flush to the keel's near side surface. The trough was filled with epoxy glue and the tube allowed to set.

The prototype has fairing on both sides of the prop shaft. I used 1/2" half-round molding to cover the open side of the trough and to strengthen the opposite side. These were later shaped to the contour of the hull forward and to the diameter of the hub of the prop itself aft. The fairing is continued on a vertical support aft of the prop and on the rudder.

The rudder post was 1/4" brass rod. A hole was drilled vertically through the keel for a 5/32" stuffing box.

Jim Pentimall of Exact Miniatures in Oxford, Maryland, custom made the five-bladed brass prop to my specification as to hub length, diameter and taper as well as overall prop diameter and bore. I can't say enough about Jim's craftsmanship. He also made for me in brass the six blocks for rigging the cargo boom and the davits from my rough specs and photos of the real thing. They are sensational.

After the hull was planked and released from the building board, it was turned right-side up and work began on the interior. I epoxied 1/32" plywood squares to the interior of the planking to strengthen the area where the bow thruster tunnel would penetrate the hull. Then the two holes were cut, filled and sanded to snugly accept the plastic tunnel (the tunnel comes with extension pieces which are easy to use). I selected a Marx Monoperm 12v motor to power the thruster and it was mounted under the forward hatch on the buoy deck for access. Epoxylite was used to affix and "caulk" the inside joint of the tunnel where it passed through the hull. When that dried, the excess tunnel tubing was cut off flush with the planking.

Motor mounts were installed for the 12v Marx Hectorperm main motor. It has 21 reduction gearing built in. Accommodations for batteries, servo tray and wiring terminal strip were installed.

I had planned to use a 12v. Sears wet cell motorcycle battery to power both motors but found that it was too tall to fit athwartship and under the sides of the upper deck. I ended up using two 6-volt 9-amp. sealed lead acid batteries wired in series to give 12v. One fits flat under the buoy deck and the other stands tall athwartship under the deck house. This arrangement gives the right ballast and balance with very little other weight needed.

Next month, we'll carry on, beginning with the installation of the decks, bulwarks, and superstructure.
Overall view of the 1/48th scale HORNBEAM.

Modern USCG vessels, even those of the "Black Fleet" are among the most colorful subjects a modeler could hope to find.
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PART TWO

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Concluding our two-part essay on building a radio controlled scale model of the Coast Guard buoy tender HORNBEAM in 1/48 scale.

In the last issue, we left off with the installation of the battery, main drive, gear reduction, and bow thruster units 10.

The entire inside of the hull was given a thick coating of polyester resin. SIG two part foam was used to fill empty and inaccessible spaces for buoyancy should she be holed. The forecastle, main (buoy) and upper decks were made of 1/16-inch plywood. There is no camber on the buoy deck. Bulwarks of 1/32 inch plywood were added to the forecastle, buoy deck and aft portion of the upper deck. Cap rails were added and various openings for scuppers, mooring ports, chain stopper ports, etc. were cut through. There are removable sections of bulwark (buoy ports) on the buoy deck. I elected to leave the starboard one permanently removed and the port one permanently fixed.

Supports for the bridge deck and wings were epoxied to the inside of the planking amidship. This assembly and the bridge screen are permanently fixed and must be very strong to allow for the tension placed on them by the stainless steel cable (Stock Drive Products) for the cargo boom. The rest of the superstructure is built from plywood as one unit and is removable for access to the hull. The towing winch and all hatches are removable.

One of the most intriguing features of these tenders to me is the rigging and tackle of the cargo boom and other mechanical gear for lifting the buoys and their concrete sinkers in and out of the water and moving them around the deck.

The prototype has six hydraulic winches operated from the boom shack under the bridge. Two of these are mounted on the boom at its foot. The top one operates the “whip” and the lower one operates the “main hook.” The remaining four winches are mounted in over-and-under pairs in the port and starboard aft corners of the buoy deck. The upper winches control the port and starboard power vangs/topping lifts and the lower ones can be used to
pull gear around the deck.

