



It's hard to believe a piece of metal with no moving parts can be the approximate equivalent of adding 200 horsepower, 100 gallons of fuel and 100 miles of extra range. But when it's a hydrofoil attached between the hulls of an Aquila 36 Sport power catamaran (above, far right), that's the net effect.

While the efficacy of foiling boats is

well-documented, this technology has surprisingly had little impact on the recreational powerboat market. Hydrofoils that lift a hull entirely out of the water seem to be too alien to most boaters. Plus, most foil designs require dynamic control using computers to remain aloft at a constant elevation. But they are proven to be effective. With the Aquila 36 Sport, we

experienced its benefits on a recreational boat and compared it in real time to the same boat without a foil but with 200 extra ponies. Here's what we found.

HYDRO WHAT?

Gino Morrelli and Pete Melvin, of Morrelli and Melvin Design and Engineering, applied their decades of foiling experience to design

PHOTO: FOREST JOHNSON



CARVE OR SLICE?

We pit an Aquila 36 Sport Hydro Glide power catamaran with 600 hp against a nonfoiled 36 Sport powered by 800 hp. Did this new hydrofoil work as advertised, or did we bring a blade to a gunfight?

By Alan Jones

the Hydro Glide Foil System for Aquila. It consists of a main hydrofoil attached slightly aft amidships to each hull and the top of the tunnel. It lifts approximately 40 percent of the hull's weight out of the water when at cruise speeds, for better performance and fuel economy. Farther back, twin fins act like an airplane's horizontal stabilizers to prevent porpoising at higher speeds. What

makes hydrofoils so effective is the dramatic reduction in drag. A typical planing hull has a 4-to-1 lift-to-drag ratio, while a hydrofoil can have up to a 25-to-1 lift advantage.

How does it work? The fields of aerodynamics and hydrodynamics are kissing cousins, so many of the principles of one apply to the other. The silhouette of a typical asymmetric hydrofoil wing wouldn't

look out of place on a 737. It consists of a convex curve on the upper side and a flatter bottom side. These taper down toward the rear. Bernoulli's principle explains that when air or water rushes over the top side of a wing, the medium has to travel farther, so it moves faster. This creates lower pressure on top, allowing the higher pressure on the bottom to push upward.

AQUILA
36 SPORT
HYDRO
GLIDE



Most hydrofoils operate near the surface and can ventilate, which is a phenomenon that occurs when the low-pressure side of a foil pulls air from the surface and destroys lift on the foil.

“Because water is denser, a hydrofoil creates about 830 times more lift for the same area and speed compared to an airplane wing, so you can use a much smaller foil in water than air,” Raas says.

Most hydrofoils operate near the surface and can ventilate, which is a phenomenon that occurs when the low-pressure side of a foil pulls air from the surface and destroys lift on the foil, Raas explains. “Foil depth, sweep, dihedral and section shape all play a significant role in avoiding ventilation,” he adds.

DUELING AQUILAS

We were able to arrange a test staging out of MarineMax in St. Pete Beach, Florida. MarineMax is Aquila’s exclusive distributor in the US. The Aquila brand is owned by the Sino Eagle Group, a high-tech Chinese builder that extensively uses vacuum-infusion technology to build the boats. J&J Design Group provided a complete design package for the Aquila 36 Sport.

Aquila is largely the brainchild of Lex Raas, Alain’s father and president of Aquila at MarineMax. Lex is South African, and his career journey has taken him from working for Beneteau (the world’s largest boatbuilder) to the Moorings (the world’s largest vacation charter operation) to MarineMax (the world’s largest boat dealer). While a big believer in power catamarans for their roominess and comfort, Lex didn’t like that most were converted sailing vessels. The unveiling of the Aquila 36 Sport power catamaran in 2017, the company’s first outboard-powered model, ushered in a new era of high performance. Because these boats would be used on bareboat charters driven by skippers of varying degrees of expertise, they are purposely designed to be easy to pilot.

ONE COOL CAT

Our first sea trial began aboard the nonfoiled Aquila, joined by Alain Raas and Jacob Coyle, a MarineMax sales associate. When we headed out into the Gulf of Mexico through the Pass-a-Grille entrance, the wind was blowing 17 mph and gusting to 23 mph from the northwest,

PHOTOS: FOREST JOHNSON

SIR
ISAAC
NEWTON

Sir Isaac Newton’s third law also applies to hydrofoils. The simplified version says that for every action, there is an equal and opposite reaction. So, if a foil is directing the water down, it’s pushed back and the foil rises, creating lift. This effect is enhanced by an increased angle of attack at the leading edge to create more lift. In the case of Aquila’s Hydro Glide foil, it will still provide lift even if the boat’s bow is pointing down 3.5 degrees, which will be useful when running down-sea because it avoids transforming the hydrofoil into the equivalent of a down-planer or sea anchor.

Too much lift can also be a problem, according to Alain Raas, brand manager for Aquila Boats.

