Tornado Boats International • Skaeringvej 107 • 8520 Lystrup • Denmark • Phone: + 45 86 26 56 55 • Email: info@tornadoboats.com

Tornado 9.5m High Performance fitted with twin Mercury Verado 300HP running at high speed

CHINE WALKING

What is chine walking?
The chine walking experience refers to the situation occurring with high performance vee-hulls as the boat accelerates, lift increases and the running surfaces raise out of the water. As hull speed continues to increase, the wetted surfaces are sufficiently diminished on the vee-portion of the hull that it becomes challenging to “balance” the hull on its keel. To counteract, additional driver steering input is necessary in order to maintain the hull in a balanced state.

If left unchecked, the boat will rock from side to side with increasing motion and drama. The boat is now “inherently unstable” – this means that if left alone, the “imbalance” of the hull is more likely to get worse on it’s own, not better (the worse it gets, the worse it gets). So the hull will now start to rock from port chine to starboard chine – back and forth. This is called “chine walk”.

Chine walking is a characteristic of all boats with vee-hulls, depending on the actual boat this will happen at higher or lower speeds.
Setup of the boat and driver “seat-time” are the best solutions to the problem.
The experience of chine walk can be only slightly bothersome on some boats, or can get to be out-and-out dangerous on others. The latter can ultimately result in catastrophic consequences if the condition is not corrected quickly.

Here are some established steps toward minimizing chine walking:

1. Check & adjust steering.
There should be no play in the steering mechanism, ensure it’s adjusted so there is no play in the wheel and carefully bleed the lines to remove all air from the entire system. On dual (or triple) engine setup (where it is possible) install a tie-bar on the rear of the engines - far from the steering axle of the engines.

2. Use solid mounts.
Stock rubber motor mounts allow for too much slack movement between steering wheel and engine. Solid mounts are much tighter and provide better steering control at high performance speeds.

3. Motor height.
Adjust engine height to minimize the instability. This is easiest to do with a hydraulic jack plate. Remember that as you raise the engine height, a low water pickup may become necessary in order to ensure that the engine gets enough water pressure. Test your rig at different speeds, weight distributions and water conditions to find the best height for each. Often, as the engine is raised on the transom, the reduced lower unit drag can have an improved effect on instabilities such as chine walking. Engine setback can also affect stability, although it is more difficult to experiment with.

Tornado Boats International • Skaeringvej 107 • 8520 Lystrup • Denmark • Phone: + 45 86 26 56 55 • Email: info@tornadoboats.com

4. Weight balance of hull.
Although this is a tricky thing to optimize for all speeds (since the dynamic balance of a hull shifts significantly throughout the operating velocity range of the boat), the onset of the chine-walking phenomenon usually occurs at a particular speed for each hull and you can focus on correcting balance at that bothersome speed. Try to situate movable payloads close to the static center of gravity – both longitudinally and laterally. This can often be a trial-and-error experience, but you'll see the results of weight balance changes immediately in the handling of the boat. Optimize portable equipment, batteries, oil tank and fuel tank positions. Also situate passengers for the best weight balance.

6. Propeller selection.
The right propeller design can change the balance of a hull as well as make or break its performance. Rake, diameter, pitch, cup and blade number, can all influence the Lift and drag generated at the aft-end of the hull. High-pitch propellers can make the boat more difficult to drive and ultimately contribute to slower achieved top speed simply because they are more challenging to drive. More blades will also usually improve handling. Propeller testing is time-consuming (and costly), but can really pay off in overall performance and stability.

7. Seat time (experience).
Chine walk on a vee hull can usually be controlled by the driver as he gains more experience and skill with his setup. Unfortunately, there is just no substitute for experience! Drive your hull in different conditions at lower speeds until you are completely comfortable with your ability to "sense" and "correct" for motions of the hull to conditions and speed changes. Then gain more experience at a slightly faster speed, in the same way. Work you way up to higher velocities slowly, under good control. With familiarity, you will develop a sense to predict your hull's motion and you'll soon be able to react accordingly to correct it prior to it getting severe. The correct driver input to balance the boat at higher speeds is very minor if the adjustments are made quickly, immediately at the onset of motion ("timing is everything").

"Timing is everything" - When you sense the onset of chine walking, reduce engine trim and/or throttle. When the motion subsides, you can increase trim and throttle smoothly as the hull drives right through the previous chine-walk speed barrier. Steering adjustments need only be small, but should be made in a timely manner in the opposite direction of the hull bow movement. When the left bow drops or the bow moves left, steer slightly right. When the right bow drops or the bow moves right, steer left. This steering input is done swiftly and in short motions. With practice you will be able to make these small steering inputs "before" the motion actually occurs. Turning the steering wheel slightly into (against) the torque of the propeller as soon as you "sense" the onset of lateral imbalance (side-to-side rocking), can help drive through the chine walk stage too.

8. Minimize Trim Angle.
This was mentioned above, but worth saying again. Use as little positive trim as possible. More trim (higher running angle of attack) causes the onset of instability to occur earlier and with more drama. A high-flying attitude is harder to balance. When chine walking starts, it is not likely that you can simply "drive through it" without first reducing trim slightly.

9. Setup of controls.
A spring-loaded foot throttle and trim controls mounted on the steering wheel can help the driver to control the boat. Two hands on the wheel is a big advantage at high speeds.

10. Choice of boat hull.
All the above mentioned steps are ways of reducing the effects of chine walking. This applies to all boats with vee-hulls independently of which boat manufacturer who designed the boat.

At Tornado we have some hulls purposely designed for higher speeds than other. These models will still be exposed to chine walking, but this will happen at higher speeds and be easier to reduce.
This includes our 9.5m High Performance, 11m High Performance and 12.5m High Performance models.

Author: Lars Hjorth