



Z-DRIVE AZIMUTHING THRUSTERS

Z-Drives for Towboats Navigating the Inland Waterways



THRUSTERS MADE IN THE USA

& SERVICED IN THE USA

LET US INTRODUCE OURSELVES

For over 30 years, Thrustmaster of Texas has been designing, manufacturing and supporting marine propulsion systems for a global network of customers. Thrustmaster is the largest manufacturer of marine thrusters in the U.S.A.

Thrustmaster propulsion units are manufactured in Houston, TX in a variety of configurations including self-contained and portable deck-mounted propulsion units, thru-hull azimuthing thrusters, Z-drives, water jets, retractable thrusters and tunnel thrusters.

Special expertise has been developed in designing and manufacturing equipment for maneuvering, navigating and positioning of slow-speed marine craft and barges in shallow water.

Thrustmaster builds a complete line of Z-Drive azimuthing thrusters from 500 HP to 4,000 HP for the inland towboat industry specifically designed to endure the demanding conditions when operating in brown water. Using Z-drives on towboats results in substantially improved fuel efficiency, shorter trip times, decreased maintenance downtime and higher customer satisfaction when compared to traditional shaft and rudder installations.





HOUSTON, TX FACTORY

THRUSTERS MADE IN THE USA



& SERVICED IN THE USA

Z-DRIVE AZIMUTHING THRUSTERS

Vastly improved maneuverability without rudders

A Z-drive replaces the propeller, shaft, stern tube, marine gear, rudder and steering gear all with a single unit. Z-Drive azimuthing thrusters provide maximum thrust in any direction, independent of vessel speed, offering superior pinpoint maneuverability under all conditions. Rudders are completely eliminated. Rudder drag no longer exists.

Troublesome operations such as stopping while pushing a tow barge downstream are easy when piloting a towboat equipped with Z-Drives. It facilitates quick switching of barges and parallel parking. And all of this can be done with a lot less power. A 1,500 HP Z-drive boat can replace a 2,000 HP conventional towboat and a 3000 HP Z-drive boat can replace a 4,000 HP conventional towboat.

