

THRUSTOR

MARINE PROPELLER PROTECTION



The only one that solves the age-old challenge:
“having safety without loss of performance”
& without a downside

ALUMINIUM A356 CASTED/AKADIZED

1.- Introduction

The marine industry has long believed that any prop guard type device causes drag and hinders performance. William C. Schultz and Terrence L. Smith set out to solve the above challenge in 2006 as a gift to the safe enjoyment of all boaters and passengers.

On large displacement hull ships the Schultz™ Nozzle solution can provide displacement hull ships with fuel-savings and improved sea keeping.

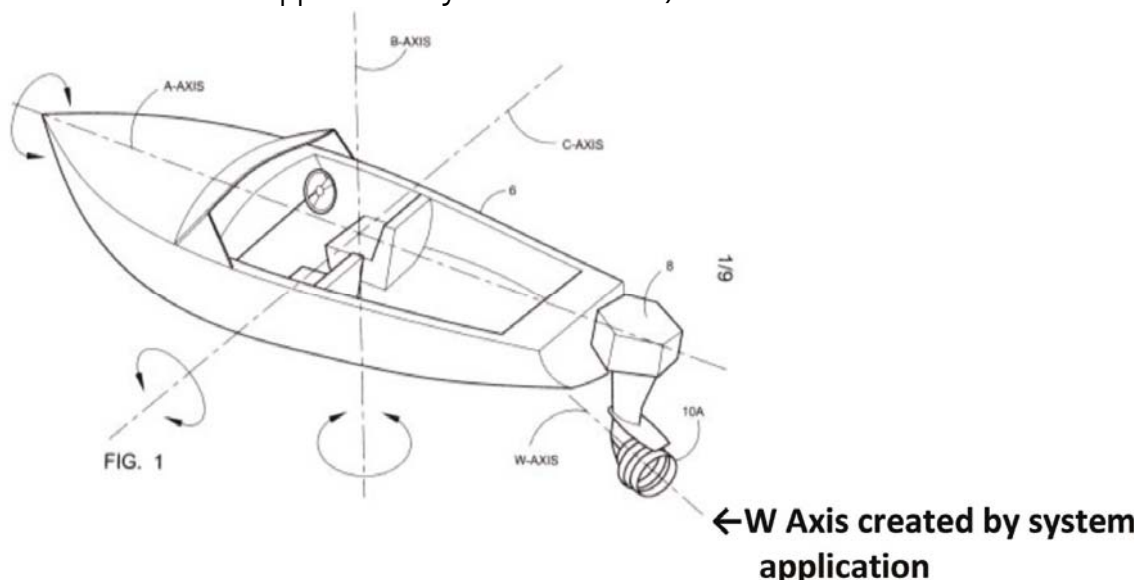
Now is ready to introduce into the market the smaller commercial and personal watercraft solution, the internationally patented main propulsion “Multi-Nozzle Venturi System”, brand named the Thrustor®.

2. Technology

The system consists of two or more hydro-dynamically engineered rigid nozzles, positioned around any boat's propeller. The Venturi ports between the nozzles draft outside water to the propeller, creating an injection of atmospheric pressure, Venturi Action (VA), add more water to the propulsion column formed by the nozzles.

The Multi-Nozzle Venturi System establishes a 4th axis (the W axis) that becomes the focal point for hull control by providing circular rudder control of all 3 axes (pitch, yaw and roll), fundamentally eliminating cavitation, vibration and creating vessel stability, while dramatically increasing thrust, power, and overall performance for all propeller-driven boats.

The system design yields lineal feet of hydrofoils that are all paralleled to the prop shaft (W axis) providing directional thrust and side force. (the 19.5" Thrustor® creates approximately 20 lineal feet.)



The multi-nozzle system integrates 3 hydro-foiled components:

Safety Ring: forward of propeller, reducing size of possible entry area into propeller, increasing structural integrity, with hydro-foiled struts and trusses for added deflection & entry protection.

Thrust Nozzle: actually shrouds the propeller itself.

