AeroMarine Research
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This month...

Marit Stromoy Becomes First Women To Win In F1 H2o History

SHARJAH (UAE) - The Khaled Lagoon became the place where in the 32 year history of the UIM F1 H2O World Championship, a women, Marit Stromoy of Norway, came home number one defeating 17 men from 10 different nations winning her first Grand Prix race at the 16th Annual Grand Prix of Sharjah in the United Arab Emirates.

The historic race marked her first podium, as she held off three-time World Champion Alex Carella of Italy and American Shaun Torrente of the Victory Team, to take her first 20 points and the top step of the podium in her eight year F1 H2O career...

"We knew we could have a shot at the lead if we could get around the first corner quickly and cleanly and we did just that moving from fourth to second on the first lap. I felt this made all the difference.

I could feel the heat behind me with Carella breathing down my neck for the final twenty laps. However, we were able to pull away a few more seconds in the final laps to secure the win. What a great feeling. This is what makes all the hard work and patience pay off with a race team and I have a great group of people who believe in me as well and that makes all the difference.

Finishing 4.7 seconds back in second was the runner-up in the championship Carella as the Team Abu Dhabi driver earned the "runner-up" trophy taking second in the championship standings for the second straight year. Finishing third on the day and also in the championship was American Shaun Torrente as he was caught up in a massive dual for the last spot on the podium with pole-sitting driver Erik Stark of the Emirates Team. Separated by just 1.5 seconds most of the day Torrente got the upper hand on the very last and 43rd lap passing the driver from Stockholm thru the right hand turn and beating him by just under four seconds at the end.

Finishing fifth was two-time World Champion Sami Selio of the Mad Croc Baba Team staying right in step with the battling duo in front of him finishing 18.4 seconds back at the end of the day for the driver from Helsinki. Swedish driver Jonas Andersson from Team Sweden was a distant 50.21 seconds in a rears charging up ten positions at the start to take sixth eventually.

The other big story of the race, came when second place starter and last years winner and now 2015 World Champion Philippe Chiappe of the CTIC China Team, raced off into the lead and held the point for the first third of the race. Looking for his third victory of the season, the Frenchman couldn't hold it as his engine started to misfire and he pulled into the pits. He came back out for a few more laps only to leave finishing unofficially 15th on the day to end his championship season with his second failure to go the distance.

So, on a very historic day, where for the first time in international racing history, a woman, has defeated 17 other competitors, all men.

Marit, has won the first Grand Prix event in the UIM F1 H2O World Championship history as a woman and she turns a page in the record books forever.

Read more at F1 H2O
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Mercury's new four-stroke ROS motor will power the XCAT class in 2016

During the SBI Key West 30th Annual World Championships week, Mercury Racing introduced its new ROS (Race Offshore) competition outboard. The motor will be used in the XCAT World Series overseas.

What Mercury calls a sinister relative to the Verado 400R, the four-stroke race motor made its on-water debut at the Dubai Grand Prix, round five of the 2015 XCAT World Series, in November. XCAT and Mercury are working together to develop the motor that will replace the existing fleet of Mercury Racing two-stroke 2.5 EFI outboards that the teams currently use...

The ROS is more powerful, more efficient and cleaner burning than two-strokes. It has the Verado 400R power head mounted on a new race midsection that features Mercury Racing's proven heavy-duty swivel clamp bracket assembly. The aluminum midsection is 10 inches to help lower the engine's center of gravity. The overall mounting height is 15 inches. The ROS utilizes a remote dry sump system that holds 8 liters of Mercury Racing four-stroke oil. A carbon-fiber lower cowl conceals the transition of the power head to the midsection. The lower front cowl features dual rigging tubes, one each for fuel and electrical systems. The same high-pressure fuel pumps used on the two-strokes feeds the ROS. A Sport Master gear case delivers the power to the water, and Mercury has developed a new series of CNC cleaver props specifically for the racing motor.

