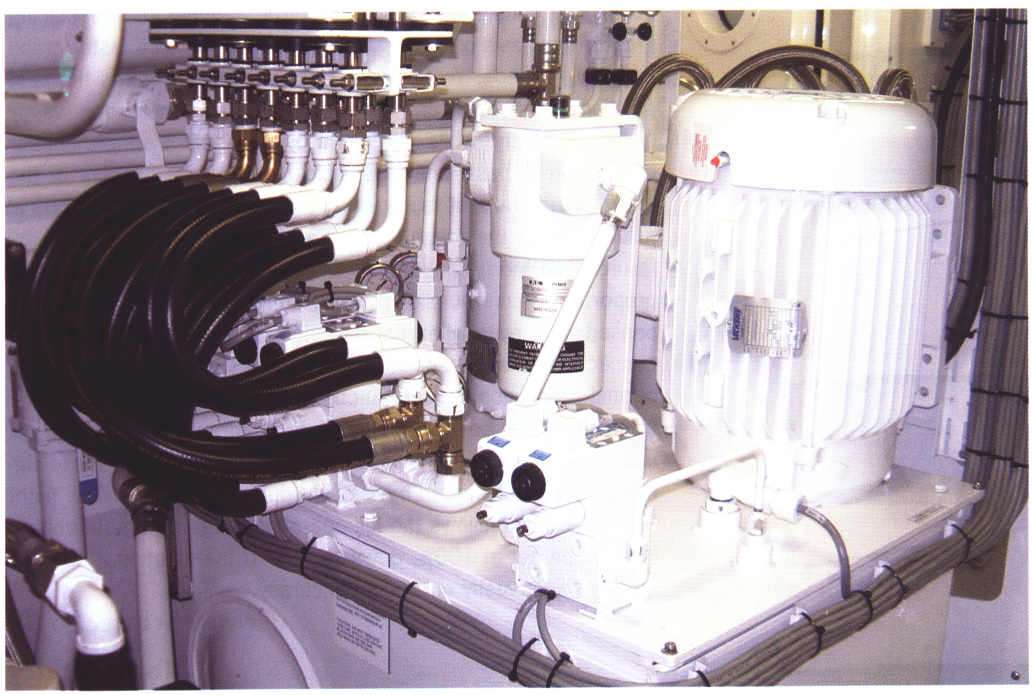
M/Y *Triton*

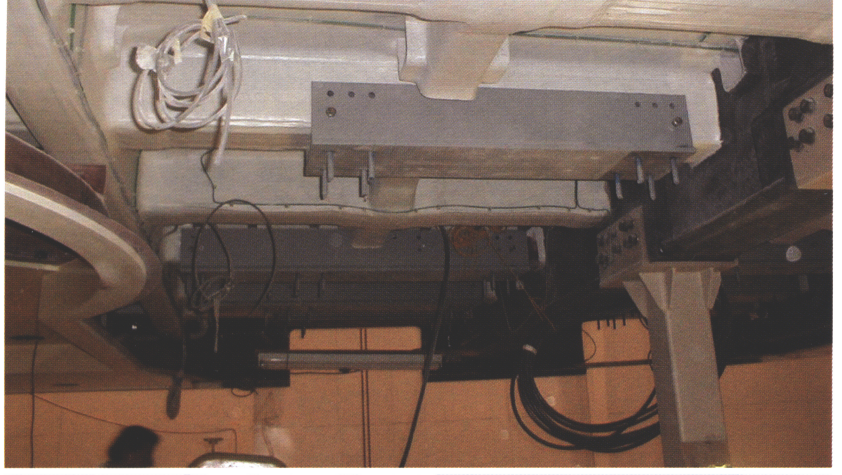
Tender Launching System

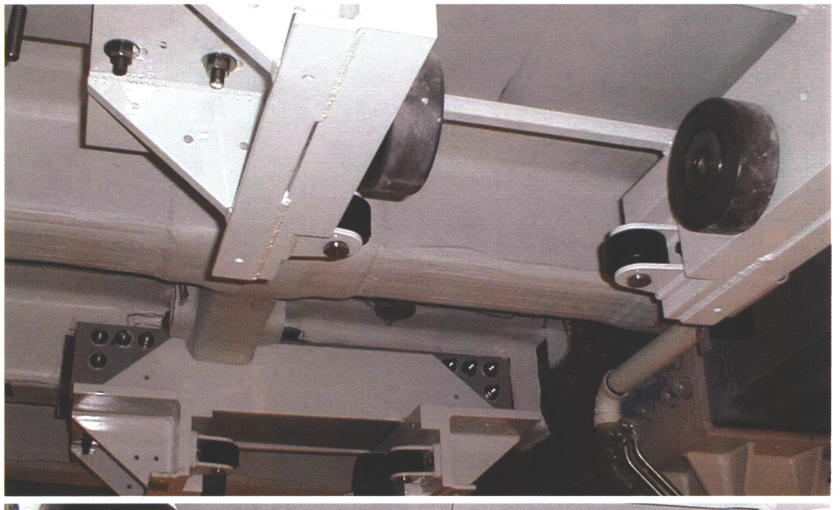
Scanning the sea from the observation deck some 11-plus metres above the ocean the look-out observes a disturbance in the water three miles off the starboard bow. In contact with the captain on the bridge, the distance and bearing to the distant disturbance is given; the captain orders the vessel to turn into the seas and prepare for under way launching operations. The launch crew assembles on the aft boat deck and the high-speed inflatable is readied with the special boat crew on board. The hydraulic overhead beam cranes attach to the fast boat and with high-speed and stealthy silence the boat and its crew of three is deployed while the mother ship continues on her new course at cruising speed. With professional coordination the boat is released from the overhead cranes and manoeuvres away from the ship, on their way towards their quarry.

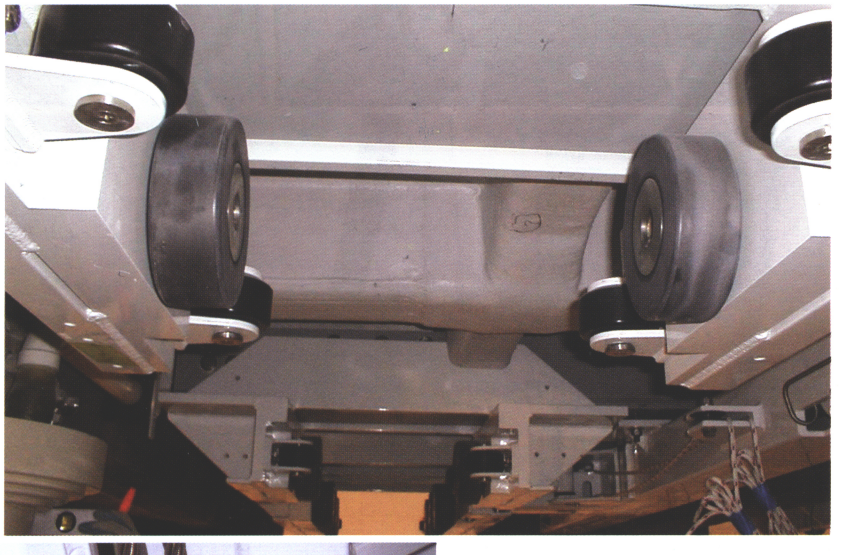
Sounds like a scenario ripped from the pages of the latest Tom Clancy novel, or a US Navy special boat team's mission? No, it's just the start of a great day's fishing! Nautical Structures in collaboration with Delta Marine have recently developed and successfully sea-trialled a tender-launching system for Delta's most recent project, the 49.7-metre/163-ft M/Y *Triton*.

At the heart of this system is a custom designed central hydraulic system built by Nautical Structures (below), configured with dual motor/pump drives. The dual motor drive design provides redundancy in the system, and three possible run-configurations for the hydraulic equipment that is supplied by the system. A 15-horsepower drive is the primary power supply, providing hydraulic power to the upper deck crane, towing boom, towing winch and deck capstans. A 10-horsepower drive is provided for emergency back-up in the event that the primary pump or motor fails. When the main-deck overhead beam cranes are deployed, both pump-motor drives are started for a combined 25-horsepower supply. The hydraulic system's reservoir holds a generous fluid capacity of 228 litres/60 gallons, and is baffled so as not to ever permit the entire volume lost in the event of a catastrophic line failure somewhere on board the vessel. The emergency pump side is isolated from the primary pump side. The low-









fluid/high-temperature sensors are integrated into the vessel's alarm system as well as indicated at all control stations with audible alarm and illuminating LED lights. The hydraulic power unit may be started and shut down from any one of four control stations on board the vessel.

