

For the safety diving.

- Equalization ears.  
Ears are equalized in the same way as for regular diving. However, the speed will cause water pressure changes faster. Therefore, ears must be equalized faster and more frequently than usual.  
As the diver's face is often turned upward when in a riding position, it is best to draw the chin back when equalizing the ears in order make the auditory canal open up more easily.
- Buoyancy adjustment.  
Because the diver's hands are freed up during hands-free riding, the diver is able to operate the inflator and exhaust valve as the diver normally would. Because the body is horizontal when riding the scooter, its position can be kept stable by discharging air using the exhaust valves located at the shoulders or hips.
- Using fins as a stabilizer.  
During hands-free riding, fins are used as stabilizers.  
The diver should try to keep the fins positioned near the center of the propeller cover during regular or high-speed runs, keeping fins even with the propeller shaft of the scooter. The water current created by the propeller will hit the fins. This will help counter the force that pushes the scooter to rotate in a counterclockwise direction (rotation torque). When running at a slow speed, the upper body will lift slightly, causing the knees to lightly bend. In this case, the diver must try to keep the fins horizontal to the propulsion direction, so that, here too, they can act as a stabilizer.

**⚠ DANGER**

- Never scuba dive alone. Always dive under the buddy system. Diving alone could lead to serious injury and death.
- Due to the speed of the scooter depth & pressure change may happen faster than usual.  
The diver must be aware at all times with regards the status of the diver's depth and direction and carefully monitor the diver's ascent rate as rapid surfacing and collisions could cause serious injury or death.  
Please practice driving at low speed until you become accustomed to the handling of the scooter.
- There are screen on the propeller cover for preventing from entangling wire and seaweeds.  
However, do not dive with the scooter at the seaweed area.

Characteristics of the apollo underwater scooter

■ Speed control

The apollo underwater scooters are a multipurpose underwater scooter equipped with an innovative "accelerator-based gear-less drive mechanism". (except av-2CLASSIC)

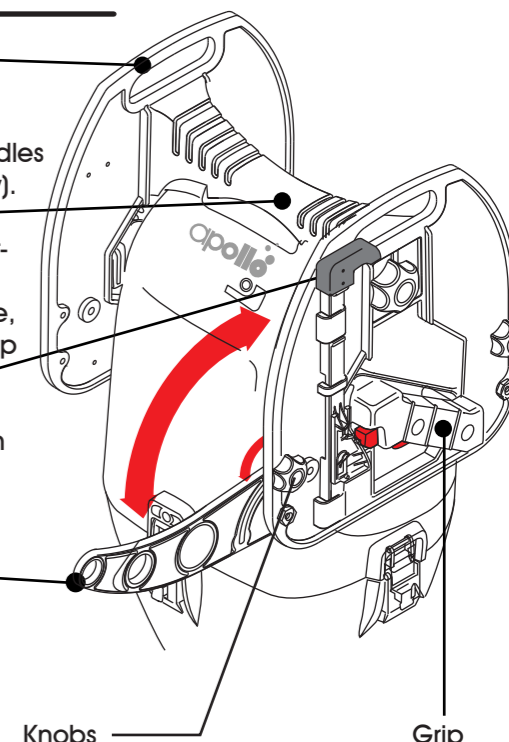
- Shifting gears while running.  
On former underwater scooters, the gears could only be shifted by manually changing the pitch of the propeller while the scooter was in a stationary position.  
Having to stop each time to change the speed was difficult and inconvenient.
- To overcome this problem, the apollo underwater scooter is now equipped with a mechanism that changes the revolution speed of the motor. Now the gears can be shifted while running, eliminating the need to stop each time.  
The mechanism that changes the motor's revolution speed has made "gear-less" speed change possible.  
Speed is no longer changed in phases by manual adjustment of the propellers pitch.
- Propeller pitch conversion mechanism.  
The apollo underwater scooter is also equipped with a propeller pitch conversion mechanism.  
Please refer to the pitch selection on page 17.

NOTE

In this book, it utilizes only the av-2EVOLUTION diagram as an example.  
Basic operation for another apollo underwater scooters are same as the av-2EVOLUTION.

■ Scooter saddle

- Handle  
The Grips on either side of your scooter can be used for take off, stopping and turns. The Grips should NOT be used for carrying the scooter on land. To carry vehicle on land, grasp both saddle handles or with one hand grasp handle bar of Single Hand Unit (see below).
- Saddle  
To minimize underwater resistance and to allow for effortless underwater maneuvering, the scooter is designed to be steered hands-free. In doing so, the saddle helps to hold the diver in place, and allows the diver to steer the scooter freely. Even relatively sharp turns are made possible when riding hands free.
- Accelerator lever  
The accelerator lever functions are same way as the gas pedal on an automobile.  
The revolution speed goes up when pushed up, and goes down as the lever returns to its original position.
- Wing arms  
Wing arms are used on the scooter for triple (refer to page 33) (three-person) rides.  
The grips are used to pull the two guest divers. By attaching a karabiner onto the hole in the wing arms, they can also be used to carry underwater equipment.  
→ To loosen the knobs, the wing arms are pulled out.→

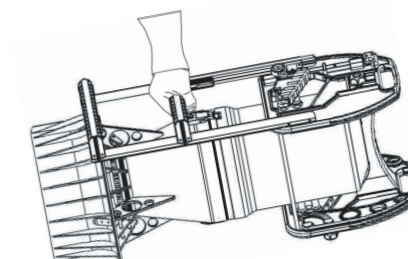
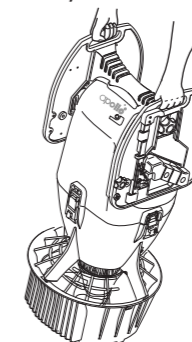


**⚠ WARNING**

- Do not carry the scooter with one hand when using saddle to transport vehicle on land.
- Verify that prop cover stay is firmly in place and single hand unit properly installed (p. 14) before attempting to lift vehicle by handle bar.

Grasp saddle handles with both hands and lift vehicle to carry on land.

Grasp center of handle bar with one hand and lift vehicle to carry on land.



■ Hands-free riding. (PATENTED)

Hands-free riding is a new riding style in which the diver uses one's body instead of one's hands to steer the scooter.  
This frees up the diver's hands. Different from past scooters that were steered using both hands, the diver steers the scooter using one's entire body. This greatly reduces the amount of physical strain put on the diver. It allows for "long-distance travel" and "extended diving time", enabling the diver to explore greater distances and diving environments that may have been impossible in the past.  
There are great benefits to being able to drive hands-free.  
Scooters that need to be steered by hand end up becoming like a piece of baggage itself underwater. Divers who thought, "Using a scooter keeps me from being able to carry anything else underwater", will now be free to take what ever they want on their dive.  
Because different items of underwater equipment can be attached to the scooter using the wing arms, the carrying capabilities are vastly improved.

