ROWING CANADA AVIRON

CANADIAN ROWING MODEL TECHNIQUE BASED ON BIOMECHANICAL PRINCIPLES

Programme national de certification des entraîneurs

National Coaching Certification Program

ROWING CANADA AVIRON

ACKNOWLEDGEMENTS

Rowing Canada Aviron would like to thank the original authors and contributors to the Canadian Rowing Model Technique. This document has been refined over the years thanks to the expertise and passion of rowing experts from the Canadian rowing community. Thanks to Chuck McDiarmid, Paul Beedling and Kate Gorsline for reviewing and providing feedback on this project.

2011 - Original Document
Peter Cookson
Al Morrow
Volker Nolte
Mike Spracklen

2017 - Sculling Additions
Roger Meager
Terry Paul

2020 - Technical Updates
Maksym Kepskyy
Mike Pearce
Mike Purcer
Volker Nolte

1. INTRODUCTION

The following Canadian Rowing Model Technique was developed to help Canadian coaches create a unified understanding of good rowing technique and use common language and terms to communicate with their athletes. This model is a detailed description of key technique elements required for effective rowing and how to achieve these movements. It is hoped this will lead to increased consistency and improved quality of technical instruction across the country.

In order to row and scull with technical proficiency, coaches and athletes need to respect the application of biomechanical principles. A rower's or crew's "style" is a reflection of the nuanced interpretation of proper technique. Regardless of the style achieved, it is important to understand and apply biomechanical principles in the quest to improve performance.

COACH'S PERSPECTIVE

Mike Pearce (UBC Head Coach):
The following Canadian Rowing Model Technique is an excellent practical tool that I use as a touchstone to help improve the technical development of my athletes. For me developing good technique is as much a creative process as it is scientific. When you are coaching, you need to use a wide variety of approaches and communication methods to get athletes to learn and acquire a particular aspect of technique but you need to be very specific as to what you are aiming to improve. I use these principles to help develop and refine my delivery of technical feedback and test that this feedback fits with the science of fast and effective rowing.

2. GENERAL OVERVIEW OF THE ROWING STROKE

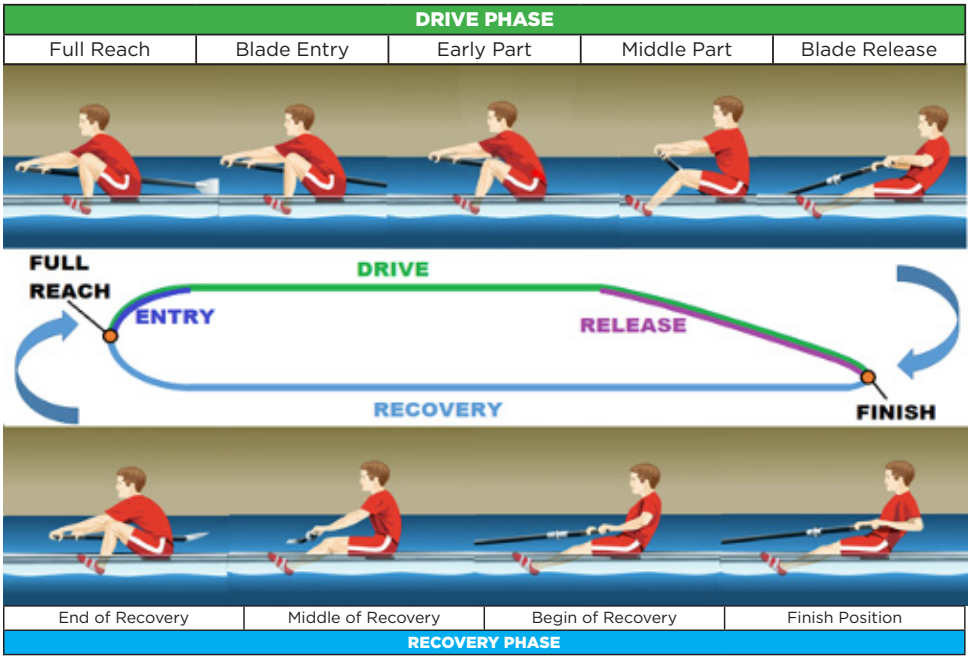
Good sweep or sculling technique consists of three main components:

1. The Drive Phase; when the boat is being propelled by the actions of the rowers. The Drive Phase starts at the Full Reach position and ends at the Finish Position.
2. The Recovery Phase: when the overall system is moving without a propulsive force from the rowers. This phase starts at the Finish position and ends at the Full Reach position; and
3. The Transition Phases of the stroke: the entry of the blade into the water at the beginning of the Drive Phase (Blade Entry) and the release of the blade from the water at the end of the Drive Phase (Blade Release).

