

210' MEDIUM ENDURANCE CUTTERS

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The new class of 210 foot Medium Endurance Cutters are the first vessels of any size to be built by the Coast Guard since World War II. These new cutters are designed primarily for search and rescue work and secondarily for law enforcement. Their area of operations, the zone out to about 500 miles offshore, contains the coastal marine traffic, the commercial and sport fishing industries, and the ever growing pleasure boating industry. In this area, too, the transoceanic lanes of marine and air traffic converge on our major sea ports and air terminals.

With their helicopter handling facilities and improved habitability features, the 210 foot Medium Endurance Cutters mark a definite change in the concept of vessel construction and utilization in the Coast Guard. The vessels are 210' 6" overall with a 34' maximum beam. They displace approximately 970 tons at a mean draft of 10' 6". The 5000 installed shaft horsepower give them a top speed of 18 knots and a cruising range of 5000 miles. They are designed for an operating endurance of about 30 days.

The ships are of all welded construction with a raised foredeck, raked stem, and transom stern. The raised foredeck keeps them dry in heavy seas, requiring the vessels to be driven into the seas at almost full power before green water comes aboard. The combination of steering system, hull form, and inward turning controllable pitch propellers gives excellent maneuverability. The superstructure is arranged in three levels

to permit 360 degree visibility from the pilot house. The free standing tower mast is fabricated of aluminum and is designed to carry air and surface search radars as well as the usual myraid of antennae, beacons, and lights required to be carried by a vessel of this size and for the type of duty performed. Access to the radar platform at the top of the mast is from the pilot house, also fabricated of aluminum, via a ladder up the interior of the mast and out through a watertight scuttle in the top of the mast. All propulsion machinery exhausts through the transom stern, thus eliminating smoke stacks and the attendant wasteful uptake space. This arrangement also serves to keep exhaust gases from interfering with operations on the flight deck, and tends to reduce maintenance of the electronic equipment mounted on the mast as it no longer encounters any corrosive stack gases. Watertight bulkheads extending up to the main deck divide the longitudinally framed hull into eleven main compartments and provide for a minimum of two compartment subdivision.

The initial armament is minimal, consisting of a single 3"/50 gun mount and six 50 caliber machine gun mounts for law enforcement purposes; but space and weight have been left for sonar equipment, additional radars, hedgehogs, and ASW torpedoes should the occasion arise that they were required. Two 25' 8" motor selfbailing surfboats are carried by these vessels in direct support of their primary mission of search and rescue. Rescue ladders, buoyant litters, swim equipment, rubber rafts, portable salvage pumps, portable fire pumps, and other rescue equipment, are all carried for assisting people or vessels in distress. The vessels also carry an oceanographic hoist in order that they may contribute their share to the Coast Guard's program of oceanography.

The enclosed pilot house contains a central steering station with the main engine control stand located just to starboard. The chart room is located in the after portion of the pilot house and is arranged so that it does not restrict the visibility aft. Navigational equipment includes a gyro compass with bearing repeaters on the bridge wings, a remotely mounted magnetic compass with reflecting prism, radar indicator, Loran, echo sounder, radio direction finder, and underwater log. Remote controls for voice communications are also provided on the bridge and 12" signal searchlights are mounted on the bridge wings. There are controls within the pilot house for two 24 inch, 2500 watt Mercury-Xenon searchlights mounted on the house top. The electro-hydraulic steering system may be controlled in the conventional manner from the steering stand, by an automatic gyro pilot, or from any place on the bridge wings by a portable follow-up steering transmitter fitted with 25 feet of cable. This latter feature, although somewhat novel, has met with good acceptance by operating personnel. It permits steering by the conning officer himself if he desires, but more important, it permits the helmsman to be directly at the conning officer's side, which tends to obviate the possibility of misunderstood rudder commands.