Exhaust Nozzle: positioned aft of the propeller, trailing by 3 inches.

3. Material specifications

The Thrustor® is made of aluminium casting alloy A356 anodized surface treated and dielectric.

A356.0 ALUMINIUM CASTING ALLOY (7Si-0.3Mg):

- Specifications:

ISO:AlSi7Mg

AMS. 356.0: 4217, 4260, 4261, 4284, 4285, 4286, A356.0: 4218

Former ASTM. 356.0, SG70A; A356.0, SG70B

SAE. 356.0: J452, 323

UNS number. 356.0: A03560. A356.0: A13560

Government. 356.0: QQ-A-601, QQ-A-596.

A356.0: MIL-C-21180 (Class 12)

- Chemical Composition:

Composition limits. 356.0: 0.25 Cu max, 0.20 to 0.45Mg, 0.35 Mn max, 6.5 to 7.5 Si, 0.6 Fe max, 0.35 Zn max, 0.25 Ti max, 0.05 other (each) max, 0.15 others (total) max, bal Al. A356.0: 0.20 Cu max, 0.25 to 0.45 Mg, 0.10 Mn max, 6.5 to 7.5 Si, 0.20 Fe max, 0.10 Zn max, 0.20 Ti max, 0.05 other (each) max, 0.15 others (total) max, bal Al. Consequence of exceeding impurity limits. High copper or nickel decreases ductility and resistance to corrosion. High iron decreases strength and ductility.

- Applications, typical uses:

Aircraft pump parts, automotive transmission cases, aircraft fittings and control parts, water-cooled cylinder blocks. Other applications where excellent cast ability and good weld ability, pressure tightness, and good resistance to corrosion are required.

Aircraft structures and engine controls, nuclear energy installations, and other applications where high-strength permanent mold or investment castings are required.

- Mechanical Properties:

0.2%. Proof Stress (N/mm²) 185

Tensile stress (N/mm²) 230

Elongation (%) 2

Impact -

Brinell Hardness 75

Endurance Limit 56

Modulus of Elasticity 71

Shear strength 120

Properties in excess of those quoted can be obtained with Strontium additions e.g.- Elongation 5%

- Mass Characteristics:

Density. 2.685 g/cm (0.097 lb/in) at 20°C (68°F)

- Thermal Properties:

Liquidus temperature 615°C (1135°F)

Solidus temperature 555°C (1035°F)

Specific heat. 963 J/kg . K (0.230 Btu/lb.°F) at 100°C (212°)

Latent heat of fusion 389kJ/kg

Thermal conductivity At 25 °C (77°F)

AKADIZED

A revolutionary metal surface process.

Akadize is a remarkable metal surface technology that vastly expands the usefulness of aluminum and its alloys. Akadize creates a permanent surface on the aluminum that is exceptionally hard, slippery and dense. It adds anticorrosion, thermal resistance, and dielectric properties that are beyond the measure of conventionally-coated aluminum. The improved performance characteristics of Akadized aluminum make it the functional equal of more expensive and heavier metals. Indeed, in hundreds of applications, Akadize has surpassed performance challenges that were never before approached by aluminum. Akadize is an electrochemistry technology developed for use by NASA and aerospace programs. It utilizes unique circuitry and special additives to transform the molecular structure of the aluminum base. The new surface is half penetration and half buildup and becomes an integral, permanent part of the aluminum.

Akadized aluminum has been commended for its superb performance in the most demanding conditions. It has proven itself in space and undersea, in extremes of temperature and harsh environment.

More information about this process on:

<http://www.lovattprocesses.com/index1.htm>

4. Tests

For over five years, the U.S. Navy has used the MPT nozzle (Thruster®) in their HM14 (and now HM 15for 2 years) craft. Both groups use MPT's 19.5" nozzle for their fleets of 7m RHIB workboats. Under heavy tow, over ground speeds in 2+ sea states have doubled.

