



# Of swings, roundabouts and stability in Kayaks

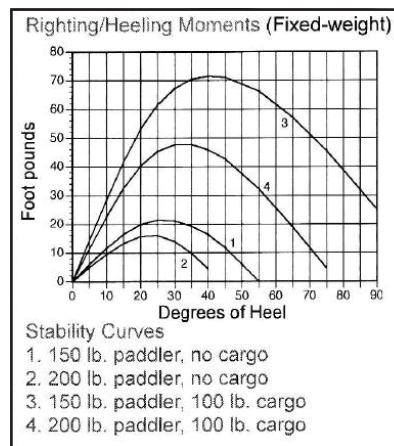
by John Anderson (reproduced with permission from the Hunter Kayak Klan site - hunterpaddler.ning.com)

I was out paddling with Phil Thomson at Swansea channel and we got to talking about stability and particularly why would you choose a kayak with low stability. It's a very good question and I thought I ought to answer it more fully here, from my rather limited understanding. If someone with a better understanding of the subject would care to comment, that would be most welcome.

Lets start off with the thesis that we want to use edging and leaning to assist in boat control and that these are good things to be able to do in rough water. I don't have any data for the stability of our magnificent local Mirage kayaks, but I do have some for the Valley Aquanaut, which feels similar to me, at least as far as primary stability goes although the overall profile is probably quite different. Lets have a look.

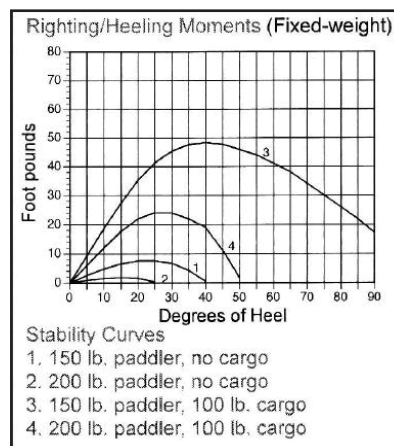
The graphics (shamelessly copied from Sea Kayaker Mag in the interests of paddler education) show the righting moment against the heeling angle for the Aquanaut, Nordkapp LV and the Tahe Marine Greenland. There are four curves as the stability profile depends on the load, which in turn has an effect on the waterline height, centre of buoyancy and waterline length and beam.

The higher the curve goes, the more force is required to tip the boat to that angle. The initial slope of the graph is an indicator of primary stability, the steeper it is the more primary stability the boat has. After the graph peaks, secondary stability kicks in. The flatter the curve after the peak, the more secondary stability you have.



Valley Aquanaut

Now lets compare the Nordkapp.



Valley Nordkapp

Curve number 2 is pretty close to me without a load. As an empty day boat, the Aquanaut is clearly more stable. The initial slope of the curve is not very steep so no great effort is required to start edging it, the maximum righting moment is about 16 foot pounds at 25° of heel, but the righting moment remains positive out to about 45°, so you're still getting some support cranked over.



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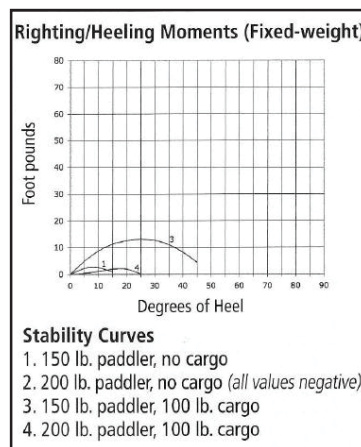
(cont'd)

The Nordkapp on the other hand has a very gentle slope initially, and a maximum righting moment of about 3 foot pounds and going negative at about 25°. This means that the boat is almost effortless to edge and that if you want to edge it hard then you may need an element of bracing in your stroke.

Now lets look at curve number three, which is roughly me with a couple of weeks supplies. WOW, it looks like two different boats. The slope of the curve for the Aquanaut is now far steeper, if you want to edge it 40° you're going to need to apply over 70 foot pounds of force to do it. You'll also still have about 25 foot pounds of righting moment working to lift you out of the water when the boat is lying on its side. In other words it's now harder work to edge for control.

The Nordkapp on the other hand now has very comfortable primary stability, very predictable secondary stability, and yet it requires much less force to edge it. It also has the longer waterline length of the two, less wetted area, and a lower drag coefficient, that all adds up to a very efficient expedition boat and a day boat that is going to really polish skills. (Especially rolling skills I hear you say ? : ) )

Is the Nordkapp really unstable though ? Lets take a look at another boat that is a striking looking boat too. If Darth Vader was going to paddle a kayak, this would be it. The original Stealth Kayak, the Tahe Marine "Greenland".



Tahe Marine Greenland

Where did curve number two go ? Hmmmm, the legend says "all values negative"..... Suddenly the Nordkapp's looking pretty stable ! It really is a case of swings and roundabouts. Stability is nice sometimes, and effortless edging and rolling can be nice too, but the rougher the sea gets, the nicer that effortless edging and rolling becomes.

The Inuit in Greenland designed their boats to handle well in some of the roughest seas on earth and they chose not to give them high levels of stability. It wasn't accidental, kayaks built in other areas were very different. They chose to build them to suit the conditions and they had many generations to get it right. There were other factors that they obviously felt were much more important than stability. Personally, I think the Nordkapp is a pretty good compromise for what I want to do. A high efficiency, high performance load carrier, that is responsive and lively enough to be a fun day boat as well.

Thank you Sea Kayaker Magazine, for the graphics, an invaluable resource for us paddlers.

John Anderson, October 2009