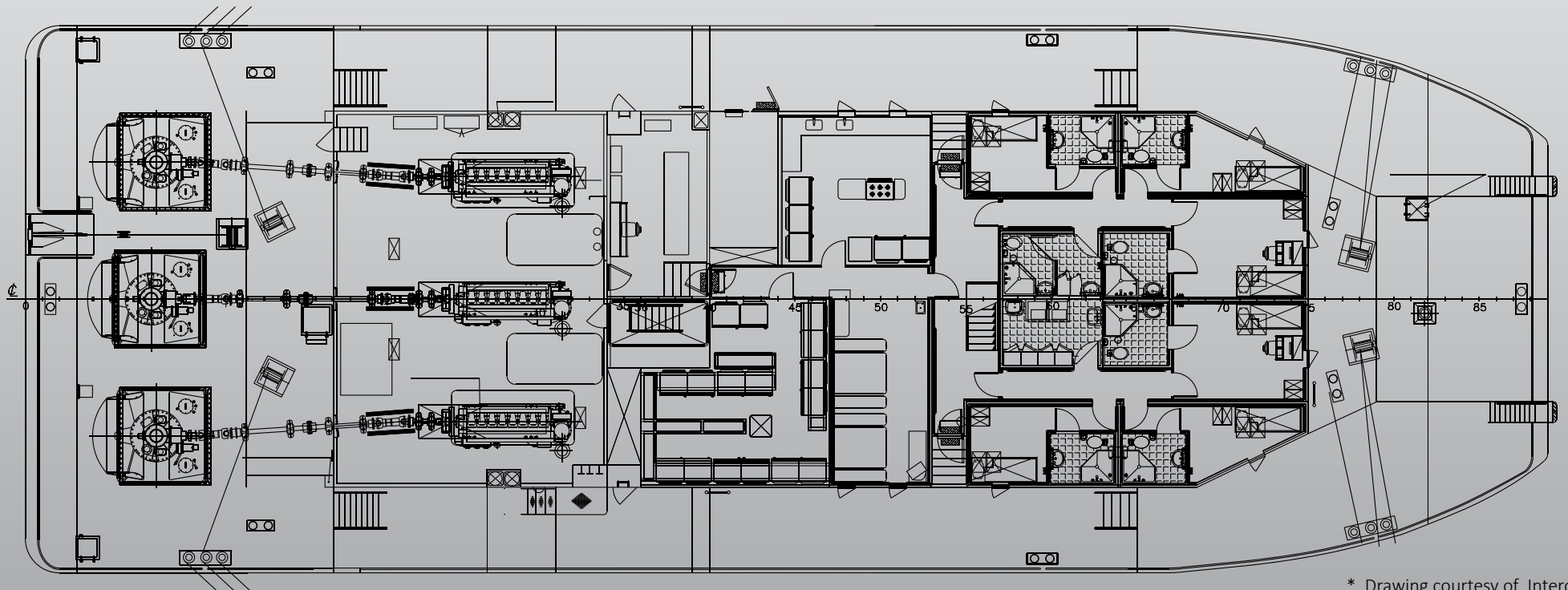
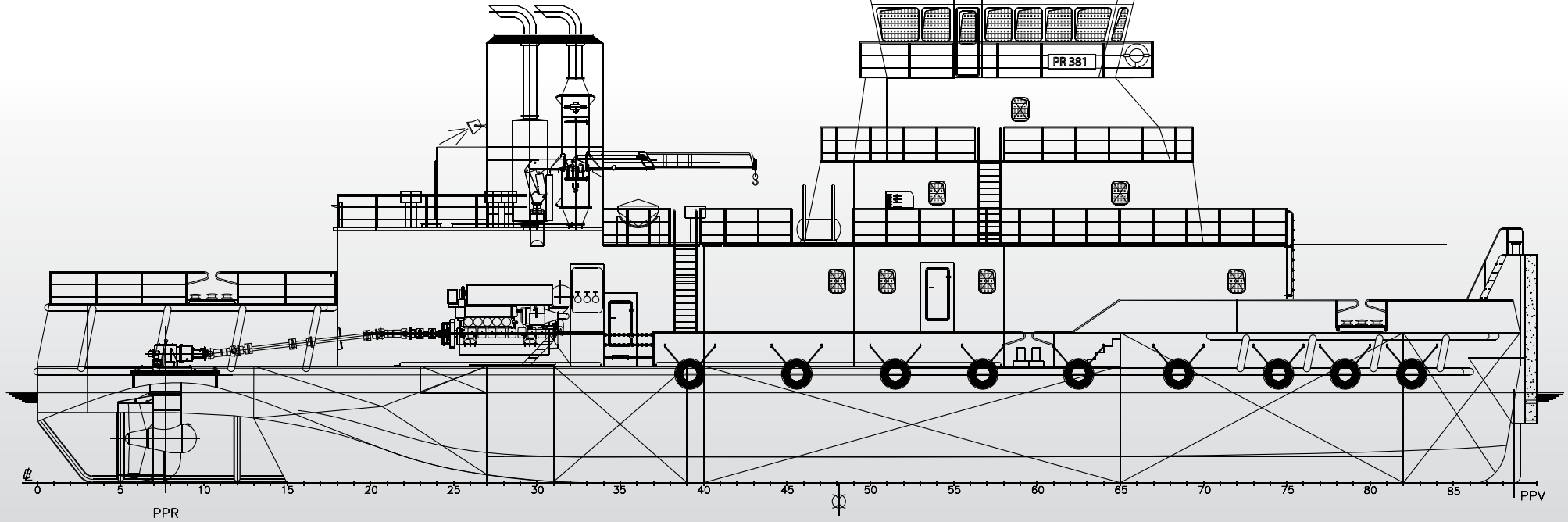
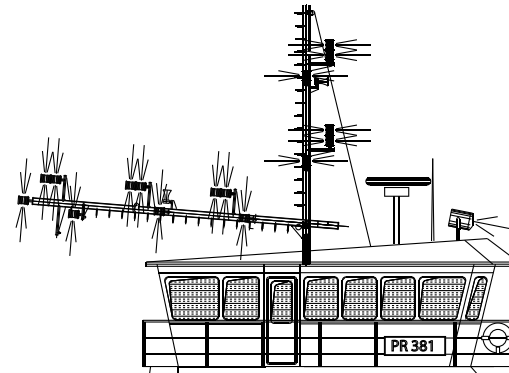
Simple and clean towboat design

Z-drives require little space. The complete Z-drives drop in from the top. The absence of long propeller shafts, shaft alleys, steering gears and rudders greatly reduces the required machinery space and weight, thus increasing the usable volume and payload of the vessel. The need for propeller shaft alignment is eliminated.

Towboats with Z-drives are not significantly more expensive than conventional towboats. The initial cost of the Z-Drives is significantly offset by reduced construction costs and installation man-hours. Shipyards have reported that the cost of building Z-drive boats is actually less than building conventional boats.



P&O Maritime operates the Mburucuya in shallow draft conditions on the Paraguay-Parana waterway. The Mburucuya is used to push up to 12 bulk barges transporting grain and iron ore. The towboat is equipped with three 2,000 HP Thrustmaster Z-Drives model TH2000MZ.



