WAVE MOVEMENT AND SWIMMING

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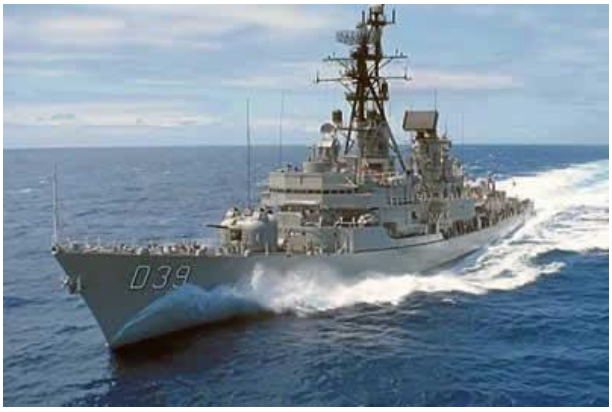
Can you achieve increased speed when swimming without getting fitter and actually decreasing the effort? Such a proposition appears “too good to be true”! A swimmer who has the almost perfect stroke may not benefit but the rest can still get speed for free.

This article will examine some of the characteristics of rigid boat and ship displacement hulls. These principles are not completely applicable to swimming but useful as we strive to do better. A displacement hull is one that is supported by buoyancy rather than a planeing hull. Such hulls are typified by barges, ships and rowing shells.

A barge is usually a long, large, usually flat-bottomed boat for transporting freight. It often has a wide beam and little taper at the bow. The length of the hull, width of the beam and depth of the draft are major factors in establishing the design speed of hull. No matter how much power is applied the hull cannot go faster. It will form many waves along its length as it powers slowly. As speed and power increase so does the size of the bow wave causing the bow to lift higher and higher so the hull is more pushing up-hill. Then a huge amount of energy is required to increase the speed slightly. To go faster, the hull will respond to such modifications as longer water line length, tapered bow reduced frontal area and narrower beam. While the craft can then go faster, but if a barge it will be capable of carrying less freight. Think again of rowing shells and naval destroyers. Streamlined hulls are fastest. There exists a boundary layer between the hull and water that imposes a friction on the hull. As a boat goes faster, the crest of the bow wave will rise up the hull and further increase friction. The wave drag is minimized when a single wave length is equal to a hull’s water line length.

Rather than completely discussing boating maybe swimming should be considered. The transferrable knowledge relates to longer water line length, tapered bow, reducing frontal area, controlling the bow wave and the wave pattern generated.



SHIP WITH TAPERED BOW AND LONG WATER LINE

STRETCH AND STREAMLINE carry into stroke

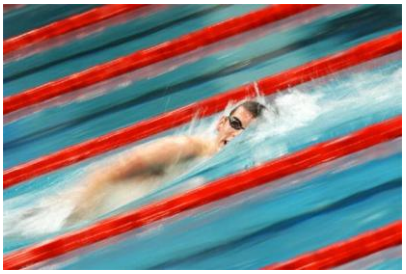
SIENE RIVER BARGE Note waves

Water line length is increased firstly by stretching the body and secondly by using the arms in front of the body as in “catch-up”. The principle applies to other strokes too. In breaststroke the arms are in a stretched-in-front position for a greater time than the during the power stroke. With backstroke the entry should not be rushed. Butterfly does require extra consideration as few people swim a classic competitive stroke and significant tuition is necessary before this theory is useful.

A tapered bow and reduced frontal area can be useful. If the arm in front is the generator of the bow wave rather than the head, the waterline length will be longer and the theoretical possible maximum speed will be increased. If however the wave originates from the head, the possible maximum speed is reduced. Raising the head and dropping the chest will further increase the frontal area. If the hips sway from side to side, usually as a result of a wide arm recovery, the frontal area is again increased. An unbalanced body often requires a counter-balanced kick that is not propulsive but increases drag. Watch good swimmers and the “high elbow” during recovery. This also requires high shoulders. The high shoulder reduces frontal area and allows the bow wave to dissipate down the side of the body rather than contribute to the wave building up. If the front arm is to contribute to the water line length it is necessary to be in an appropriate position with regard to the body.

Most swimmers will be familiar with the term “press-the-chest (down)”. Considering a ship commencing to go uphill as the bow wave gets bigger, it is reasonable for a flexible body to press the front end down and increase the maximum possible speed. Consider the importance of a stable centre line from head to toe or stem to stern. So many swimmers reduce their speed by not maintaining their centre line. This should commence in the dive and be held through each lap and re-established at the turn. Head down, squeeze the upper arms against the head, tighten the buttocks, point the toes and stretch the body. Use this position as the basis for your stroke. While core strength may be reduced by increasing age or illness, it can usually be applied for a short distance. Appropriate strengthening exercises are useful. So many swimmers don’t harness that strength and realise what capabilities they are hiding.

It is interesting to note that many top coaches including Gennardi Touretski have studied fluid mechanics. This article outlines a few principles that may be applied to your swimming.



GREAT WAVE

Remember that your body is not a rigid hull and the study of swimming is a fluid science not a rigid discipline.

My articles do not necessarily reflect text-books. Consider the content and apply if it benefits your swimming. *Patrick Devine*