The three elements of the stroke are characterized by consistent blade work throughout the entire stroke cycle:

- The blade is at the correct depth during the drive;
- The blade is at the correct height off the water during the recovery;
- The blade enters and exits from the water cleanly and smoothly.

While the stroke can be analyzed in different phases and transitions, the stroke is a continuous, fluid movement. The boat, rowers and oars are constantly in motion with varying speeds at different parts of the stroke. Each of these movements has an impact on the boat's speed and control of these movements minimizes potential speed losses. The Drive Phase, Recovery Phase, the Blade Entry and Blade Release are the essence of sweep and sculling technique. The stroke is a sequenced movement that links all phases together.



2. GENERAL OVERVIEW OF THE ROWING STROKE

In the Drive Phase, the legs initiate the movement upon the Blade Entry and generate the power as the trunk and arms are stable, transferring the leg force to the oarhandle. As the seat reaches half-slide and the knee joint passes 90 degrees, the trunk begins to open and work with the legs through the middle part of the drive. The legs extend and support the trunk movement while the arms initiate and continue the drive by pulling the oarhandle to the body. The arms complete the drive alone, maintaining the blade depth as long as possible until the point of extraction of the blade from the water during the release.

In the Recovery Phase, the hands move away from the body as the trunk pivots forward and the legs follow closely thereafter. As the hands pass the knees, the trunk moves through the perpendicular and the legs are drawing the footstretcher towards the seat. In the final part of the recovery the arms are straight and the trunk is at maximum forward angle as the athlete moves on the slide and into the full reach position.

The rowing stroke is characterized by good posture throughout the stroke cycle. The rower sits with their lower back kept strong, the spine at a neutral bend, and shoulders and upper back relaxed.

Another fundamental element of proper sweep and sculling technique is good blade work. The blade must enter and exit the water with as little disruption to the speed of the boat as possible. During the **Drive Phase**, the blade must be buried to the proper depth so that it propels the boat horizontally. Proper blade depth is when the blade is fully covered with the top edge of the blade just below the water surface, and not allowing water to come up the shaft more than about 30 – 40 cm. A good way to check this is to put a piece of tape on the shaft at approximately 30 - 40 cm from where the shaft joins the blade depending on the blade type and oar length being used. During the **Recovery Phase**, the blade must be carried clear of the water so that the blade does not touch the water surface. To achieve this, the oar balances in the oarlock, moving in a smooth horizontal direction which helps the boat run without the blades touching the water and minimizing disruption. The athlete will achieve balance of the boat and this will be felt through the footstretcher, seat and handle throughout the recovery.

The ultimate goal of sweep and sculling with proper technique is to ensure that the athlete/crew propel the boat as fast as possible. Coupled with the appropriate level of training, this combination will bring success to the athlete.

3. DETAILED DESCRIPTION OF THE ROWING STROKE

The following is a more detailed description of a correct rowing stroke. The phases are specifically analyzed using a visual representation with the main characteristics highlighted. The description of the stroke will start at Full Reach and work through one complete stroke cycle.

3.1. DRIVE PHASE

During this phase the athlete will move from the Full Reach position to the Finish Position. This phase includes the transition phases of Blade Entry and Blade Release. The goal of the Drive Phase is to effectively maximize the overall system (rower, boat and oars) velocity using the propulsive force applied to the blade in the water. The force is created by the rower pushing on the footstretcher and pulling on the handle while working the strongest and biggest muscles first through a sequence that finishes with the smallest muscles.

3.1.1. THE BLADE ENTRY

The Blade Entry is the first part of the Drive Phase. The blade moves from the Full Reach position into the water until it is completely covered and finds initial resistance in the water. The precision of the Blade Entry is critical to allow the blade to generate the propulsive force to accelerate the boat through the most critical part of the Drive Phase. While the speed of the overall system is determined by the force generated over the complete Drive Phase, without the blade finding solid connection to the water, the ideal drive cannot be accomplished.

The Blade Entry is improved by accurate timing and proper sequencing of the movements of oar handle and seat. Maintaining flow of movement coming out of the recovery is important in this transition phase to achieve quick power application.