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FOILS AND CATS

There are a few other recreational catamaran builders that use hydrofoils. One of the first was a design by Morrelli and Melvin called the Corsair Foiler 2200, a 22-footer released in 2004, which drew from work the company had done in the 1990s. The fastest is the Insetta 35 IFC (Internal Foil Catamaran), a 35-foot center-console with a 10-foot-8-inch beam that can reach 60 mph, which is about the speed limit for hydrofoils. Taking the hydrofoil concept to the max is the Nemesis One, a luxury sailing cat design that's 338 feet long and 127 feet wide, which would barely fit within the confines of a football field, including the end zones. Its projected top speed is 58 mph.

creating steep 4-foot waves. In other words, it was a glorious cat day.

Our nonfoiled test boat was powered by a pair of Mercury Verado 400 outboards derived from the Mercury Racing division. This engine does some serious overachieving given its smallish 2.6L inline-six-cylinder block, thanks to twin-scroll superchargers, which lend it substantial punch when a driver needs a blast of power. Ultra-rapid acceleration is less important for catamarans, which usually do best in rough water when kept at a steady speed that is faster than you would think.

The big difference between most power cats and the 36-foot Aquila 36 Sport is the Aquila's incredible 14-foot-7-inch beam, which creates a living room's worth of space in the cockpit/salon for up to 26 passengers and is mostly

enclosed by an optional hardtop (see our review of the Aquila 36 in the January 2020 issue). In addition to helping its optional Joystick Docking for Outboards system work more efficiently, this wide footprint creates an ultra-stable platform that will be reassuring to those without sea legs (or stomachs). It's so stable, according to Alain, no customers have ever asked Aquila to install a Seakeeper gyro-stabilizer.

Settling into a cruise speed of 33 mph felt like the cat's happiest velocity for that sea state. The narrow profile of the twin hulls cleaved the water without the pounding that characterizes most monohulls when running into steep waves. We used a little bit of engine trim to bring the bow of the hulls out of the water to reduce drag and prevent bow steering, and the boat offered a smooth ride, even when we turned the beam to

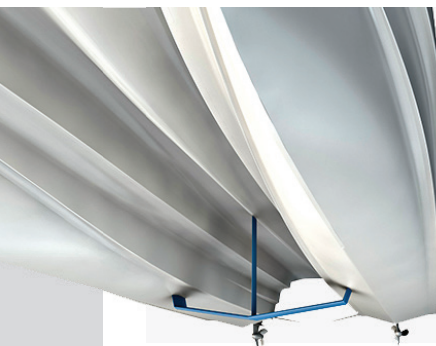


**AQUILA
36 SPORT**

PHOTOS: (FROM TOP) COURTESY AQUILA, FOREST JOHNSON



**AQUILA
36 SPORT
HYDRO
GLIDE**



The Hydro Glide foil is positioned just forward of the boat's longitudinal center of gravity and set at zero degrees of attack, allowing the driver to use engine trim to increase the angle for optimal lift.

the waves. Narrower cats of similar lengths can snap-roll alarmingly in large beam seas, but the Aquila remained surprisingly level.

Heading into Bunces Pass is tricky because of shoaling on each side, but once through, it put us squarely into the Tampa Bay area's recreational boating epicenter. With Egmont Key State Park and Fort De Soto Park to starboard and Shell Key Preserve to port, we were surrounded by great beaches that are perfect to nose up to. The Aquila 36 Sport Hydro Glide showed off its ability to float in just 2 feet of water with the engines trimmed up as we beached it. We beached the foil boat too. Even though the bottom of the foil is about a foot lower than the hulls, its extruded aluminum construction is stout enough to withstand being gently beached.

TIME TO FLY

Switching boats, we were curious to feel the difference the foil makes. The experience was subtle. The Hydro Glide foil is positioned just forward of the boat's longitudinal center of gravity and set at zero degrees of attack, allowing the driver to use engine trim to increase the angle for optimal lift. On this boat, little trim is needed because the optimal angle of attack of the hydrofoil is only about 1.5 degrees, according to Lex. In our case, because the fuel tanks were almost full, we just trimmed the engines to their neutral position and let the weight of the fuel give the Aquila 36 Sport Hydro Glide its proper bow-up angle.

Because the Hydro Glide Foil System lifted the hull only about 6 inches, there was a general feeling of riding higher in the water, but the most tangible evidence was how the steering felt lighter and more responsive—an indication that the foil is running at its proper angle of attack. The wake behind us flattened out significantly, unlike the tall rooster tail and wake that shot aft

from the nonfoiled boat. Offshore, it handled the steep chop well and felt best at a cruise speed of 38 mph. There was never a moment when it lost its lift from the foil.

Another difference lay in the cornering characteristics. Without the foil, the 36 Sport has a slight lean to the outside, which some find off-putting. With the Hydro Glide foil, the cat leaned slightly inward and felt nimbler as it carved hard turns. A driver can overcook it during extremely hard turns—the hulls can dig in and turn more sharply than expected—so whipping it into a corner like it's a jet boat isn't advised.



Foils that raise a boat's hull entirely out of the water can plummet should the boat lose lift. But the dihedral V-shape of the Aquila's foil allows it to descend a little at a time when exposed above the water. This results in gentle corrections in heave, or a boat's up-and-down motion.