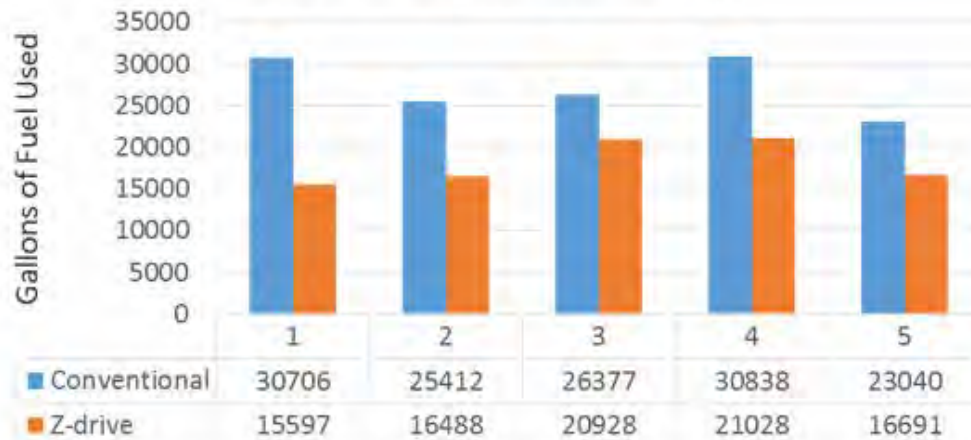
* Drawing courtesy of Interocean

FUEL SAVINGS

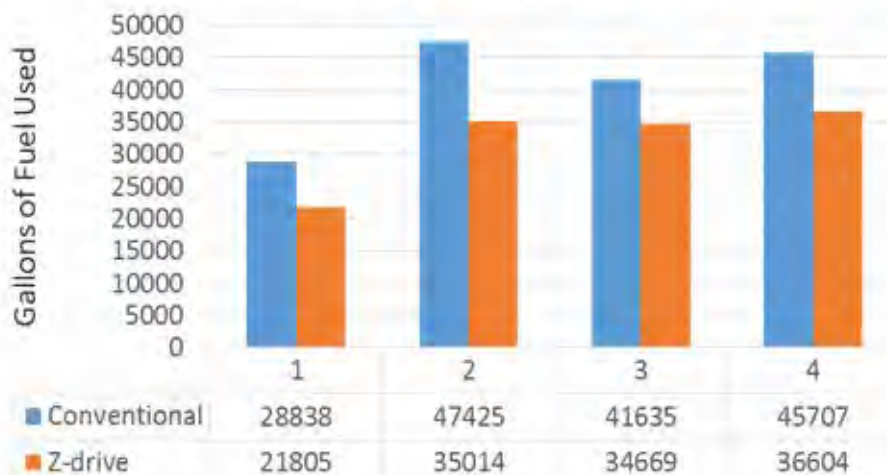
Due to the greatly improved maneuverability with Z-drives, costly collisions can be avoided. There is no longer any need to slow down in turns and bends in the river. Decreased time making lock, docks and fleets reduces trip times and each trip requires a lot less fuel. A study conducted by The Shearer Group, Inc. showed an average of 28% fuel savings during a set of controlled experiments with unit tows when using Z-Drives instead of conventional shafts and rudders.



