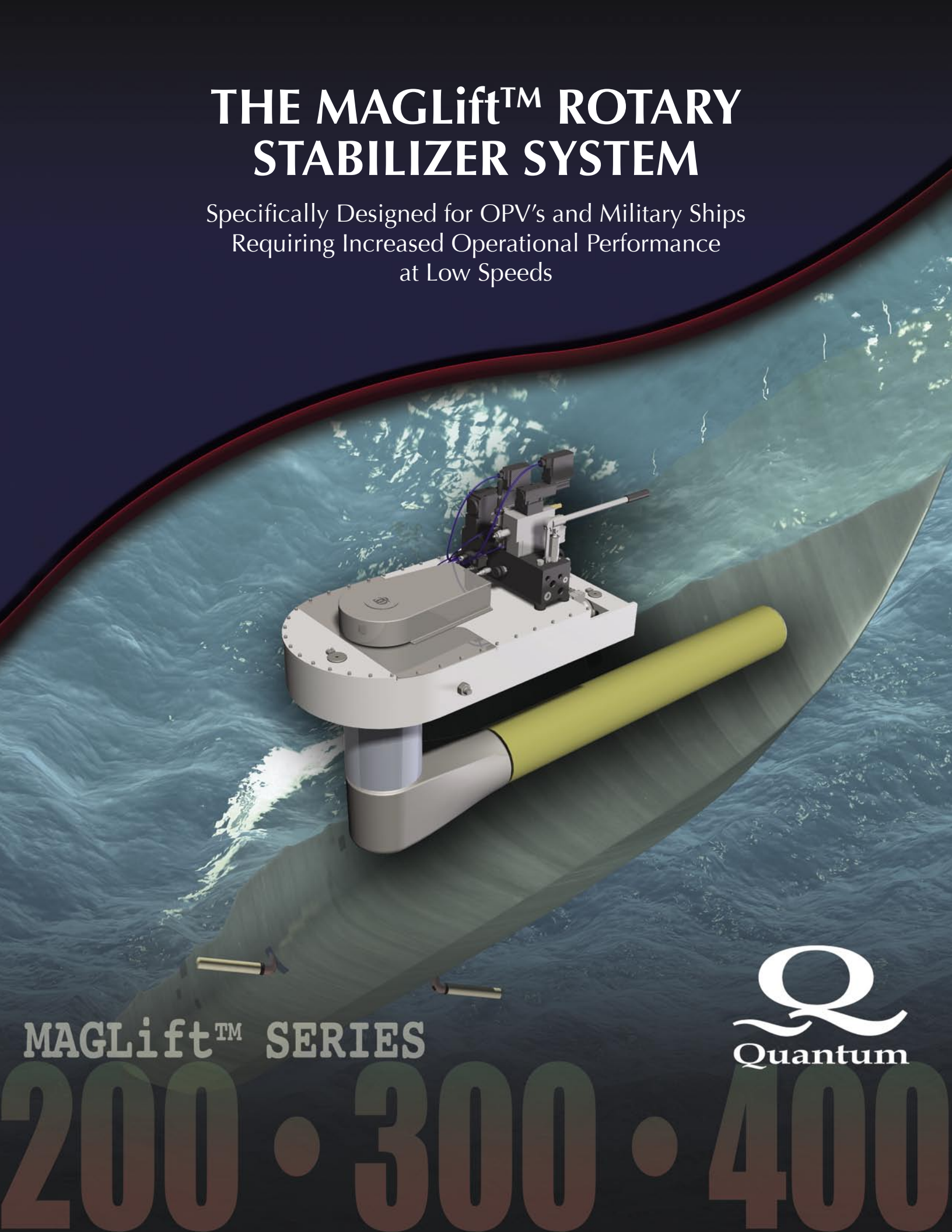
THE MAGLift™ ROTARY STABILIZER SYSTEM

Specifically Designed for OPV's and Military Ships
Requiring Increased Operational Performance
at Low Speeds



MAGLift™ SERIES

200 • 300 • 400

Quantum

Quantum Marine Stabilization... A World Leader in Motion Control:

As the first company to successfully introduce and implement its heralded Zero Speed™ stabilization technology (designed to stabilize vessels when underway and when at anchor or adrift), Quantum Marine Engineering has been recognized in the field of ship motion control for over 20 years.

Our experience in providing stabilization solutions to the world's militaries and commercial fleets is quite extensive, and we offer comprehensive equipment packages designed to meet the most exacting stability requirements. Quantum's portfolio of products and technologies includes a range of stabilizer systems suited for vessels from 24 meters (80 ft.) in length to 160+ meters (525+ ft.).

The Military's Need for Low Speed Stabilization:

Operating speed requirements for motion control system performance have become more demanding and varied, especially when it comes to the requirement of "Low Speed" stabilization. The latest platform design requirements call for optimized motion control allowing the vessels to accomplish multiple mission profiles in different modal configurations.

