Cutter Design

THE SERVICE - OLD & NEW

MEC-270

by CAPT R. G. Moore, '52

"It's time we started talking about this exciting new ship. It represents a transition from old ways to new."

This summer, the Coast Guard will award a contract to begin construction of a new class of Medium Endurance Cutter. When the first ship is delivered in 1980 we will gain an extremely versatile addition to our inventory and take a quantum step forward in the technology and techniques applied to Coast Guard missions.

The construction program derives from requirements identified in the Cutter Plan for both replacement and additional ships to meet existing and projected mission requirements through the remainder of this century. Although the class is clearly a multi-program resource, particular emphasis was given to law enforcement needs. The requirements for that mission fixed the basic parameters of the design and were incorporated into the Designated Task Statement. Essential elements of that Statement included the following requirements:

- Sortie from homeport and conduct 14-day law enforcement patrols in areas not more than 400 miles distant.
- Conduct ship-helo operations with an aircraft routinely deployed with the cutter for the duration of patrols.
- Possess a speed advantage over a significant portion of the World's existing and projected fishing fleet.
- Exploit technology in order to reduce manning, and to enhance mission effectiveness.

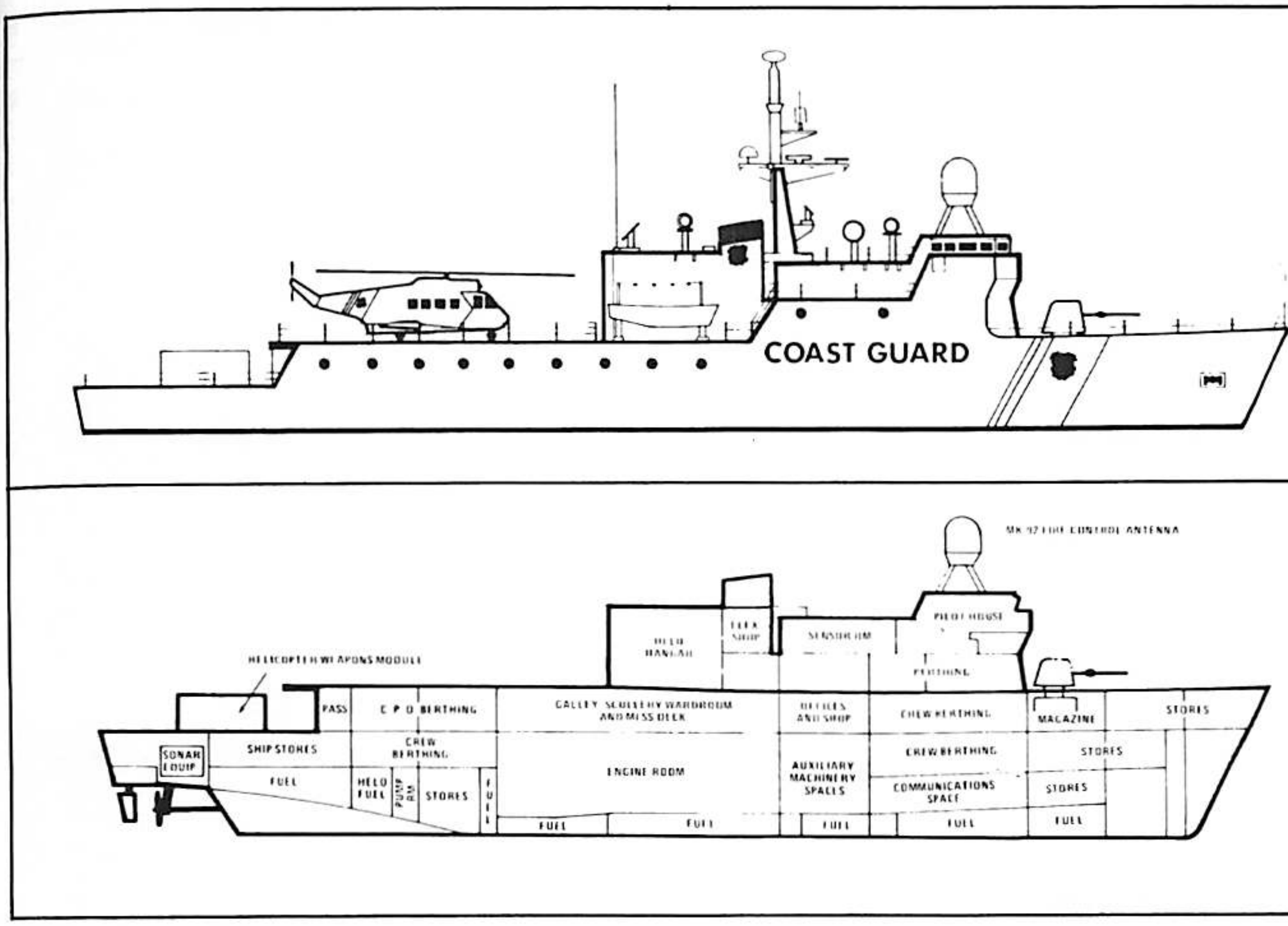
The ability to conduct ship-helo operations includes the requirement to hangar the aircraft to protect it from salt-induced corrosion and to provide a shelter within which to accomplish maintenance and servicing.