5000 T. Tows on Same Trip



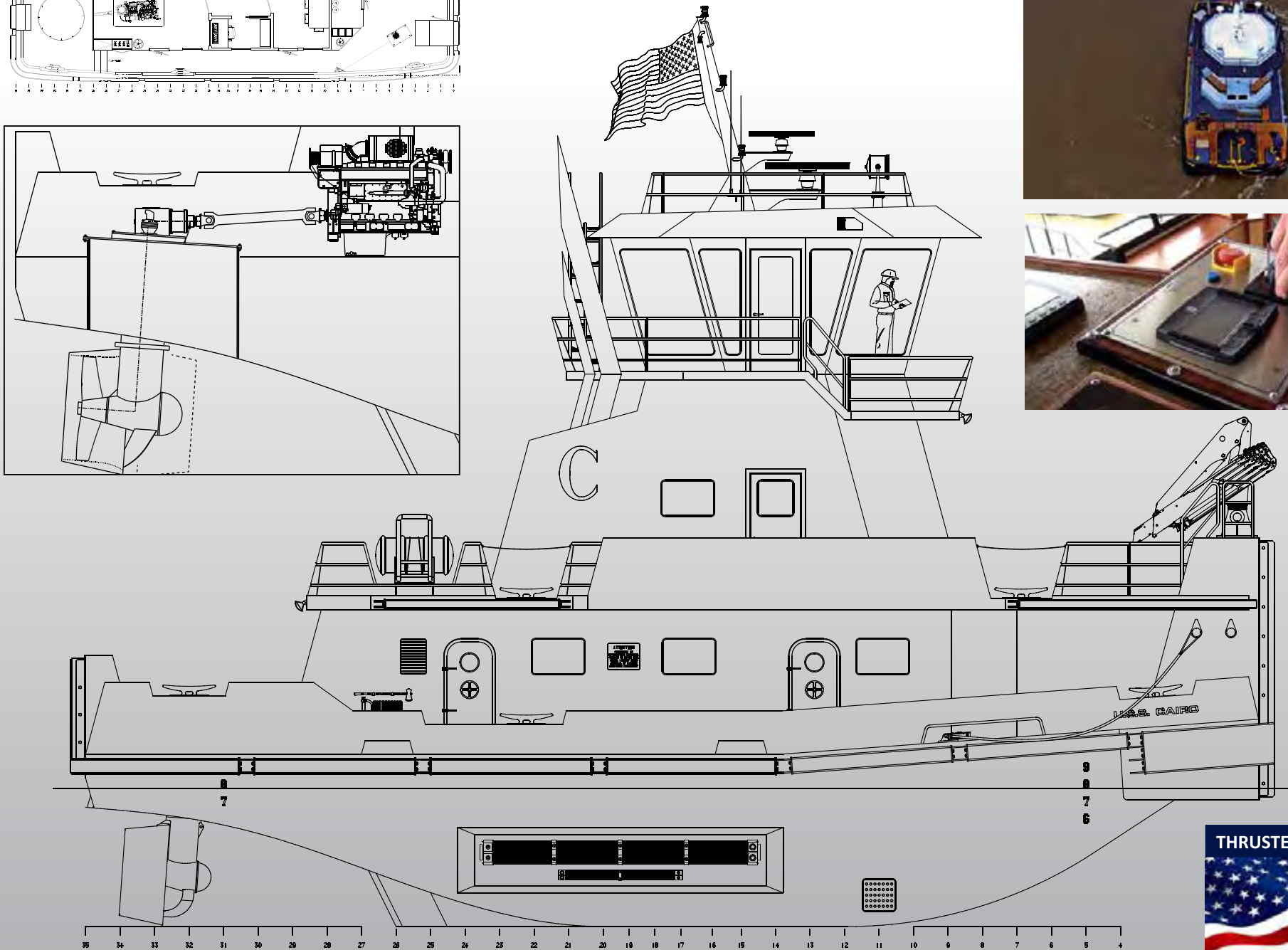
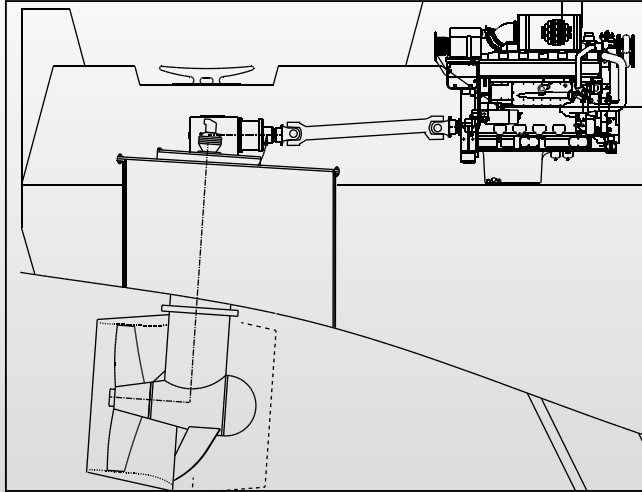
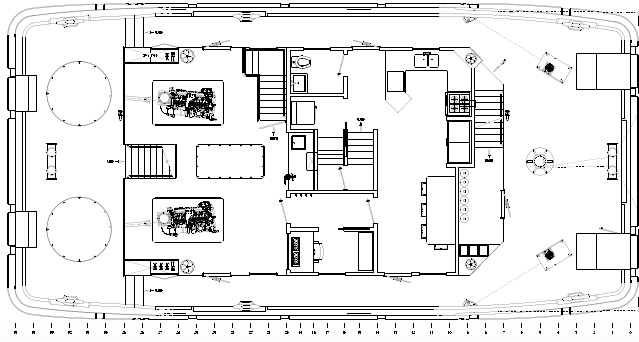
12,000 T. Tows on Same Trip



The Carline Companies owns and operates the USS Cairo, a fleet boat measuring 68 ft by 34 ft with a depth of 10 ft. The towboat features twin Cummins QSK-19-M Tier 2 engines that drive custom Thrustmaster TH750MZ thrusters with 57-inch nozzled propellers for a total 1,500 hp.

When the Carline Companies set out to design a fleet boat specifically for its Burnside fleet, the major issue to address was the swift-moving current at Impala's CBU during high water. Because fleet boats have to operate in tight quarters with precise timing and movement, Carline went with azimuthing thrusters from Thrustmaster. But Carline and CT Marine went beyond placing Z-drive thrusters in a traditional towboat hull. CT Marine designed a towboat hull especially designed to make the most of the maneuverability and operational efficiency prized in Z-drives. The USS Cairo is wider than other towboats of the same length to improve stability when moving laterally. The vessel's operational depth is also greater for the same reason. The vessel's bottom is essentially flat "so the thrust won't cavitate along the bottom. It's unimpeded," said Brad Parks, Carline's chief operating officer. Michael Duncan, captain of the mv. USS Cairo, said the vessel's design functions perfectly in real-world working conditions.

"You couldn't ask for a better boat in a tight quarters situation," said Duncan, who's been with Carline for more than 20 years. "It's built wide for stability, and it's real stable. You can do anything you want to with one of these boats."