- Long-distance travel is made possible.  
av-2 series can travel underwater distances of around 7,200 meters when a Li-ion battery is used.  
Since it takes over 110min to cover 7,200 meters when traveling nonstop, a diver can easily travel continuously over the time span of a regular single dive. For leisure diving, in which the diver uses the scooter only to travel between certain diving spots, it can easily run for two dives.

**⚠ CAUTION**

- Battery duration may vary depending on how it has been stored or used. Do not use a battery that is old or damaged on outside, as its power could suddenly drop, or it could have an extremely short running time.

# STEP 1

## 1. Positioning for hands-free riding

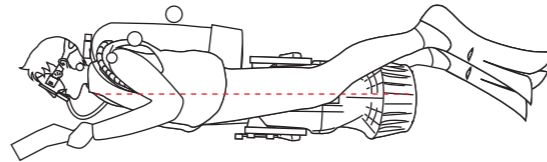
The diver positions the scooter between the legs so the scooter's propeller shaft and the axis of the diver's body are lined up.

As the scooter moves forward, the body will naturally be pushed from behind.

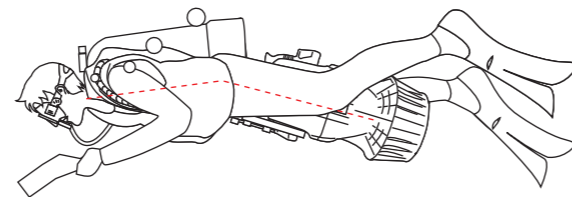
The diver does not need to grip or force oneself to sit on the scooter.

Just wait as the scooter will naturally push the body.

Good posture:  
Pushed by the scooter.



Bad posture:  
The diver and the scooter will not be able to move as one, which will throw the diver off balance and prevent a smooth takeoff.

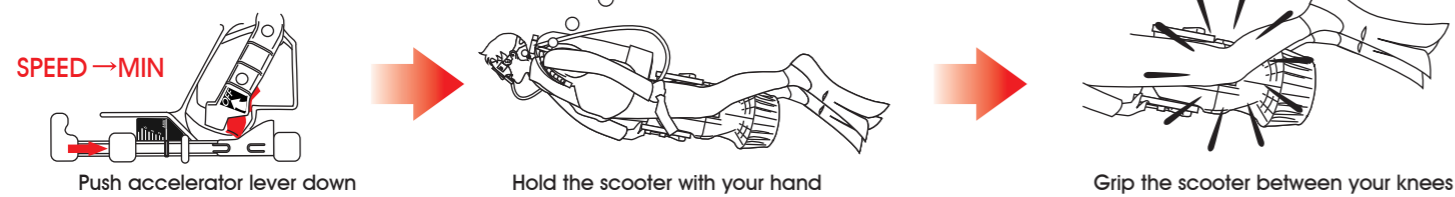


## 2. Stopping

The point to be cautious of when stopping is adjusting your balance when there is no longer any forward-moving force. Without momentum, the diver's body will become unsteady. You must adjust and attain your balance. If there is no place to land, you may need to adjust your buoyancy.

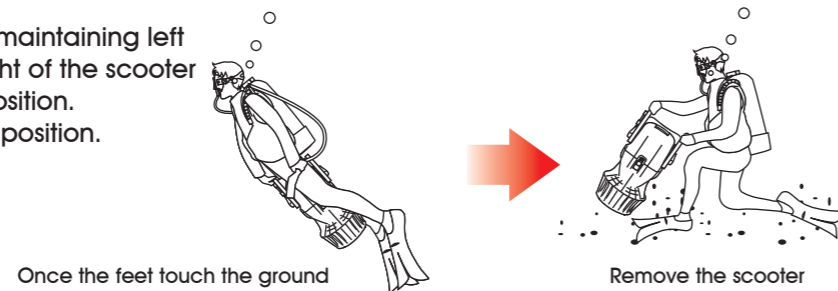
### ■ Landing

- ① Stop the propeller by lowering the accelerator lever.
- ② Using the same hand that moved the accelerator lever, take hold of the grip on the saddle unit. Hold the scooter with your hand and also grip it between your knees.



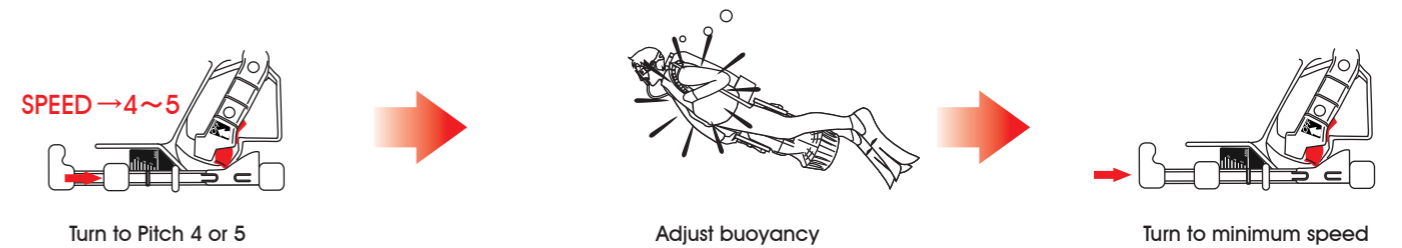
**⚠ WARNING**  
● In the case of dry suit diving, please pay attention of air volume in the suits. It is possible to blow the air from the suit or sudden surfacing. Please put the air in the suit shorter than usual for diving with the scooter.

- ③ After the scooter stops, and while maintaining left and right balance, allow the weight of the scooter to move the body to an upright position. Land on the ground in a standing position.



