

Safer Foiling



An important facet of foiling is to address the issue of safety as foiling boats can be very fast and potentially dangerous. There are several aspects involved, including crashing, impacts and losing the boat. This article explains the various issues around Foiling Safety and provides some solutions.

Sailing Capsize

All dinghies can capsize if they are not balanced by the crew. This is part of the challenge. If you get it wrong, the boat capsizes, and you get wet.

With the advent of foils, dinghy sailing has become even more of a balancing act, especially when using centreline foils. Even when not foiling, the foils are providing lifting forces as the boat moves through the water. This makes the boat unstable and much easier for the boat to capsize, especially to windward as the foils are lifting the boat from far to leeward.



Windward capsize – getting wet!

Capsizing to windward can occur when on foils, heeling to windward and the wind drops or changes direction or just driver error. As the boat falls in to windward, it is accelerated by the foils lifting from the leeward side giving you much more righting moment, resulting in a dramatic splash which is only an aggravated capsize. Sure, you get pretty wet, but it is relatively safe, although if you are on a trapeze you can get knocked right off the boat.

The Skeeta and Nikki scow hull provides natural stability from the hull, which greatly reduces the risk of capsize, simply due to the wider hull shape. This makes the boat very easy to sail for both beginners and experienced foilers.



The Skeeta hull is wide and stable, making capsizes less likely and the boat inherently safer.

Foiling Crashes

A foiling crash is when the boat lifts so high that the foils breach the surface or ventilate and suck air and loses lift, the boat falls suddenly and violently to the water usually at good speed. Depending on the type of boat and foil design, a crash can end up in a "nose-dive", or worse a "pitchpole", even leading to a "cartwheel".



Credit: © ACEA / Photo Giles Martin-Raget

Full on 'nose-dive' is dangerous in large fast boats

Skiff dinghies such as Moths and multihulls with their fine bows tend to suffer much more catastrophic issues. There is very little buoyancy forward, so when the bow hits the water, it tends to bury in a nosedive. The boat stops, and the crew keeps going.

The effect is to fling the skipper and crew off the boat. If there are stays or foils in the way, there is a high risk of serious injury.

Crew on trapeze can have even more dramatic being flung well ahead of the boat, sometimes into the mast, rigging or foils. It is dangerous and hurts, no wonder these sailors are now wearing full crash protection!



Credit: SuperFoiler Grand Prix, Photo: Andrea Francolini

Even more catastrophic is pitchpoling, where the nosedive ends up with the whole boat pitching head over heels and the crew catapulting into the water!



Live 1 © ACEA 2017 / Photo Gilles Martin-Raget

Nose diving can lead to pitchpoling



American Magic's nose-dive in "the mule"



American Magic's crash in the Prada Cup.

While this is not a common occurrence, it is generally considered as a normal challenge when foiling and does not seem to be recognised as an “issue”, because most of the boats have the same problem.

Nosediving or pitchpoling is not just due to fine bows, but it is greatly exacerbated by the design of the foils. All multihulls and Moths today use fixed foils, or fixed sections with flaps. Once the boat starts to crash, the fixed section of the horizontal lifting foil can easily go into negative angle of attack. The flap has insufficient authority to correct this, the foil then acts like a brake in the water, dramatically increasing the nose-dive, even leading to a pitchpole or cartwheel. In effect the boats “trip up” on their own foils.