The C.I.C., radio room, code room, electronics workshop, and the electronic storeroom all combine to form an electronic complex which takes up practically the entire area of the O2 deck. The C.I.C. and radio room contain all of the equipment normally found in these areas, and although they are compact they are adequate to the needs of the vessel. Communications equipment includes high frequency, medium frequency, and single sideband transmitters and receivers as well as teletype facilities. The electronics workshop is fitted with bench boards, tools, and other equipment necessary for the repair of the electronic equipment on board. Directly aft of the

workshop is the electronic storeroom with its integrated bin stowage of spare parts. The combining of all the electronic repair facilities in close proximity to the operating equipment has paid off in convenience to, and the time saving of, repair personnel.

The flight deck is designed to handle any helicopter the Coast Guard presently operates, including the HH52-A (Sikorsky S-62). Helicopters will normally operate with the cutters on a temporary basis during search and rescue operations, rather than being assigned to them permanently. The cutters carry 2500 gallons of JP-5 fuel for refueling the turbine-driven helicopters; and provide a small helicopter workshop just forward of the flight deck. Extra berthing is also provided for the flight crews should the aircraft remain on board for any length of time.

As is the case with any ship operating aircraft, a number of personnel are involved in flight operations, including a landing signal officer, a safety officer, and a fire-fighting party at both sides of the superstructure. A rescue team, including a boat crew and litter detail, is stationed on the forecastle; a tiedown crew mans the safety nets at each side of the flight deck. The flight deck safety nets fold up to form a safety railing around the deck edge when flight operations are not being conducted. It has been found generally impractical to rely on the primary tiedowns to prevent a skid of the aircraft on the first roll of the vessel after touchdown. This is particularly true if the deck is wet. The period of roll of the vessel is eight to ten seconds and the best that the tiedown crews have been able to do is to secure the helicopter in ten to eleven seconds. It is thus obvious that the aircraft cannot be secured in one half the period of roll of the ship. Experience has shown that an immediate and inexpensive solution to the problem is the use of a wooden grid or "egg crate" secured

to the deck. This grid permits the pilot to land essentially with his wheels in a box. This technique has proven very effective in stopping a skid before the aircraft can gain significant momentum. Actual operations have shown that the vessel can safely land helicopters with the ship rolling 15 degrees and with the winds up to 30 knots relative from any direction forward of the beam. This points out specifically that the design of the superstructure and lack of stack serve to create no significant turbulence on the flight deck. To handle larger helicopters safely under more adverse weather conditions would require some sort of improved rapid tiedown or winch down system. Operations to date with helicopters have shown the flight deck installations to be well worth the cost, and has expanded the vessels' search and rescue capabilities manyfold.

In further support of their primary mission, the cutters each carry two 25' 8" selfbailing surfboats stowed port and starboard on the O1 deck. Designed and built by the Coast Guard, the boats are constructed entirely of fiberglass re-enforced plastic. The majority of the boats now in service are powered by small 60 horsepower diesel engines. Those on the first two cutters, RELIANCE and DILIGENCE, however, are powered by a gas turbine driven hydraulic pump and motor combination developing 50 horsepower on a single propeller. The cost of the gas turbine units has precluded using them any more extensively at this time.

The surfboats are stowed in crescent davits which are capable of being breasted by hydraulic cylinders from a stowed position to outboard within 15 seconds. Electro-mechanical boat winches, operating single whip wire falls, are capable of placing a boat in the water in 18 to 20 seconds, and can raise an 8000 pound load at rates up to 120 feet per minute. This capability of rapid boat handling is most advantageous when utilizing the the boats in heavy weather.

The single 3"/50 gun mount forward and the six 50 caliber machine gun mounts in other areas of the ship are primarily for use in the Coast Guard peace time mission of law enforcement. As was stated previously, however, space and weight have been left for the future installation of ASW armament. In fact in some areas of the vessel the additional deck stiffening and insert plates for ASW armament foundations were installed during the original construction.

The vessels also carry two high altitude flare projectors which are used to provide night illumination when required for search and rescue or other operations. These flare projectors will be replaced in the near future by 81mm mortars.