The ROS utilizes Mercury's Digital Throttle & Shift system for smoother shifting and throttling. Mercury Racing's Zero Effort digital controls have integral power trim switches on the throttle handle, plus one-touch Smart Start and automatic throttle synchronization... [more] [back to top]

Read more at Mercury Racing and at Boating Mag

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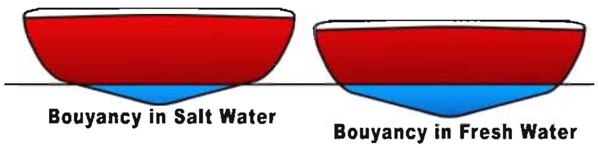
Is Fresh OR Salt Water Faster?

Which is faster – salt water or fresh water? You've probably heard "points of view" on both sides of this question. Actually, the 'Salt water vs. Fresh water comparison is more complex than you'd initially think. I'll try to outline the differences and how they influence performance of a power boat.

Salt water is slightly more dense than fresh water. Density is the measure of how much mass a material has for a given volume. The density of fresh water is 1000 kg/cubic meter (62.4 lbs/cu ft) and a typical density for salt water is 1035 kg/cubic meter (64.5 lbs/cu ft).



So, things float better in salt water than they do in fresh water. You have probably noticed this, finding it easier to swim in salt water than in fresh water. So, if salt water supports us better, then our boats should be faster in salt water, right? Well, regrettably, it just isn't that simple...

There are several influences that the water has on a boat, and they act in totally different ways. Buoyancy, wetted surface, hull lift & drag, lower unit drag and other influences – even hull type, are all affected differently by salt or fresh water – so there is no 'obvious' answer to the question "is it faster in fresh or salt water?" Does it really make a difference? Here is how it works...

<u>Buoyancy</u>
Since salt water is more dense (about 3.5% more than fresh water), your hull will float higher when at rest. That's why we float better when swimming in salt water than we do in fresh water. A displacement hull (e.g.: sailing, or displacement-speed powerboat hulls) has more buoyancy in salt water due to the higher density. This can be readily observed with the boat at rest, where the freeboard in salt water will be higher (more boat out of the water) than when the same hull is resting in fresh water.

So for boats that rely on mostly buoyancy lift, such as displacement hulls, the answer is different than for boats getting most of their support from planing lift, such as high performance vee hulls and tunnel boats. Even underway, displacement hulls will have slightly more buoyancy in salt water than in fresh water, which can mean less wetted surface and less drag, meaning potential for higher speeds. Planing hulls, however, rely very little on buoyancy lift, and so the difference in buoyancy due to the density of salt water does not have much effect.

<u>Planing Hull Lift and Drag</u>
Lift and drag are, among other things, both related to the density of the water. So more density means more drag, but it also means *more lift*.

The amount drag on a planing hull as it moves over the water is also a function of the speed and the amount of wetted surface area. The drag of the hull must be overcome by the horsepower of the engine, so more drag = less speed.

As an example, here is the design formula for drag, so that we can see the relationships we are talking about.
D = [½ * ρ * V2 * S * Cd]
where: D = drag (lbs)
ρ = density of water
V = velocity
S = wetted surface area
Cd = drag coefficient

More water density means more drag (less speed). So, since salt water is more dense (about 3.5% more than fresh water), our boat has more drag and thus should go slower, right? Well, not necessarily…

The weight of our boat is always balanced by the lift generated by the hull moving in the water. The lift generated by the hull works generally the same way as the drag. More density (of salt water) means more efficient lift. So this means the boat planes with less wetted surface – and less wetted surface causes less drag (more speed). So the effects on water lift and drag are working against each other, and it's not always obvious which will win!

Clear as Mud?
The water density issue is, perhaps, easier to visualize if you consider our boat in fresh water compared to running in a MUCH more dense fluid – like "mud"! The higher density (mud) might be considered to give faster speed result - because of more lift - right? But no, due to MUCH higher drag in "mud", the net result is MUCH slower speeds! This makes more sense, doesn't it? The same is true for fresh vs. salt water.