### ■ Moving to hovering mode.

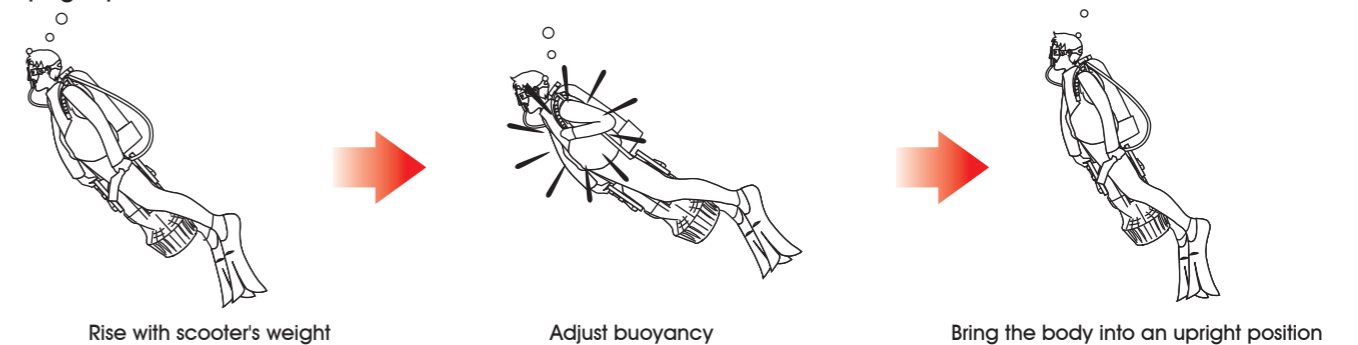
- ① Reduce speed by shifting the accelerator lever to the low-speed position.
- ② Once the speed is reduced and the weight of the scooter can be felt, adjust buoyancy.



- ③ Using the same hand that moved the accelerator lever, take hold of the grip on the saddle unit. Hold the scooter with your hand and also grip it between your knees.



- ④ After the scooter stops, maintain left and right balance and go into hovering mode. Do this by adjusting buoyancy once again while allowing the weight of the scooter to bring the body into an upright position.



Repeating steps 1 and 2 will reduce the amount of buoyancy shift that occurs at the point in which the scooter reaches a complete stop, making for easier maneuvering.

# STEP2

## 3. Take off

### ● Learning to be pushed by the scooter.

The key to successful takeoff is to learn to be pushed by the scooter. If the diver is too eager to move forward, the diver and the scooter will not be able to move as one, which will throw the diver off balance and prevent a smooth takeoff.

### ● Counter balancing the rotation torque.

Right after takeoff, the diver will feel the scooter rotate in a counterclockwise motion relative its forward movement. This is due to the rotation torque of the propeller. As a way of countering this movement, the diver can twist one's upper body to the right. Another simple technique is for the diver to imagine taking off in the direction of "11:00 (forward to the left)". This will naturally twist the diver's body to the right, which will reduce the effect of the rotation torque. Once a stable forward motion is achieved, the rotation torque will become weaker.

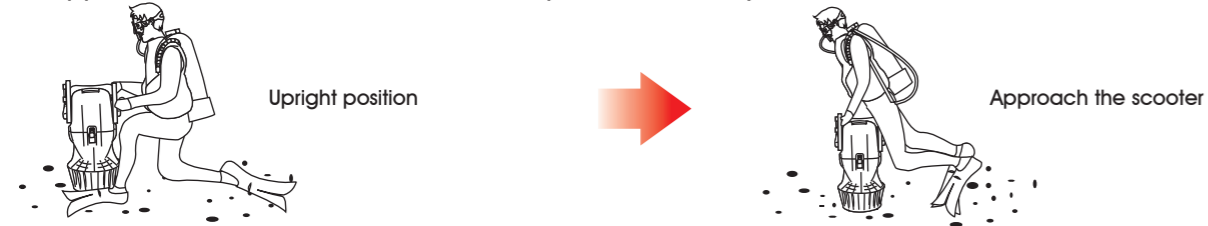
### ● Preventing sand disturbance.

The water current caused by the propeller is more far-reaching than one might imagine. At take off, the diver must be aware of what is behind the diver, so as not to hit other divers with a slipstream coming from the propeller. Taking off from a landing position will disturb the sand underneath. Kick to move slightly off the seabed and sufficiently tilt forward before turning on the propeller.

### ■ Taking off from a landing position.

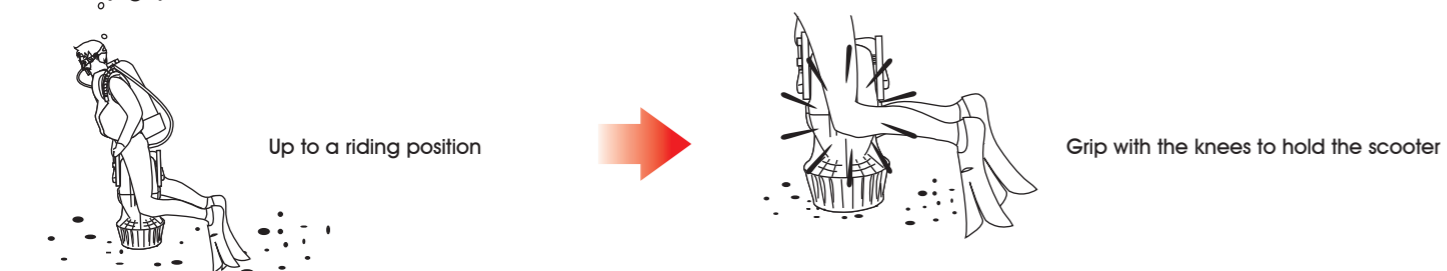
① Hold the scooter in an upright position on the seabed.

② Approach the scooter from behind, and position the body above the saddle of the accelerator unit.

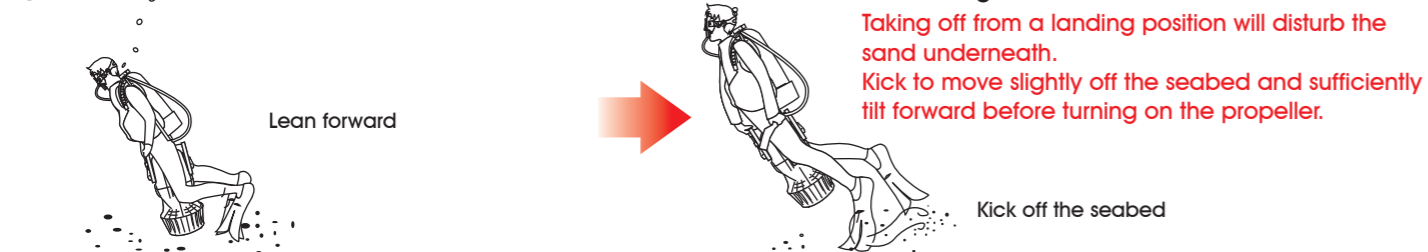


③ Pull the scooter up to a riding position by taking hold of the handle of the saddle unit.

④ Firmly grip with the knees to hold the scooter.



⑤ From there, lean forward, and kick off the seabed in order to avoid disturbing the sand.