This class of cutters were the first operational vessels in the United States to be powered by a combination diesel engine and gas turbine (CODAG) installation. Propulsive power for the vessel comes from a 1500 horsepower diesel engine and a 1000 horsepower gas turbine connected to each shaft, and its seven foot six inch controllable pitch propeller, through pneumatic clutches and a reduction gear. Main machinery propulsion options, on either shaft, provide for the diesel engine operating alone, the gas turbine operating alone, or both units operating simultaneously and sharing the total load in proportion to their individual horsepower ratings. Control of the main machinery may be accomplished from the pilot house, either bridge wing, or from the main engine room control booth. Local control and gauge boards are also provided right at the engines for use in and emergency. The control system, which is pneumatic, in operation, is so designed that no matter what combination of main machinery is in use, the same mechanical position of the control handles will always produce the same total horsepower on the propeller shafts.

The propeller pitch control mechanism is designed to shift the propellers from full pitch ahead to full pitch astern within ten seconds. In the unlikely event of loss of propeller or engine control air pressure, the propellers will return to neutral pitch and the engines to idle speed. In addition, provision is made for reducing propeller pitch automatically in the event of engine overload. One advantage of this is to permit the engines to develop full rpm (i.e., maximum thrust) when towing, regardless of the size of the tow.

The main engine room control booth is an air-conditioned enclosure located at the forward end of the upper level of the main engine room. The control booth contains the main engine control console and also serves as the Engineering Log Room. All main engine operations as well as the control of the ship's service generators may be controlled from this booth. Here the operator on watch may sit at the control console and look out over the engine room while monitoring the machinery by means of a complete set of installed engine instrumentation, including recording horsepower meters. In addition to main engine and ship's service generator alarm panels, the booth is also fitted with alarms that permit limited remote monitoring of the automatic boilers and evaporator located in the after auxiliary machinery space.

Electrical power for ship's service is provided by two 200 kilowatt, 450 volt, 3-phase, 60 cycle diesel generator sets. There is also a 100 kilowatt, 450 volt diesel generator located in the steering engine room for emergency power. Electrical load sensing engine governors on these generating sets will maintain the steady state frequency within plus or minus 0.5 percent for all loads from no load to full load. With the sudden application or removal of load, the frequency variation will not exceed plus or minus 1.5 percent of rated frequency and will recover to the steady

state band within two seconds. Static type voltage regulators will maintain the steady state voltage within plus or minus 1.0 percent of rated voltage, will limit transient voltage variations to plus 5 or minus 10 percent of rated voltage, and will recover from transient to steady state within two seconds. Each of the main ship's service generators has its own distribution switchboard while the emergency generator is connected to its own control and distribution switchboard located in the steering engine room. Non-vital loads, such as heating, air conditioning, etc., are split between the two main boards. The two main boards are themselves connected to the emergency switchboard by bus-tie feeders and automatic bus transfer switches. All vital loads are fed from the emergency switchboard. Both ship's service switchboards may be supplied by either generator by an interconnecting bus-tie circuit. The output of the emergency generator is transferrable to the main switchboards through a feedback switch and feeder. Thus any generator can supply power to any switchboard or all three generators may operate independently.

Compressed air for engine starting, control, and for ship's service purposes is provided by a total of four air compressors. The starting air compressors and reservoirs are located on the upper level, starboard, at the after end of the main engine room. The control air compressor and tank are located in a similar position on the port side of the engine room. The starting air compressors supply air at 250 psi while the control air tank supplies air at 100 psi to the main propulsion control system. The ship's service air compressor and associated reservoir is located on the upper level, port, at the after end of the main engine room. This unit supplies air at 100 psi to the ship's service low pressure air system. Cross-connections are provided from this system to the starting air and control air systems for use in an emergency.

