SECTION CONTENTS

6

Paddle boat handling

In a water rescue, a boat can be one of the most useful tools at the rescuer's disposal. However, the wrong boat used in the wrong environment, or even the right boat used by an inexperienced crew, can lead to the rescue team being put in danger, or needing rescue.

It is important that any rescue team chooses craft that are transportable, dependable, and appropriate for the type of environment in which they are to be used.

Teams should receive Swiftwater and Flood Rescue Boat Operator (SFRBO) training after their Swiftwater and Flood Rescue Technician (SRT) training if they are to use powered rescue boats in the future. Rescue 3 also offers a dedicated Swiftwater Paddle Boat Handling (SPBH) course that builds upon the introductory session delivered in a Swiftwater and Flood Rescue Technician (SRT) course.

It is then essential for the crew to ensure that they get adequate practice with their chosen craft to develop experience and judgment. Only with all the above in place will any boat be a valuable asset to the team. Without the above, any boat will be at best a hindrance, at worst a potentially life threatening device.

For more information on boat types, see page 68.

Paddling a boat

The traditional method of paddling a whitewater raft is with one experienced guide and a crew usually made up of at least four less experienced people. The guide would issue commands and their decision would be final. Commands such as all forward, all back, left turn, and right turn, would be used to maneuver the boat downstream.

As a rescue team, it is much more common for a boat to be R2ed or R4ed, which basically means there would only be 2 or 4 paddlers in the boat. In this scenario, the crew have to work together and make decisions as a group. If one member of crew is more experienced than the others, they may still make some of the route-finding decisions, and call out commands, but if all paddlers know the objective and are experienced, they tend to paddle together to achieve that objective.

Boat handling

Understanding the hydrology is essential if you wish to control a boat in moving water. Learning to read a river is the key to effective boat handling. Whether water is running over a natural river bed or down a flooded urban street, the river features that form, such as waves, hydraulics and eddies are universal. The boat handling skills that are needed to effect a successful rescue are the same.

The hydrology of the future water (the water the boat is about to travel into) is going to massively dictate the future direction of the boat. It is essential that this is taken into consideration when planning the next move.

The three key elements to proficient boat handling are speed, angle and trim. With all three elements used and balanced effectively, whitewater can be run safely and efficiently.

Speed

This can relate to both the speed of the water and the speed of the boat - and, more importantly, the difference between the two (speed over water versus speed over ground). For example, when ferry gliding the boat has very little (if any) speed over ground, but may have considerable speed over water.

Another example is the speed required to travel through a hydraulic. If the boat is too slow, it will stall and possibly flip. More speed is required in order to punch through the powerful recirculation of the hydraulic feature. In order for the boat crew to retain control of the boat, it must be traveling either faster or slower than the water to retain directional control. Otherwise, the boat will simply float down the channel under the control of the water.

Angle

The angle of the boat in relation to the current vector determines which direction the boat is heading or is about to head. To use ferry gliding as an example again, the closer the angle of the boat to the direction of flow, the slower or more controlled the ferry glide would be.

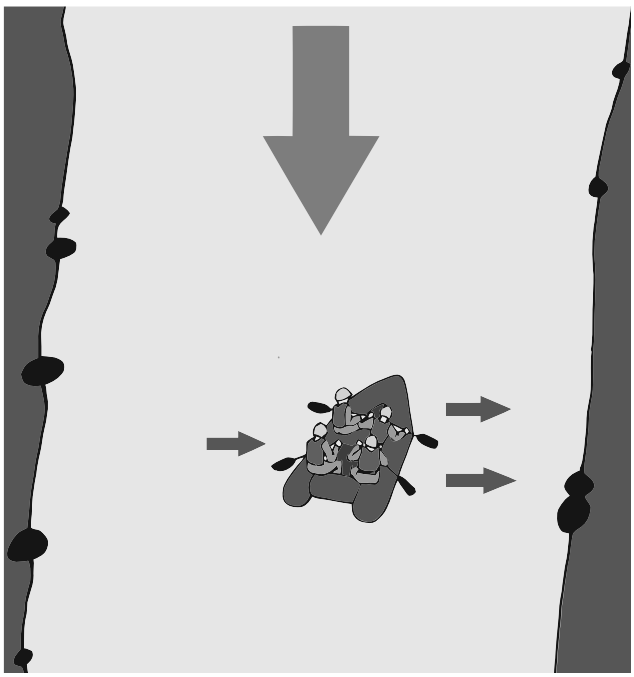
Trim

In the flowing water environment, correct application of trim (or edging the boat) can make the difference between a successful ferry and a complete capsize. By placing the crew's weight on the downstream side of the boat (edging), it presents more of the bottom of the boat to the flow. This has the double benefit of increasing the speed of the ferry and preventing the water from swamping over the upstream side of the boat, potentially capsizing. If the boat is incorrectly trimmed, with too much weight in the bow, there would be a greater possibility of water swamping the boat. This would also make steering the boat difficult, due to the effect of the water on the bow.

