

Boat Design

Regardless of what you build a boat from – [fiberglass](#), [carbon fiber](#), [steel](#), [wood](#) or [aluminum alloy](#) – the first and most important thought process is design. Intelligent, modern, tested design.

You can have the finest craftsmen and the best materials on the planet but if your design is awful “Voila!” bad boat. And they’re everywhere. It drives me nuts. You don’t have to buy one of our boats but don’t buy a badly designed boat! Wet, pounding, unstable – awful, miserable, bad boats.

Boatbuilders, boat designers and knowledgeable boat owners will all agree that every boat design is a compromise. There is no “perfect” boat. One day I was reading a popular boating forum and a number of contributors were trying to compile the elements of a boat that did everything well. They were attempting to make the “perfect” boat. I scratched my head and felt bad for them because they were on a fool’s errand....

Later that same night I was in bed with a piece of graph paper sketching a boat and realized that I was doing the exact same thing!

We’re men and we don’t like to think that there is no answer to a problem. A boat should be able to be designed that rides well, be stable, be dry, be fishable and be safe!

So let’s attack the problem together.

First we have to agree how the boat will be used.

What category of boat design are we discussing?

For the purposes of this “book” and our boats we are discussing far offshore capable, high-speed monohull boats in the 25’-45’ range. We are not discussing “flats” boats or “bay” boats or “racing” boats or “catamarans”. Our category of boats is used for near shore and offshore (up to 150 miles out) duty in seas from 1’-8’. Are we in agreement?

After having spoken to literally thousands of boaters over the years who are interested in this category I think that I can safely say that the single, over-riding element of importance to these mariners is ride. They’d like the boat to be stable, fuel efficient, etc but not at the expense of the best ride possible. This makes complete sense. Anyone who’s been 100 miles from shore (or even 2 miles from shore) in a bad riding boat on a rough day will tell you that it is a miserable experience. A few more gallons of fuel or a bit more “tenderness” would definitely be traded for having an intact back, knees and teeth.

So if the single most important element is “ride” than we’re pretty lucky. Today the naval architecture community has pretty much nailed this down. The true deep-vee 24 degree deadrise bottom, as it’s commonly referred to, has proven through many, many designs and iterations to be the best riding bottom for monohulls. There are boatbuilders who will call their 21 degree or 22 degree bottom boats “deep-vee” but with all things being equal they simply will not ride as well.

But that simple moniker “deep-vee” or “24 degree transom deadrise” isn’t the whole story. It’s the right beginning to a longer story.

There are only really three elements to a boat's ride:

- 1) Shape
- 2) Weight
- 3) Balance

Shape. What shape is the boat presenting to oncoming seas? How much weight is behind that shape and finally where is the boat's center of gravity (COG).

In boat discussions people (including us) use the 24 degree deadrise as a catch-phrase for a desirable and proven "shape". As it only describes a single angle at a single point on the hull it doesn't tell nearly the whole "shape" story. As you well know the term deadrise as used to describe boats is describing the angle between a flat surface placed underneath the bottom of the "vee" and the ascending side of the "vee" at the boat's transom – a "transom" deadrise.

As the two planes that make up the boat's bottom move forward from the transom there are two different ways of designing and building these surfaces:

- 1) Monohedron – The deadrise moving forward is constant at 24 degrees for a good portion of the boat and the finally "warped" into a more "sharp" entry.
- 2) Warped – The deadrise as it moves forward is constantly changing from 24 to 26 to 30, etc.

The differences between these two approaches in the category we are discussing are minimal at best (large sportfishermen have warped bottoms and for good reasons). We have chosen the monohedron as it helps sustain a smooth, consistent waterflow all the way back along the run, avoiding suction and turbulence that can be caused by warping of the bottom.

A more important and rarely discussed issue with shape is "entry". What is the deadrise of the boat where the boat is actually cleaving the water far forward of the transom? This is usually described at the point where the waterline ends forward. In our boats it is around 55 degrees – quite sharp – extremely sharp (unheard of really) in the plate aluminum world. Pay attention to entry deadrise in addition to transom deadrise!

The fiberglass deep-vee boatbuilders have this right while the aluminum builders have this wrong. Even in aluminum boats that are considered or marketed as "deep-vees" their entries are usually quite flat so even if they are right or approaching the right shape aft they are failing at the right shape forward.

Weight. Water is heavy stuff. A cubic foot of water weighs 62 lbs! So when hitting a large wave you are hitting a heavy thing. The heavier you are when hitting that heavy wave the better your ride will be (assuming a constant shape). One of the great features of aluminum is its great strength/weight ratio. You can make extremely strong things with relatively light structures. This is great when you are trying to achieve fuel efficiency or great speed and is the reason you see aluminum alloy used for motorcycle and race car frames. Strong and light. For the category of boat we're speaking of we don't necessarily

want a very light boat. For this reason we actually design a more robust frame than is necessary – this has two very good results.

1) It makes us a similar weight to the fiberglass boats we are competing against and thus makes our ride as good as theirs.

2) Since this weight is very low it helps move the COG down (see: balance)

Balance. In boatshows or demo rides or in online forums where boats are discussed you almost never hear “balance” discussed but it is hugely important and must be thought of during the design process. Many boats may be designed with good balance but then the company makes a decision to add a tower or increase fuel capacity or some such thing and this moves the boats COG – sometimes with horrible effect. Struggling to get on plane, squirrely in a following sea, extreme tenderness in a beam sea, etc.

This is especially prevalent in the fiberglass boat business because they have a “set” hull and structure and then they go about adding stuff all over the place. Unlike shape and weight this is a hidden design element – you can’t measure or see it. As a semi-custom boat builder we make sure that your boat is in balance. Period.

From a design standpoint the fiberglass builders have done a superb job. Boats such as SeaVee (my favorite), Contender, Yellowfin, Regulator, Intrepid and others have designed (or had designed for them) great shaped boats with decent weights while some are better balanced than others.

From a design standpoint the aluminum alloy builders have been a mess. Too flat, too light and sometimes terribly balanced. This has made many people say that “aluminum boats pound” or “aluminum rides badly”. Neither of these axioms could be further from the truth – it’s not the material but the design.

What we have done is take the absolute best from fiberglass design and incorporated it into tough, durable, low maintenance aluminum. We ride as well or better than our fiberglass friends and we kill our aluminum fellow builders!

So...

For our friends in the recreational sector who like and enjoy and use true deep-vee, hard-sided, monohull offshore boats you’ll finally find an aluminum alloy boat that will equal or exceed the boat designs you already employ.

For our friends in the government/commercial sector you’ll find (for the first time) a metal boat that has the shape and the weight and the balance that has been missing from your options in the past!