U.S. Navy Chief Benjamin Moore reported (The US Navy's Operational Proof: Four years of operations by the Navy's HM14, anti-mine group, with MPT's 19.5"): "The deck runs quiet and the sea moves under the boat – does not slam

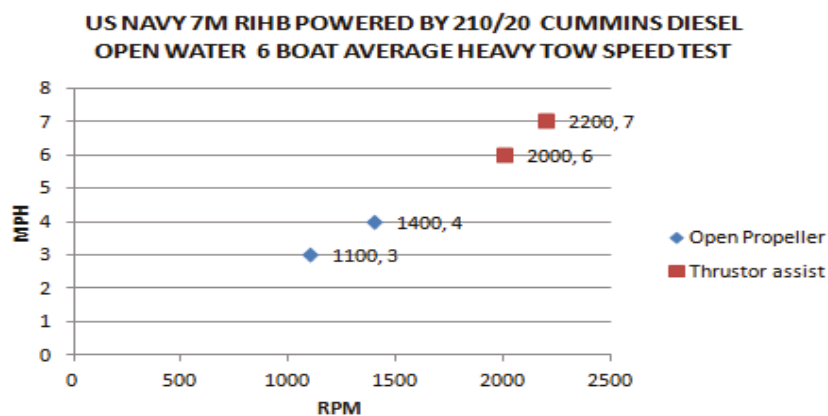
into it.” He also provided annual reports describing how Thrustor® solved their vital issues concerning speed, power, shock mitigation, habitability, performance and safety, and without downside. According to Moore, the nozzles rapidly paid for themselves by eliminating the need for propeller replacements and damages to lower-end drives. The Chief noted all their vital benefits were maintained at all hull speeds ranging from 0 to 30+ KT and that personnel reported less physically damaging impact effects due to WBV (Whole Body Vibration) and RS (Repeated Shock). According to MPT, the HM14 operational evidence compares performance (with and without the Thrustor® respectively) for these test issues: (1) open-water speed in 2 to 3 sea states (20mph vs. 9±mph); (2) open water speed under heavy tow (6-7.5mph vs 3-4mph); (3) average top speed (31-33mph vs. 28.5mph); and (4) hole shot (6-8 seconds vs. 15-20 seconds).

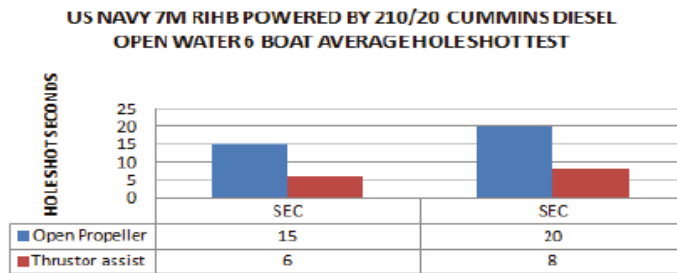
5. Performance benefits

For over 50 years, a wide variety of propeller guard designs have been developed with the idea of protecting water sport enthusiasts from injury and deaths caused by propeller strikes, as well as capsized and over-the-side incidents. During this period most of the designs presented to the market have resulted in a significant decrease in vessel performance.

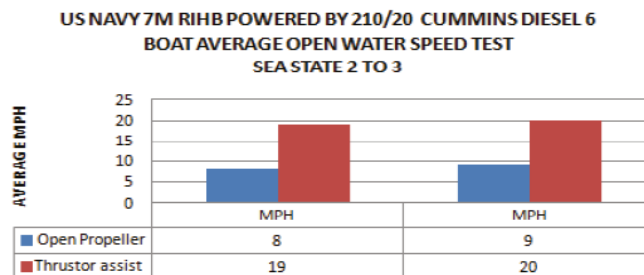
Although the MPT prime objectives are to deliver ecological and safety benefits, when Mr. Schultz and Mr. Smith developed the Thrustor® and Schultz Nozzle™ technology, their design objective was to create a system that would also address vessel performance.