There are many new classes of vessels being built for coastal and harbor security where the missions dictate that the ships spend considerable time in station-keeping or slow loitering patrol speed modes although maintaining the capability to go fast when required. These vessels now carry maximum firepower, cutting-edge technologies and require a high level of endurance and sea-keeping ability, especially when deploying helicopters, RIBS, UAV's, ROV's, etc., all the time operating with a minimum crew.

As the crew compliments are being reduced to economize, their training and hence financial investment has increased significantly. Safety and crew comfort cannot be underestimated and military operators today have found that making personnel more comfortable onboard can significantly increase crew retention and therefore increase the overall "Performance Envelope" of the vessel.

The illustration and photo below shows the new 43.5 meter (143 feet) "Advanced Multimission Platform" (AMP) built by RiverHawk Fast Sea Frames, Tampa, Florida.

They selected the MAGLift™ to enhance the performance envelope for low and loitering speed operations.

Introducing Quantum's MAGLift™... Low Speed Rotary Stabilizer:

Quantum's MAGLift™ – A Proven COTS (Commercial off-the-shelf) Technology for Low Speed (Loitering) Stabilization.

Recognizing the future need for Low Speed Stabilization in a variety of vessels, Quantum's engineering team began almost 10 years ago to develop an active low speed system. The initial problem is that at low speeds (3 – 12 knots), traditional underway fins need to be quite large to provide any type of roll damping performance, but large fins equate to increased drag which is a disadvantage if the vessel is required to also operate at higher speeds.

A new radical approach was required that was outside of the paradigm of traditional fin design and technology. The answer was rooted within the utilization of a phenomenon called the "Magnus Effect." The Magnus Effect: Heinrich Gustav Magnus, German chemist and physicist in 1853 basically stated...

"A sideways force is generated on a spinning cylindrical or spherical solid immersed in a liquid when forward or reverse motion is applied to the spinning body within the liquid, e.g. the force responsible for creating the curve on the trajectory of a curve ball!"

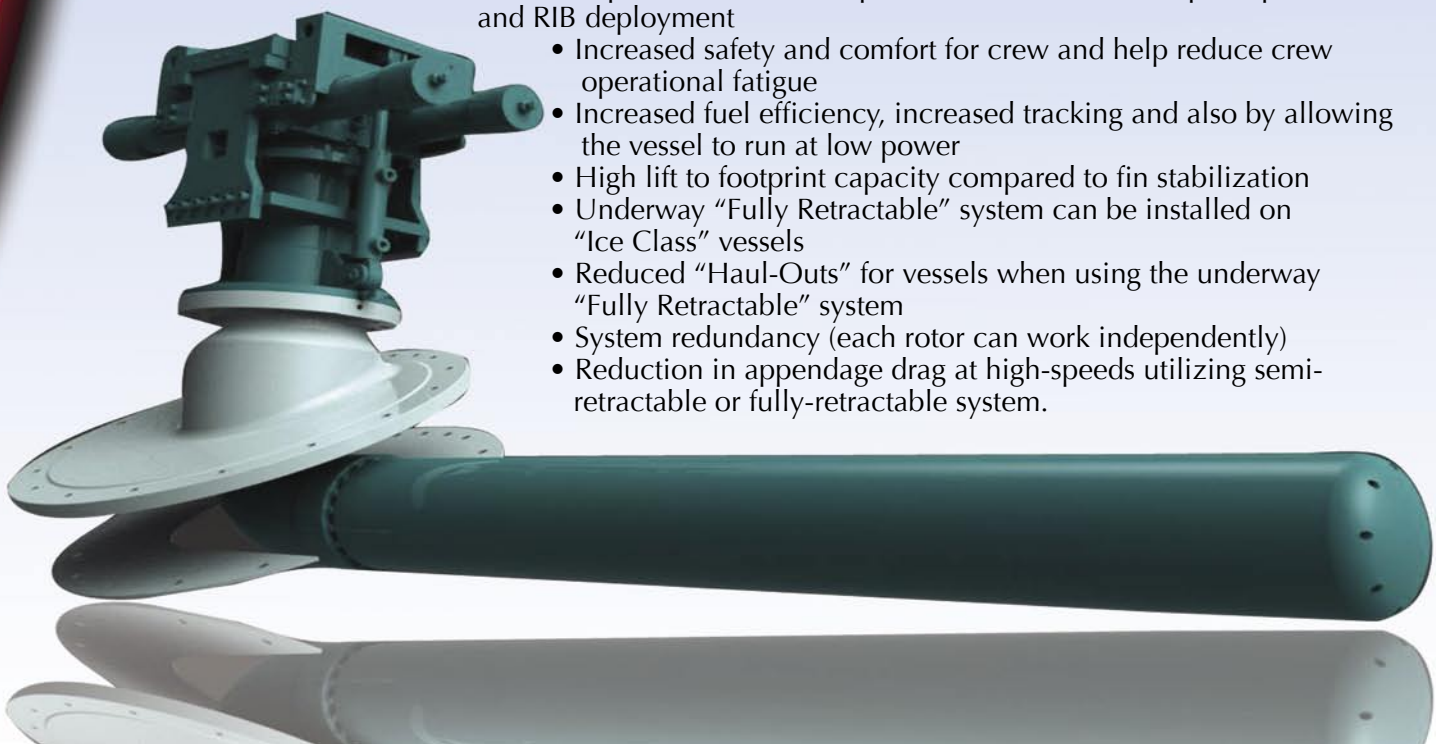
After several years of numerical analysis and tank testing, Quantum began to manufacture for installation the first MAGLift™ systems and to date over 20 systems have been installed on a variety of vessels ranging in length from 24.3 meters (80 feet) to over 162meters (525 feet).