* Drawing Courtesy of CT Marine, Inc.



TRIP TIME SAVINGS

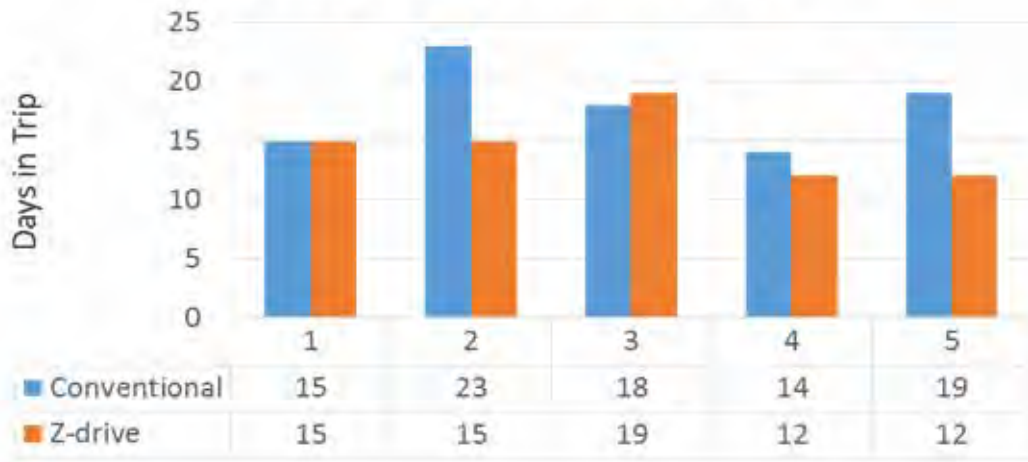
In tight turning maneuvers, a towboat steering with rudders will have to come to a stop mid turn and head in reverse to adjust the trajectory angle prior to heading forward again to complete the turn radius. The engine speeds up when steering the rudders and the tow loses speed.

A study conducted by The Shearer Group, Inc. showed an average of 11% trip time savings during a set of controlled experiments with unit tows when using Z-Drives instead of conventional shafts and rudders.

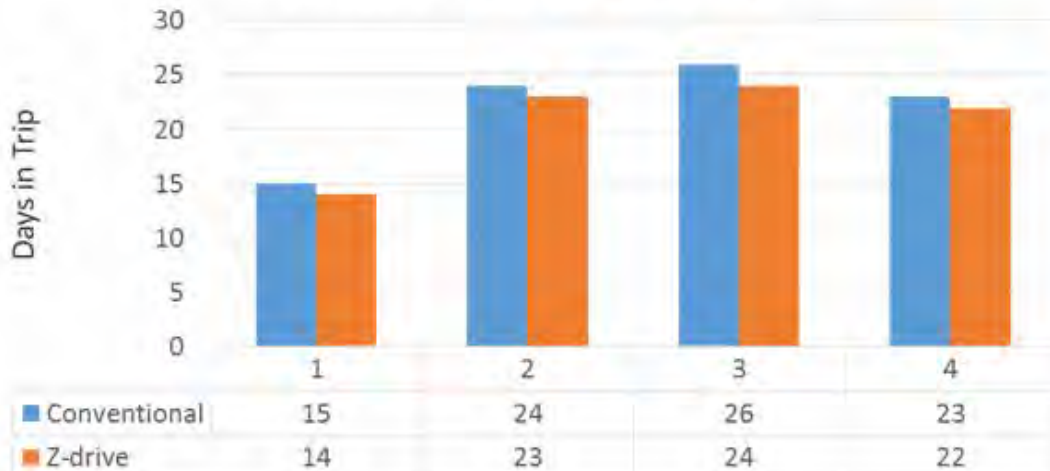


Conventional Towboat with Shafts and Rudders

5000 T. Tows on Same Trip



12,000 T. Tows on Same Trip



* Graphs Courtesy Ed Shearer, P.E. & Greg Beers, P.E. 2014. "INLAND TOWBOATS The Next Generation." Pg. 13.



Z-Drive Towboat



---Thru-hull
Top Mount

Z-DRIVES ELIMINATE COSTLY COMPONENTS

- ✘ No Drive line shaft
- ✘ No Steering rudders
- ✘ No Flanking rudder(s)
- ✘ No Rudder steering shafting, piping or tubing
- ✘ No Rudder steering power unit
- ✘ No main engine reduction gearbox,
- ✘ No intermediate shaft, tail shaft, shaft couplings, shaft support bearings, no stern tube and stern tube bearing, strut and strut bearing, tube and upper and lower bearings, flanking rudder tubes and upper and lower bearings, tiller arms, jockey bars, steering rudder hydraulic cylinder, flanking rudder hydraulic cylinder



