Huck Finn’s raft was a basic flat-bottom boat. So was Robert Fulton’s Clermont, the first commercially successful steamboat. The design of a boat hull does not depend on overall size, but on the intended use of the boat, or the results the boater wants to attain. Misuse of a boat whose hull was designed for another application could be costly.

When my son was about eight years old, we took our wide-bowed flat-bottom car-topper to a Van Sciver Lake, part of the privately run Penn Warner Club, in Tullytown, Pennsylvania, for an afternoon of fishing. This portion of the lake was a result of a sand and gravel operation that left the entire bottom an almost perfect 20 feet deep with few mounds and very little bottom structure. The spring day was bright with no noticeable wind.

Launching the boat was usually an easy one-man operation, except on these weekend outings when it took both of us, “working together,” to get the boat ready to sail. About an hour after we were on the lake, I noticed a slight wind. About 15 minutes later, I could feel the coffee-can cement anchor begin to bounce as the wind and small waves lifted and settled the boat. Nothing to worry about, I thought, and probably if my son weren’t on board and there was no lightning, I’d just ride it out.

My “time to head for shore” announcement was met by a frown as he put his rod in the boat. With some anxiety in my voice I suggested he tighten the straps of his life jacket, and I pulled the 3 HP engine to life.

As I began our 100-yard journey quartering into the wind, and back to shore where the station wagon was parked, my concern for his safety grew. The boat began to porpoise as the increasing wind quickly raised waves, and the bow of the boat began to scoop water into the boat. Now I could see my son’s grip tightening as he watched my reaction. This was the first time I experienced this problem with the little flat-bottom boat, and maybe it was just because of his added weight near the bow, but I knew I could not proceed on course or we’d swamp.

The wind wanted to blow us parallel to the shore and into a cove that had some lily pads. I quickly calculated that a long walk around the lower part of the lake was much better than a short swim, so I slowed the motor enough to maintain a controlled drift, and the water no longer came in the boat. We floated into the pads, which were close to shore, and with the help of the oars we reached safety. It could have been worse, and even though the flat-bottom johnboat was not the problem, it met its match. A high-sided “V”-hull design soon found its way to the racks on the wagon.

Flat-bottom boats

The one thing you can say about flat-bottom boats is that with their large bottom area, the boat is very stable in calm weather. Characteristically, however, the flat, broad bow area creates a rough ride. These boats are usually limited to low horsepower motors because they don’t handle well at high speed. Flat-bottom boats are greatly suited for fishing in skinny water from the Susquehanna River to the Florida Keys, where a very shallow draft is a must.

Early in our nautical history, boats were powered by wind or by hand-stroke oars. Early boat designers found that boats went faster, and were
easier to steer, if the bow was pointed. They also soon discovered that by lowering the center of gravity, the high sail masts had better balance, and usually kept the boat upright even in bad weather.

**Displacement, planing hulls**

These early boats were constructed with “displacement” hulls. This means that the hull would push through or cruise through the water. The proper propeller for a displacement hull is one with a lower pitch when powered by an outboard or stern drive. With the advent of mechanical power came boats with “planing” hulls, which lift the boat partially out of the water to skim on the surface. Today, it’s sometimes difficult to tell the difference between the two, but there are slight differences. Propellers on boats with planing hulls often are not fully submerged, so they need to provide holding ability as well as higher pitch and rake, because of higher top-end speeds.

**Round-bottom hull, “V” bottoms**

The round-bottom boat has mostly a displacement hull and is usually used for dinghies, tenders, and some car-top boats. This boat style is usually easier to maneuver at slow speeds than the flat-bottom boat.

The “V”-bottom boat is probably the most common hull design. Most manufacturers of boats built today use modifications of this design. This design offers a good ride in rough water as the pointed bow slices forward and the “V”-shaped bottom softens the up-and-down movement of the boat. The degree of the angle of the “V” is called “deadrise.” As the “V” shape extends to the back of the boat, it usually flattens out until it all but disappears at the transom. Some “V”-bottom boats have a flat surface at the very bottom called a “pad.” This pad allows a little more planing surface and at the sacrifice of a little softness in the ride, but this addition increases top speed.

**Tri-hull, tunnel hull**

There are many boats in Pennsylvania waters that are a distinct modification of the “V”-bottom that are called tri-hulls and cathedral hulls. The tri-hull boat is the traditional “V” hull with additional outside hulls. This design is more stable than the “V”-bottom at rest, but it gives a rougher ride in choppy water because of the increased surface at the bow.

Tunnel boats have been designed to trap a cushion of air beneath the hull to reduce drag on the outside hulls. This design is different from a catamaran bottom because the inner edges of the outside hulls have sharp corners to improve the handling of these boats at very high speeds. Many race boats are constructed with tunnel hulls and are sometimes called “hydroplanes.”

**Pontoon boat**

Very popular in the Keystone State are pontoon boats. And just as the name implies, the pontoon, or deck boat, is a flat, raised deck supported with two outer hulls (pontoons) that are usually constructed of aluminum. These boats combine a lot of features of other boats. They ride very dry because the deck is raised above the floats. They are stable, and with the transom mounted to the underside of the deck, they are easy to maneuver with an outboard motor.

The boater who is looking for all-around use can make almost any hull design work for many water conditions. But even in the broadest markets, hull design is a continual research and development project. In specific niche markets, like water skiing, and now in the fastest growing of the water sports markets, wakeboarding, the competition for better hulls is tough.

When you are shopping for a new boat, first consider the water in which you’ll use the boat. Then take into consideration how many people will generally use the boat, and then determine how the boat will be used. Boats come in a wide range of colors and cockpit configurations that you can live with if you like all of the other attributes the boat has to offer. But the one thing that should be at the top of your shopping list is what’s on the bottom of the boat you want to buy.