In all categories the patented Thrustor® system has added a dimension of functionality to hull control and vessel stability (pitch, yaw and roll) previously not considered possible. This unprecedented advancement dramatically increases the vessel’s operational abilities, improves habitability and overall safety... especially during challenging wind and surface conditions. The Thrustor® assisted drives have the added dynamics of ten to twenty-four lineal feet of hydrofoils surrounding the propeller, creating stern lift, 3 axis trim and directional control of the hull that far exceeds the physical capabilities of any open propeller drive. The multi-nozzle system mitigates chining of the vessel.





The “hole shot” in all categories is faster and maintains visibility over bows. The towing and directional thrust is increased, with the US Navy reporting a 230% increase in speed with a improved seakeeping and habitability: In any weather, sea states 2 and above, Thrustor® assisted drives have proven to be a faster, smoother and safer ride. Personnel can count on more platform stability for a successful mission and return.



The sea trials verify that the Thrustor® mitigates propeller cavitation and vibration in all categories of vessels (the deck goes quiet, no vibration), predicting a longer life to the gear train, electrical instrumentation and other support systems.

6. Safety benefits

As a propeller guard the Thrustor® has far exceeded the expected strength, and the load increase that can be carried. The skegmount, or skeg lock, integrates the system to the cavitation plate, creating a structure that will support the transom weight of most outboard and stern drive boats, while also shrouding and protecting the propeller.

Reduces propeller strike injury to mammals, especially dolphins and manatees.
Reduces chances of a propeller strike to persons engaged in diving or water sports activities.

Increases planning hull control, thus reducing over-the-side and capsizing incidents.

7. Ecological benefits

It is anticipated that the patented technology will provide the following ecological and safety benefits.

Reduction of Fuel consumption at cruising speeds due to lower required RPM. On small craft at a 3500 Cruising RPM, preliminary Thrustor® testing resulted in speed increase of 5% or a reduction of up to 300 RPM to maintain the same speed, which will result in additional fuel savings of 5%.

Reduces Hydro Carbon emissions by decreasing fuel consumption.

A reduction in cavitation-vibration reduces potentially dangerous sound frequencies to sea life. These negative effects on sea life are currently under serious study.

Narrows the normally disruptive 360 degree propeller wash into a tight, directional thrust towards the rear which: protects fish/egg habitat; protects shallow-water plant habitat; and reduces beach erosion caused by normal prop wash.

8. Range and Size Application Chart

Now the full range of O/B and I/O are covered and it is a Thrustor® available.

BAITRA Ref. No.	Thrustor®	RCM ^{Prop} (1)	HP
266153	19.500"	17.500"	250 to 440 (2)
266161	17.750"	15.750"	200 to 350
266160	17.000"	15.000"	200 to 300 (3)
266152	16.500"	14.750"	90 to 250 (4)
266159	15.750"	13.750"	80 to 115
266151	14.750"	12.750"	60 to 115
266158	13.750"	11.750"	40 to 60
266150	12.750"	10.750"	25 to 60
266157	11.750"	09.750"	15 to 30
266156	10.750"	08.750"	10 to 15
266155	09.750"	06.750"	08 to 10
266154	08.750"	06.750"	02 to 8

(1) Propeller Diameter recommended for optimal performance.

(2) Quote for Custom Heavy Duty 3-piece 19,5" Thrustor designed for: Konrad, Bravo 2, Volvo DHP and Yanmar.

(3) Fits all counter rotating motors with a 14" to 16" diameter propeller & 200+hp.

(4) Fits 150hp to 250hp with prop modification.

Manufactured by: IAD Global

Distributed in Europe: BAITRA, S.L. – Spain

After seven years of successful sea trials have confirmed the following results:

- ❖ **The Thrustor®** functions as a prop guard that protects persons, sea life and nature from propeller strikes.
- ❖ **The Thrustor®** will significantly improve vessel handling at all speeds, and it is the only one in the market that performs at medium-high speeds.
- ❖ **The Thrustor®** increases the vessel performance coming out of the hole.



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METS

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