U.S. COAST GUARD

The Next FRC?

PCX-150 concept addresses key technology risks that shelved a previous Coast Guard cutter effort

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Program Similarities

An experimental PCX-150 has been pitched to the Department of Homeland Security by Northrop Grumman, which is on the Deepwater prime contracting team.

- Northrop had been working on the Fast Response Cutter (FRC) design that was shelved by the Coast Guard in May.
- New proposal follows same development timeline as that for the FRC.
- PCX-150 program manager had been Coast Guard program manager for Deepwater's failed 123-foot patrol boat conversion program.

Few people have heard of the PCX-150. But the experimental, composite-hulled, 150-foot cutter, equipped with next-generation rudders and a hybrid propulsion drive, could be the Coast Guard's future Fast Response Cutter (FRC).

Department of Homeland Security (DHS) briefing documents obtained by *Seapower* describe the PCX-150 — a concept that exists only on paper — as a cutter that will be impervious to hull corrosion, energy efficient and environmentally friendly. It will leverage Navy, university and industry research that was done to reduce costs and risks connected with the FRC program, which was shelved by Coast Guard Commandant Thad Allen in May.

The FRC program, which was part of the service's $24 billion Deepwater modernization effort, was suspended because of the technical risks associated with using composite materials for the hull.

However, the DHS documents show that the PCX-150 addresses several of those technical risks.

The vessel's builder, Northrop Grumman Ship Systems, presented concept papers for design and production of a prototype PCX-150 to the DHS in May, at about the same time work on the FRC was suspended. DHS documents detailing the concept show its development would coincide with the timeline that had been put in place for the FRC.

The company proposed splitting the funding for the prototype craft three ways — with Northrop Grumman, the Coast Guard and DHS each chipping in $8 million for 2007 and 2008 to develop the boat — if the Coast Guard and DHS agree to develop the Northrop Grumman design.

The documents also describe explicit characteristics of the PCX-150 that will mitigate some of the FRC's technical risks. Northrop Grumman, as part of the Integrated Coast Guard Systems (ICGS) joint venture with Lockheed Martin that managed the Deepwater program, submitted a design proposal last November for the FRC that was turned down by the Coast Guard, partially because the composite materials were deemed too heavy.

The concept papers for the PCX-150, however, tout the use of lightweight composite panels of 20 to 40 feet, manufactured by the University of Maine, which have already been produced and approved by the DHS. The composites planned for use in the PCX-150 hull are 20 percent lighter than steel.

A technology readiness assessment also was conducted to thoroughly examine the FRC before a decision to move forward could be made. Findings from the technology readiness assessment, released earlier this year, found that "maturity levels of necessary critical technology elements do not yet support immediate production of a composite-hulled patrol boat," according Capt. Rich Murphy, the Coast Guard's FRC program manager.

The service instead opted to build a non-composite-hulled FRC model, based on an existing design, as an intermediate solution for the Coast Guard's cutter needs. An intermediate FRC design is expected to be

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The Fast Response Cutter program was suspended this spring by the Coast Guard because of technical concerns and weight issues with its composite hull design. A new proposal for a 150-foot cutter, the PCX-150, also features a composite hull, but touts the use of lightweight composite panels that have already been produced and approved by the Department of Homeland Security.

announced next spring from the pool of companies that submitted a design to the Coast Guard in June.

But simultaneous development of Northrop Grumman's PCX-150, also known as the scalable composite patrol cutter, is being conducted. The documents indicate that the PCX-150 is the composite hull version of the FRC design pitched by Northrop.

The scalable composite patrol cutter is "one example of where we have an industry team trying to make amends," Jay M. Cohen, DHS undersecretary for science and technology, told the House Appropriations subcommittee on homeland security in March.

Clarifying that those are "my words, not theirs," Cohen cautioned the laughing galley, "I don't want to affect the stock prices for a prior performance."

Cohen was alluding to ICGS's failed effort under Deepwater to modernize the Coast Guard's 49 heavily used 110-foot Island-class cutters and lengthen them to 123 feet. Last November, the first eight boats that had been lengthened were deemed unusable and dry-docked in Key West, Fla.

The project's failure created a capability gap that prompted the Coast Guard to move the original delivery date of the FRC from 2020 to 2010.

The program manager for the PCX-150 work is Lt. Cmdr. Chad Jacoby, former Coast Guard program manager for 123-foot patrol boat conversion program.

ICGS officials, however, said there is no link between work on the PCX-150 and the Deepwater program.

Margaret Mitchell-Jones, communications director for ICGS, said the PCX-150 experimental cutter "is not under Deepwater and has never been under Deepwater."