The use of this technology increases the performance envelope of the vessel and the crew when considerable time in station-keeping or slow patrol speed modes are required.

Our patented "MAGLift™" systems also have significant advantages over alternative systems in that the rotors retract and therefore reduce drag for higher vessel speeds. In addition, the MAGLift™ has the highest lift to weight characteristics and the smallest interior footprint of any stabilizer system today.

Benefits of MAGLift™ Low Speed Rotary Stabilizer System:

- Ability to deliver roll stabilization at relatively low vessel speeds (3–18 knots) based upon vessel specifications
- Increased performance envelope of the vessel for Helicopter operations and RIB deployment
- Increased safety and comfort for crew and help reduce crew operational fatigue
- Increased fuel efficiency, increased tracking and also by allowing the vessel to run at low power
- High lift to footprint capacity compared to fin stabilization
- Underway "Fully Retractable" system can be installed on "Ice Class" vessels
- Reduced "Haul-Outs" for vessels when using the underway "Fully Retractable" system
- System redundancy (each rotor can work independently)
- Reduction in appendage drag at high-speeds utilizing semi-retractable or fully-retractable system.



MAGLift™ Series ML200SR, ML300SR and ML400SR – The Underway "Semi-Retractable" Rotary Stabilizer System:

The ML200/300/400SR Series is designed to provide maximum energy transfer in terms of lift force based on the Magnus Effect. The unit is a compact rugged design built to withstand the most demanding military and commercial applications.

For maximum roll reduction, the ML Semi-Retractable System is mounted in the turn of the bilge with the rotor oriented perpendicular to the vessel hull during underway operations. Rotor spin direction and speed are altered during operation, as needed, to obtain optimal performance. To minimize appendage drag, the rotor stows neatly, parallel to the vessel hull, when the stabilizers are not in use. The rotor orientation and spin functions are precisely managed by Quantum's hydraulic and electrical control systems.

Designed using the latest technology and high-quality materials, the ML Semi-Retractable Series system offers the best performance of any system where significant roll reduction is required at loitering speeds.

Simple Installation: The stabilizer unit is delivered fully assembled with minimal disassembly required for installation. Since no customized hull pocket is required for the rotor's stowed position, complicated hull shape fabrication is avoided.

Smooth Operation: The unit provides smooth power transfer from the ship's hull to the rotor via precision roller bearings used in both the spin drive shaft and the main shaft.

Precision Control: By varying the RPM and direction of rotation of the tube, the lift force can be controlled with razor sharp precision, resulting in instantaneous response.

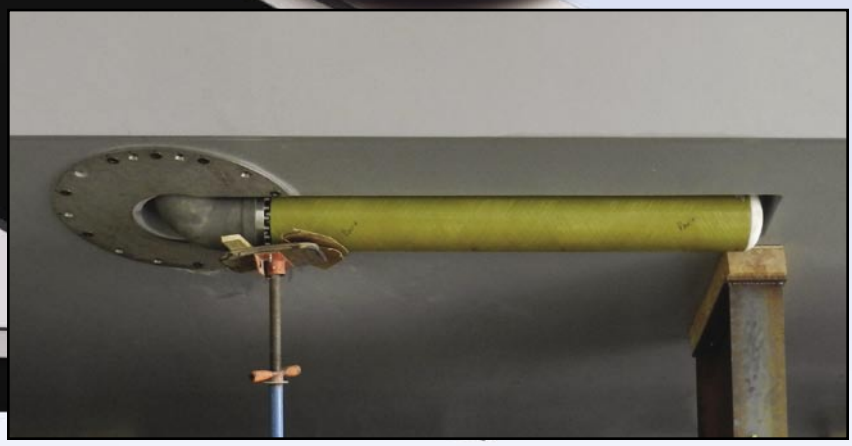
Efficiency: When properly sized and operating within acceptable vessel speeds, rotary stabilizers provide exceptional hydrodynamic efficiency compared with other stabilizer systems available.

Safety: The rotor's hydraulic system is equipped with an automatic retract mechanism to allow the rotor to swiftly stow in case of impact during operation. While not in operation, the rotor is elegantly stowed along the hull, where it presents minimal possibility of impact and minimal effect during maneuvering conditions. In case of severe impact, half of the rotor tube will break away, in a design feature intended to sacrifice the rotor unit in order to preserve hull integrity.