---Skewed Propeller

---Kort Nozzle

THRUSTERS MADE IN THE USA



SERVICED IN THE USA

TECH SPECS

Model	Input Power	Motor RPM	Propeller Diameter	Thruuster Weight
	HP		in	lbs
TH500MZN	500	1800	51	13,000
TH750MZN	750	1800	57	17,000
TH1000MZN	1100	1800	57	21,000
TH1500MZN	1700	1600 / 1800	78	35,000
TH2000MZN	2250	1000 / 1600 / 1800	83	43,000
TH2500MZN	2750	1600 / 900	94	52,500
TH3000MZN	3350	1200 / 900	112	69,500
TH4000MZN	4000	1000 / 900	118	84,000

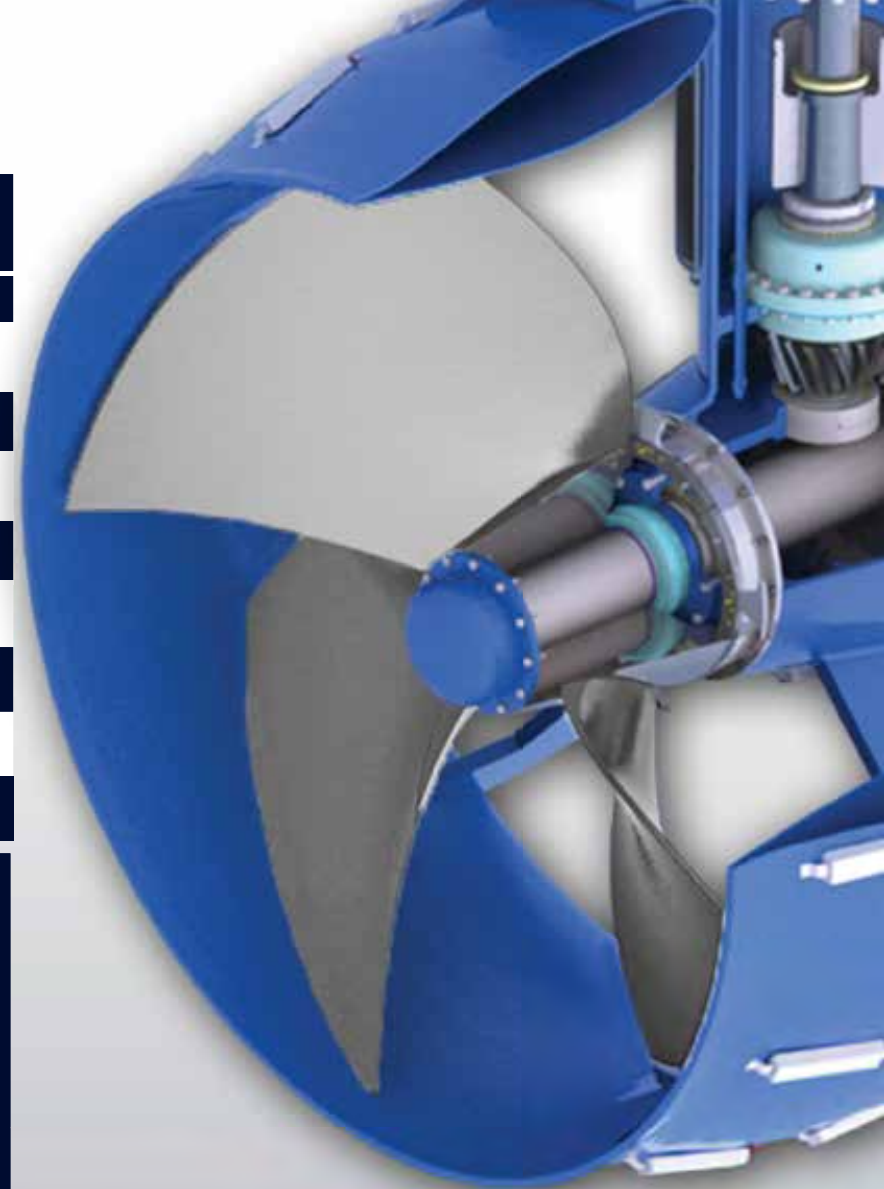
Robust and Reliable. Designed and built in America.

Thrustmaster knows and understands brown water applications. We have been building brown water propulsion equipment for more than 30 years. Thrustmaster Z-drives are designed based on conservative American standards observing ample safety margins. They are built to last even in the harshest operating environment. The units are built in our headquarters facility in Houston, Texas, using American materials, American components and American labor.

Each Z-drive is equipped with a husky stainless steel propeller running in a nozzle with stainless steel internals. The gears and transmission shafts are generously sized and are protected by a quick release coupling at the input shaft of the Z-drive. This quick release coupling acts as a mechanical fuse whenever the drive line is blocked, for instance when the propeller ingests a log, a tire or a rope. The mechanical fuse can be reset manually after the obstruction is removed out of the propeller.

Easy Maintenance

Routine maintenance is limited to periodic replacement of filter elements for the lubricating oil and the steering hydraulic fluid. Whenever major maintenance or repair is required, the complete Z-drive is lifted out of the vessel while the vessel is afloat. A replacement Z-drive can be dropped in and the boat is back to work within hours





Z-Drive Features

Z-Drive Benefits



360° steering of propeller provides omni-directional thrust for unequaled maneuverability at any vessel speed.

