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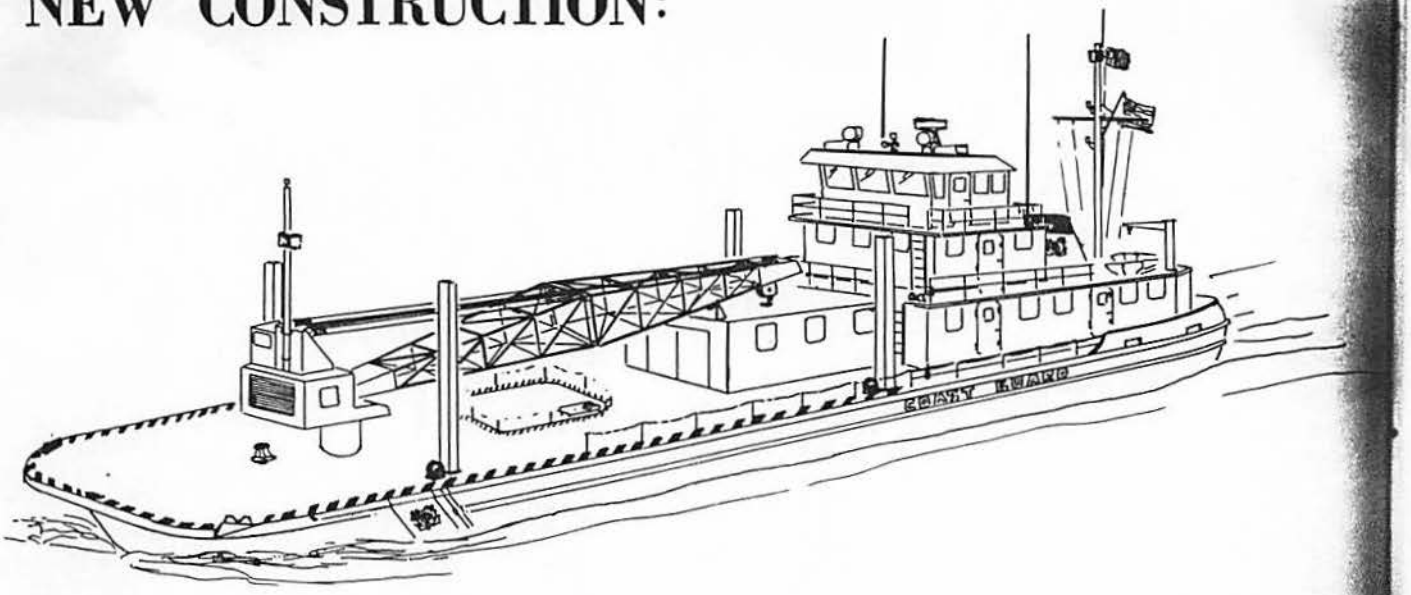

THE 160-FOOT SINGLE UNIT CONSTRUCTION TENDER

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A program to replace some of the 30-year-old inland construction tenders is underway. With the increased need to construct and maintain fixed structures in ever-expanding areas, Specific Operating Requirements suggested that vessels similar to the 75-foot WLIC pusher, with 100-foot barges (Fig. 1), would be satisfactory if they could be upgraded to achieve shallow water speeds of 10 knots.

The 75-foot WLIC, tow boat only, was designed for approximately 11 knots in shallow water. As could be expected, the addition of a barge reduces this substantially. During the standardization trials, the 75-foot WLIC with an 84-foot barge averaged 8.9 knots in deep water, and, with a 100-foot barge, averaged about 7.7 knots in shallow water. The existing 75-foot WLIC is a twin screw pusher which develops a total of 600 horsepower. Model test data for the tow boat with a 100-foot barge indicates three times that horsepower would be needed to achieve the desired 10 knot speed. By comparison, integration of the same units into a single-unit hull thus eliminating the wave-making losses at the pusher-barge interface, was estimated to provide the desired speed with approximately 1,000 SHP.

Two additional design requirements also favored the single hull:

a. Propeller diameter was limited by draft restrictions to four feet. This constraint limits shaft horsepower to about 600 horsepower per shaft. Thus, an upgraded pusher with barge would require three shafts to meet the 10 knot speed.
b. The increased need for habitability improvements, sewage retention, and oily water separation could not be adequately accommodated in the 75-foot WLIC. Furthermore, the engineroom would require extensive modifications to accommodate higher

horsepower engines; the electrical power system is barely adequate; and habitability areas do not meet current standards.

If a single unit design was operationally acceptable, elimination of the pusher-barge interface, and increasing the beam, (from 22 to 30 feet) in the "pusher" section, would provide adequate space to house the additional systems. In addition, integration of piping systems, electrical distribution systems, etc., would utilize the added space more effectively.