As can be seen from the previous three examples of ferry gliding, all three elements of speed, angle and trim seamlessly combine to effect a successful ferry. It is this seamless integration of techniques that make up every successful rescue.

Ferry gliding

This is without a doubt one of the most important skills to master when on any form of moving water. At its simplest, it is a method of moving across the current without moving downstream.



Forward ferry gliding across the flow

The boat can be pointing either up or downstream, although more power can be applied while paddling forward. There is less chance of water coming over the bow than over a transom (depending on type of boat used). As already mentioned, speed of the water dictates how much power must be applied to maintain the ferry, and the angle and trim are constantly being adjusted by the helm and crew, to ensure that the boat does not swamp and moves in a controlled manner across the flow.

Imagine a victim has tried to cross a flooded road. Their car has become swamped and they are now sitting on the roof of the car awaiting rescue.

One of the simplest and quickest methods of rescue is for the boat to cross from an eddy on a level with the car by applying the correct levels of power or speed. The crew must constantly adjust trim and tweak the angle of approach. The boat can move across to the car by holding station in the flow, and the victim can enter the boat. The boat then takes the opposite ferry angle and returns to the eddy that they started from.

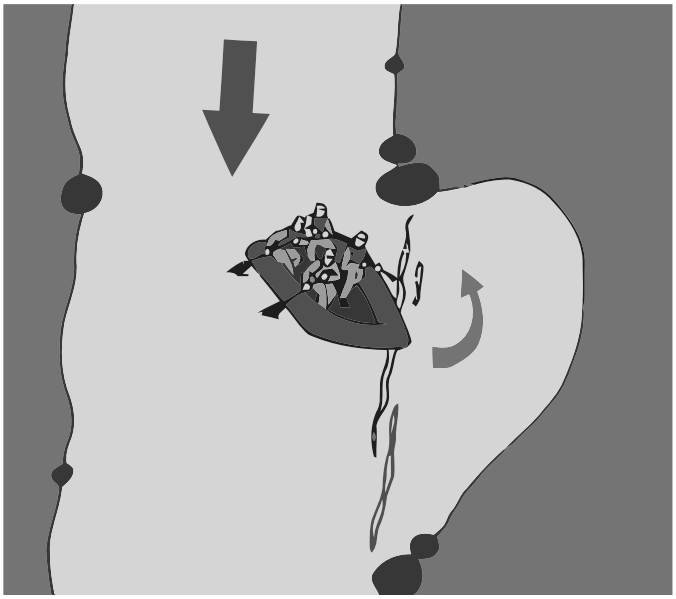
Breaking out and breaking in

These are the terms used for entering the flow (breaking in) and exiting the flow (breaking out). There is never one correct technique, but the seamless combination of speed, angle and trim are essential.

Dynamic break out

For a dynamic break out, it is important to know the water and individual eddies, as the speed at which you enter the eddy can be great. If there are submerged rocks in the water or debris in the eddy, then at best there will be a large repair bill! You must choose your eddy in plenty of time as you move downstream. You then need to accelerate towards the top of the eddy with the boat at about a 45° angle.

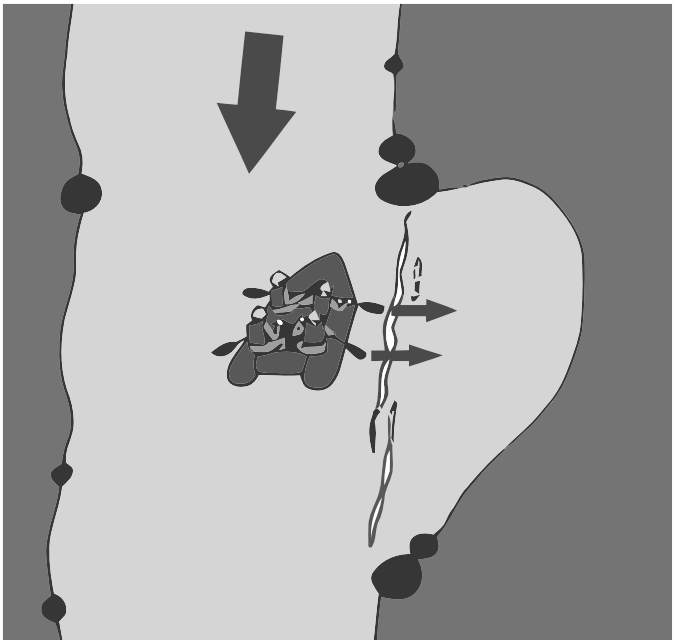
As the boat crosses the eddy line, the crew need to position their weight on the inside of the turn. This enables the boat to carve a turn into the eddy, and prevents the downstream tube from dipping and potentially flipping. As soon as the boat is in the eddy, the crew need to return to their original positions. The act of the bow entering the slow moving water helps turn the boat quickly, but does make this a dynamic maneuver, and depends on a lot of crew cooperation and awareness. With practice and knowledge of local areas, it is very effective.