SPECIFICATIONS FOR SR ROTOR*	ML200-SR	ML300-SR	ML400-SR
Typical Vessel Length	35 - 37m (85 - 120ft)	37 - 76m (120 - 250ft)	76 - 106m (250 - 350ft +)
Operating Speed Range	2 - 16 knots	2 - 16 knots	2 - 16 knots
Rotor Tube Dimensions (diameter x length)	220mm x 1540mm	344mm x 2500mm	460mm x 3220mm
Length (inside vessel after installation)	1145mm (45")	1770mm (70")	2442mm (96")
Width	570mm (22.4")	920mm (36")	1355mm (53")
Height (overall)	1400mm (55")	1950mm (77")	2310mm (91")
Weight (dry)	1300kg (2870lbs)	3000kg (6600lbs)	5800kg (12800lbs)

** Please Note: The above information is for reference only and subject to change.*

Close-up of the MAGLift™ rotor.



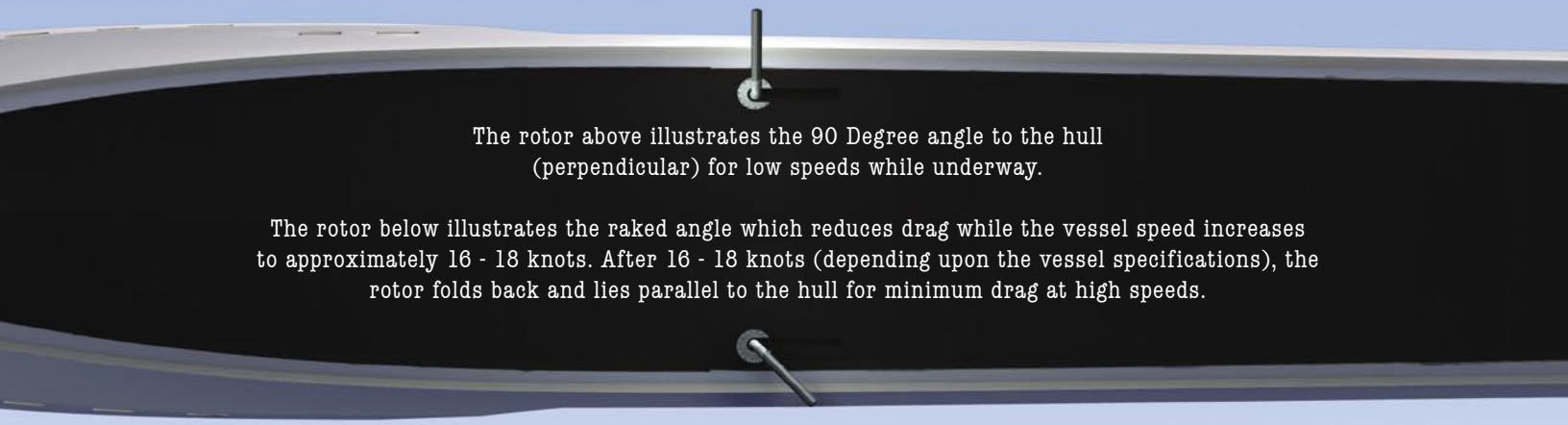
Longitudinal Location for the MAGLift™:

A rotor has distinct advantages over a fin because it can be placed in a much larger longitudinal region on the hull. A fin is restricted to the mid 1/3 of hull length due to pitching forces and steering effects, however this is where the fullest shape of the hull exists and therefore restricts the size of the fin.

A rotor however has a distinct advantage since it does not influence steering if placed too far aft and will not experience excessive forces due to pitching if placed too far forward.

Underwater Appendages:

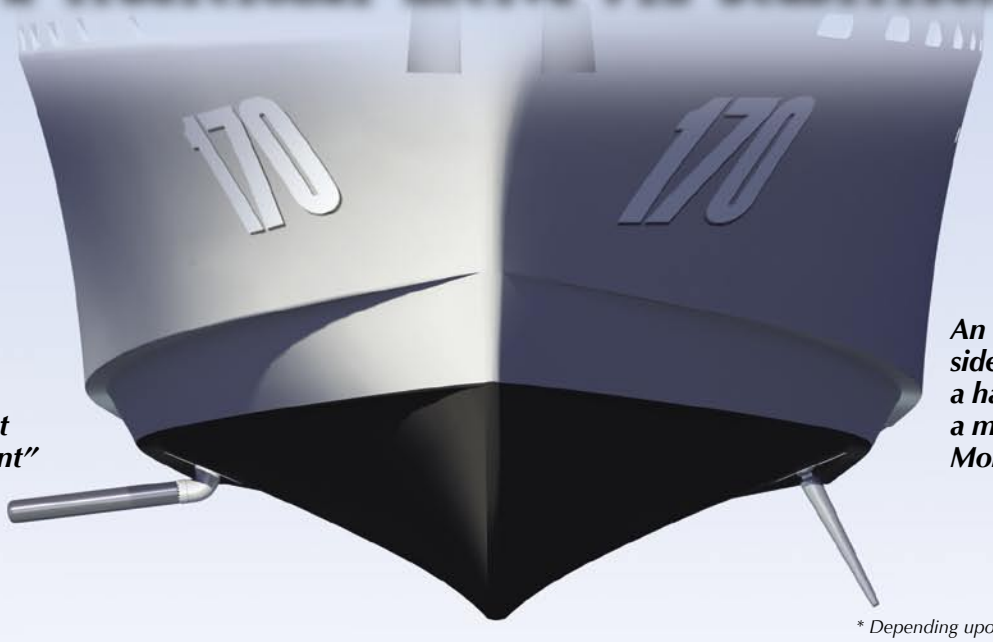
At lower vessel speeds, the rotors are deployed as shown. As the vessel increases in speed, the rotors are swung partially aft to reduce drag, however due to the increased water flow over them, the effective power is not significantly reduced. Finally, as the vessel passes the effective speed of the rotors, they turn off and swing fully aft for minimum drag in the MLSR (Semi Retractable) series or are Fully-Retracted in the MLFR (Fully Retractable) series.