Coast Guard officials also are reticent to declare a connection between the PCX-150 and the Deepwater program's FRC.

Currently, there is no "official" service involvement in DHS efforts to look at alternative materials for next-generation watercraft, said Coast Guard Capt. Dave Newton, director of borders and maritime security for DHS' Science and Technology Directorate.

"However, I think there is still an interest within Science and Technology to take a look at some of those things," he said, "which will, in turn, potentially go to inform other acquisition vehicles like Deepwater."

The DHS documents present a tentative timeline showing that the agency and the Coast Guard were to have signed a memorandum of agreement to begin development of the PCX-150 in August. It was unknown if an agreement was signed at press time.

A contract between Northrop Grumman Ship Systems and the DHS would come three months after the agreement — in November, if the timeline holds — and development and a detailed design of the ship will take about a year.

The documents propose construction of the demonstrator craft in December 2008, manning with a Coast Guard crew in October 2009 and delivery of the vessel by June 10, 2010, the exact date set forth by the Coast Guard in the now-stalled plan for the composite-hulled FRC.

The construction of the hull for the PCX-150 would be a unique "vacuum-assisted resin transfer molding" process, which essentially uses a vacuum bag to press together composite materials beneath tubes of resin, DHS documents show. The vacuum bag and ports and resin tubes affix to a pliable surface and comprise a reusable mold that can form other hull panels.

Composite materials do not corrode nor do they need repainting or frequent dry-dock repairs. Additionally, the use of composites in ship construction takes advantage of the inherent strength-to-weight ratio, resulting in a lighter ship that requires less propulsive fuel, according to the documents.

While the primary goal of creating the PCX-150 craft is to demonstrate the feasibility of lightweight advanced composites in the production of a 150-foot patrol craft, other potential goals are to develop a full-size platform to test lifting-body technologies and an advanced loiter drive.

"The level of interest within the DHS as it pertains to some of the vessel characteristics is not limited to the material itself," Newton said. "It could be hull design. It

could be propulsion. It could be a whole litany of things."

The lifting-body technologies that might be tested if the PCX-150 comes to fruition include a large ray-shaped bow-lifting foil at the bow of the ship and two parallel ray-shaped foil rudders at the aft.

Honolulu-based Navatek Ltd. has conducted research using computer modeling and scaled prototypes of lifting bodies. Jeff Klein, a senior engineer for Navatek, said the application of these technologies to a patrol craft design has "potential for significant increase in efficiency and improved sea-keeping."

Navatek pioneered twin-hull technology in the early 1990s when it designed and built the first commercial, U.S. Coast Guard-certified Small Waterplane Area Twin Hull craft.

Another potential goal of developing the PCX-150 would be to test advanced loiter drive technologies, which are essentially diesel-electric engines that switch to the electric motor during slow-speed operations.

With 80 percent of Coast Guard operating hours conducted at low speed, according to the documents, using this hybrid technology would reduce fuel consumption and diesel engine maintenance. This boils down to more sortie hours for the ship. Such hybrid technology has been used to a great extent in Navy submarines, but never for a ship of this size.

But what is the likelihood of turning such a developmental craft into the next FRC — the future workhorse of the Coast Guard fleet?

In developing requirements for the FRC, the Coast Guard's technical review authority identified critical elements that must be addressed by whichever design is chosen prior to production of a patrol craft. Some of these elements are specific to the development of a composite-hulled patrol cutter.

The PCX-150 documents note 40 of the FRC critical technology elements as being addressed by its design. These elements include actual manufacturing costs, joint performance and shrinkage issues, equipment attachment methods, repairability of structure and fatigue calculations, according to the DHS documents.

In a nutshell, $8 million of Coast Guard funding buys $24 million in risk mitigation annually, with the balance being equally shared by the DHS and PCX-150 designer, Northrop Grumman.

The goal for the DHS would be to provide some game-changing advances in technology to enhance the capabilities of the department's operational elements, according to the documents. The PCX-150 would fill the Coast Guard's need to mitigate risks — both technical and cost-related — in a science and technology environment prior to production.

Should the PCX-150 prototype be realized, Northrop Grumman may make historical advances in composite ship production, paving the way for follow-on contracts with the Coast Guard, other government agencies and foreign militaries.

Northrop Grumman officials were unavailable for comment.

"Part of the job of the DHS Science and Technology borders and maritime security division is to reduce risks for large procurements of vessel types," Newton said. "If the Coast Guard is building Fast Response Cutters and they choose a conventional material design, then the level of effort for DHS Science and Technology would go to inform a follow-on to that platform, or other government customers. ■