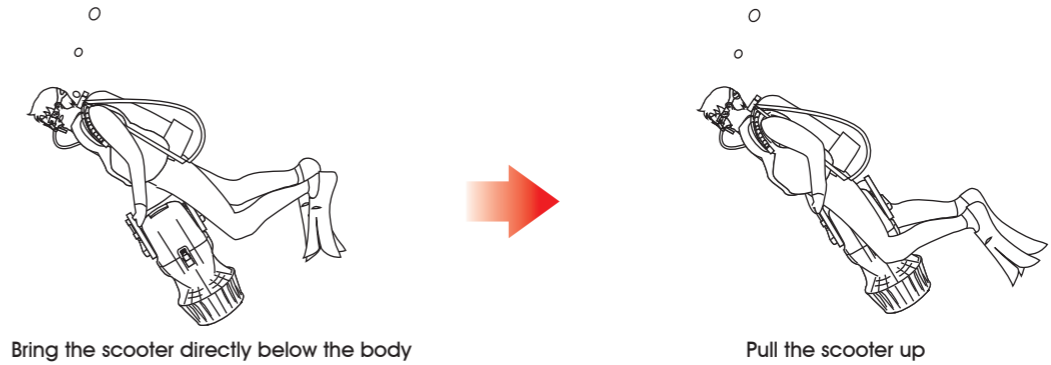
⑥ After moving away from the seabed with the entire body tilted forward to around a 45-degree angle, pull the accelerator lever for takeoff.



### ■ Taking off from a hovering position.

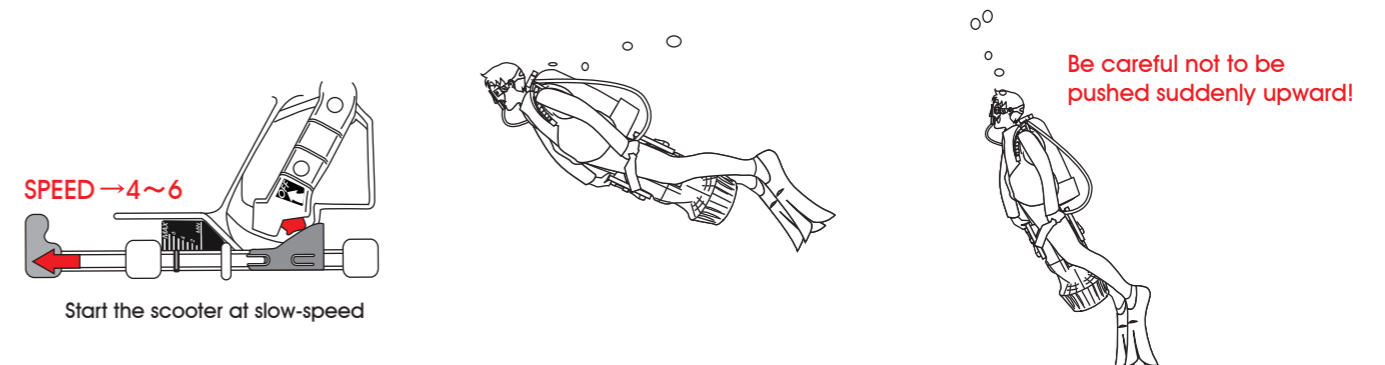
① Take hold of the accelerator unit and bring the scooter directly below the body.

② Pull the scooter up to a riding position.



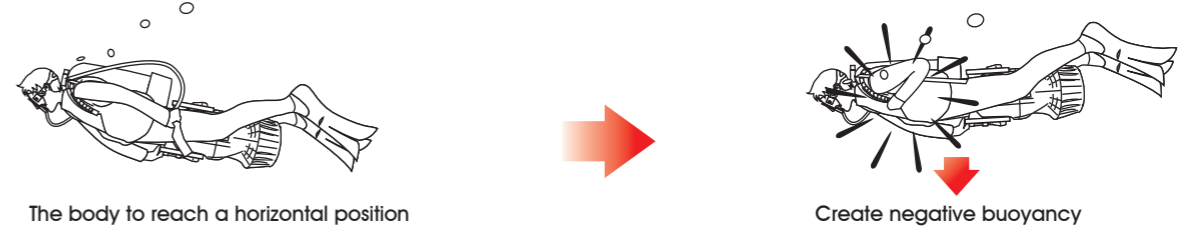
③ Start the scooter at slow-speed by pulling the accelerator lever slightly.

The scooter itself will move toward the body, eliminating any sense of instability. Be careful not to be pushed suddenly upward by the scooter.



④ While adjusting the body to reach a horizontal position, gradually build up speed and take off.

⑤ Once stabilized, the key is to make your buoyancy slightly negative, or to descend in the water to create negative buoyancy.



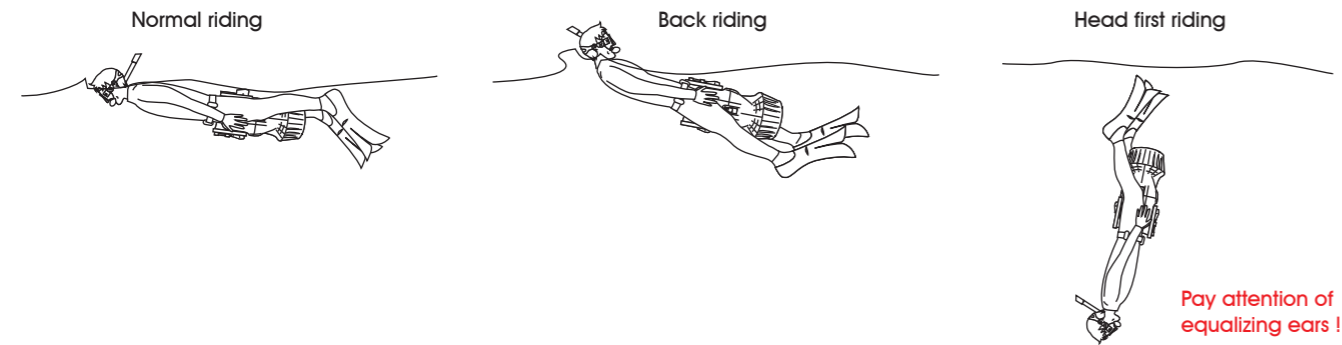


# STEP 3

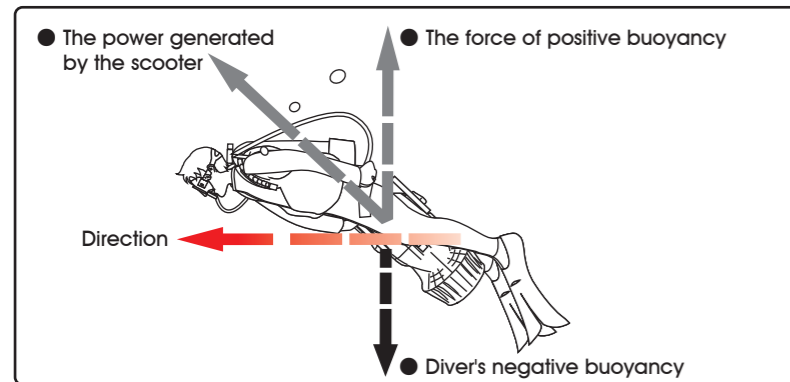
## Riding

### ■ Surface riding

Riding at the water's surface is also possible with the scooter. By wearing equipment designed for skin diving (mask, snorkel, and fins, and appropriate amount of weight on the hips), the diver can easily move around the water's surface.