The primary tenders are stowed on the main deck, and launched with an 8,000-lb capacity overhead beam crane system designed and built by Nautical Structures. The overhead beam crane incorporates a number of technological innovations that enhance its performance and safety. From the very start this crane system was tasked with the mission of launching the starboard tender while under way, at cruising speed in moderate sea conditions. To this end the beam structures had to be capable of supporting their load capacity in two axis, anticipating the forces that will be applied as the tender is potentially pulled through the water after launching or just prior to hoisting.

Integrating the aluminium structure into the FRP/composite superstructure also created a unique set of demands on the system. Large steel hangers were designed to mount to the overhead's structural composite beam members. Precision placement was paramount to the proper operation of the system, the rollers and guides had to be aligned in the lateral as well as the longitudinal axis to support the travelling beam cranes properly. Delta resolved this concern by suspending the individual hangers in the overhead, laser-sighting the parts and then chockfasting the parts into proper placement.

The beam cranes are powered in and out of the vessel not with toothed-belts or chains as most overhead beam crane systems are, but with Nautical Structures' Linear-Winch Traversing cable drives in a pre-tensioned pull-pull configuration. Although considerably more expensive to build in this configuration, the linear cable traversing drives provide a number of operational advantages over conventional belt or chain drives. Most significantly is the precise control the operator maintains over the operation of the cranes. The linear-traversing drive system incorporates a hydraulic tensioning system that maintains 1,360 kg/3,000 lb of constant tension on the drive cable, ensuring that at no time-travel-slack is permitted into the system. The beams move in positive-control without the potential of shuddering, or reacting to the roll of the vessel. The interface with the crane's proportional control system provides the ability to touch the joystick and traverse the beams as slow as a few millimetres per second through the entire range of speed control upwards of a full metre per second.

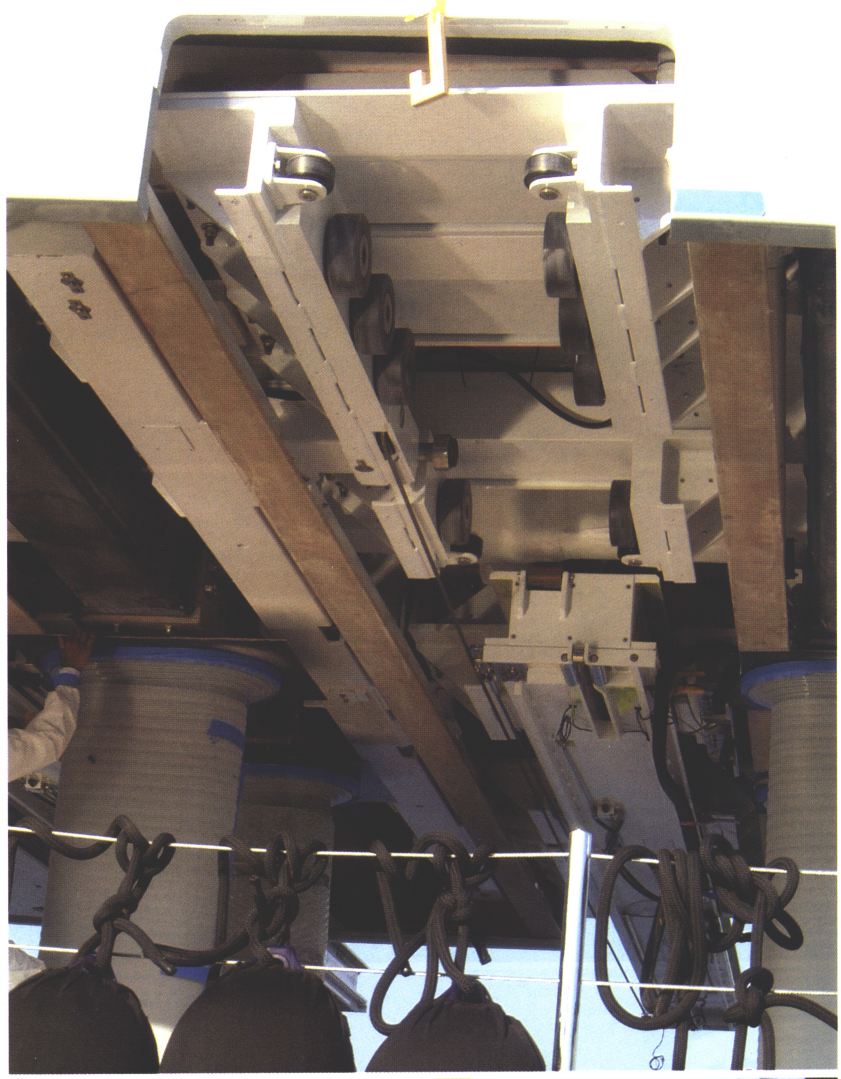
The linear-winch traverse drive provides additional benefits in addition to precise control of the tender. Because the system does not use chains or gears to drive the beams, the system is silent in operation. The positive, tensioned-cable attachment ensures that the beams will stay where the operator places them, even in the most dramatic beam seas. Hydraulic locking valves ensure that during operation of the cranes the positioning cylinders maintain position. Secondary locking cylinders retract every time the joystick control is functioned, permitting the beam's release for travel, and fire closed with authority when the function command ends. This drive system is fully capable of complying with LSA/SOLAS launching requirements for vessels over 500 gross tons, launching against a 20-degree list/10-degree trim.