Auxiliary machinery, outside the main engine room, is located primarily in four separate areas. The after auxiliary machinery space contains the two 150 psi, fully automatic, packaged oil fired boilers which provide all steam requirements for the vessel. Located in this same compartment is the two stage, flash type, 3000 gallon per day distilling plant. The forward auxiliary machinery space contains the diesel oil transfer pump and manifold, diesel oil purifier, and the fresh water and sanitary pumps. Located here also are the two refrigerating machinery plants for the vessel's chilled water air conditioning system. The refrigeration machinery space, located between frames 156 and 172 below the commissary stores, contains not only the two independent Freon-12 refrigerant systems but also the JP-5 service pumps and filtration system. The after fire pump is also located in this same compartment. The IC and gyro room contains the gyro compass equipment and the IC switchboard. Located in this same compartment is one of two sewage ejection systems; the other being located in a storeroom forward.

The habitability features of the vessels stem from a sound desire to reduce day to day maintenance; and to improve the living and working conditions of the personnel and consequently their efficiency. All living spaces are fully air conditioned and are furnished in bright colors. Bulkhead and shell paneling of high pressure plastic laminates, and overhead paneling of aluminum with a baked enamel coating, provide smooth easily cleaned surfaces that need no further painting. All piping, wiring, and duct work are concealed in runs behind the paneling. Hinged doors allow quick access to valves and damage control fittings, and all of the paneling can be easily removed for maintenance purposes.

Quarters for the Commanding Officer are located on the 01 deck forward. The Commanding Officer's cabin doubles as a day room and office and is directly adjacent to his stateroom. The seven other officer staterooms are all essentially identical in facilities and each has its own adjoining toilet and shower space. All staterooms are furnished with built-in berth, desk and lamp, bookcase, bureau, safe, lounge chair and reading lamp, and full length deck to ceiling wardrobe. The staterooms are all conveniently located either directly above or below the Wardroom. The Wardroom itself is located on the main deck and provides the officers' messing facilities, as well as a comfortable and decorative lounge area. The Wardroom Pantry is located directly aft of the Wardroom and is adequately equipped with a range, oven, refrigerator, sink, garbage grinder, and automatic dishwasher.

The two four man CPO berthing compartments, located on the second deck amidship, are separated by the chiefs' head. Each space is fitted with two double bunks, four full length lockers, and a desk and lamp. The passageway connecting these two berthing areas contains an access ladder leading directly to the CPO mess and lounge on the main deck.

Four crew berthing compartments, two on the main deck and two on the second deck, provide accommodations for fifty eight enlisted personnel. Each berth has its own reading light and the berths are grouped into semi-enclosed four man cubicles by full length lockers at the ends and partitions between berths. Each berthing compartment has the head facilities directly adjacent and each has a small recreational area with a table and chairs. Ship's recreational equipment includes television, standard radio receivers, AM/FM high-fidelity receivers, and tape recording and playback equipment; all of which can be piped throughout the ship.

The crew galley and mess is located on the main deck aft. The mess deck is equipped with eight four man mess tables, each with four upholstered swivel stools with back rests. The galley is designed to feed the entire crew cafeteria style with the steam table and serving line separating the galley from the mess deck. The galley is provided with a service elevator to facilitate the handling of refrigerated and dry stores to and from the storage spaces on the second deck. The scullery is located directly forward of the mess deck to permit the deposit of dirty trays and utensils as personnel leave the mess deck.

The engineers' workshop, with lathe, drill press, grinder, hydraulic press, welding machine, etc., is located in the after auxiliary machinery space on the second deck. The electricians' workshop and the damage control storeroom are both located next to the hawser and rescue equipment stowage space, second deck aft. The engineers' storeroom is in the hold directly below the after auxiliary machinery space; while the bosh's and miscellaneous stores are all in the forward portion of the vessel. The armory and ordnance workshop is located adjacent to the magazine area third deck forward.