The single unit concept was presented as the best solution to the Specific Operating Requirements. This was confirmed by a review of existing pusher-barge operations when it was determined that:

a. Seldom, if ever, do the existing units uncouple (in the Districts receiving the new units).
b. Considerable difficulty is encountered by existing units when transiting open waters. The barge and pusher tend to override one another.
c. A single 160-foot unit would not encounter any known operating area restrictions, or suffer from limited repair or mooring facilities.

The development of a single unit hull design began with an arrangements study to determine principal dimensions. The operating requirements included a sketch of a minimum work area, and to this area was appended space for crew accommodations. Elimination of interface structure on the comparable tug-barge combination meant that a 160-foot single unit could provide equal or better arrangements than a 175-foot pusher/barge combination. Increasing the beam of the "pusher" section of the single unit design allowed the incorporation of two-man staterooms for all personnel, and adequate galley area to feed an entire crew at one sitting (Fig. 2).

The arrangement drawing provided sufficient data for a rough weight estimate, and development of hull lines. With displacement, draft, length and beam all determined by operational requirements, little room was left for optimization and trade-offs. Particular attention was given to bow entrance and stern form both to ensure adequate water flow to the propeller, and minimize wave formation which might cause river bank damage. Considerable bow flare was incorporated to provide work space forward, and to ensure a dry deck at the higher speeds anticipated.

Next to speed, the work area and crane facilities were considered the most important. A new, all-hydraulic marine crane has been specified for the tender, and

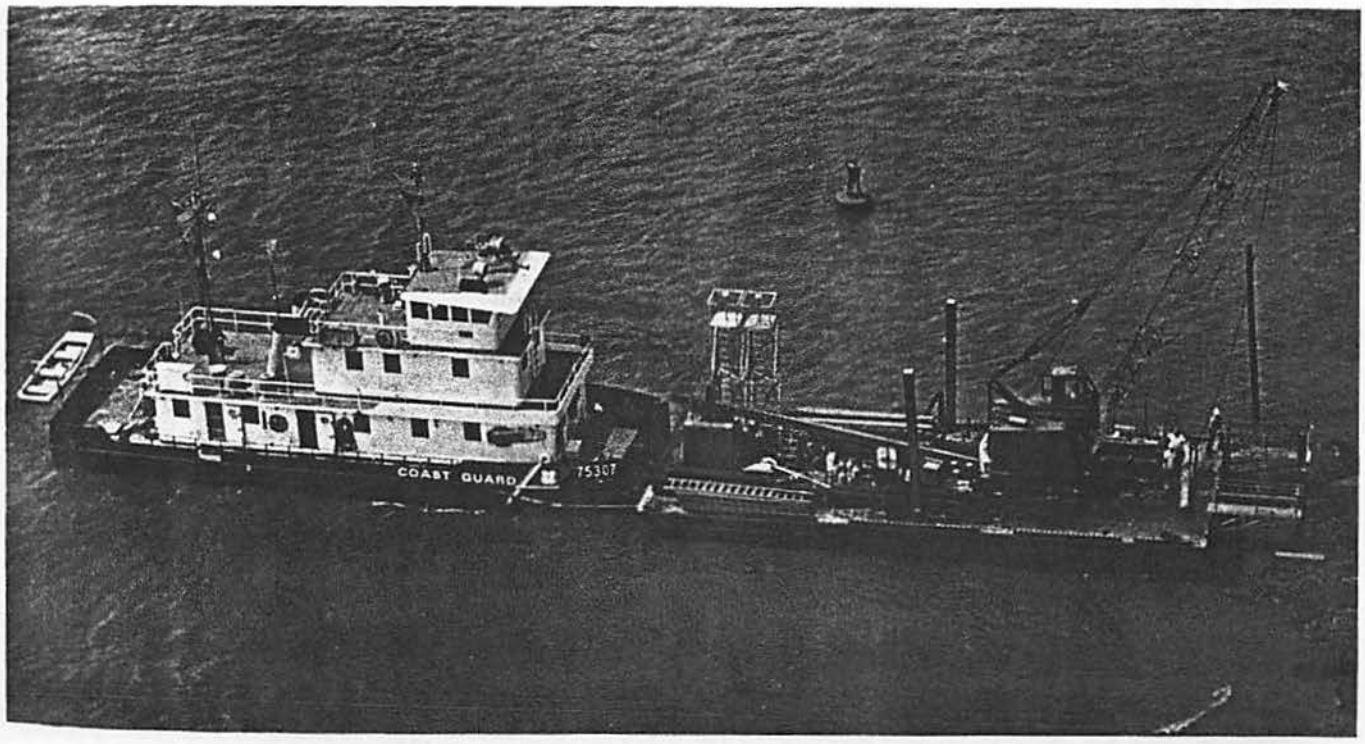
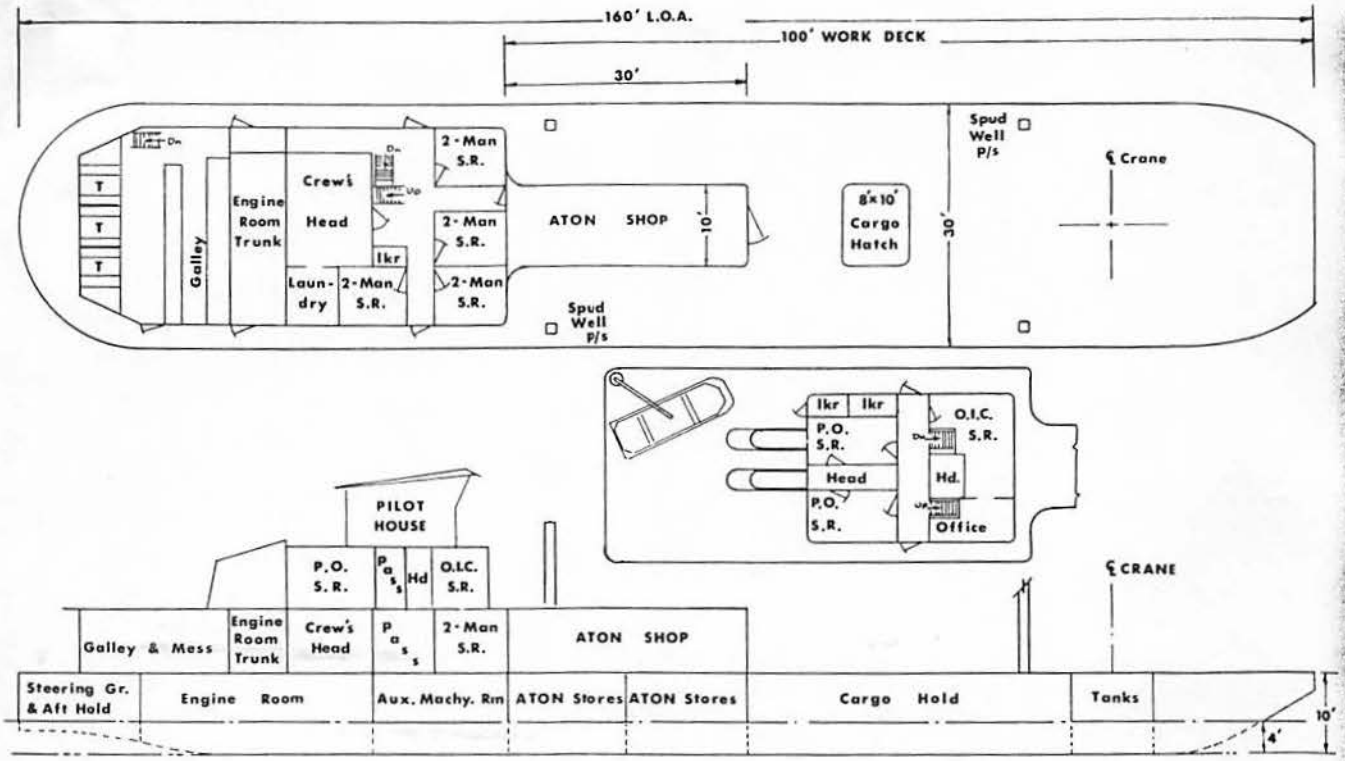