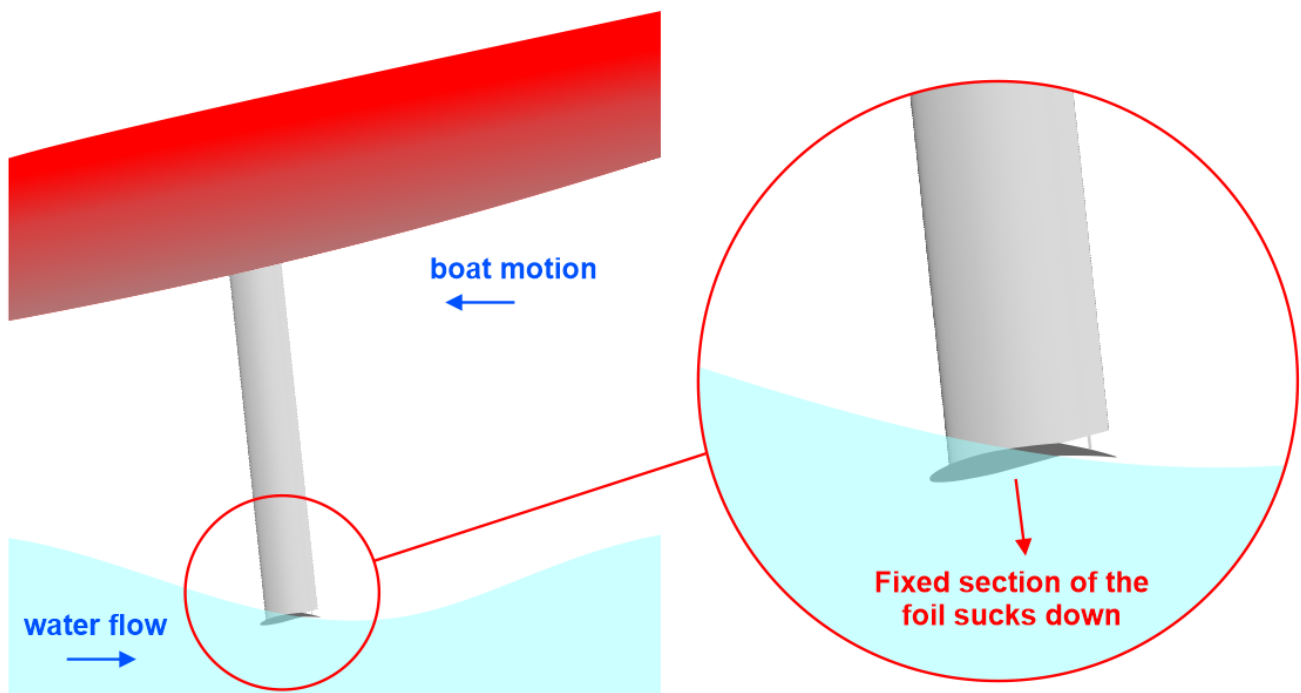
Credit: Ben Hartnett and Hartas Productions

Breaching the surface and ventilating



Credit: Ben Hartnett and Hartas Productions

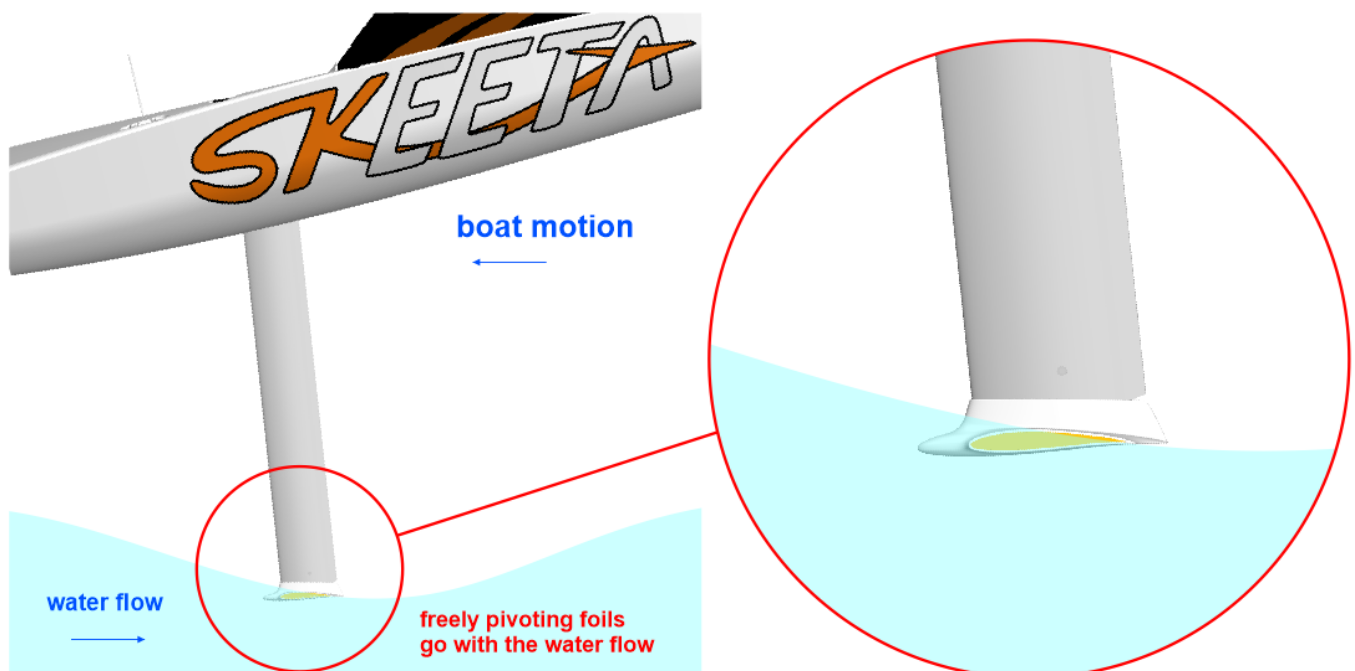
Heading down for a 'nose-dive'