Dynamic break out

Ferrying out

A more controlled method of breaking out can be accomplished by turning in plenty of time to point upstream as you travel down river, and then by maintaining an upstream ferry angle. The power can be regulated to cross the river or move downstream in a controlled manner to the intended eddy. This method does not involve huge movements of crew or weight, and there is much less chance of dipping a tube and flipping the boat as it crosses the eddy line.



A ferry glide breaking out of the current

Dynamic break in

A dynamic method of leaving an eddy or breaking in to the main flow is to start from the bottom of the eddy and to accelerate upstream. Cross the eddy line at around a 45° angle, with the crew positioned to the downstream side to ensure the correct trim. With the correct application of power as the bow enters the flow and starts to turn downstream, the boat carves a turn and can continue downstream without sinking the upstream tube, avoiding the risk of swamping or even flipping the boat.

Ferry in

Another method is to maintain a steady ferry angle as you leave the eddy. Once in the main flow, power can be reduced until the boat is moving downstream at the same speed as the flow and then a turn can be initiated. This works well if there is lots of room and time, or if it is not possible to initiate the turn from the eddy. There is also less chance of dipping the upstream tube or edge.

Fade in

A third method is to fade in to the main flow from the bottom of the eddy (commonly called fading out of an eddy). Here, the eddy line is less powerful and therefore less likely to affect the balance of the boat.

Whichever method is used, an important point to remember is that the water in the eddy moves upstream. When ferrying across a river, the moment the eddy line is crossed, the water is suddenly traveling in the

opposite direction. If speed is not carefully controlled, the boat can move upstream at a fair rate of knots, usually to the accompaniment of splintering fiberglass or ripping fabric as the boat hits the top of the eddy.

Understanding hydrology

Learning to read any section of moving water either from the boat or the bank is an essential skill to develop. It is good to observe sections of water and plan a safe route through any obstructions. Scouting, as it is called, is essential if the water is unknown or the local river is unrecognizable due to flood conditions.

Five minutes spent scouting a section of water can save hours trying to extricate a wrapped boat later. It is good to get an overall view of the section of water at hand and decide whether or not it is possible.

And if not, is it possible to carry the boat round?

If the decision is made to run the section, it is worth building up a picture of where the boat needs to be at certain points in the section. One method is to walk downstream, getting an overall picture, and then walk back to the boat inspecting in more detail. This way the water can be broken down into small sections, allowing you to picture where the boat needs to be at any one time, and what hazards there are if it goes wrong. There is no one correct way. The judgment needed to make the call of whether any section of water can be run safely can only be built up over time.

A technique of scouting from the boat is called eddy hopping. This can be extremely effective, and involves moving from eddy to eddy, but only if they are in line of sight. It is good practice to ensure that two clear eddies can be seen before leaving the eddy. Using this method, the water in between the eddies can be seen and the route planned. Standing up in the boat allows a better view. Once in the next eddy, look for the one after that, and only move on if it can be seen. If a section disappears around a bend or over a fall, you must scout from the bank.

Momentum and drift

Momentum and drift can be used for an advantage on all moving water. This can be seen as using the flow of the water and river features to assist. In a paddle boat, this is essential - however strong the crew is, the river always has more force and never tires.

