Selecting the right canoe
For Your Dreams!

Shapes & Lines

The shape of a canoe, or the way its "lines" come together, determines both how the canoe will handle under various conditions and what it will look like. Generally, it is the shape on and beneath the surface of the water (below the waterline) that influences the performance characteristic, and the lines above water that determine the styling and to some extent the capacity of a particular model. It helps to know a little about the shapes of canoes before you consider building one, and you don't have to a hold a degree in naval architecture to understand the fundamentals.

There are three basic views or perspectives from which to evaluate the line of any boat. If you were to stand well back for the center of a canoe sitting right side up on a pair of sawhorses, you would be looking at the canoe's profile. The profile view best indicates the configuration of the keel line, the curve of the stem, and the sweep of the gunwales or the sheerline. From the performance aspect, the keel line is of the greatest importance. Occasionally you'll see a woodstrip canoe with a keel that is perfectly straight. If you were to compare it with a parallel and level baseline of some sort, you couldn't detect the slightest rise in it the entire length of the bottom until the stems actually began their curve. A canoe with a keel line that rises slightly towards the ends - an inch or two at the beginning of the stems – displays what canoeists call rocker. A keel line that rises rapidly from the center towards the end to height of several inches is heavily rockered. The "hogging" of the bottom is just the opposite configuration. A canoe is hogged if the keel line actually dips down toward the ends from a highpoint amidships. This is usually a sign of a poorly manufactured or tired old canoe, rather

than an intentional design feature, because it does nothing positive for the canoe's performance.

A straight keel line is designed for flatwater paddling, and because it helps keep the canoe on a straight course (tracking), it can be helpful to inexperienced paddlers who otherwise might have to exert considerable energy just keeping to their course. On the debit side of the ledger this same characteristic severely limits a canoe's responsiveness when it come time to turn it. When up to speed, it can act like a freight train on its track, and no light maneuver with the paddle is going to quickly bring it about. Such sluggishness can be disheartening to an accomplished paddler on flatwater and in rapids where quick maneuvering can be crucial, it is a trait that can be downright dangerous.

On the other hand, the severely rockered canoe in experienced hands can be spun like a top, almost in place, and with ease of perform the maneuvers coveted by today's freestyle paddlers on flatwater while at the same time behaving well in the tight spots in a whitewater situation. Even a paddler of average ability, however, can have difficulty getting on these banana boats to stay on a straight course between point A and point B.

The hull with moderate rocker tends to average out these extremes. With a little practice, almost anyone can get such a canoe to track reasonable well; yet it is also possible to execute graceful and decisive turns at the dock to impress those ashore. This same boat will allow the canoeist to make the occasionally necessary quick maneuver in quickwater, yet it can be held without great effort in a line parallel to the current for ferrying across the river to safe channel on the opposite side.

The sheerline in profile can afford you further indications of a particular canoe's merits and limitations. The height of the sides, for example, helps to determine the safe load capacity of a hull,

although it is by no means the only factor. This height of the side, along with the surface area of the bow and stern is, however, the chief determining factor of the extent the canoe will be affected by crosswinds. A high-sided canoe with high ends is obviously going to be more difficult to manage in a stiff wind than is low-sided craft with modest ends, especially if the canoe is lightly loaded. However the deeper canoe will be the dryer one in really tough going whether you are caught out in a lake in a squall or running through haystacks in a rapid, and this is a feature that could someday save your life. Exactly where the sheerline attains its height above the waterline is also a factor. When a canoe is descending heavy water in a rapid, the water generally tried to climb aboard in the forward quarters of the boat, if it is going to, just about where the bow paddler is kneeling. Seldom will it come pouring in right over the bow, or amidships where most of the wave has been flattened out or turned back by the increasing width of the hull. The same is true when going to windward on a rough lake; the oncoming waves find the canoe most vulnerable in the forward quarter, just about at the bowman. This being the case, a moderate rise to the sheer, beginning at the center of the boat and gaining gradually all the way to the to the tip if the bow, can be more effective in repelling water than one that runs flat for most of its length then suddenly flares up into a high bow. At the critical point, near the bow seat the more moderate sheerline has already gained a couple inches in height above the waterline, while the other has basically the same freeboard in the quarter as it does amidships. For the most part, however, the sheer is the product of styling and very often reflects what a builder thinks looks attractive is much as it does practical considerations.

The shape of the bow is also a matter of taste and tradition, not that there is anything wrong with that. If the Native Americans had built their boats strictly artistic talents, their lovely designs would have been as dreary as some of today's canoes, designed by obsessive performance engineers or computer models with any regard whatever for appearance. Basically, there has been very little new in

bow shapes for hundreds of years. If you consider the stem profiles of the various Indian Canoes developed across the continent, you will see that they run the whole gamut form essentially no bow at all to the immense, full curved bows of the later Ojibway canoes, with everything in between – be it flared, plumb or curved back.

If you were to look down into a canoe form a vantage point such as a bridge you wild be enjoying what is known as the plan view of the craft. From above it is easy to see just what the canoe's beam is, how fine or full the ends are and how the two extremes come together. Fast canoes are generally narrow for their length and display a fine entry – the end of the bow where it meets the water is the point of a sharp V that very gradually widens as it approaches the quarter. Such an entry disturbs the water minimally, slicing the medium and parting it, rather than plowing through.