The rotor above illustrates the 90 Degree angle to the hull (perpendicular) for low speeds while underway.

The rotor below illustrates the raked angle which reduces drag while the vessel speed increases to approximately 16 - 18 knots. After 16 - 18 knots (depending upon the vessel specifications), the rotor folds back and lies parallel to the hull for minimum drag at high speeds.

MAGLift™ Righting Moment Geometry Vs. A Traditional Active Fin Stabilizer:



This illustration shows how the MAGLift™ has a far more efficient "Righting Moment" because of its basic design geometry.

An active fin (right side of illustration) on a hard chine vessel has a minimal "Righting Moment."*

** Depending upon hull design and displacement.*

MAGLift™ Series ML200FR, ML300FR and ML400FR - The Underway "Fully-Retractable" Rotary Stabilizer System:

The ML200/300/400FR Series is also designed to provide maximum energy transfer in terms of lift force based on the Magnus Effect, however the system is fully retractable and therefore provides several benefits over the Semi-Retractable system including the application for "Ice Class Vessels." Originally designed for applications for the US. Navy, the unit is a rugged compact design built to withstand the most demanding military and commercial applications.

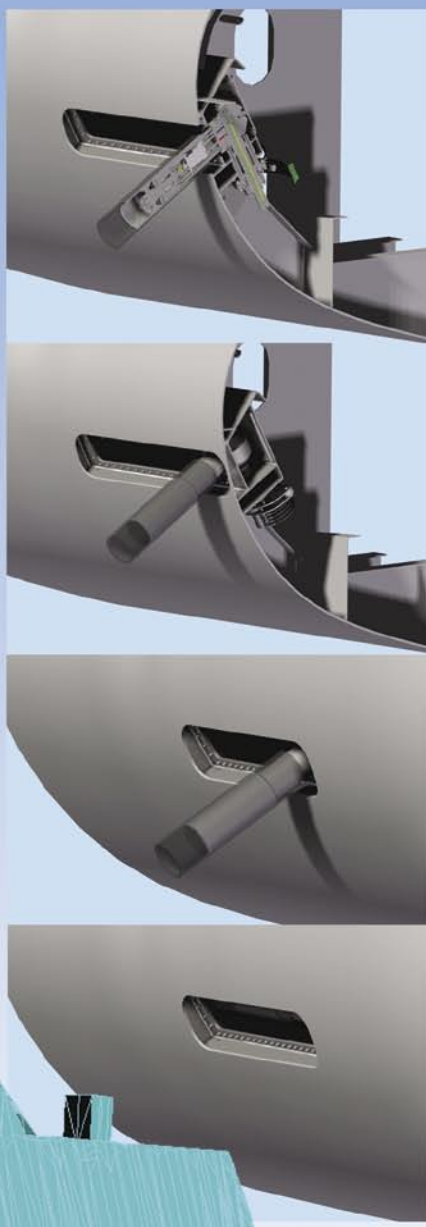
For maximum roll reduction, the ML Fully-Retractable System is mounted in the turn of the bilge with the rotor oriented perpendicular to the vessel hull during underway operations. Rotor spin direction and speed are altered during operation, as needed, to obtain optimal performance. To minimize appendage drag, the rotor stows neatly, parallel to the vessel hull when the stabilizers are not in use. The rotor orientation and spin functions are precisely managed by Quantum's hydraulic and electrical control systems.