### ■ Slow speed riding (propeller pitch = 2 or 3 ; accelerator position = 4 - 6)



When riding at slow-speed, it is necessary to adjust your buoyancy slightly using a buoyancy compensator (B.C.). In doing so, the diver's legs will sink due to the weight of the scooter, making the upper body rises up slightly. In order to balance out the upward force caused by the lowering of the scooter and the diver's negative buoyancy, the revolution speed of the propeller and the angle of the scooter must be adjusted.



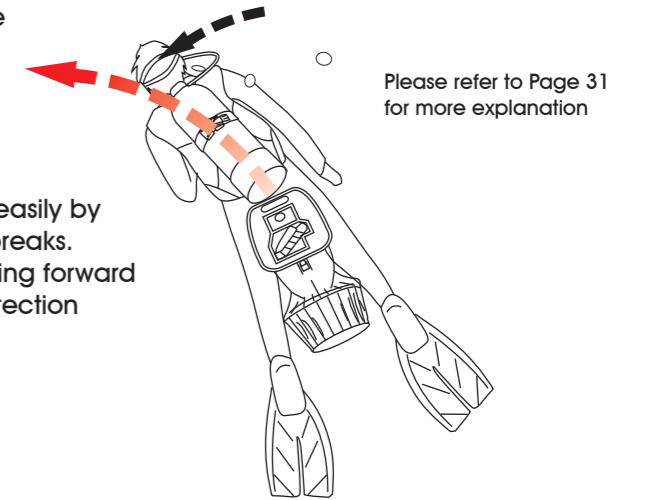
Making turns using the body to help steer is not as effective when riding at low-speed. To make a left or right turn, lean the upper body while in an up upright angle / position in the direction of the turn, and the scooter itself will begin to move in that direction.

### ■ Normal-speed riding (propeller pitch = 2 ; accelerator position = 6 - MAX)

There is increased stability in the forward motion when riding at a normal speed, and therefore, the scooter will not sink even when there is a certain level of negative buoyancy. Because the diver's entire body is being hit with an appropriate amount of water current, using the body as a rudder for steering and hands as breaks is very effective thus providing a high level of freedom in underwater movement.

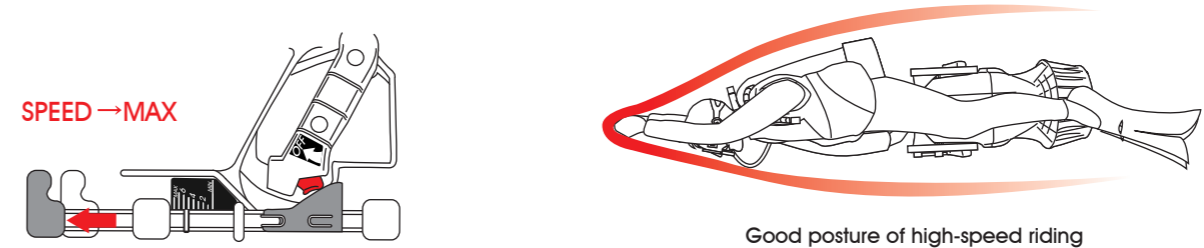
Therefore, when riding in an area where water depths vary, buoyancy that is perfectly neutral can actually prove to be a hindrance. However, in traveling long distances through water with constant depth, it is better to attain neutral buoyancy, since this will improve battery efficiency and make it easier for the diver to stay underwater.

Under normal speed, the diver can make left or right turns easily by using the body as a rudder for steering and the hands as breaks. The diver must try to maintain directional control while moving forward by bending your body at the waist towards the target or direction you intend to travel.



### ■ High-speed riding (propeller pitch = 1 or 2 ; accelerator position = MAX)

Similarly, in high-speed riding, having slightly negative buoyancy will make it easier to maintain control. Riding form is very important for high-speed riding. The diver should be aware of the surrounding water current, and keep the frontal body area as low profile as possible. Also, the diver should try to reduce drag and may obtain increased speed by holding one fist out in front of the body.



At high speed, the difference between Pitch 1 and Pitch 2 is very subtle. At Pitch 1, the maximum level of efficiency cannot be achieved unless the divers equipment is low profile and body posture is good.

The turning radius becomes larger at high speed, and therefore the diver must be careful of obstacles.

# STEP4

## Turning

Steering with your body. (Using your upper body as a rudder)

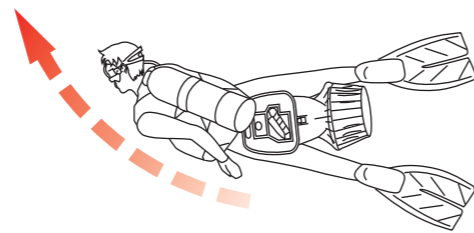
The diver's entire body, from the top of one's head to the tips of one's fins, is used as a rudder. It is especially effective to use the upper body, as you will be propelled in the direction to which your body is bent.

### ■ Open turn

The diver arches one's body back while thrusting one's chest forward.

The scooter will curve toward the diver's back in a large circular motion.

With open turns the diver feels safe because the diver is able to see where the diver is going while turning.

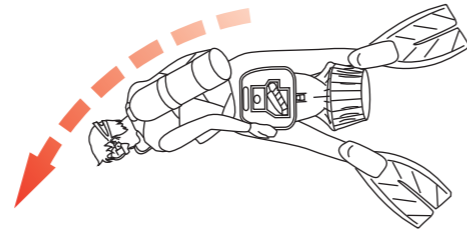


### ■ Closed turn

The diver bends forward at one's stomach. This allows for a sharp turn.

However, it is difficult for the diver to see where the diver is going, or judge the depth of water.

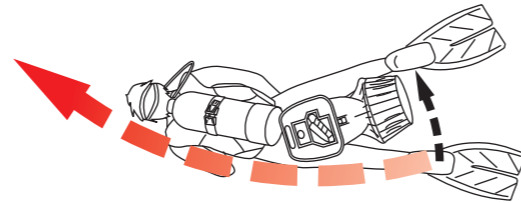
This turn is also used to go into a drift mode.



