

Meta-technique in sprint kayaking explained Part 2 - Managing the Boat

In our introduction to [meta-technique for kayakers article](#), we divided the meta-technique phenomena into groups addressing the following 3 areas: managing the boat, managing the blade and managing the energy. Today we will continue by explaining the meta-technique phenomena influencing how successfully you manage your boat and its movements.

The motion of the boat represents the cornerstone of all athletic movement in watersports (A.Pace, 2017). As such, it is the most important and sensitive element in the Meta-technique evaluations (A.Pace, 2017). We always start optimizing the elements of boat motions first, we address the interaction with water and force transmission only after this.

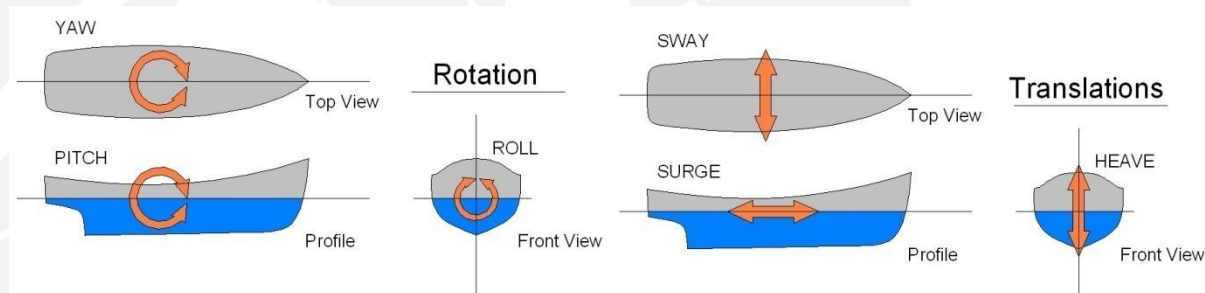
The elements of boat motion

The goal of Meta-technique is not to eliminate all the movements except the forward movement. The goal is to **optimize these motions** into a natural, harmonic, efficient movement of the boat in sync with the:

- Stroke rate and rhythm
- Body movements (propulsion, balancing and compensation movements)
- Boat speed and stroke energy

The elements of the boat motion are:

- Translational: Sway, Heave and Surge
- Rotational: Yaw, Pitch, and Roll



Body movements and boat motion

The mass of the boat is small compared to the mass of the body so even minor movements of the athlete's body during the stroke cycle (jerking motions, [lateral translations](#), rotation, arm swing, head ducking etc.) can result in big boat movements that can drastically influence boat mechanics. The understanding of which combinations of boat motions are positive and which not, involves a lot of experience and knowledge of hydrodynamics and mechanics.

The Surge

The forward motion of the boat during the stroke is perhaps the easiest one to observe and the same time very important for estimating (trained coach eye) or measuring (from video) the efficiency of the technique. For the coach, it is important to train his/her eye to:

- Distinguish **how much advance** during one stroke was obtained during the water phase and how much during the air phase. Both advancements sum up into what we call distance per stroke (length covered by the boat between a catch and the next for example). The goal of the technique is to obtain a lot of advance during the water phase (achieved by a slower angular speed of the shaft, bigger radius, bigger working angle). Except during power and technique drills, it is not our goal to maximize the advance of the boat obtained during the air phase (this would imply stretching the air phase to obtain more distance per stroke, which in turn demands proportionally higher forces during the pull to achieve the same speed). A trained eye can distinguish whether the stroke distance was achieved during the 'air' or the 'water' phase of the surge.
- Distinguish the **correct rhythm of bow and stern** coming out of the water and sinking back in during the stroke cycle. There are slight differences between the winners in various categories. Inevitably a correct rhythm of the boat can be observed when both the bow and the stern start climbing out of the water a few hundreds after the contact of the blade with the water at the catch. And they start to dip back down into the water a few hundreds before or the blade exits the water completely. With less skilled athletes the bow and stern may come out of the water much later during the surge or start going back in before the pull phase is over. In some cases, we can even observe a boat rhythm completely opposite to the positive one – when the boat sits high during the air phase and deep in the water during the pull (see BLR K1 in the London OG final K1 1000m).

The Pitch and Heave

Are both connected with the boat rhythm and some degree of each is inevitable. Too much of both is inefficient and an absolutely smooth running boat is also usually not a good sign (can be a sign of low inertia of the system etc.).

Often we see a higher degree of both at lower speeds and less of both at high speeds. It is important for the coach and athlete to try to understand why this happens. Consequently, they can decide whether to optimize these phenomena only at race speeds or at all speeds. In some cases, the athlete's movements provoking these boat movements change with the race pace technique. In others, they are always there but covered by the high stroke rate.

Usually, pitch and heave movements are a consequence of head and body jerking motions during the stroke and of the legwork (see the appropriate use of the footplate and the pullbar, kicking versus pressing etc.).

Inevitably the surge, the pitch and the heave boat movements need to **merge into dolphin-like movement** (or a low amplitude sinusoidal wave). When they sync together with the stroke rate, the body forward movements (body thrusts and swing, legwork) and the speed of the boat the 'dolphin' like movement becomes smooth and to the trained eye somehow 'logical'.

The Yaw and the Sway

The Yaw and the Sway are mostly consequences of:

- Minimal, but always present lateral translation of the body mass of the paddler that happens during the setup phase
- Alignment of the body in the boat before, during and after the rotation/pull phase
- Direction of the pull in the water

To better observe these two movements we need a video shot from above or a viewpoint on a bridge with the athlete passing under.

There is some bow yaw that is always present especially at the start. The best athletes manage to exploit it in order to keep the equilibrium of the masses and inertias present in the boat.

On the other side, there can be more or less yaw on the stern side too. This is what we try to avoid and if measured can easily reach an amplitude of 20cm or more. You can observe this phenomenon very clearly if you hold the bow of the boat and ask the athlete to paddle on the spot with the boat fixed from the front. There will be quite a lot of stern yaw and sway, but the athletes will be able to quickly manage it better if you explain them to:

- Manage better the final part of the stroke (the part after the hips, shortening it a bit helps)
- Manage better the [Radius 2](#) (R2 is the increasing horizontal distance of the shaft from the boat during the pull phase; the R2 should be always increasing). Some athletes tend to decrease the R2 in the last part of the stroke and come closer to the boat just before exiting; this last move of the blade approaching the boat can result in stern yaw and sway.

Heavier athletes often use bigger sized rudders especially in K1 in order to minimize sway and stern yaw (even at the cost of some additional drag from a bigger rudder).

The Roll

The roll of the boat is mostly dependent from hip movement, legwork and the paddler ability to transform efficiently the [translational movements into body rotation](#). Incorrect transformation of leg and hip movement into the athlete's body rotation usually results in excessive boat roll or in a 'break' of the alignment of the spine in the frontal plane (side folding).

For more info about boat movement and meta-technique in general, please refer to the book: [Complements to the base technique in Canoe Kayak: Methods of Evaluation](#) (Author: Andrea Pace; Languages: English & Italian; Published: 2017, [download here](#))

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