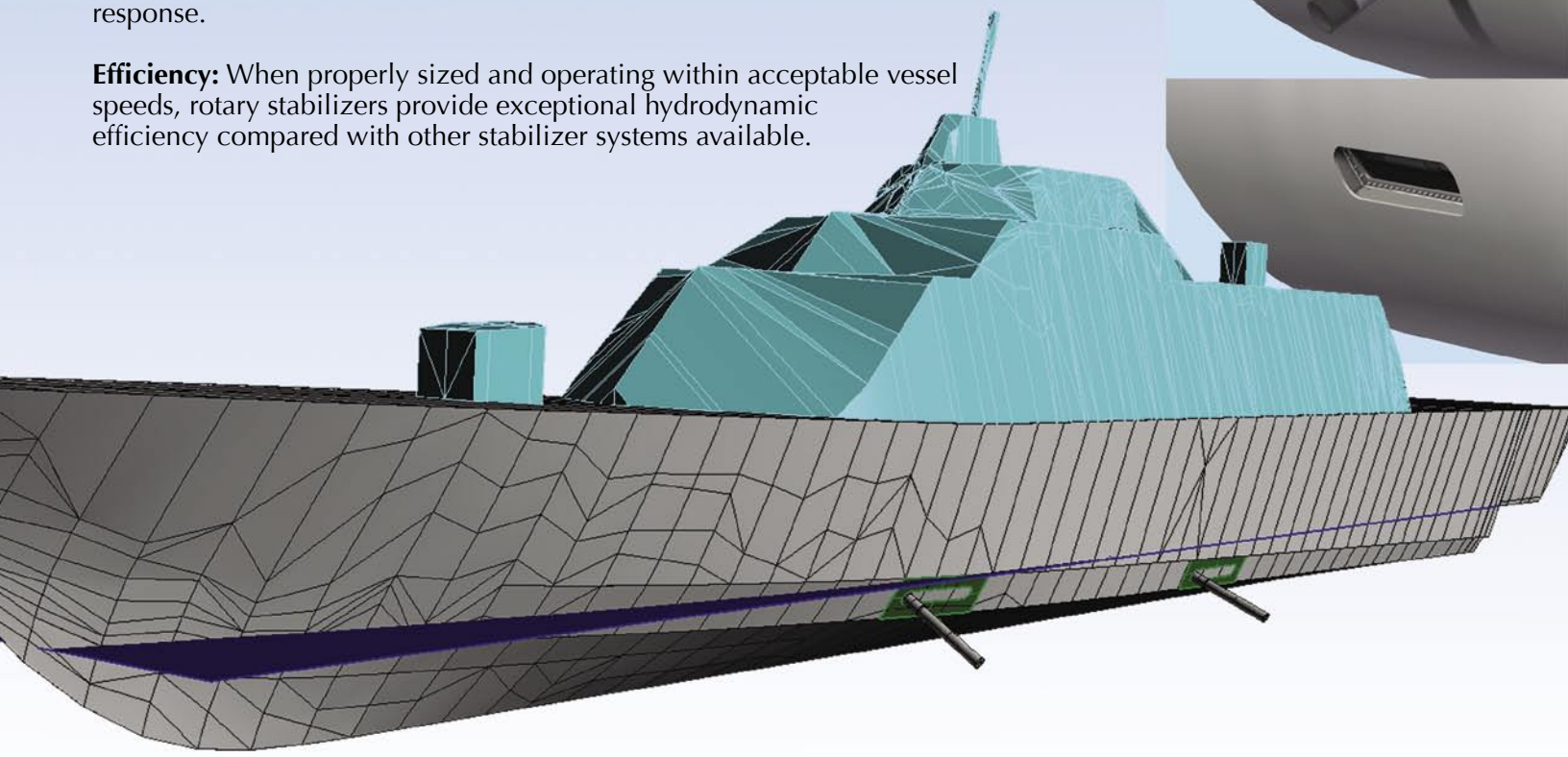
Designed using the latest technology and high-quality materials the ML, Fully-Retractable Series hull unit offers similar performance as the Semi-Retractable System where significant roll reduction is required at loitering speeds, with the added benefits of it's ability of being fully retractable.

Smooth Operation: The unit provides smooth power transfer from the ship's hull to the rotor via precision roller bearings used in both the spin drive shaft and the main shaft.

Precision Control: By varying the RPM and direction of rotation of the tube, the lift force can be controlled with razor sharp precision, resulting in instantaneous response.

Efficiency: When properly sized and operating within acceptable vessel speeds, rotary stabilizers provide exceptional hydrodynamic efficiency compared with other stabilizer systems available.





Safety: The rotor's hydraulic system is equipped with an automatic retract mechanism to allow the rotor to swiftly stow in case of impact during operation. While not in operation, the rotor is elegantly fully retracted into it's pocket. In case of severe impact, half of the rotor tube will break away, in a design feature intended to sacrifice the rotor unit in order to preserve hull integrity.

Extended Time Between Ship Haul-Outs: To service the system, the MLFR System can be serviced without the need to haul the ship out of the water. A plate is simply attached to the exterior opening and sealed, then water is pumped out from the pocket within the vessel, allowing for any service or routine maintenance as required. This extends the "mission time" of the vessel and reduces the need for time consuming and expensive haul-outs.

SPECIFICATIONS FOR FR ROTOR*	ML200-FR	ML300-FR	ML400-FR
Typical Vessel Length	35 - 37m (85 - 120ft)	37 - 76m (120 - 250ft)	76 - 106m (250 - 350ft +)
Operating Speed Range	2 - 16 knots	2 - 16 knots	2 - 16 knots
Rotor Tube Dimensions (diameter x length)	220mm x 1540mm	344mm x 2500mm	460mm x 3220mm