A large-capacity freight canoe on the other hand will be considerably wider amidships and it will carry these proportions the full length of the canoe to a full bow. This volume results in buoyancy that gives the canoe the large carrying capacity necessary for its work. The full bow also rides safely up on the heavy water where a fine-bowed boat might cut through, fill, and swamp. Most traveling canoes, whether Native American, cruising or guiding in origin are actually blends averaging out the two extremes. Wilderness travelers encounter all types of conditions, have varying capacity requirements at different times, and yet must cover long distances. Thus they required a combination of the traits of these two very different types of canoes. The canoes of the Native Americans evolved naturally over hundreds of years to fulfill these requirements but the manufactured canoes of the guides were designed with their specific needs in mind.

Plan View

In a general what these hybrid canoes had in common was a moderately wide bottom amidships (it became very wide later on in

some of the guide canoes), which had good initial stability and would carry a good load when necessary without drawing much water. In the plan view the bows of these canoes often displayed a hollow or reverse curve entry, which was necessary in order to glare the canoe out to its substantial width in the quarters.

Some designs are not symmetrical in plan view in order to fill certain requirements. When the outboard motors became popular on the larger rivers in the East for example, fright canoes were designed that had conventional bows, but whose stern sections were purposely blunt and bulbous. This extra buoyancy aft was necessary to accommodate the outboard motor and the operator who was confined to the stern in order to run the thing. Many high-tech racing designs and free-styles canoes of today take advantage of asymmetry to achieve specific performance qualities.

Cross-Sectional View

The view of a canoe that reveals the most information in respect to its performance is the end-on cross-sectional view. When these cross sections or stations are superimposed one over the other, you have what a marine architect or loftsman would term the body plan. Naturally you do not see these cross sections when you view the canoe from the end. The most you can perceive clearly is the shape of the canoe at its widest point and the stem, with the foreshortened gunwale line connecting the two. But if you were to take your chainsaw and cut the canoe up into 16" sections – these sections viewed separately, then stacked together would afford you a lucid view of the changing shapes that make up a hull. The basic characteristics would jump out at you. Right away you would see whether the boat was flat, shallow-arched, or round-bottomed at each particular station. You would also see whether the sides were straight (vertical), flared out, or curved in at the sheer in the configuration known as tumblehome. The shape of the bottom is perhaps the best single indicator of the canoe's handling

characteristics. A wide, flat, or nearly flat bottom amidships indicates a shallow-draft canoe with good stability and a large carrying capacity. Such designs were favored by guides in Maine and on the salmon river of New Brunswick. Shallow water in the summer months required a canoe that would not draw more than a few inches of water even with a petty good load aboard. During the hunting season a Maine guide might expect to carry his clients' gear, and food for up too a couple weeks' comfortable living in the woods, with the possible additions of a large buck and black bear at the end of a trip. A wide, flat-bottomed canoe of 20' would carry all this without requiring a foot of water to do it in. Such canoe were seldom very deep, usually just 12" because their buoyancy allowed them to maintain plenty of freeboard even when loaded. The flat bottom had the additional advantage of providing excellent stability. This was also critical when you consider the guide was often stand in the stern of the canoe wielding his setting pole, while a passenger in the bow, probably totally inexperienced, was moving around trying to fish.

A bottom with a shallow arch in it makes a superior paddling canoe, and a round bottom results in even greater speed. This ease of paddling comes at the expense on initial stability, however and a canoe with a pronounced round bottom can be very tender, even tippy when lightly loaded. Such a design often displays good "secondary stability", however, which means that once the canoe rolls well up onto its side, it once again achieves a stable position, which can be maintained by an experienced paddler indefinitely. A novice, unfortunately, unaccustomed to checking his own momentum as he goes over can very easily overcome this secondary stability and find himself in the water alongside his inverted canoe.

The cruising canoes favored in the Canadian Shield country were similar to the Native American canoes of the region and generally were of moderate width shallow-arched or round-bottomed and deep – making them fast, maneuverable, and dry. The large lakes

and deeper rivers of the Shield wilderness made draft a minor consideration.

The distinctive tumblehome of the sides of many traditional canoes can be very attractive, and because the sides are arched, such a configuration is structurally stronger than either a straight – or – flare – sided arrangement. Tumblehome likewise makes paddling – especially for a kneeling bowperson of modest stature – somewhat easier because the gunwales are tucked in a little closer. The disadvantage of tumblehome is that in choppy conditions waves tend to follow the curve around to the sheer and toss what water they can spare into the canoe. A flare-sided canoe, almost always associated with a round bottom, is most effective at "knocking sown" the chop before it can enter the canoe. Additionally, a flare-sided design actually gets more stable the more heavily it is loaded because the wetted surface increases the deeper the canoe sits in the water. Finally, the flared configuration displays the best secondary stability characteristic.

This has been a very brief introduction to some of the basic design features that determine a canoe's performance so that you might at least recognize them when you encounter them on various canoes. Obviously other factors, notably length and weight, play important roles along with shape in determining hops a canoe will ultimately perform, and help define a particular design's limitations. A good lines plan will clearly show all three views of the canoe and allow you to see at a glance if the model is likely to display the characteristics that you make it a suitable canoe for you. The best way to understand exactly how these features affect a canoe is to paddle as many different various characteristics interact my be pure speculation until your understanding is reinforce with actual experience. Since the combinations are so numerous, you would do well to supplement this hands-on experience with a look at some of the more successful traditional canoe, especially the one that were favored for the type of canoeing you are interested in. Usually a

canoe model was successful and sought after, for good reason. Familiarity with the best of them, coupled with a basic understanding of why they perform as they do, should give you as the potential builder, the proper background for selecting an existing design, or even designing your own canoe to best suite your needs.