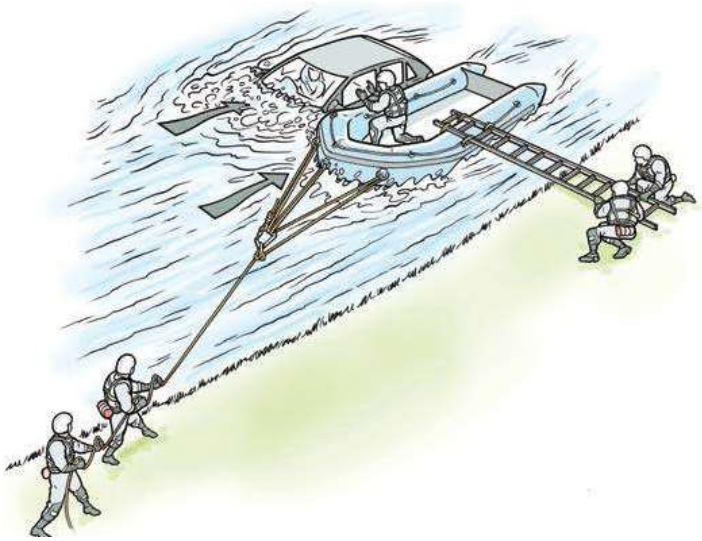
With powerboats, it is easy to neglect momentum and drift because there is a motor to get you out of trouble. To develop as a competent and safe boat handler, and especially a paddle boat handler, rescuers must learn to feel what is happening to the boat underneath their feet.

Waves can be used to cross water or to correct the position of the boat in the middle of a rapid. Even rocks can be utilized to speed up a turn if contact is made at the right time and in the right part of the boat.

For paddle boats, reacting in plenty of time and planning ahead are essential. Knowledge of how powerful the water is, where the current is trying to go, and how to utilize this power to assist, must become second nature.

Tethered boats

A tethered boat system is versatile and quick to set up. The system is useful in slower flowing water, to gain access and to provide transportation for rescuers, equipment, or victims.

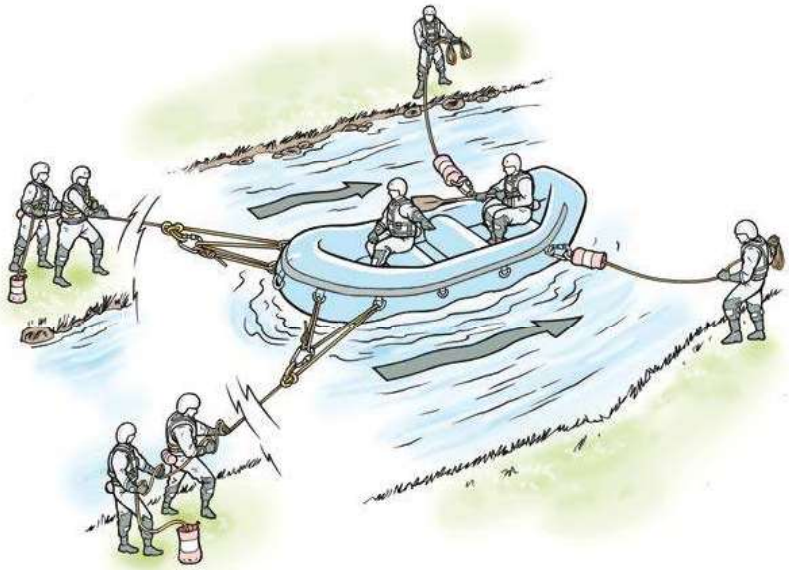


Single-point boat tether with ladder extension

The single-point and two-point systems can be used to transport crew or equipment from one location to another without the need for continually paddling the boat. It may also be used to pick off a victim from a vehicle, midstream rock or from a lowhead dam.

The principle of the two-point boat tether is fundamentally the same as the pendulum method (see page 132) except there is a boat on the rope system rather than a person. The two-point setup can be used for transferring the necessary personnel and equipment across the channel.

The initial setup of the two-point and four-point systems requires the team to get a rescuer and a rope over to the far bank. While this is taking place, the boat should be prepared for the task, for example, the anchor points should be rigged with a suitable load-distributing anchor system (see page 83).



Four-point boat tether

The four-point system requires more rope, people and time to set up, but it does provide more control, particularly to the downstream end of the boat. Additionally, the boat can be placed into a ferry angle position which assists with the crossing of the current.

The key to operational success is that the belay points remain mobile. It is the only way to maintain control of the boat effectively. In order to remain mobile, the terrain around the operational area needs to be quite open so that the belayers are not restricted.

If the ropes are attached to the very front of the boat with a fixed and focused anchor point, the rescuers in the boat can control the angle of the boat with their weight. With active rescuers shifting weight rocks can be navigated, as well as waves and hydraulics. Rescuers should have paddles for reaching, or to help with downstream momentum. If additional control is required, then additional ropes can be attached on the downstream corners of the boat, making a four-point tether.