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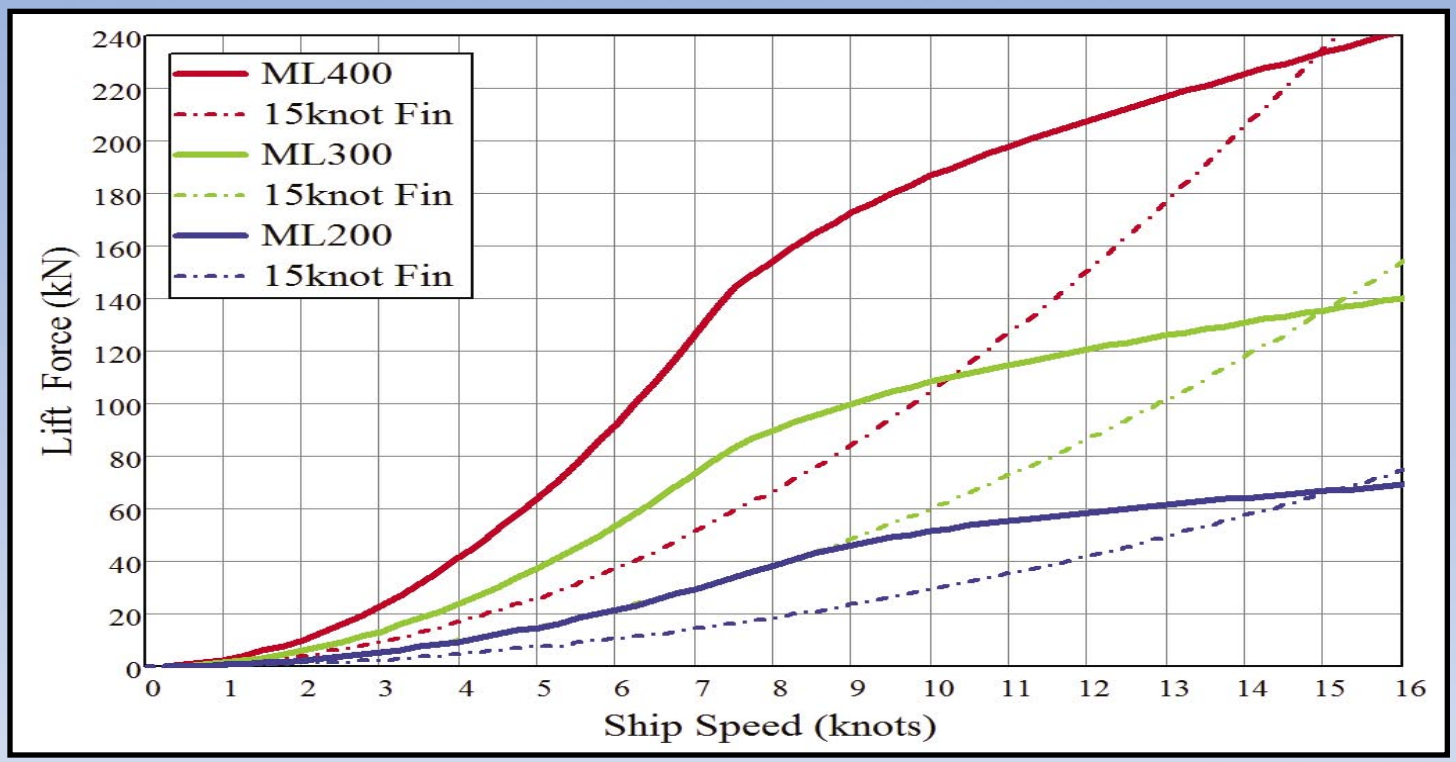
Below left and right are photos showing the "Fully Retractable" rotor system installed on one of four submarine support ships for the United State Navy and built by Hornbeck Offshore Services, Covington, Louisiana.

All equipment manufactured by Quantum is covered by Quantum's one year comprehensive warranty.

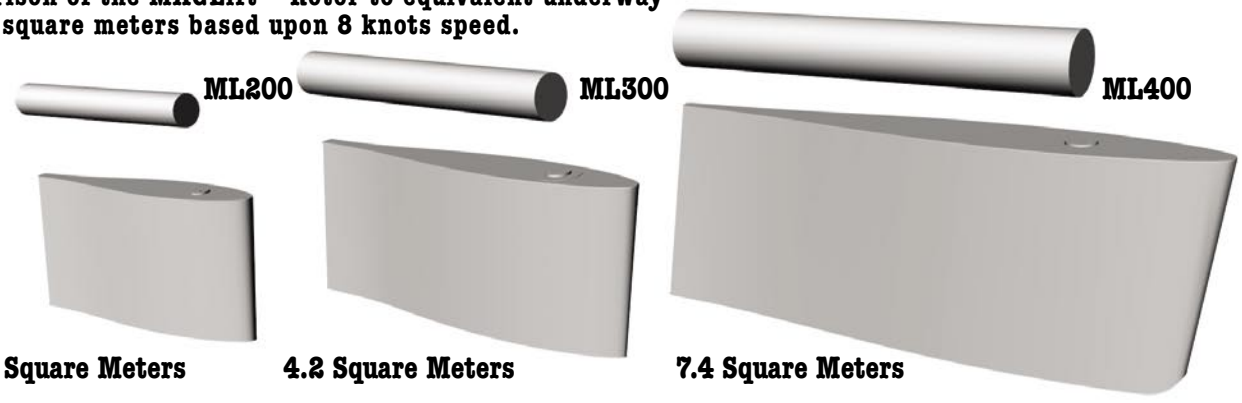
Service and technical support are available worldwide.