The whip runs out to a sheave at the head of the boom, is hooked to the deck and provides an opposing force and stabilizing effect (especially in rough seas) to the lifting forces of the vangs/topping lifts. It can also be used for light lifting (rigged as either single or three part tackle) either by itself or in conjunction with the main hook.

The main hook is rigged under the boom and is used for the heavy lifting of buoys and sinkers. Another force can be applied for steadying swinging buoys or shifting them on deck. Lines wrapped around the catheads of the anchor windlass can be led through the roller chocks at the after edge of the forecastle deck down to blocks on the buoy deck to form cross deck lines.

I was concerned about how to get the proper tension on the vangs and the two hooks. After considerable thought, I decided to do it like the prototype. I made three pairs of winches out of large brass tubing, sheet brass and brass angle. A wooden drum was made for each of the four "operating" winches out of dowel the proper diameter (a snug fit is needed). It was bored through both its length and its diameter. A piece of square brass tubing was fitted through the drum's length with
A few commercial fittings were used such as watertight doors, pulley blocks, and searchlights. Other items were scratchbuilt, examples being the buoy on deck, davits, and flag lockers. Together, the effect is very satisfying and realistic.
Seamanship aboard a USCG buoy tender is of a high order. As the author relates in the text, the youthful Coast Guard ensign who was conning the ship during this operation managed to hold the bow off the lighthouse while staying close enough to allow technicians to step from the ship to the lighthouse. At no time did the vessel actually touch the lighthouse.

A hole drilled through it to match the hole in the drum. Now the winches can be assembled so that there is a hole drilled through the brass tube which encloses the wooden drum and so that the end of the cable can be inserted through the brass tube, wooden drum and square tubing. One of the brass end plates must have a hole drilled through its center to match the lengthwise hole in the drum so that the square tube can protrude just a little. Now when finally fixed in position, a key made from the next smallest size square brass tubing can be inserted into the end of the winch and cranked to tighten the cable. A simple cap can be made to cover this keyway.

Those of you more mechanical than I can figure out how to energize these things and operate the boom.

I engaged both hooks in pad eyes and links on the boom and tightened their cables so that the boom rests securely in its crutch. Then I tightened the port and starboard vangs. I used small (0) fishing tackle swivels between the hooks and their cables. The rigging of the seven part vangs is too long to go into here but if anyone is interested and doesn't have a tender nearby to study, drop me a line.

Still another device is used for safety bringing in or setting out buoys and their sinkers—the chain stopper. When the tender comes alongside a buoy and the main hook is engaged in lifting lug to bring the buoy aboard, the buoy's mooring chain is dragged through and snubbed in the chain stopper on the appropriate side of the buoy deck. This isolates the buoy from its sinker. The buoy can now be chained to the deck, tightened down by steambot jack, and disconnected from its mooring chain without fear of its breaking loose and being dragged back overboard. The tender, then, is effectively moored to the sinker. If only the buoy need be replaced, a new one is attached to the mooring chain and set back to sea.

The tender must maintain her station during this exercise so that the chain is running straight up and down just as if she were hauling in her own anchor. This is when the bowthruster is most useful in winding the ship in or out in conjunction with the main propulsion system which is keeping her properly located forward or astern.

The model runs like a top and with 9 micros it can go all day at the lake. A Futaba electronic speed control works the main motor. A servo was rigged with two brass arms which enclose a bathanded toggle. This momentary d.p.d.t switch with a center-off position controls the bowthruster motor's current direction. It is either full speed left or right and will turn the motor in its own length. I just give it short bursts. It's very handy on a steering course with tight turns. The bowthruster is ineffective when the model is underway. This is true on the prototype also.

One problem I have encountered is some radio interference from the small Monoperm that powers the bowthruster. Some times when it is operating, the main motor will also be activated even though they are
Note the small control station for the boom located just beneath the pilot house windows.

The boat carried in the davits shown here was built from a Staubbitz of Buffalo molding, no longer available.
controlled on different sticks. I have the main motor and rudder control on the left stick and the B.T. on the horizontal axis of the right stick.