Once the task is complete, the empty boat can be sent over to the far side, all the personnel and equipment loaded into it (depending on the boat's capacity), and then it can be swung back to the bank on a single rope.

The overall rigging and operation of a tethered boat system would be the remit of Rescue Technicians. However, the individual control ropes may be operated by First Responders under supervision.

Boat wraps

A wrap occurs when a boat gets held on an obstacle by the force of the water flowing into the boat. Such an obstacle may be a rock, log, or bridge pillar. Picking lines that avoid these obstacles is the best method of avoiding a wrap.

If contact with an object is imminent, all attempts should be made to turn the boat so that the front or back of the boat hits first. This dramatically reduces the chances of the boat becoming wrapped.

If the boat hits the object side-on, the downstream tube will rise up the face of the object, due to the force of the water on the upstream tube. This exposes the internal compartments of the boat to the full force of the river. The boat will then be forced to wrap around the object. The upstream tube of the boat is likely to be held under the water.

Wraps can be avoided during the split second of impact, by transferring the weight of the crew onto the side of the boat that has hit the object (usually the downstream edge of the boat). The command for this move is, 'High-side left/right' or 'Jump left/right'. The response from the boat crew must be immediate.

If there is no high-side attempt, chances are that the tube furthest away from the object (usually the upstream tube) will be forced under the water. Crew may be thrown from the boat, pinned between the boat and the obstacle, or may be able to scramble onto the upper tube or the obstacle that caused the wrap.

It is important that you keep track of the crew by counting heads. If there is the possibility that a person may be trapped between the boat and the rock, it may be necessary to cut the floor of any Hypalon-floored boat to free trapped people.

A wrapped boat is a boat that is stuck on or against an obstacle in the current and has water flowing into it.

A perched boat is one that is stuck on something but does not have water filling the boat.

Before trying to free the boat, count your personel and be sure all are accounted for. Make an assessment of what will happen AFTER the boat is free. Be sure there are no hazards downstream, and have a plan for getting the boat and everyone in it to shore safely.

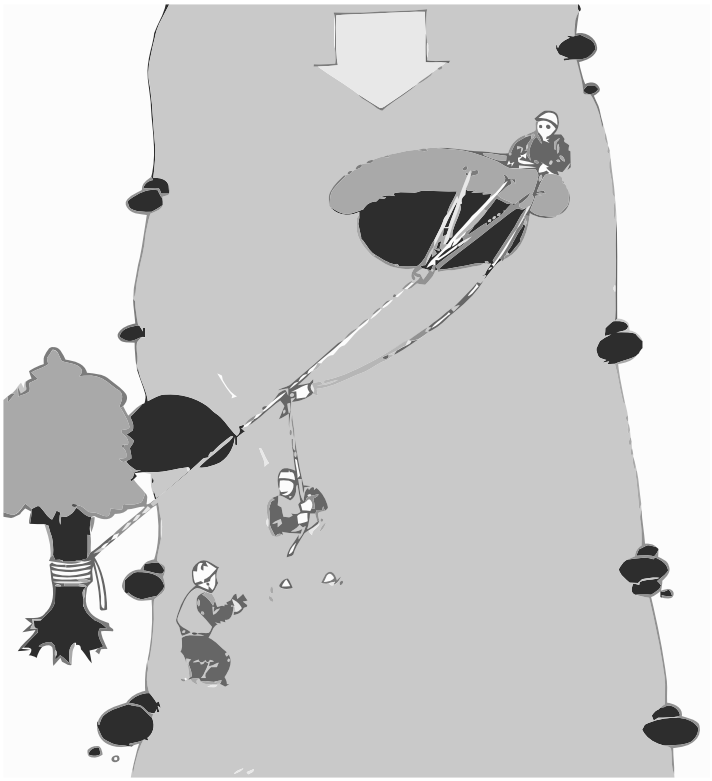
A general procedure for removing boats from a wrap situation is:

- Attempt to dislodge the boat immediately by moving crew to the front or the back of the boat. This can change the balance of the boat and allow the water flow to push the boat off the obstacle. Freeing the boat is often a matter of increasing water pressure on one side of the boat and/or reducing it on the other side. Pick the side of the boat that looks like it has the most current flowing into it, and try to add pressure to this side, and reduce the pressure on the other.
- If this does not work, then perhaps the crew should be transferred from the boat to the bank by making use of techniques such as swimming to shore, individual throw bag rescues, use of a second boat to evacuate people, or a tensioned diagonal. If using a tensioned diagonal, remember to attach the tensioned diagonal to the boat in such a way as to pull the boat onto the rock, in order to prevent the boat from accidentally unwrapping while evacuating people. No attempt should be made to dislodge the wrapped boat before people are safely on the bank. Keep it simple.
- An upstream spotter should be positioned to warn other river users of the wrapped boat so they can either pull over to shore, or navigate around the boat.