The Blade Entry is performed correctly, if the blades cause a small “V-splash” and make a distinct tone during their immersion into the water.

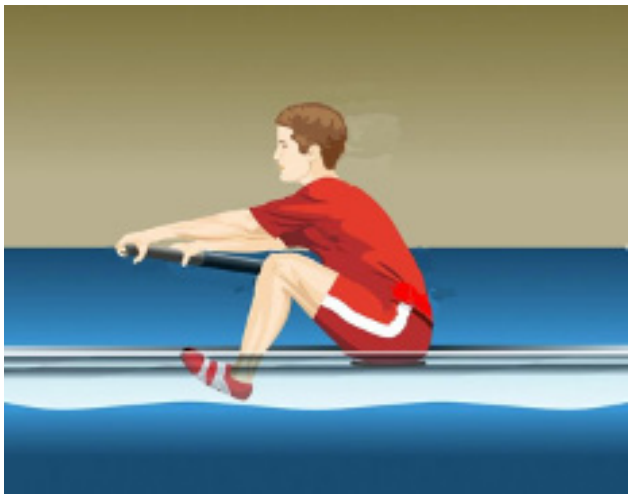
3. DETAILED DESCRIPTION OF THE ROWING STROKE

Characteristics of the Blade Entry Phase:

- The Blade Entry starts at Full Reach and is a quick and well-coordinated motion of legs, arms and hands;
- The hands rise quickly but smoothly to control the path of the blade and achieve proper blade depth in the water;
- At the same time the rower begins a properly timed and coordinated horizontal hand/seat movement. The legs push strong through the balls of the feet on the footstretcher that provide the impetus for the blade to move quickly enough to find resistance in the water;
- The angle of the trunk is maintained and arms held straight with hands hanging onto the oarhandle;
- The oarhandle and seat move together as the legs initiate the quick connection of the blade in the water;
- The back is in a neutral and braced position, supported with good activation of the core;
- The trunk angle is forward with the shoulders ahead of hips.

3.1.2. EARLY DRIVE PHASE

The Drive Phase begins with an immediate push with the legs. The feet push firmly against the stretcher in coordination with the blade finding full force in the water. The blade now covered, moves on a horizontal path through the water to generate the force that propels the overall system. As the legs drive, the back and arms hold firm transferring the rower's power to the oar. The rower at this point feels suspended between the footstretcher and the handle and feels a subsequent sensation of lightness on the seat without ever losing contact. The shoulders are relaxed and the arms fully extended towards the handle as the legs push off the footstretcher.



Characteristics of the Early Drive Phase:

- Drive starts with a strong push on the footstretcher by the legs;
- Torso holds firm - good posture throughout the Drive Phase;
- Arms are straight and shoulder girdle stretched;
- Head is moving mainly in a horizontal direction;
- The blade is buried with the top of the blade just below the water surface.

3.1.3. MIDDLE DRIVE PHASE (LEG FOCUS)

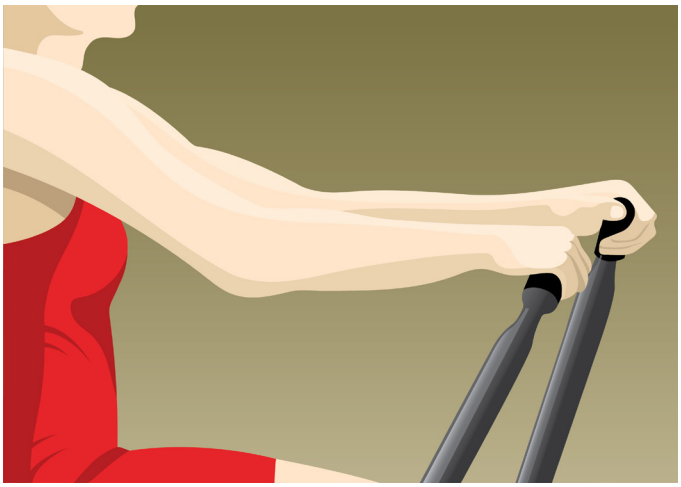
After the Early Drive Phase, where the emphasis is on the legs to generate pressure on the balls of the feet, in the Middle Drive Phase the rower needs to maintain patience to feel the work of the legs. The arms are still straight as the trunk holds the power of the legs to the footstretcher to feel the bend in the oar. This phase is the most efficient part of the drive and the rower is using their strongest muscles. The handle and blade force reach their peak which underlines the importance of this phase.