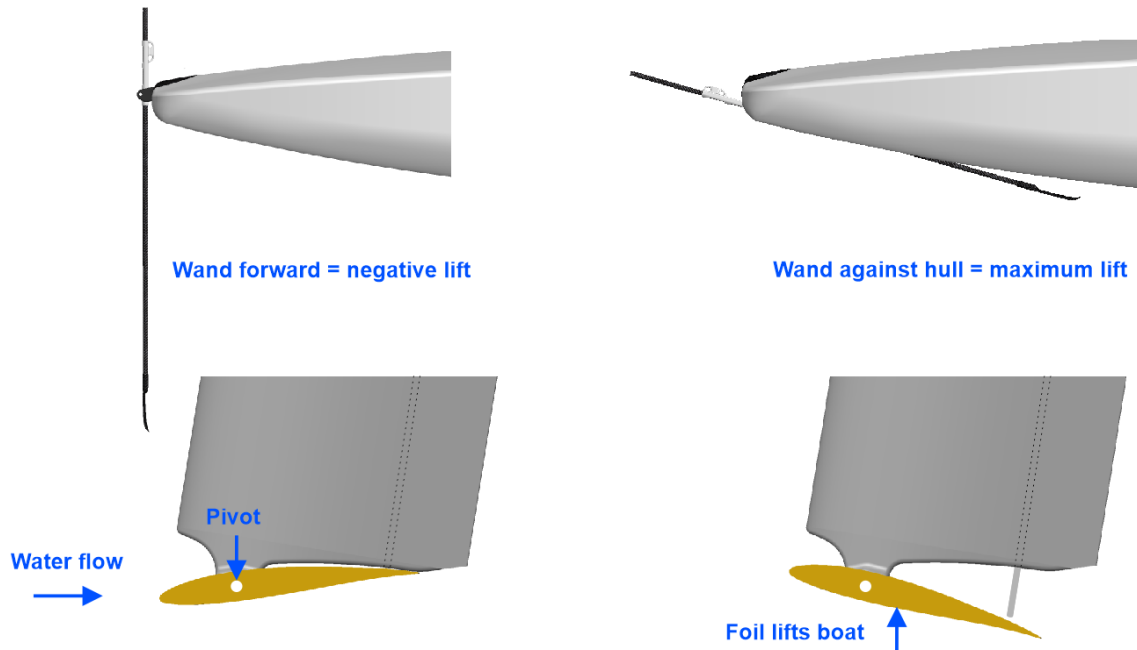
The same thing happens with fixed lifting foils.

The Solution

While it is not possible to completely prevent breaching and ventilation, as this depends on the wave conditions and control systems, it is possible to prevent the foils acting as a brake and going into negative lift.