Figure 1. 75 foot pusher with barge.



it is anticipated that this crane will be similar to those being procured to replace the old commercial type presently installed on the construction barges. The crane will be purchased to a marine crane specification requiring inorganic zinc coating, simplified controls, spray-proof brakes, and a rugged cab with marine doors throughout. Additionally, provision has been made for cross-deck winches located on the 0–1 level which may be used to control the motion of pilings during loading and unloading. The winches also may be used to handle up to 90 feet of chain in a single pull, or for warping the ship at pierside. Four spuds have been located on the hull to provide a stable position while pile-driving, and each spud well is located in a void space to contain flooding in the event the well is damaged. The workshop area is located on the work deck and also provides an access path to the accommodations areas.

Once the major design features had been discussed, arrangement drawings, and a deck arrangements model were prepared. Representatives from all concerned Headquarters and District levels met at Headquarters and reviewed the design to ensure maximum usefulness in assigned operations. As a result of this conference, several major changes were made in deck arrangements to improve the ship's capability.

The 160-foot construction tender is currently at the end of the contract design stage. It is anticipated that construction of two 160-foot WLICs will start at the Coast Guard Yard this spring with the first unit completed about 1 October 1975. The ship should prove to be a valuable addition to the Coast Guard fleet.

ABOUT THE AUTHORS

CDR John T. HOWELL is a Coast Guard Academy graduate, class of 1959. He received his masters degree in the fields of Naval Architecture, Marine Engineering and Mechanics at the University of Michigan in 1965. Since then he has had tours as engineer officer on board the icebreaker STATEN ISLAND and as an engineering instructor at the Academy. CDR HOWELL is presently Chief, Aids to Navigation Cutter Section in the Shipbuilding and Maintenance Branch of Naval Engineering Division at Headquarters.

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