A maximum speed of 20 knots was selected after analysis showed that this would give the ship a speed advantage over an estimated 95% of the World's existing and projected fishing fleets through the year 2000. As an aside, it is interesting to note that this was about 5 knots lower than initial, subjective estimates. Automation efforts concentrated on operations functions but were applied to reducing manning requirements in engineering spaces also.

From the very beginning, the hangar was the key factor which drove the design. It determined basic dimensions and offered the most difficult design problem when meeting the 100 knot wind speed criterion. Logic as well as the Designated Task Statement demanded that the embarked aircraft be employable to the maximum extent possible. To permit launch and recovery of the aircraft 90% of the time, considering historic weather and seastate data for anticipated operating areas, the ship will be actively stabilized and provided with an IFR air control capability.

Law enforcement continued to be a key element in the conceptual approach to command and control, and to the selection of other systems as well. An effort was made to project the future impact of the 200-mile Fisheries Conservation Zone, drug interdiction, and the probable growth of new areas of law enforcement activity in protection of offshore assets. Note all of these areas of law enforcement activity have some common factors:

- Each requires substantial involvement with other agencies, both federal and state.



• Each, by contrast to missions like Search and Rescue, places the Coast Guard in an adversary role vis-a-vis potential or actual violators.

• Each, based upon our experience to date and events such as the "Cod War" and North Sea terrorism, potentially involves the use of force.

The "adversary" climate and the increased sophistication of the tools available to violators require the application of advanced equipments and techniques to detection and interdiction. Because of the potential for confrontation and the nature of the devices available to terrorists, the weapons suite cannot be as simplistic as that of the 210's. Given the interagency involvement, the international sensitivity of enforcement actions, and the immense areas involved, forces can be effectively employed and controlled only if sophisticated command, control, and communications capabilities are provided. Much more of the decision-making process will be centralized; at the same time more information will be required by both commanders ashore and commanding officers afloat.

The explicit language of Title 14 also required that wartime employment be considered early-on, and it was apparent that the ship had great potential as an addition to the Nation's naval forces in being. While in-house planning went forward, the Commandant sought Navy input as part of the equipments selection process.

The Command and Control (C^2) complexities associated with present-day naval operations are extensive. It would be an understatement to simply say that these will change in the future. A more accurate position is that not only will there be change, but that the change will be of revolutionary magnitude. The fleet operational environment of 1980-2000 will be characterized by strict control of all electronics emissions prior to contact with opposing forces, and voluminous exchange of information/C^2 thereafter. Anachronistically, the strict control of electronics in the precontact phase will increase reliance upon visual communications, while the degree of integration required after contact will be achievable only through data-linking and automatic processing. Concurrently, threat levels will evolve to ones which compress time for detection through reaction into a matter of seconds; conditions which, again, require automation. Future requirements will thus force the reduction in the numbers of people involved in the C^2 system as fundamental to reducing processing time.

Naval environment aside, automation was part of the Designated Task Statement because we are faced with the reality that personnel costs associated with ship operations have soared dramatically since 1974. The focus was on operations functions since command and control facilities, as represented by the HEC-378 CIC configuration, are the most people-intensive we have. Those functions must be automated, both to limit costs and to provide the requisite capability. Accordingly, an automated Command, Display And Control (COMDAC) system is being developed for the ship. It is a system which relies upon computer assistance to accomplish plotting and display, to present alternatives for decision, and to perform library functions, e.g. decode/encode signals, etc. Although this approach is a new one for the Coast Guard, it has been the subject of extensive developmental work worldwide since the late 1950's.