The Skeeta and Nikki foiling system recognises this issue producing a foil which solves the problem. The horizontal foil is fully articulated, allowing it to rotate freely with the water flow. It is actuated by a pushrod which touches, but is not attached, so it can never apply an upward force causing the foil to suck down. There is no resultant negative lift, even when the boat is pitching nose down, so there is no braking force applied to the boat.



The pushrod is not attached to the foil, so it can go into negative lift angles when needed and will not suck the boat down even during a severe nose-dive.

The result is a foiling system which is inherently safe and easy to manage.

In the event of a foil breach, where the foil comes to the surface and sucks air, reducing lift, the entire foil is oriented with a positive angle of attack. This rapidly slows the decent and allows flow to re-establish over the whole foil. The boat quickly recovers and keeps going. This is not the case with other foils where the fixed section of the foil is at a much lower angle of incidence to the flow.



Riding too high, the main foil ventilates and begins to dive



The main foil recovers easily, without a crash or pitchpole

Capsize

Foiling boats are no different to others when capsized other than keep clear of the lifting foils as they can be sharp. Dinghies tend to be easy to right, but multihulls are difficult to right when upside down, so care must be taken to have rescue crew or hauling lines available to get the boats upright. Some are not possible for the crew to right by themselves without outside assistance. Due care needs to be exercised when sailing these types of boats.

On the Skeeta and Nikki we have found righting ropes are a great help to get the boat upright quite useful, once upright the boat sits flat and low to the water so you can get aboard easily.



Survival mode

Sailing home in strong or in very light winds can present special issues for foilers. If you get caught out in strong winds, foiling boats can be both difficult and dangerous to sail, especially downwind. It is easy to breach and crash, nosedive and cartwheel, not a good or safe way to finish the day.

In high winds, it is therefore important to be able to either retract the wand or de-activate the foil, so you can sail home safely in displacement mode. Some narrow foiling skiffs will not sail easily in strong winds when not foiling, they have insufficient buoyancy in the hull to allow full control of the boat.

Skeeta and Nikki foilers allow the foil to be fully disengaged for safe foiling in displacement mode. The scow hull allows the wand to be fully retracted and the boat is easy to manage as it planes like a normal scow. This is a fun way to sail if it is too windy to foil safely.



Conversely, light air can also be a problem for some foilers. The lifting foils produce a lot of drag, enough to slow the boat significantly in under 2 knots of wind. Deactivating the foils or retracting them can help. On the very narrow unstable boats like Moths, balancing the boat in no wind is difficult and exhausting. Often they don't even go sailing until there is at least a steady 7-8 knots of wind, missing out on some great sailing!

Skeetas and Nikkis are great to sail in light winds, you can even detach the lifting foils completely and sail like a normal boat.



Losing the boat

Foiling boats travel very fast, when you fall off the boat can travel a long way before it stops.

This means a very long swim to get to the boat. In strong winds, the boat can blow away before you reach it, so whenever possible hang on to the mainsheet so you get dragged with the boat.

Dinghies using centreline foils tend to capsize as soon as you fall off. The wings dig in with the boat on its side reducing their drift, so are inherently safe. Multihulls with or without foils are particularly stable and can sail long distances, even kilometres unmanned, especially if the tiller is self-centring.

When in difficulty

Boats that have pocket luff sails make it impossible to drop the sail when in trouble. Getting help from a rescue boat is made very difficult when you cannot stow the sail or even tow the boat to safety.

The Skeeta and Nikki scows have halyards and enable you to drop the sail when on the water. The scow hull is easily towed behind a rescue boat.



Conclusions

There are several aspects to foiling which generate safety issues, especially around crashing. The experience of the skipper and its crew is a vital component to safety, the more practice foiling, the less chance to put yourself in an unpleasant situation.

Skeeta Watersports have set out to design the entire boat and its foiling system to address all the safety concerns they could associated with foiling, while making the boat easy to rig, launch and sail, with excellent performance both on foils, in displacement, semi-foiling and planing modes.

As time goes on and technology improves, Skeeta Watersports mission is to create boats safer, easier to sail and fun for everyone.