### ■ Compulsive turn

Turn with holding the grip and move the scooter by grip compulsively for adjustment of turn.

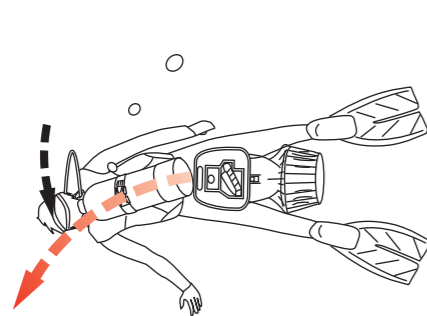
This way makes smoother like car driving during turn.



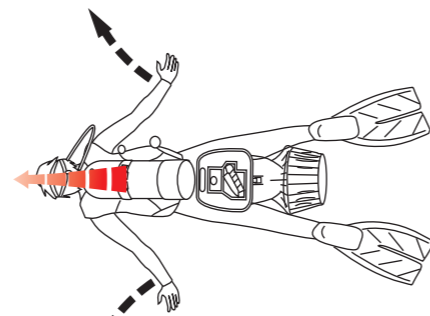
### ■ Hand brake

The diver creates resistance on either side of the diver by "holding the palm of a hand against the water current", or "holding an arm away from the body".

This will reduce the speed on the side that the resistance is created, causing the scooter to veer toward that direction. This technique is used to make slight adjustments in the direction to which the scooter is already moving.



Holding on arm away from the body

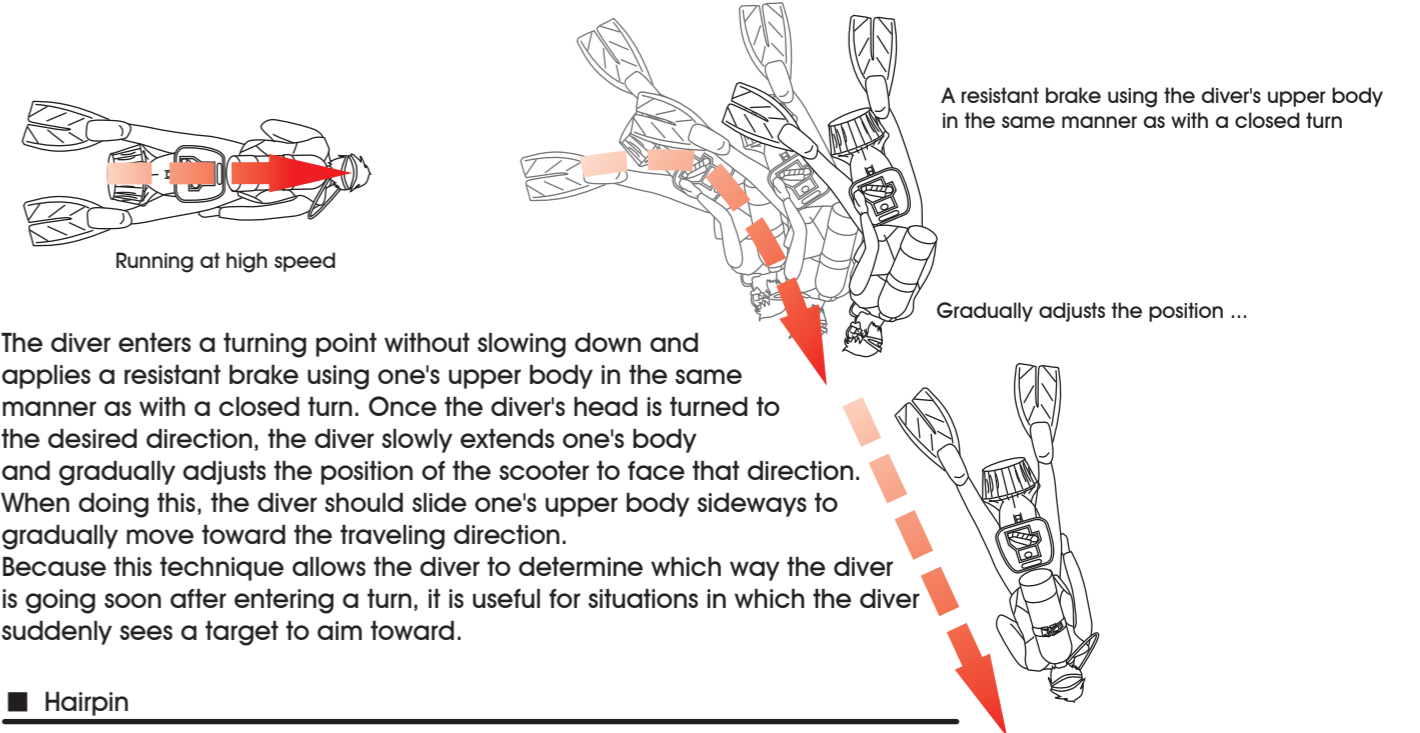


Open both arms for reduce the speed

# STEP5

## Advanced operations

### ■ Drifting



The diver enters a turning point without slowing down and applies a resistant brake using one's upper body in the same manner as with a closed turn. Once the diver's head is turned to the desired direction, the diver slowly extends one's body and gradually adjusts the position of the scooter to face that direction. When doing this, the diver should slide one's upper body sideways to gradually move toward the traveling direction. Because this technique allows the diver to determine which way the diver is going soon after entering a turn, it is useful for situations in which the diver suddenly sees a target to aim toward.