No need for steering and flanking rudders.

Z-drive towboats can get equivalent performance with smaller power output allowing tug fleets to use smaller engines.

The mechanical fuse instantly relieves any transmission overloads.

Z-drives can be installed and removed topside with a crane while the vessel is afloat.

Thrustmaster Z-drives are made in the USA.

Collisions can be avoided. Much greater control of the tow going through turns and river bends. Quick switching of barges when going through locks. Downstream stopping and docking.

No rudder drag. Substantial fuel savings. Tows move faster, shortening trip durations.

Lower capital investment and reduced fuel consumption.

It protects the mechanical drive train when foreign objects are ingested by the thruster, preventing expensive downtime and repairs.

In the event of a serious breakdown, the Z-drive can be replaced in a matter of hours.

American design using American parts readily available from Thrustmaster or from local parts distributors. American service technicians available 24/7. A network of support centers along all major rivers.



THRUSTERS MADE IN THE USA



SERVICED IN THE USA

PRODUCT SUPPORT

Support throughout the entire life of the product.

Thrustmaster offers comprehensive support throughout the entire product life-cycle.

The focus is always on customer satisfaction, efficient operation of the Thrustmaster product, and on short repair and maintenance times.

In order to ensure optimum service with minimal response times, Thrustmaster signed a service agreement with McGinnis Inc. - National Maintenance & Repair. Each of their four service centers are strategically located along major rivers in the USA with 24/7 availability. Their experienced service technicians are trained and authorized to provide installation, commissioning, maintenance, repairs and upgrades on our propulsion and control products.

Thrustmaster maintains a large inventory of spare parts at all times. Current parts inventory in our Houston plant is almost \$30 million dollars.

Thrustmaster Services Include:

- 24/7 Service Response Hot line
- Propulsion System Trouble Shooting
- Mechanical, Hydraulic & Electrical Repairs
- Emergency Service Tiger Teams
- System Installation & Commissioning
- Technical Services & Field Engineering
- Upgrades & Modifications Equipment
- Efficiency Improvements
- Operational Training