- Attempt to dislodge the boat immediately by moving crew to the front or the back of the boat. This can change the balance of the boat and allow the water flow to push the boat off the obstacle. Freeing the boat is often a matter of increasing water pressure on one side of the boat and/or reducing it on the other side. Pick the side of the boat that looks like it has the most current flowing into it, and try to add pressure to this side, and reduce the pressure on the other.
- If this does not work, then crew should be transferred from the boat to the bank by making use of techniques such as tensioned diagonal, individual throwbag rescues, or by use of a second boat to evacuate people. If using a tensioned diagonal, remember to attach the tensioned diagonal to the boat in such a way as to pull the boat onto the rock, in order to prevent the boat from accidentally unwrapping whilst evacuating people. No attempt should be made to dislodge the wrapped boat before people are safely on the bank.
- An upstream spotter should be positioned so that they can warn other river users of a wrapped boat. Spotters should direct river users to move in order to avoid the hazard.
- The Rescue 3 Best Practice Guidelines still apply. Remember that you may need to respond quickly in order to provide downstream safety cover for the crew, in the event that they should fall in and get washed downstream.
- To unpin the boat, start with the simplest methods. Take the time to read the water, and work out the ideal angle of pull. Working with the water is always going to be more effective and efficient than fighting against it.

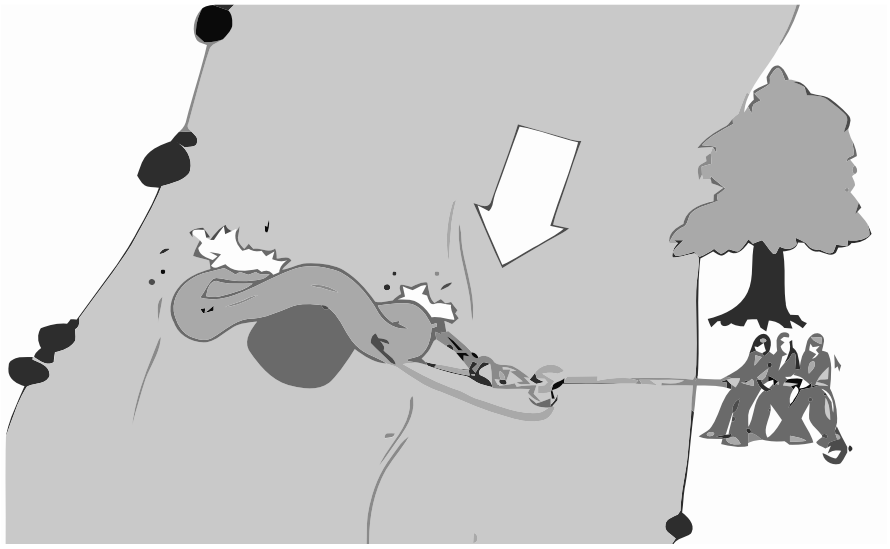
6 Tensioned diagonal

Using a tensioned diagonal is a fast and effective way of evacuating crew from a boat. Note that the crew member is being transported into a safe eddy and there is also a Technician in the eddy to receive them and act as downstream back up with a throwbag if required.



Strong arm method

The strong arm method is the simplest method of using a rope to assist. It is simply a case of getting 10-15 people on the rope to start pulling. If this method doesn't work at first, try altering the angle of pull. Remember, a 14 foot boat full of water weighs over a ton. The goal is to change the shape of the boat, or the way the current flows into it.



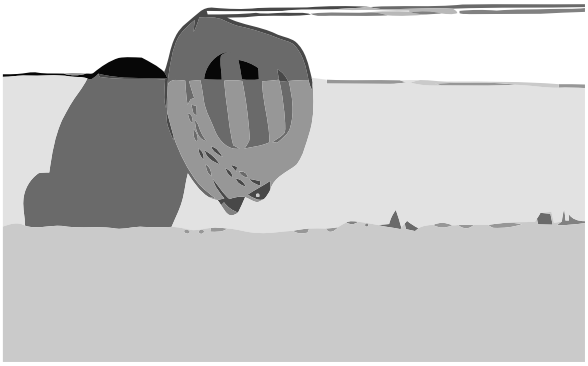
Strong arm method (with a vector pull)

Initially the rope is tensioned by using a strong arm pull. The rope is then tied off with a suitable releasable hitch, in this case a no-knot. A second rope is then clipped to the tied-off rope and a vector pull is applied at 90° to the tied off rope. The force on the anchors and on the tensioned rope can be huge. It is important that a load-distributing anchor system is used to attach the rope to the boat.