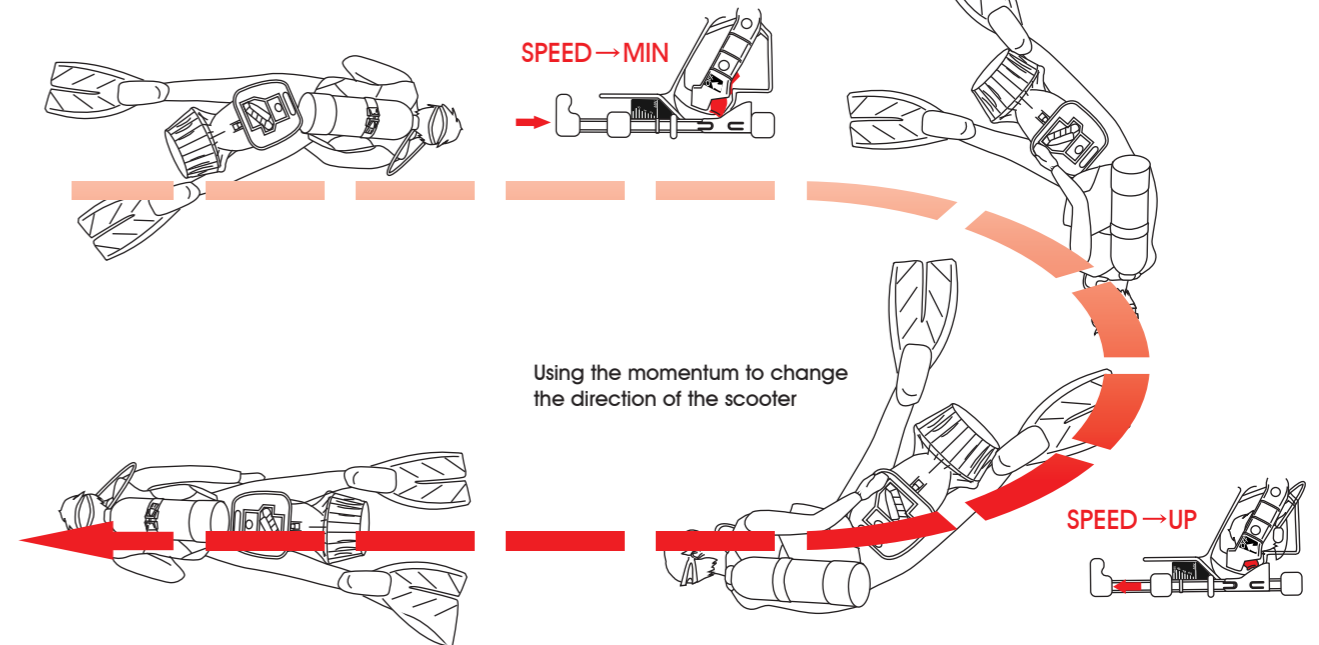
### ■ Hairpin

This is a technique in which the accelerator is briefly shut off before or during a turn, allowing the diver to drastically reduce the radius of a turn.

It is used when the diver needs to change directions on the spot, much like making a flip turn in swimming.

In the same manner as making a closed turn, the diver turns one's body at a slight angle and applies the brakes using upper body resistance.

Once the body begins turning, the accelerator is shut off, reducing the propulsive force of the scooter to zero for a time. While using the momentum to change the direction of the scooter, the diver shifts one's upper body to face the desired direction and then stretches one's body in that direction. After the scooter has changed directions, the diver switches the accelerator back on to start up again.



SPEED → MIN

Using the momentum to change the direction of the scooter

SPEED → UP

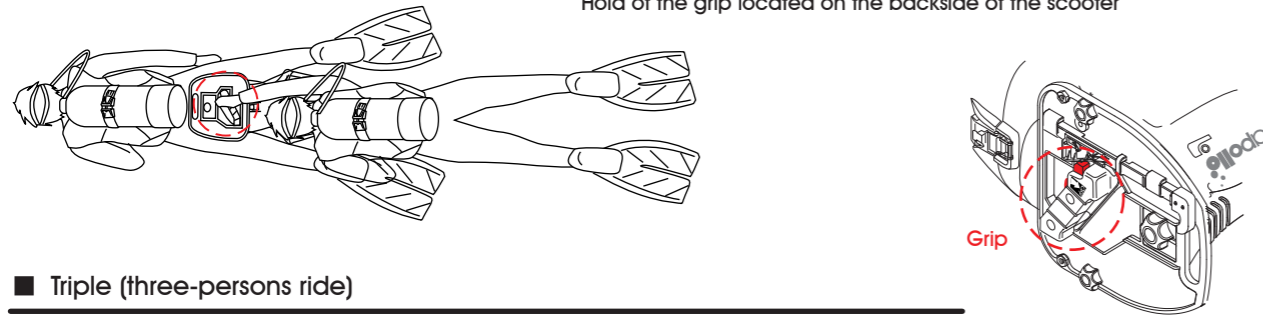
## STEP 6

### Advanced operations

#### ■ Tandem (two-persons ride)

The pilot diver boards the scooter at the regular position. The guest diver takes hold of the grip located on the backside of the scooter. In doing so, it is not necessary to hold on tightly. It is enough to hook on a few fingers. If the guest diver holds the grip too tightly, he will constrain the movement of the scooter, making it difficult for the pilot diver to steer.

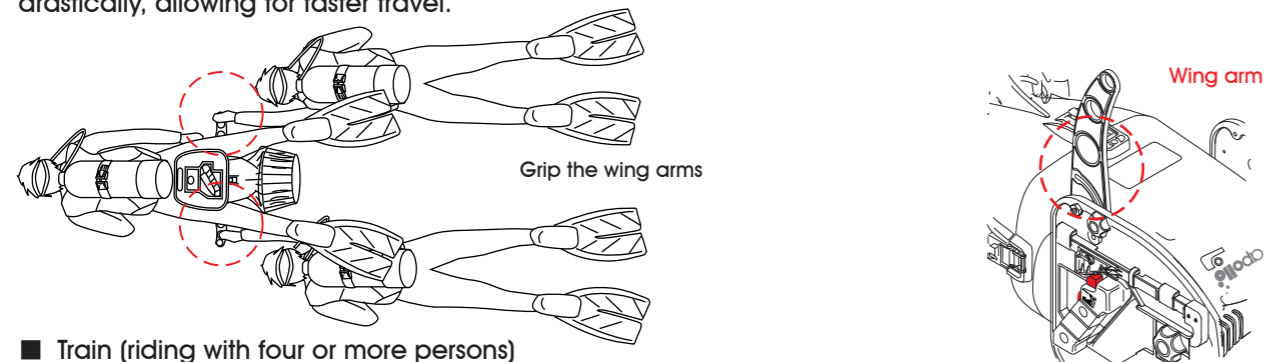
Hold of the grip located on the backside of the scooter



#### ■ Triple (three-persons ride)

The pilot diver boards the scooter at the regular position. The two guest divers open and grip the wing arms of the saddle.

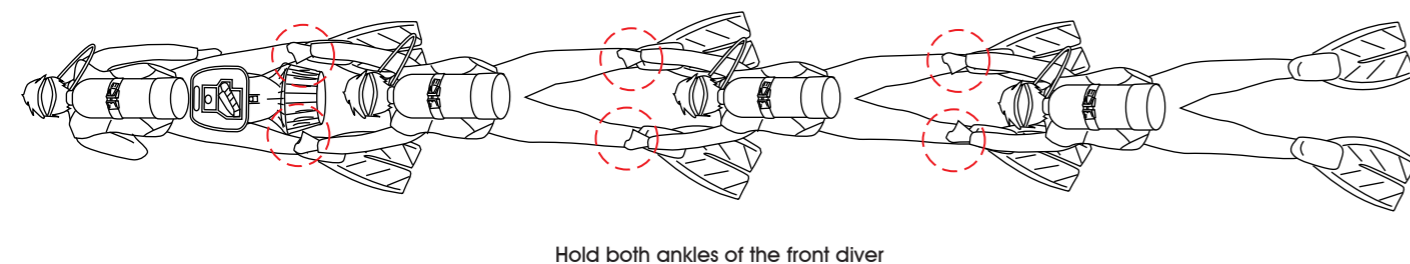
The guest divers should position themselves underneath and horizontal to the pilot diver. This will stabilize the overall movement. As for left and right positioning, the guest divers should try to stay in the water current created by the pilot diver. Such positioning will keep the propulsion resistance from increasing drastically, allowing for faster travel.