Paducah, Kentucky



South Point, Ohio

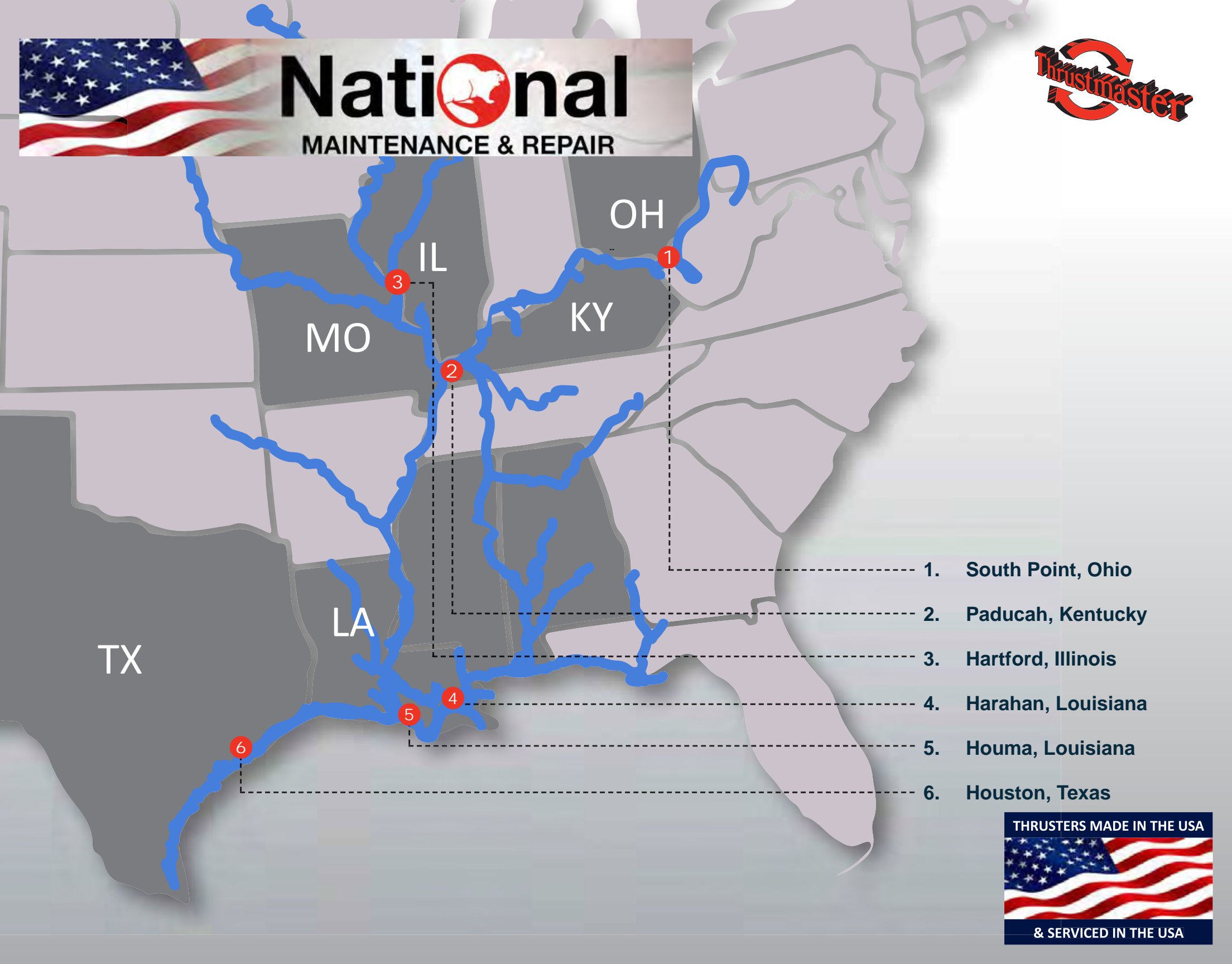


Harahan, Louisiana



National

MAINTENANCE & REPAIR



- 1. South Point, Ohio
- 2. Paducah, Kentucky
- 3. Hartford, Illinois
- 4. Harahan, Louisiana
- 5. Houma, Louisiana
- 6. Houston, Texas



HYDRAULIC Z-DRIVES for FLEET BOATS

Thrustmaster's hydraulic azimuthing Z-drive thrusters are especially suitable for fleet boats. A hydraulic Z-drive consists of a high-thrust, fixed pitch propeller on a husky propeller shaft directly coupled to Thrustmaster's exclusive podded hydraulic motor.

Simple, Efficient & Reliable

The diesel engine drives a hydrostatic transmission pump at constant RPM. The propeller is driven by a variable speed hydraulic motor. In between are fluid conductors. There are no drive shafts, gears, bearings, or other mechanical components to fail. The drive is an infinitely variable torque converter. The hydraulics are virtually maintenance free and provide many years of reliable operation while performing in the harshest marine environments, as long as the hydraulic fluid is kept in clean and cool condition.

Highly Resistant to Damage

The hydraulic drive is extremely resistant to damage. Foreign objects ingested by the thruster are unlikely to damage the hydraulic drive train, as the hydraulic system instantly relieves any transmission overloads.



TECH SPECS

Model	Input Power	Propeller Diameter	Thruster Weight
	HP	in	lbs
TH500N	500	49	17,000
TH750N	750	57	21,000
TH1000N	1000	63	35,000



Hydraulic Z-Drive Features

No clutch required. When the hydrostatic pump goes to neutral (zero swashplate angle), the propeller comes to a complete standstill regardless of engine RPM.

Propeller speed can be infinitely controlled from zero to maximum regardless of engine RPM.

Engine runs at constant RPM, just like a generator.

No shafts to align. The hydrostatic pump is installed on the bell housing of the engine and the only connection between the engine driven pump and the Z-drive is hydraulic hoses.

The engine driven pump, hydraulic reservoir and accessories can be installed at any convenient location.

Complete system is supplied by Thrustmaster.

Thrustmaster hydraulic azimuth thrusters use a podded design concept. The propeller shaft is directly driven by the hydraulic motor in the thruster .

The hydraulic drive train can instantly relieve any transmission overloads making the Z-drive extremely resilient and durable.

Hydraulic Z-Drive Benefits

No clutch wear. No clutch maintenance. There is no clutch.

Incredible maneuverability when combining azimuthing steering with infinite thrust control by virtue of propeller speed control.

Full engine torque available at any vessel speed for fast acceleration and stopping of the vessel. Low engine maintenance, just like a generator engine. Low emissions and no coking.

Very easy and quick installation. No alignment required. Equipment runs very smooth. No vibrations.

Allows optimum utilization of space and weight distribution.

Single point of contact, single point of responsibility.

High propulsion efficiency, no gear losses. Reliable due to its simplicity & limited number of moving parts. Lateral & torsional critical speeds are far above operating speeds. Runs smooth, no vibration.

Foreign objects ingested by the thruster are unlikely to damage the hydraulic drive train as the hydraulic system instantly relieves any transmission overloads.



Thrustmaster of Texas, Inc.

6900 Thrustmaster Drive
Houston, TX 77041 USA
Phone: +1 713 937 6295
sales@thrustmastertexas.com
www.thrustmaster.net

Thrustmaster do Brasil Ltda.

Av. Nilo Peçanha, 50 - Sala 2911
20020-906 Centro
Rio de Janeiro, RJ Brasil
Phone: +55 21 3045 9730
sales@thrustmasterbrasil.com



THRUSTERS MADE IN THE USA



& SERVICED IN THE USA