Wetted Surface
The amount of wetted surface has a big impact on the hull drag and its attainable top speed. High performance planing hulls achieve high speed by reducing hydrodynamic drag by minimizing wetted surface and are sensitive to changes that affect the amount of surface exposed to the water surface. So the higher density of salt water can reduce wetted surface through more efficient lift, but also can generate more drag. It's often a 'break-even' result for such boats. It gets MORE complicated….

Lower Unit drag

The water density has an effect on the drag of the lower unit too...more dense salt water causes more drag on lower unit. Sometimes this can make as much or more difference as the other contributors! The profile and the exposed drag surfaces of the lower unit remain the same whether it's in fresh water or salt water, so the only difference is the higher density of salt water, so the lower unit drag in salt water is always more than in fresh water.

Hull Type
ALSO, type of boat hull makes a difference. For example, a displacement boat (e.g.: sailing, or displacement speed powerboat hulls) has more buoyancy in salt water due to higher density, and thus these hulls can experience slightly faster speeds.

The answer is different for boats with mostly planing lift, such as performance vee hulls or tunnel hulls. These hulls can see slightly more efficient hydrodynamic lift in the more dense salt water, but also experience higher drag for the same reason.

Hulls that also use aerodynamic lift tend to see even less effect of water type on hull drag, and so the biggest influence is the higher lower unit drag in more dense salt water.

Other Influences
Differences in altitude, air density, temperature, pressure, and humidity also affect aerodynamic lift & drag performance - but even more importantly, can affect performance of the engine. While present day engines typically use MAP or MAF sensors to measure changes in air density and adjust engine operations for optimum combustion, these systems can't compensate completely and ambient conditions can make a difference to performance.

Of course, differences in wind conditions, water conditions, water temperature, water currents, etc. can also have a huge impact on a hull's operation. These are all factors that are usually different between offshore salt water and inland fresh water locations.

Here's How It Works
We use our *Vee Boat Design Program* software to evaluate the combined effects of water type on buoyancy, wetted surface, hull lift & drag, lower unit drag, and propeller efficiency. Some of these factors tend to contribute to faster top speeds and some work to cause lower speeds.

Here's an example to show how these 'pluses' and 'minuses' can work out in the end.

For a 21ft (6.4m) performance vee hull with 200 Mercury outboard, all weighing in at 2700 pounds (1230 Kg) with passengers and payload, running in fresh water we could see a top speed of 72.5 mph. With the same hull and ALL other operating conditions the same (water temperature, air temp, atmospheric pressure, relative humidity, boat weight, fuel load, passenger payload, water conditions, engine setup, etc.), this setup would see a top speed of 72.1 mph. That's an overall difference of +0.4mph faster in fresh water.

The Bottom Line
Our 'test hull' experiences slightly MORE hull wetted surface area, but actually sees LESS hull drag in the lower density fresh water. The lower unit drag is LESS in the lower density fresh water. All of these differences are very small, some balancing out the other. The overall NET result is a slight +0.4mph (gain) in fresh water.

There is no "rule of thumb" that can be applied to all hulls or to any circumstance, however you can now understand all the different factors that act differently in salt water than in fresh water. The engineering of power boat performance can show us the answer in each case – and it's usually a very small, perhaps hardly noticeable, difference in the end!

Get Jim Russell's full article "Is Fresh OR Salt Water Faster?".

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[Note: Do you have any of your own questions on performance hull design? Send your question or story to mailto:jimboat@aeromarineresearch.com?subject=TBPNews%20article%20suggestion&body=I've%20got%20a%20suggestion%20for%20an%20article%20in%20your%20TBPNews%20newsletter!]

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Video - World's Fastest Outboard in 1958

Carl Kiekhaefer creates a state-of-the-art marine outboard engine, the Mercury Mark 75, and sets a new outboard speed record on Lake-X in 1958. [click for video] [back to top]

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