Right from its beginning, the dialogue with the Navy demonstrated the importance with which they viewed the program *and* the benefits which would accrue from our use of combat systems for peacetime missions. The Chief of Naval Operations was asked to propose wartime missions for the class and to determine the combat systems needed to accomplish those missions. In responding, the Vice Chief of Naval Operations said that "*. . . the greatest need is for forces in being with ASW capability in support of the Navy sea control mission in wartime. There is also need for forces in being to conduct coastal surveillance and mine countermeasures operations. Additionally, it is desirable that units carrying out these missions have some AAW/ASUW capabilities.*" From that precept the system selection process proceeded as a joint venture. The following background rationale is of interest:

• The direction of surface ASW is toward long range passive sensors in order to deny the enemy submarine the alerting feature and beaconing effect of active sonars. Given a ship of conservative speed, with the capability of employing helicopters, the LAMPS/TACTAS (Tactical Towed Array Sonar) system will, by a significant margin, provide the most effective results.

• Cutters operating in the coastal zone provide excellent monitoring platforms. In coastal surveillance the ideal ship sensor suite provides for detection of enemy forces or weapons in sufficient time to enable warning of coastal fixed or mobile forces so that they can take defensive measures. This capability can be achieved by air search and surface search radars, and by an Electronic Systems Module (ESM) suite capable of passively detecting probable threat emissions.

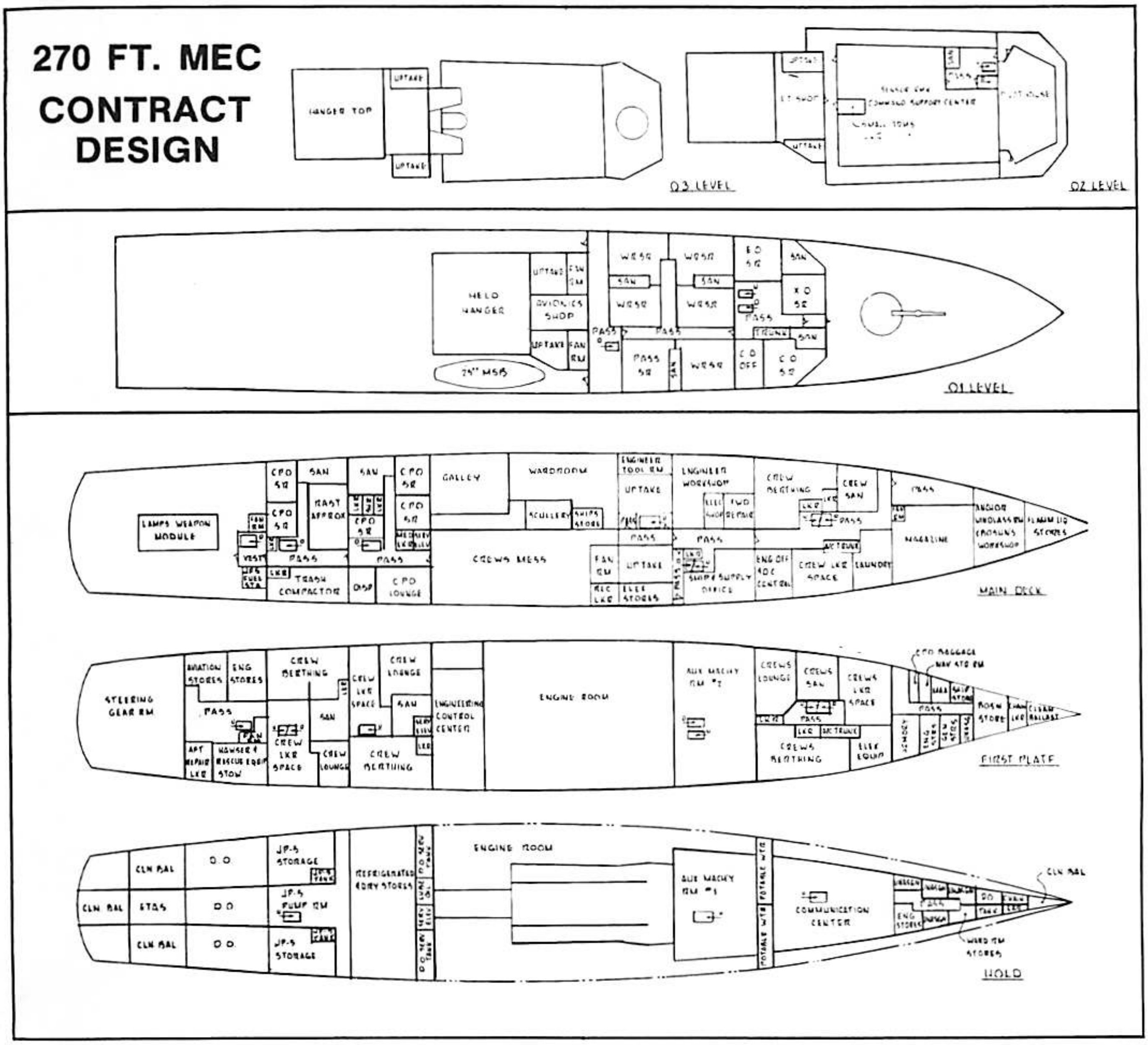
• The ideal ship mine countermeasures (MCM) system provides for mine sweeping by airborne devices towed by helicopters. The cutter/helicopter system provides a useful MCM capability. In addition it is possible that a new mine hunting sonar now under development could be temporarily installed without changing the ship's characteristics.