A vector pull only works if the ropes are very tight. Once the angle created by the vector pull reaches 120°, there is no additional benefit to using the vector pull method. The forces are only high when the angle is very wide.

Rollover method

A rope is placed under the boat. As tension is put on the haul rope, the boat is rolled over, spilling the water. This method is very useful if trying to free a boat from a height, such as a bridge. Getting the rope under and around the boat can be a very problematic and complex procedure. This works great for canoes.

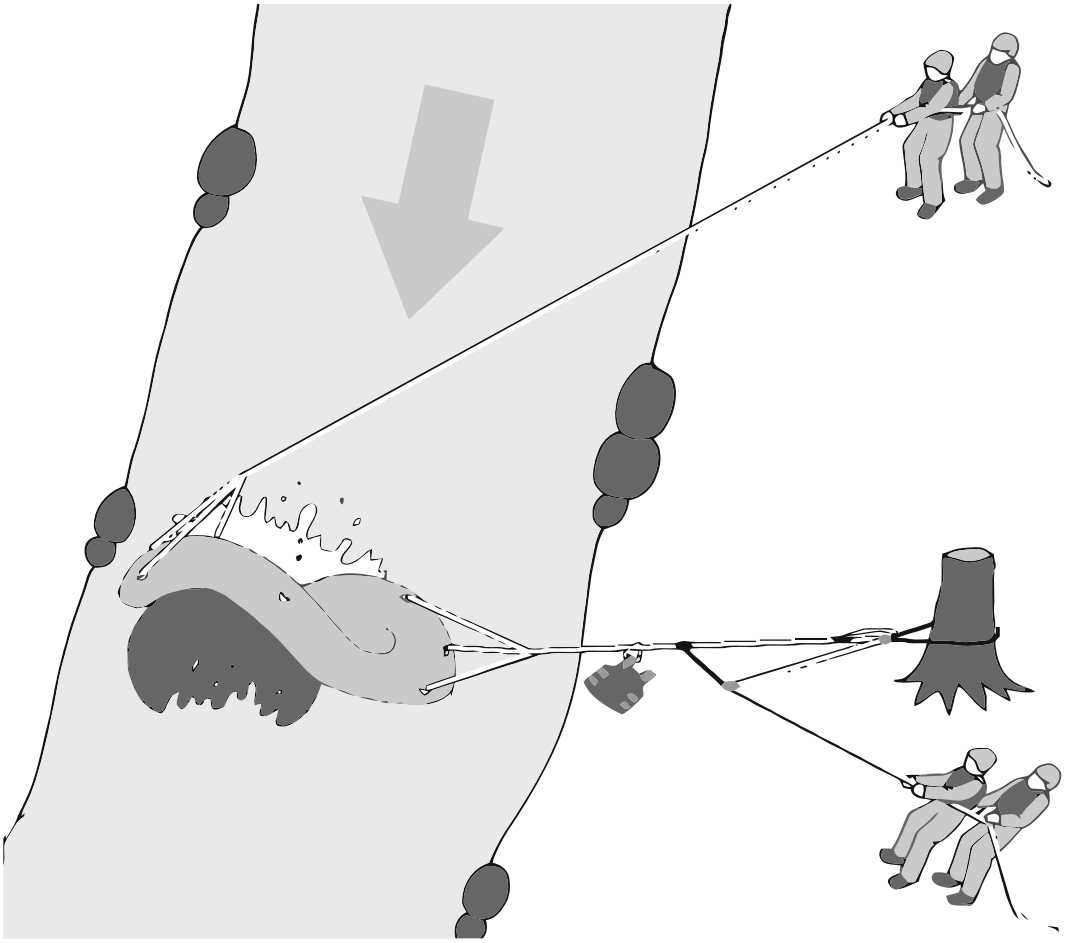


Peel and Pull

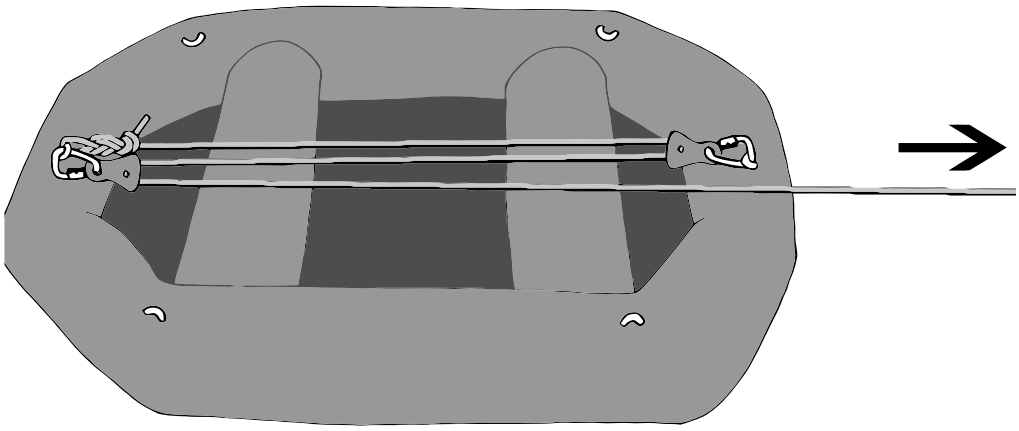
It is often beneficial to combine the peel and pull methods to free a wrapped boat. This is simply one end of the boat being peeled off the rock while the other end is pulled off. This method does require more equipment, as two ropes are being tensioned. Each rope should be attached to the boat with a load-distributing anchor system.

In the diagram, the Technicians have set up a 3:1 mechanical advantage system, to pull the boat off the obstacle. A second rope is used to peel the other side of the boat from the obstacle by using the strong arm method. The Technicians are using a spare buoyancy aid attached to the rope to act as a dampener. If the anchors on the boat fail, this dampener prevents the hardware (which is under tension on the boat), flying back and hitting the haulers.

Be very alert when applying mechanical advantage to a wrapped boat from the shore. When the boat begins to come off the obstacle, the initial movement is likely to be small, but when the boat comes loose, it will do so very suddenly. All personnel should be prepared for this eventuality. Nobody should be standing on the downstream side of the ropes or they may be injured as the boat dislodges and swings towards the bank. Crew on shore should be prepared to release tension from the system if needed. Crew, if left on the rock, could be stranded.