Performance of a Traditional Underway Fin Compared to a Rotor:

Below: *The graph shows the lift force that various stabilizer pairs can generate for a given vessel speed. The dashed lines represent a fin size that provides the equivalent lift force at 15 knots, which is typically the slowest speed that fin stabilizers can supply adequate stabilization.*



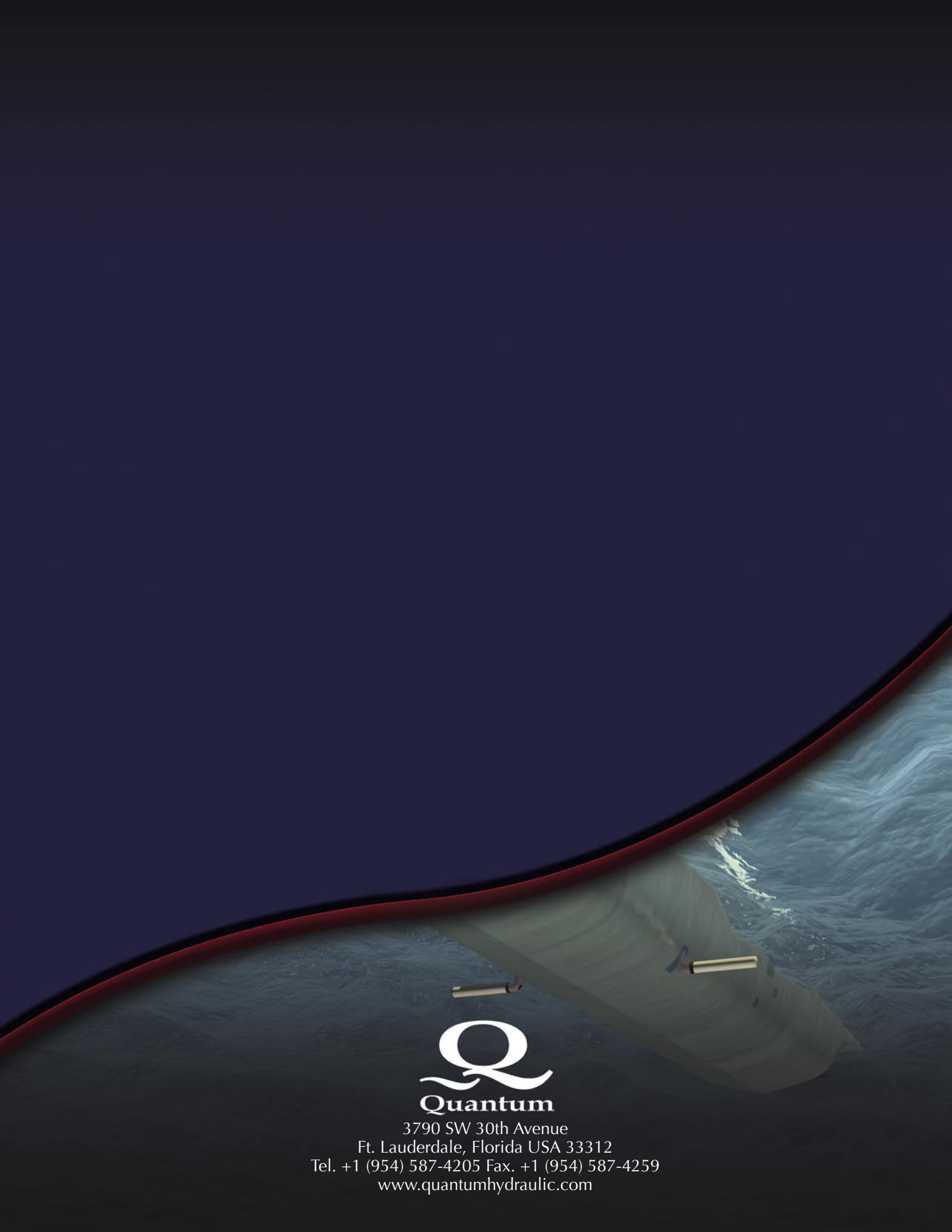
Comparison of the MAGLift™ Rotor to equivalent underway fins in square meters based upon 8 knots speed.



Operational Summary:

The rotor has an outer GRP (glass reinforced plastic) tube which spins on its shaft. When deployed perpendicular to the vessel this will create a righting moment when the vessel is moving thru the water. When the stabilizers are off, they fold back to impose less drag, obstruction to docks and overboard operations. One rotor can be stowed while the other is operating if coming along side another vessel, however performance will be reduced.

**Provided for reference only. Consult a Quantum representative for system sizing. ** Dimensions are of the equipment, and do not include service allowances. All information contained within this document remains the absolute property of the Quantum Group and is subject to change at any time. Any use of the information for other than the intended purpose is expressly forbidden. Consult a Quantum representative for more information.*



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