• Since retrofit of defensive systems after mobilization would involve delays of at least six months, ships should carry their self-defense systems in peacetime. Ships which will function in an escort role should be capable of defending unarmed ships under convoy as well as themselves.

The combat systems which were selected for the 270's provide a formidable warship; they significantly enhance the ship's peacetime capabilities as well. This last point is important since it means that the expenditure for the system is cost-effective and that personnel skills for war or contingency are kept fresh through constant use. The MK 75 gun and MK 92 fire control system meet the Navy task criteria and give a strong peacetime capability for law enforcement. In addition to fire control the MK 92 system provides an acceptable air search radar capability for both peacetime use and coastal surveillance. For a "hot" war, the ship requires a secondary battery to provide full 360 degree coverage. However, an appropriate secondary weapon is not currently available. Consequently, a space-weight reservation has been made for later installation, and the PHALANX Close-in weapons system (CIWS), or its equivalent—available in the mid 1980's—will be the likely choice. A space-weight reservation has also been made for the HARPOON missile. That, too, will be available in the mid-1980's.

For minimal anti-ship missile defense (ASMD) capability, a modularized Early Warning (EW) suite with Rapid Blooming Offboard Chaff (RBOC) will be installed. RBOC provides the electromagnetic or infra-red decoy by which to deflect missiles. The Electronic Systems Module (ESM), itself is an advanced version which replaces operator analysis functions with a computer. The ESM also supports the coastal surveillance requirement for a passive means of threat detection. There is an on-going R&D effort to identify modifications required to adapt the equipment for use in law enforcement.

A LAMPS III helicopter will provide wartime ASW contact localization and weapons delivery. The LAMPS capability offers significant advantages for other day-to-day operations as well. In order to be LAMPS III capable, the ship must provide IFR air control and be able to launch and recover aircraft under marginal conditions. This necessitates TACAN, a Glide Slope Indicator, other visual landing aids, and RAST (Recovery Assistance and Traversing system). The



Glide Slope Indicator is a stabilized tri-colored beam of light which enables a pilot to establish and maintain the prescribed glide path angle during his approach to the ship at night or when the visibility is poor. RAST simplifies the problems associated with recovering an aircraft without deck grids, and the spotting of the aircraft in and out of the hangar. LAMPS III support items, sonobuoys, and weapons will be housed in a van located on the fantail. The van will be carried only when the LAMPS aircraft is embarked.

In addition to its use as an ASW sensor, the Towed Array Sonar System (TACTAS) holds promise of adding significant capability for passive detection in a surveillance and law enforcement role. Such an application is being investigated by R&D. Part of the LAMPS/TACTAS package is a ship-helo data linking capability which should also enhance the efficiency of the ship-helo team in any role.