As of this writing, four of these vessels are actually in service, CGC RELIANCE (WPC-615), CGC DILIGENCE (WPC-616), CGC VIGILANT (WPC-617), and CGC CONFIDENCE (WPC-619). The first three were built by Todd Shipyard, Houston, Texas, and the fourth by the United States Coast Guard YARD, Curtis Bay, Baltimore, Maryland. The CGC ACTIVE (WPC-618) is now nearing completion at Christy Corporation, Sturgeon Bay, Wisconsin; and the CGC RESOLUTE (WPC-620) is under construction at the Coast Guard YARD. The RESOLUTE is the lead ship for seven ships (WPC-621 through WPC-627) being built by the American Shipbuilding Corporation, Lorain, Ohio; and three more vessels (WPC-628 through WPC-630) to be built at the Coast Guard YARD. This brings the number of new Medium Endurance Cutters built or building to a total of sixteen.

Development of new equipment and evaluation of operations on cutters already operating has resulted in a number of changes in later vessels. Some of the differences between the first vessel built, CGC RELIANCE, and the sixth vessel, CGC RESOLUTE, are very minor and apply only to details of construction or equipment changes; others are of more significance. The pilot house has been enlarged by making it "T" shaped. It has also been rearranged and the doors now open aft giving better protection from the weather and better overall utilization of the pilot house and bridge wings. The radio room and code room spaces have been rearranged to provide more space in the code room and to better integrate it with the radio room to provide for increased secure communications equipment. Flight deck facilities have been greatly improved by the addition of a homing beacon, touchdown and landing lights for night operations, and additional tiedown points. An additional feature which is under consideration for these vessels is a helicopter rapid winch down system which will firmly grab and hold the aircraft to the deck. Laundry facilities have been changed from the standard type of ship-board laundry equipment to regular commercial type laundry washers and dryers, all complete with coin boxes. All sewage will be piped to a central sewage treatment plant and will be organically treated thus permitting the discharge of clean waste from the vessel instead of the customary raw sewage. Propulsive power will be provided by a single 2500 horsepower diesel engine on each shaft. The boilers and the evaporator, which were in the after auxiliary machinery space, have been relocated to the engine room proper; and the degaussing equipment has been moved from the engine room to what used to be the electricians' workshop. The electricians' workshop and the engineers' workshop have been rearranged to utilize the original workshop area and the auxiliary machinery space. The propulsion control booth has been

relocated to the after end of the engine room and has been reduced in size. The log room functions that were originally done in the control booth are now carried out in a separate log room located next to the relocated electricians' workshop. The net result is a better utilization of space, better workshop areas, and provides for a distinct and separate log room.

With their good sea keeping qualities, excellent maneuverability, helicopter handling facilities, and other modern features, these cutters are proving to be an extremely valuable addition to the Coast Guard's growing fleet of modern vessels. Their capability for operations with helicopters has increased the vessels' search and rescue abilities and has extended their potential future usefulness. The increasing tendency toward the Continental Shelf concept of national boundaries could conceivably require Coast Guard law enforcement over an area which could not be economically covered by ships alone. The vessel with a helicopter, therefore, already represents the answer to a possible future requirement for increased coverage. The mere existence of the helicopter handling capabilities on these vessels has extended their potential usefulness into a number of areas, and into possible functions, which have not yet been envisioned.

Inevitably, or course, there are complaints about these vessels. Even the people who have had a hand in their design and construction find fault with them. The old story that no matter how good a thing is there is always some darn fool who thinks he can make it better, can certainly be applied to these ships. That this is so is a good thing for our nation, for it shows a disregard for complacency and a desire for improvement which are the backbone of progress. It is gratifying, however, for those who have participated in the design and construction of these vessels, to know that the ships are more than accomplishing the tasks for which they were designed. The following quotation ^{from an} best

evaluation report of one of the vessels in operation perhaps best typifies the feelings of the men who sail these ships; "In general, it appears to all of us -- Officers and crew -- that _____ is capable of accomplishing far more than was originally conceived. This class vessel will prove to be an extremely effective addition to our operating forces in carrying out Coast Guard missions."