THE NUMBERS DON'T LIE

The Aquila 36 Sport Hydro Glide reached plane in 6.4 seconds, which was 1.4 seconds faster than the nonfoiled boat. Its zero to 30 mph time

PHOTOS: CLOCKWISE FROM TOP: FOREST JOHNSON (2); COURTESY AQUILA

was 2.4 seconds quicker, taking 12.4 seconds. While those might sound like modest gains, remember this test boat had twin 300 Mercury Verado engines—200 fewer horses than the nonfoiled boat. Of course, these 300s are the new-generation Mercury V-8 engines, featuring 4.6L in a naturally aspirated design instead of the 400's 2.6L twin-supercharged powerplant. Having two more cylinders and 2 liters of increased displacement negates the need for supercharging because big blocks inherently have more low-end torque.

Most impressive was the lack of penalty for going fast on the 36 Sport Hydro Glide. Even at its top speed of 44.7 mph, it was still getting nearly 1 mpg, and the effect on its range was dramatic. At that speed with a full 356-gallon tank, we could theoretically travel the 322 miles from St. Pete Beach to Havana, though exceeding our 10 percent reserve. The nonfoiled Aquila 36 Sport, traveling at its top speed of 46.1 mph, would fall well short of reaching Key West

(231 miles away) with a full tank. At its best cruise speed of 30.6 mph, the hydrofoil-equipped Aquila can go 381.5 miles, compared to the nonfoiled version's 303.9-mile range, when traveling at 29.4 mph, factoring in a 10 percent reserve.

At first blush, opting for the Hydro Glide Foil System might cause sticker shock with its \$32,452 price tag, which equates to running through about 13,000 gallons of fuel at \$2.50 per gallon to recoup the investment. But if you factor in the difference in buying a pair of 300s versus 400s, the price is much closer, and you get a better-handling boat with more capability because of its increased range. Aquila 36 Sport owners will be happy to discover the Hydro Glide Foil System can be retroactively fitted at an estimated additional labor cost of \$10,000. Twin 300s are the max power with the foil because higher speeds cause cavitation, which then adds drag. But the improvements in ride, acceleration and range make this the biggest no-brainer on the options list.



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AQUILA 36 SPORT TWIN MERCURY VERADO INLINE-SIX 400

SPEED				EFFICIENCY				OPERATION		
rpm	knots	mph	gph	naut. mpg	stat. mpg	n. mi. range	s. mi. range	angle	sound level	
1000	4.0	4.6	3.0	1.3	1.5	422.3	485.9	1	62	
1500	5.4	6.3	4.4	1.2	1.4	395.5	455.1	2	67	
2000	6.6	7.7	6.5	1.0	1.2	327.7	377.1	2	71	
2500	7.9	9.1	9.0	0.9	1.0	281.5	324.0	2	74	
3000	8.4	9.7	13.6	0.6	0.7	197.6	227.3	5	75	
3500	9.4	10.8	19.0	0.5	0.6	158.3	182.1	6	76	
4000	15.8	18.2	21.8	0.7	0.8	231.8	266.8	6	80	
4500	19.8	22.8	25.4	0.8	0.9	249.9	287.6	4	81	
5000	25.5	29.4	31.0	0.8	0.9	264.0	303.9	4	86	
5500	30.6	35.2	43.4	0.7	0.8	225.8	259.9	4	83	
6000	35.9	41.4	59.0	0.6	0.7	195.1	224.6	4	87	
6500	40.0	46.1	72.0	0.5	0.6	178.1	204.9	4	89	

MOST ECONOMICAL CRUISING SPEED



AQUILA 36 SPORT HYDRO GLIDE TWIN MERCURY VERADO V-8 300

SPEED				EFFICIENCY				OPERATION		
rpm	knots	mph	gph	naut. mpg	stat. mpg	n. mi. range	s. mi. range	angle	sound level	
1000	4.1	4.7	3.2	1.3	1.5	408.9	470.5	0	63	
1500	5.8	6.7	4.1	1.4	1.6	455.0	523.5	1	67	
2000	7.0	8.0	6.5	1.1	1.2	342.7	394.3	1.5	71	
2500	8.0	9.2	10.2	0.8	0.9	251.1	289.0	3	73	
3000	9.0	10.4	15.3	0.6	0.7	189.3	217.8	4	74	
3500	14.9	17.2	16.2	0.9	1.1	295.6	340.2	2	78	
4000	18.4	21.2	19.9	0.9	1.1	296.6	341.3	2	81	
4500	26.6	30.6	25.7	1.0	1.2	331.5	381.5	2	82	
5000	33.0	38.0	32.4	1.0	1.2	326.5	375.8	2	86	
5500	36.8	42.3	41.7	0.9	1.0	282.4	325.0	1	84	
5850	38.8	44.7	45.9	0.8	1.0	271.1	312.0	1	87	

MOST ECONOMICAL CRUISING SPEED



PHOTOS: (FROM TOP) FOREST JOHNSON, COURTESY MERCURY MARINE (2)