Characteristics of the Middle Drive Phase (Leg Focus):

- Legs are fully engaged;
- The trunk position is set and is holding with a strong core;
- Arms are straight and connected to the handle;
- The rower achieves the connection between the handle and the footstretcher to produce a strong “hang” resulting in a very efficient acceleration to the boat;
- The blade is buried so that the top of the blade is just below the water surface.

3.1.4. MIDDLE DRIVE PHASE (LAYERING THE PULL ON THE PUSH)

The legs continue to push strongly on the stretcher and the trunk starts to pry open. The arms beginning to engage and draw the handle so that all three major muscle groups (legs, trunk, and arms) are working together to maximize the speed of the handle through the Middle Drive Phase. The oar handle velocity reaches its peak when perpendicular to the boat and the rower must maintain a strong draw on a horizontal plane to the chest.



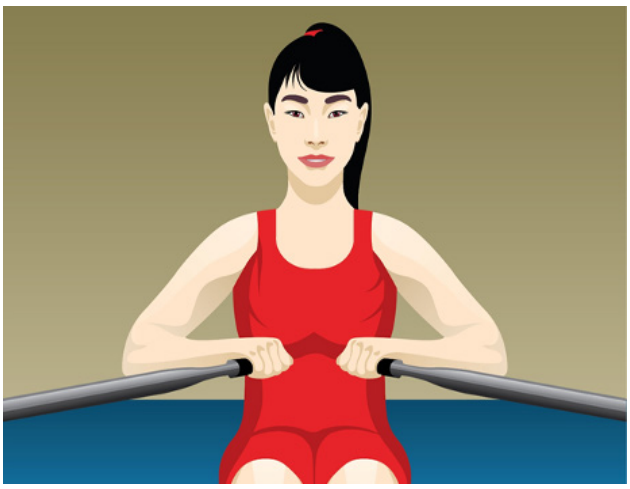
Characteristics of the Middle Drive Phase (Layering the Pull on the Push):

- The legs push strongly, the trunk continues to pry open and the arms begin to draw the handle towards the body;
- Legs almost reach their full extension;
- Handle velocity reaches its peak, so that the rower needs to continue with a strong and precise draw;
- The hands draw towards the base of the breastbone (sternum)

3.1.5. FINISH DRIVE PHASE

When the blade is held at its correct depth through the stroke, a cavity is formed from which it can be extracted cleanly from the water, provided it is kept open with pressure on the blade. In sweep rowing, that pressure is maintained by drawing specifically with the outside arm as it has the most leverage. The inside hand is used to eventually turn the blade onto the feather.

The legs are fully extended and the feet are maintaining a solid connection to the footstretcher. In sweep and sculling the lower back is kept firm as the arms pull the oar handle strongly towards the Finish Position. The hands pull towards the lower part of the chest.



Characteristics of the Finish Drive Phase:

- The legs are extended, providing support through the footstretcher and allowing the arms to complete the stroke;
- The lower back and core provide a firm support for the arms to draw the handle towards the Finish Position;
- The arms maintain a strong horizontal draw to the chest.

3.1.6. THE BLADE RELEASE

The blade is released cleanly from the water at the end of the Drive Phase allowing the boat to run freely between strokes.

A blade that hits water or drags out and along the surface creates resistance that slows the whole system down thus negating some of the work that has been done through the Drive Phase.

A blade too close to the surface of the water also reduces freedom for the movement of the boat which can cause tension and problems with balance.

A good Blade Release leaves a solid puddle in the water that is denoted with clean foam free edges.

Characteristics of the Blade Release:

- The outside hand continues a solid pull and thus maintains pressure on the blade to end the drive;
- The fingers and wrists control the handle to ensure a clean release of the blade from the water just before the handles reach the body;
- Just before the hands complete the movement at the end of the drive, the handle is still moving towards the body while the blade is being extracted from the water. The focus is on horizontal movement, aiming for a clean extraction and stepping away from the puddle;
- While working to maintain the elbow position, the inside hand for sweep rowing turns the blade onto the feather;
- The feathering in sculling is performed mostly by the fingers with minimal wrist movement.

3.2. FINISH POSITION

The Finish Position marks the end of the Drive Phase. The arms have completed the handle movement. The oars are at the maximum finish angle where the handles are closest to the bow. The blade is out of the water, completely feathered and the rower is ready to begin the Recovery Phase.

At the Finish Position, the feet are flat on the footstretcher connecting the rower solidly to the boat. The legs are straightened.

