

# GYROS vs. FINS

## HOW THEY WORK

Until recently external fins were used only for underway applications (almost exclusively on low speed displacement boats) where the fins were dependent on the speed of the boat, producing lift the way a rudder does, by deflecting the passing water. Because the worst roll motions tend to occur at rest and low speed, these types of fins had limited value on most boats. So the fin companies introduced a new product, called “Zero Speed Fins” which used fins in an entirely different way. To get some idea of how this works, imagine a person in the middle of a stationary small boat with a paddle in the water, twisting the paddle back and forth to counteract the roll energy created by the waves. In the case of the zero speed fins, the twisting paddle is a fin on a shaft going through the hull below the water line which must move a large quantity of water very fast, requiring large amounts of instantaneous energy.

Gyros use a fundamentally different mechanism to achieve roll reduction. It operates on the principles of gyro dynamics, in which a spinning wheel resists any movement which is at 90 degrees to the spin axis. The stored energy of the spinning wheel is an anchor in space, and acts like a virtual spring, resisting roll in either direction. Because it does not have to push on anything (including water), it does not need bursts of energy, or anything sticking into the water.

## PERFORMANCE

Whether its gyros or fins, performance is dependent on sizing. In the case of the fins, the bigger the fin and the more energy applied, the better the anti-roll authority. Similarly, with gyros, the bigger and heavier the flywheel, and the faster you spin it, the better. The question is: What are the tradeoffs as the size of each type of device is increased? What we believe is that fin stabilization at low and no speeds is severely limited by the practical limits of fin size and power

requirements. What we know is that there are a number of Seakeeper equipped boats on the water today that achieve a level of zero and low speed roll stabilization never seen on boats equipped with fins. As for underway performance, fins operate much more effectively in this mode because of the lift provided by their movement through the water. Here the question is the window of application. The vast majority of boats on the water are planning hulls, which pick up so much roll damping at speed that roll is only a significant problem at zero and low speed. On low speed boats, the fins can be very effective at the target cruising speed, but lose performance as the speed decreases, a situation commonly occurring when it gets very rough. On the other hand, the gyro is not dependent on speed, for underway performance, its authority fully available in the roughest conditions, when every boat must slow down. What fins can do, and gyros can't, is to correct sustained heeling motions sometimes occurring on low speed boats, such as heeling outboard in turns, wind induced heeling and instability running down sea. Boats with these characteristics are a tiny portion of the boating market.

#### ADVANTAGES/DISADVANTAGES

It is here that the gyro completely distinguishes itself from the fins, principally in three aspects: The first is power consumption. Zero speed fins require short bursts of power that far exceed the stored energy requirements of the gyros spinning flywheel. The second aspect is that fins create parasitic drag reducing both speed and efficiency, ruling them out from high speed boats. Finally, and most importantly, the hazard of having underwater hull penetrations and appendages sticking out at vulnerable locations is a serious compromise to feeling secure on the water. Every experienced boater has watched as partially submerged objects have slid past the side of their boat, glad that the clean hull side has pushed the obstruction out of the way of the propellers and rudders. Not so with fins, which must be mounted at the side of the bottom where fishing lines, crab pot floats, flotsam, and submerged logs go by, ready to snag or collide in our increasingly littered waters. Perhaps the most serious risk is damage to the

hull or fins in the event of grounding since the fins will likely be at the exact location where the weight of the boat must be borne.

## CONCLUSION

There is no question that, for most boats, most of the time, zero and low speed roll is the worst part of being on a boat. Even if you avoid open water and windy days, ever increasing boat traffic means more wakes creating unexpected roll that can spoil the nicest outing. Nor is there any doubt that boating consumers are becoming increasingly aware that this situation is not inevitable. In a short period of time all boaters will come to expect stabilization, which will not only be a boon to experienced boaters, but will bring in many new participants who were formerly uncomfortable on the water. We believe that this revolution will not occur with fins, with their inefficiency and hazards. Rather we think state of the art gyros will make this happen. This magical "Gravity in a Bottle" device is the most effective and least troublesome solution to an age old problem and may finally do away with the expression, "don't rock the boat".