When all of this was blended into a single hull, the result was a ship that is tightly volume-constrained. As can be seen from the layout, there is little space to spare. Habitability, in terms of square feet per man, is at about the 378′ standard. The living spaces are arranged along modular lines, and reflect not only naval practice but our own experience in the WLB rehab program. Living space is at least adequate, particularly when the relatively short deployments are considered.

Other features of the 270 include the NAVMAX A+ communications system, probe refueling, replenishment at sea fittings on the port side, and a Zodiac boat for use by boarding parties.

The engineering spaces are designed for operation by a two man watch, one at the control station, the other serving as a roving security watch. The plant is straight forward—a single medium speed 3600 HP diesel engine driving each of two shafts with CCP "wheels". Single lever pre-programmed bridge control will also be provided. The two 500 KVA Ship's Service Generators are each sufficient to handle the entire electrical load, and are backed up by a separate 500 KVA emergency generator. Conventional evaporators have been replaced by a waste heat distillation system. There is the full range of pollution control systems.

One of the unique features associated with the Command, Display, and Control (COMDAC) design is the use of a periscope for bearing-taking. In the navigation mode the periscope is automatically laid on predicted bearings generated by computer. The operator makes such corrections as are needed and feeds the actual bearings back into the system by touching a switch. Incidentally, the operator does not look through a reticule at the base of the 'scope. The image is relayed through TV and a video processer, and can be called up for view at any of the console positions. The autotrack feature can also be used when taking visual bearings to determine if risk of collision exists. The TV element is sensitive to extremely low light levels and a high intensity light source is slaved to it, providing passive visual surveillance capability.

Since an adequate discussion of COMDAC is a rather large undertaking, it will not be described in detail here. Its concept is quite simple, however—the use of an interactive computer to take raw data from sensors and other sources, and process it into a form that can be readily absorbed, evaluated, and acted upon by an operator. The operator enters the system through a keyboard, calling up a "menu" appropriate to what he wants to do. The resulting data is displayed—at his choice—as raw or processed material in either graphic or alphanumeric form. Manual plotting is eliminated; so too the need for sound-powered 'phones and manually maintained status boards. Normal steaming routine will require only an OOD and a quartermaster-assistant. Between them they can accomplish all of the functions and have immediate access to all of the information presently generated by a fully manned CIC. As the tempo increases, the bridge watch can be augmented by one or more operators in the Command Support Center (CSC) until, at General Quarters, all of the functions are divided between the three CSC positions. This leaves the bridge free to maintain an overview and make decisions.

About the Author

CAPT Robert G. Moore, '52, is currently serving as Chief, Military Readiness Division at Coast Guard Headquarters. Previous assignments include Coast Guard Activities, Europe as Deputy Commander; Commanding Officer, Base Milwaukee; and as an advisor in the Somali Republic.

He has served in COOK INLET, CASTLE ROCK, and BRAMBLE; and commanded HAWTHORN, OWASCO and BURTON ISLAND. He will report during June to a new assignment as Commanding Officer, POLAR STAR.

Some time ago a correspondent whose letter appeared in *The Bulletin* posed the question of what happens when the "seagoing Batmobile" blows its fuses. He will perhaps take comfort from the high degree of redundancy incorporated in the design. Given the continued availability of electrical power, vital functions can be continued. When all else fails, those same vital functions can be performed by the tried and true MK 1 Human.

A close relationship between shipboard maintenance capability and shore based support is critical to the concept of reduced manning. A careful balance must be achieved between that which is done by the ship's company and that which is accomplished by a dedicated support facility. The manning level of the MEC-270's is currently being determined. The first step in the process was to identify the manpower required to operate the ship in a fully self-sustained mode—no more dependent upon shore support than are the HEC-378's. The manning level thus derived is currently being reduced, measuring the capability of each man removed against the "fully-self-sustained" baseline so that it can be identified and compensated in shore support. This methodology ensures that the requisite capacity is not lost. It appears either afloat or ashore.

Any short treatment such as this cannot hope to address all of the features of the 270. This article's most useful purpose may be to suggest that specific features of the ship be the subject of future articles. It's time we begin talking about this exciting new ship. It represents a transition from old ways to new.

REMEMBER HOMECOMING COMES EARLY THIS YEAR! 1 OCTOBER 1977

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