At the Finish Position, the weight of a rower is fully transferred onto the seat.

Characteristics of the Finish Position:

- It is the point when the handle is closest to the bow of the boat while the trunk is at the initial phase of the return from the bow to the stern;
- It is both the end of the Drive Phase (Release Phase) and the beginning of the Recovery Phase;
- Legs are straightened and connected to the core;
- Trunk position is supported with good posture;
- Shoulders are back providing proper support to the arms to continue with the movement;
- Elbows are drawn through the trunk;
- Forearms are near parallel to the water surface with hands and oar handle at the body.

3.3. RECOVERY PHASE

The aim of the Recovery Phase is to return the athlete to the Full Reach position for the next Drive Phase with maximum efficiency of boat movement. During this phase the athletes pull the footstretcher towards their seat while pivoting the trunk forward from the hips and extending their arms into the Full Reach position. Throughout the recovery the rowers take care to maintain linear movements of the shoulders and the head.

3.3.1. BEGINNING RECOVERY PHASE

The Recovery Phase begins with the feet pulling on the footstretcher that supports the initiation of the trunk swing forward. At the same time the hands start moving away from the body. Following the initiation of the trunk and hand movement (the trunk swing must initiate from the hips with movement that maintains a neutral spine avoiding flexion at the lumbar/sacral joint) the legs begin to pull the footstretcher towards the seat. The arms extend, trunk swings and legs contract simultaneously. These movements of the body parts, generate a force on the footstretcher that accelerates the rower's center of mass towards the stern as the boat accelerates beneath them. This acceleration at race rates is so strong that the boat increases its speed in the water.

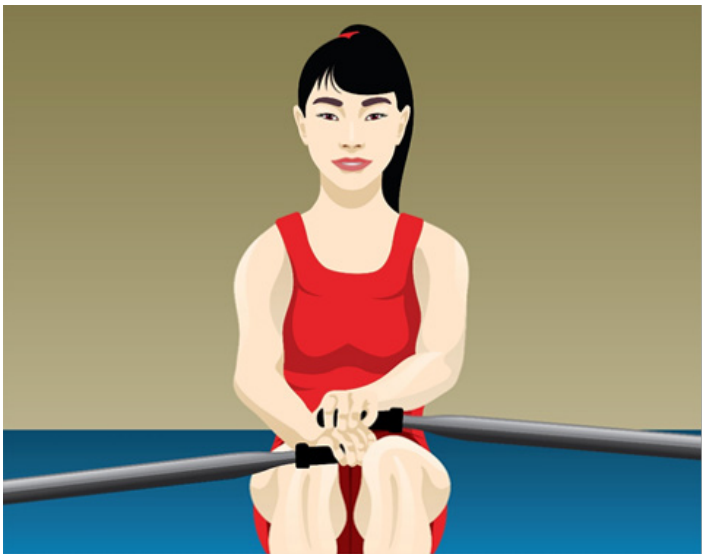
The oarhandle is carried at a height off the gunwales to allow the shaft of the oar to be almost parallel to the water and the blade well above the surface.

Characteristics of the Beginning Recovery Phase:

- The lower back is in a neutral position with good posture (not slumped);
- Since the elbows are still up, there is a light press on the handle with the hands to carry the blades above the water surface;
- The arms begin to move the hands away from the body;
- The legs engage a solid connection with the footstretcher and initiate the trunk pivot forward from the hip;
- The legs begin to move the seat as the trunk swings and arms move the hands away from the body. These movements are simultaneous and transition the athlete's center of mass towards the Full Reach;
- These movements are more deliberate at low stroke rates and become faster at race stroke rates;
- Proper sequencing and speed of movements are critical for a successful recovery.

3.3.2. THE MIDDLE RECOVERY PHASE

As the seat moves forward, the knees are rising and the trunk continues to pivot towards the Full Reach angle. These movements are completed before arriving at the forward position on the slide. The rower focuses on distributing even weight on the seat finding stability and using the proper oar handle height to support balance of the boat. Stability allows the rowers to relax and feel the boat moving beneath them and prepare for the next drive.



