A little-known or at least little-mentioned fact by canoe builders is the effect of the hull shape on pitching. It is well known in ship and yacht design circles that symmetrical hulls pitch more than asymmetrical hulls that have their centre of buoyancy aft of midships. The finer bows tend to cut through rather than lift over waves, and the fuller sterns bury less as the bow rises. Like any good thing, however, fine bows have drawbacks, not the least of which is that they are much wetter for the bowman. A further disadvantage is that steering can be more difficult when the bow is more deeply immersed. It is apparent that the perfect design is a very subtle compromise and that, for novice paddlers, canoes with more rocker and cut-away bows are advisable. It is also important NOT to follow the conventional wisdom of approaching waves at an angle instead of head-on. At the crest of the wave, the particles are moving against the canoe at the worst possible moment as the bow is most deeply buried. Thus, if the canoe is slightly off course, the wave magnifies the problem and makes it far more difficult to correct your course.

Another heavy-weather trick is to avoid the worst of the waves. This is possible because waves do not march across the water in neat orderly ranks like so many good soldiers. A topographical map of the water surface would show a maze of troughs, crests, and pyramidal piles of water caused by variations in wind direction, strength, and shoreline influences. It is possible to weave a snakelike course through these waves and thus avoid the worst. You may well make better headway in this manner despite the greater distance paddled. Figure 2 shows the added resistance caused by hitting waves head-on. The data was obtained from testing sailboats but is probably not that much different from what we can expect from canoes.

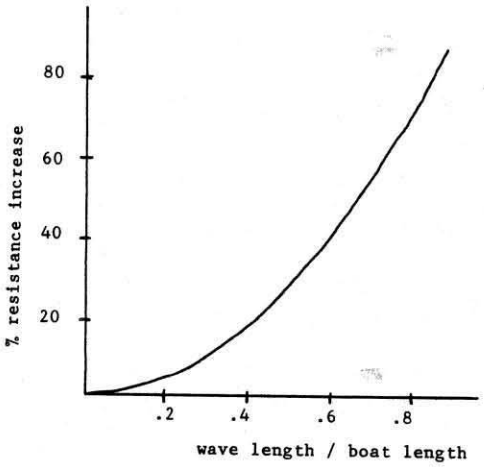
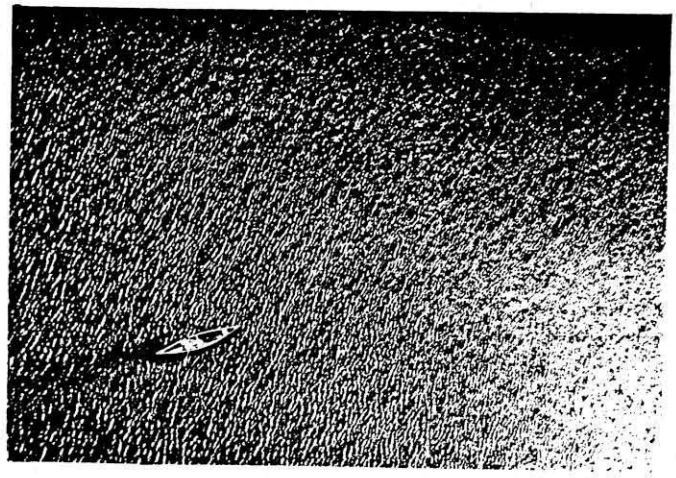


Fig. 2

Things really get interesting when you are:

CANOEING IN A FOLLOWING SEA

Compared to beating your head against wind and waves, paddling with the wave should be a piece of cake. Unfortunately, nothing could be further from the truth. A canoe riding down the front of a wave gains speed rapidly due to the direction of surface flow and gravity, and slows just as dramatically climbing the back of a wave. Aggravating this yo-yo effect is the variation of water flow within the wave. At the crest of a wave 0.6 m high, six metres long, and with a period of two seconds, the surface velocity will be 3.4 km/h. In the trough of the wave the situation is reversed and the water is travelling in the opposite direction. So, if the stern is in the crest and the bow is in the trough, the effect is to amplify the turning movement of the hull which can result in a broach.



The worst scenario is when the wave is twice the length of the canoe. An additional problem is that normal steering strokes have less effect due to the reduction of speed through the water. Those who have experienced this momentary loss of control appreciate the effect on morale. The solution is to use pries and draws which operate across the water flow as you would use in whitewater. Once again, as in heading into waves, a bit of rocker and cut-away ends are called for in the canoe.

Figure 3 shows two canoe profiles (superimposed over each other) in a broaching situation. The solid-line profile is that of a straight-keeled canoe with plumb ends as is popular in the USA. The dashed line is a rockered canoe with cut-away ends. It is easy to see that the more traditional canoe has less hull in the water at the ends and so would be less affected by water flow, thus allowing easier course correction. While moving weight aft on the straight-keeled canoe would help matters, there can be no question that "modern" shapes demand greater skills from the paddler than traditional canoes.

Every so often you will find yourself paddling:

ACROSS THE WAVES

The situation here is much the same as when travelling with the waves except that the worst-possible situation is when the waves are twice the canoe's beam in length or are breaking. Angling the canoe across the wave direction is the usual method of combatting the waves but the most important factor is to have a canoe with a rounded hull-shape rather than flat-bottomed. The round hull shape does not react so fast to the passing wave, and the paddlers, as a consequence, are less likely to overcorrect for the canoe's motion. Ideally the paddlers will allow the canoe to move about under them without attempting to stabilize, but this is far easier said than done since it takes a strong will to do the opposite of what comes naturally. Keep in mind that by leaning toward the crest of a wave to right the canoe you are, in effect, leaning upstream relative to the water flow.

OK, so now you know all there is to know about waves. Well, not really. There are a number of big, heavy books written on the topic and I have just scratched the surface. A real understanding comes from experience and knowing what to do instinctively. A fellow I have always respected as being an expert in heavy-weather sailing once told me that all one had to do was never lose your concentration, and know the right thing to do under an infinite number of variable circumstances. Not long afterwards one of those variable circumstances caught him unawares and he broached a forty-footer, losing the rig in the process.

And so it goes with experts! For us mortals, waves are a worthy challenge to our canoeing abilities and, as our skills grow, downright good fun.

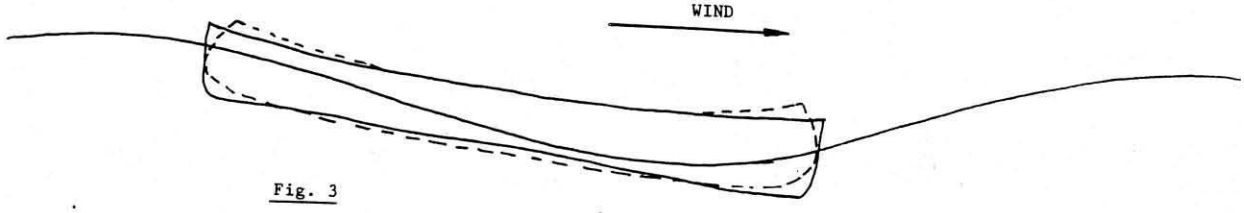


Fig. 3