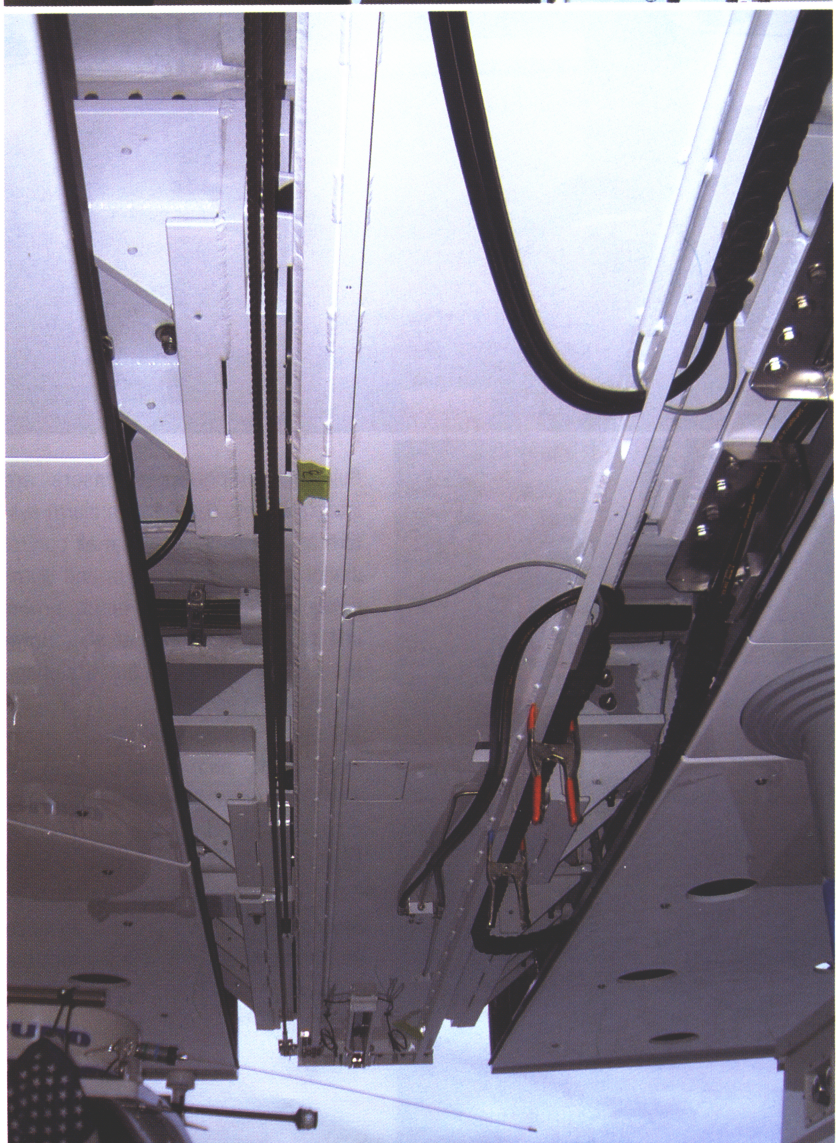
The overhead beam crane's launching winches are also from the Nautical Structures' design Hydraulic Linear-Winch – positive control, non-fouling and silent operating. In this highly loaded application Spectron 12+ (AmSteel) composite fibre line was selected for use over more conventional wire rope. Maintaining the appropriate D:d ratio (relationship of the sheaves' diameter when compared with the diameter and minimum bending radius of the cable or line) is paramount in the design of the crane. Using the wrong ratio guarantees premature wear and potential eventual failure of the hoisting cable.