Characteristics of the Middle Recovery Phase:

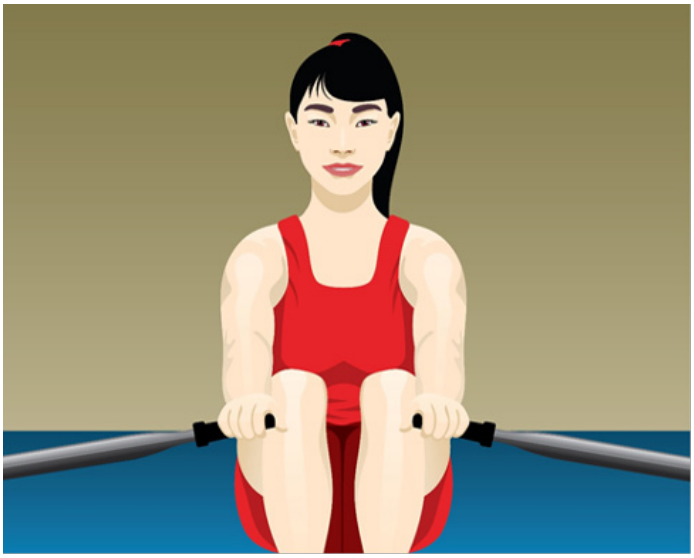
- The speed of the movement relates to the stroke rate and the speed of the boat;
- Arm extension, trunk rotation and knee bending continues with the required speed of the motion depending on the stroke rate;
- The body is stretching forward towards the Full Reach position of the stroke;
- The boat is balanced with blades off the water;
- The movement of the seat is controlled depending on stroke rate;
- The boat is gliding uninhibited beneath the rower.

3.3.3. THE END RECOVERY PHASE – APPROACHING THE FULL REACH POSITION

As the sweep rower prepares for the next stroke, the inside hand squares the blade as both hands rise to bring the blade down close to the water surface. This helps to increase the amount of length gained upon entering the water. The shoulders are relaxed and the arms are at full extension as the sweep rower's body reaches between the knees for a long stroke. The upper body follows the rotation of the oar handle with the inside shoulder slightly lower.

The same principles apply to the sculler and the squaring is performed mostly by the fingers with minimal wrist movement. Moving towards the Full Reach position the rower starts to increase the pressure on the footstretcher to prepare for the transition to the next stroke in a quick and well-timed movement. In this very last part of the recovery, the rower exhibits good posture and good length by reaching between the knees (sweep) or with trunk compressed on thighs (sculling) to be in a strong position from which to apply power. Shins reach a maximally vertical position.

The arms are straight and the trunk achieves the forward angle before the rower reaches the front of the slide. In the final part of the recovery the arms lift from the shoulders and the wrists rotate the oarhandle to square the blade. The rower achieves Full Reach as legs move the fully extended arms and trunk while simultaneously lifting the oarhandle. The completion of the Recovery Phase occurs when the athlete achieves the Full Reach position.



Characteristics approaching the End of the Recovery Phase:

- The trunk is fully prepared with a neutral back position;
- The head remains level with the neck and shoulders relaxed;
- The rower gathers for a quick change of direction;
- The blade is squared and close to the water surface.

3.4. THE FULL REACH POSITION

The Full Reach position is the moment when the rower reaches the closest position to the stern and the oar is at its maximum horizontal angle. The rower's legs are fully compressed in the Full Reach position connecting only with the balls of the feet to the footstretcher, exerting solid pressure to initiate the Entry Phase of the stroke. The trunk is in a forward position and arms are straightened to extend the oar handle to maximum reach.

Characteristics of the Full Reach Position:

- The rower is closest to the stern of the boat;
- It is both the end of the Recovery Phase and the beginning of the Drive Phase;
- Legs are fully compressed with shins perpendicular;
- Trunk is reaching forward with good posture (neutral spine and solid core);
- Shoulders are level and turned towards the oarhandle (sweep) to allow straight outstretched arms;
- The wrists are flat and the oarhandle is held by the fingers of the outside hand;
- The head is up and looking forward;
- The lower edge of the blade is close to the water.

4. CONCLUSION

The Canadian Rowing Model Technique provides coaches and athletes a common description of the movements to enhance consistency in Canadian rowing. Through this standardization of technique based on biomechanical and hydrodynamic principles, Canadian athletes will maximize performance and reduce injury. Rowing Canada Aviron promotes this model in the National Coaching Certification Program (NCCP) to enhance rowing across the country and to promote consistency to allow athletes to come together, with minimal adaptation required to improve performance in Canadian crews.

The Canadian Rowing Model Technique is a knowledge guide and a source of information to improve rowing technical skills. Knowing and, most importantly, understanding the technique for coaches and the athletes in the same way will help to organize the learning sequence and categorize all these factors to be able to define specific goals throughout the athletes' development pathway.