I purchased many commercial fittings but also made many such as the towing bitt, flag lockers, cargo boom, mast, and small boat cradles.

I had some parts custom made as I mentioned—the prop, davits, and cargo boom blocks. However, I did rig the davits with A. J. Fisher blocks and made the base pivots and cranking gear. I also made the pivoting sheaves on the bridge wings which carry the topping lift cables down to the winches. These tenders carry two small boats (both fiberglass) a 25 ft 8 in Motor Cargo Boat on the port side and a 25 ft 8 in Motor Surf Boat on the starboard side. I have official plans for each. However, I elected to portray the port side with the cargo boat "away" and the manropes down. The surf boat is a Glen Slaubitz vacuformed hull which is fairly accurate except...
it lacks the molded-in spray deflector at the waterline in the bows. Glen has not finished the interior for these boats in 1/48 so I covered my boat.

I made the skeg, rudder, rudder protector, strut, prop shaft and prop enclosure. I also added the self-bailing ports with their floats and retainers as well as the exhaust port. I used some Lindbergh decals for the small boat striping and logo with dry transfer lettering in the proper style (Universe 75) for COAST GUARD and HBM1 (boats carried on Starboard side are odd numbered and port boats even numbered).

The hull of the model tender was covered with fiberglass cloth and painted with several coats of epoxy.

The striping was painted on using Testor white and #1110 blue and Accupaint's International Orange.

The orange has developed cracks and I would not recommend it to you, although it is the right color. The Coast Guard logo was cut out of a bumper sticker. Again, dry transfers were used for the lettering and numbers.

From the Yard at Curtis Bay where many of the buoys are manufactured, I obtained a set of plans for an 8 x 26 ft LWR type buoy (8 ft in diameter x 26 ft long with light, whistle and radar reflector). I made a model of this from cardboard tubing, wood, brass and plastruct angles, painted and numbered it and chained it to the deck. The sinker is Sakrete mortar formed in an ice cube tray.

When the model was completed, I sent some photos to the commanding officer of the Hornbeam with my thanks for the visits I had made aboard. He felt that anyone who showed that much interest in his cutter and the USCG should see how a buoy tender goes about her
missions. I was invited to spend a day aboard. One June 17, 1985 at 0730 we left the berth in Cape May to service an 8 x 26 ft buoy at the mouth of Delaware Bay. The buoy’s flashing light had been reported not working. The tender was held on the buoy’s station while it was lifted aboard. In the hour that the buoy was on deck much was accomplished. One stack of batteries was replaced in one of the pockets in the buoy’s hull. After rescoping the pocket, the hull was pressure tested against leakage. A new set of light bulbs was installed and tested. The entire hull above the waterline and the superstructure were painted. The mooring chain, shackles and swivels were checked to a depth of about 30 feet. Before replacing the buoy, its position was thoroughly checked.

We then proceeded north up the Bay to Miah Maull Shoal Light. This is an unmanned light that operates by generator rather than from a cable from shore. Hornbeam pumped 895 gallons of diesel fuel into its tanks for the next six months. A young ensign had the con for this operation and he maneuvered the cutter to a position, by using bow-thruster and minute changes in the main engine’s rpms, to hold the bow at a landing platform on the light to allow two men to step off the forecastle. The cutter never touched. A line was sent from vessel to light and the fuel hose hauled across the gap. The tender fell back on two bow mooring lines until the transfer of oil was completed. Then the process was reversed just as deftly as before. I was amazed! On the trip home a non-commissioned officer took the con and put the cutter through a man-overboard drill. We tied up at 1930—a full day’s work.

Commander Robert W. Thorne, was turning Hornbeam over to a new commanding officer that week so I benefitted from their conversations. I was fed lunch and dinner in the wardroom and was presented with a Hornbeam cap and a Coast Guard Ensign which I fly proudly from my flag pole. It was a wonderful experience.

I entered Hornbeam in the 1985 Mariner’s Museum Scale Ship Model Competition. She was awarded third place in the semi-scratch, powered ship division and I believe was the only R/C model to win an award of the 80 plus models entered.