#### ■ Train (riding with four or more persons)

Four or more persons can ride together by linking up vertically like a train. The pilot diver starts the scooter at low speed. The first guest diver takes hold of the pilot diver's ankles. As soon as the first guest diver attaches oneself, the pilot diver increases the speed to stabilize the overall balance.

When the pilot diver pulls the accelerator, the scooter will not speed up right away. While waiting for the speed to increase, the third and fourth divers take hold of ankles of the diver in front of them. The scooter has enough power to pull five to six persons, but having that many will make certain maneuvers such as turning difficult. It will obviously slow the speed down, and making sharp turns will be impossible. Riding with many divers should be seen not as a mode of transportation, but as a form of recreation.



Hold both ankles of the front diver

## STEP 7

### Advanced operations (Carrying)

The wing arms of the scooter are used to carry underwater equipment. The diver opens both the left and right wing arms of the accelerator unit. Karabiners attached to any equipment you want to carry are hooked onto the holes in the wing arms.

#### ■ Distribution of underwater weight

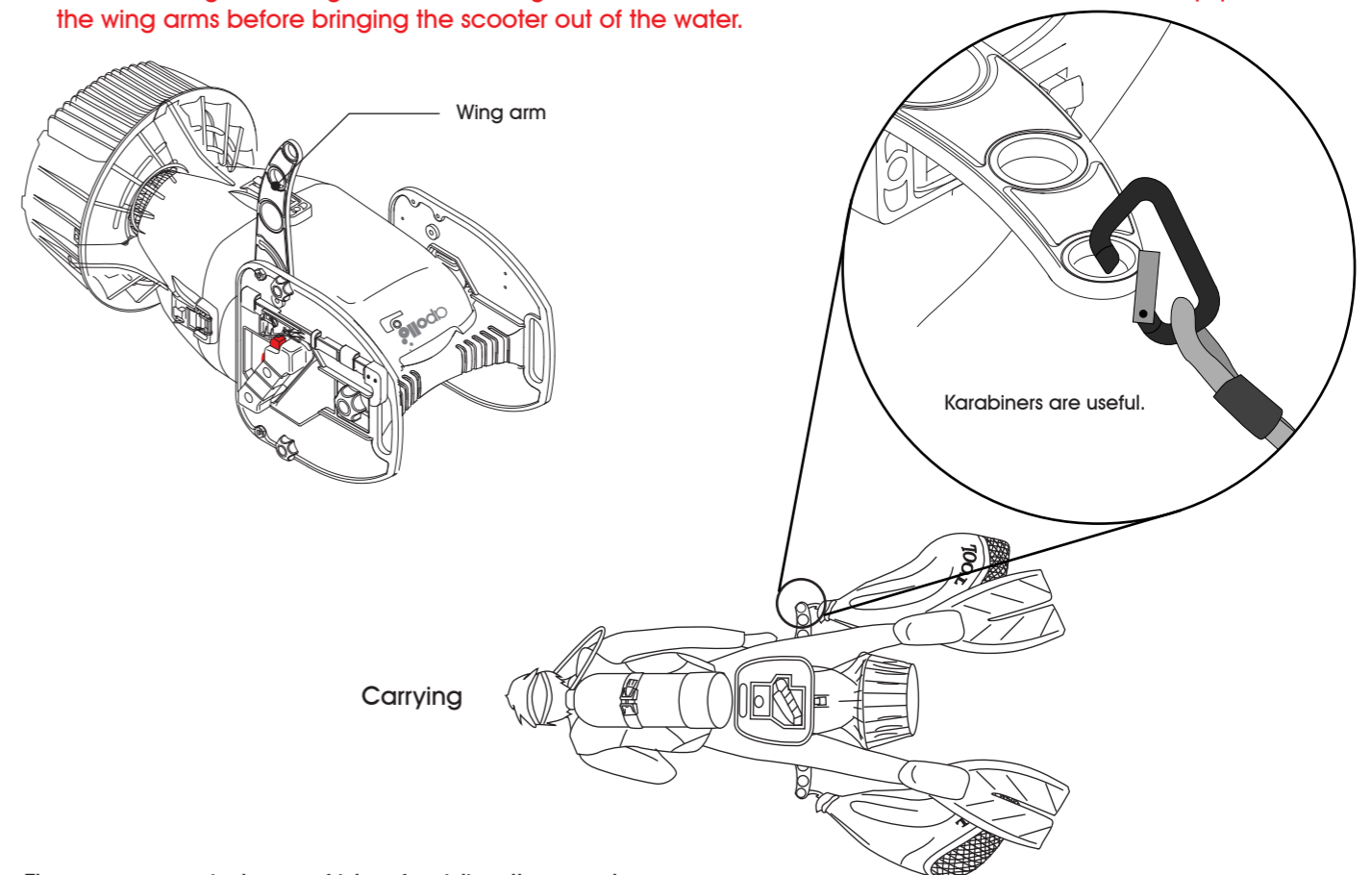
As a general rule, the underwater weight of equipment that is attached to the wing arms should be evenly balanced between the left and right sides. When it is not possible to distribute the weight evenly, it is best to attach the load that is slightly heavier onto the right wing arm, since the rotation torque turns toward the left (counterclockwise) relative to the direction in which the scooter is traveling.

#### ■ Underwater resistance

The diver must take into consideration not only the underwater weight of an object being towed, but also the underwater resistance. When an object that causes great resistance is towed underwater and is attached to just one side of the scooter, it could throw the scooter off balance when moving forward.

#### ⚠ WARNING

- Equipment that could get caught in the propeller is not suitable for carrying.
- Practice keeping attached equipment as close as possible to the scooter body otherwise your ability to turn and take off effectively may be reduced.
- The wing arms are designed to sustain underwater weight. Equipment that is able to be carried underwater could damage the wing arms if it is brought on land while still attached. Therefore, remove the equipment from the wing arms before bringing the scooter out of the water.



Those ways are just one of idea for riding the scooter. We hope you create a new idea of riding the scooter. There are more idea of riding way unlimitedly.