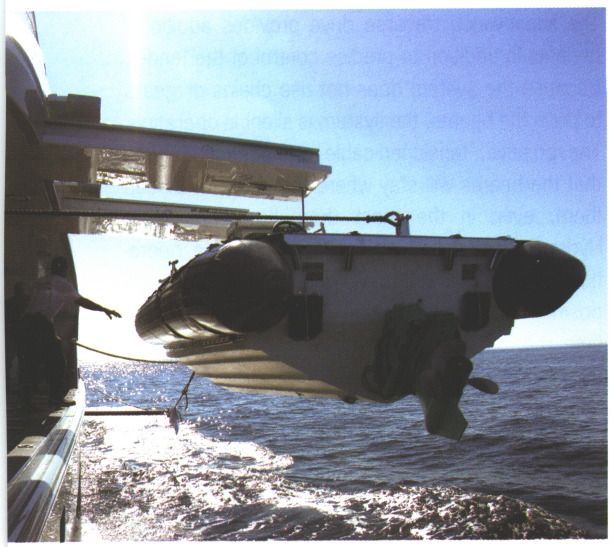
Composite fibre line tolerates a much lower D:d ratio, thus permitting the overhead beam cranes a lower section profile and a nicer fit into the yacht's overhead. Composite fibre line is incredibly strong and easy to work with. An in-the-field replacement of composite fibre line is relatively easy to accomplish without the need for special tools, fittings or hydraulic presses. Wire rope is much more difficult to handle and replace in the field. In M/Y *Triton*, knowing the directional loading and fairlead challenges envisaged during launching operations while under way made the selection of composite fibre line an easy decision.

To assist further in the operation of launching the starboard tender while maintaining seaway with the yacht, a towing boom has been integrated into the launching system. The towing boom is constructed from carbon fibre and concealed in the yacht's bulwark while stowed. During launching operations the towing boom is hydraulically deployed, and a short tow bridle is run through the boom and run aft to the forward towing ring in the tender.

During the launching operations this bridle mitigates much of the aft-loading to the overhead beam cranes and is controllable with a hydraulic towing winch. Once the tender is in the water and running at match-speed to the yacht, the







The look-out described at the beginning of this article was accessed by a specialised lift system to the crow's nest, designed and built for M/Y *Triton* by Nautical Structures. The company has developed a lift system that transports people from the upper boat deck to the crow's nest up in the mast. This lift system needed to be designed to live out on deck, integrate aesthetically into the architecture of the mast, and operate silently and safely. Again, we utilised our Linear Winch Technology to actuate this system. /This cable-handling system runs silently and protects the hoisting cable from deformity and premature wear. Redundant hydraulic cylinders live in each of the two aluminum columns that define the structure of the lift. Either of the two cylinders will operate the system; the use of two hoisting systems running parallel ensures the level of safety required to transport people. The lift platform has been designed to look like it is 'floating' between the two side columns, and runs up the columns at a rate of 40 feet per minute. Sensors slow the rate of speed as the platform approaches the end of its travel, ensuring that the passengers are not 'jolted' to a stop.

hoisting lines are released and then the tow-line is released using a load-release hook. Retrieval is done in the reverse manor; the tender will run up to the towing boom and hook-up, then attach the hoisting lines.

The beam-crane structure has been designed with consideration to the potential operational/procedural failure; the towing boom may be released prematurely or fail in a heavy sea, transferring all of the towing forces back up to the beam cranes. Stainless-steel rollers have been fitted into the beam-ends to protect the AmSteel composite fibre line in the event that the loading suddenly changes from true vertical to an aft or aft-outboard line fair-lead configuration.

Finishing details of these cranes include 6-watt LED lights, manufactured by IntelTech, stainless-steel line retractors that automatically retract the hoisting lines up into the beams for flush storage and hinged closure doors located at both ends of the beam cranes.

Projects like this one become successful when the shipyard and supplier work together in a partnership, as was the case with Nautical Structures and Delta Marine. The uniqueness and specific requirements of the design required months of planning, the vision to foresee what was possible, and cooperative interaction between Nautical's and Delta's engineers. The end result is equipment that embellishes the yacht and the yachtsman, who ultimately got exactly what he desired.

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Launching images by Delta Marine
Detailed images of equipment by Nautical Structures