In–boat mechanical advantage system



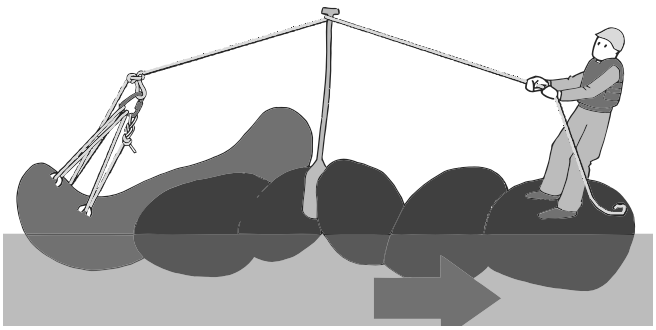
In-boat MA: For clarity, no anchor system is shown. A load-distributing anchor system is recommended to reduce the risk of ripping of a D-ring or attachment point.
However, this will reduce the throw of the MA system.

Another method of unwrapping a boat is to use a throwbag or a long bowline to form an in–boat mechanical advantage system. By hauling on this, either from in the boat or from the bank, it may be possible to upset the balance of the boat enough to dislodge it.

6

Unwrapping boats without bank access

Occasionally, access cannot be gained to either bank. Ropes may not be long enough, or the river is too large to gain any access. It is possible to lever the boat from the wrap. A load-distributing anchor is set on the upstream side of the boat. The rope is wrapped around a paddle, oar or cut branch. Using their body weight, the guides can lever the boat up just enough to start spilling water from it, which may allow the boat to slide free.



Flips and rights

Flips need not be a disaster if they are managed correctly. A lot depends on the section of water, how deep it is, what is immediately downstream, and how many crew are in the boat.

The severity of a flip is dictated by the nature of the particular section of water. A flip on a shallow, continuous stretch of rapids can be very difficult and dangerous to recover from. A flip on a pool-drop river, where hard rapids are followed by long sections of clear water, gives the crew time to right the boat and recover personnel and equipment.

The correct handling of a flipped boat depends on all crew members staying calm and working efficiently as a team. Once flipped, the first priority is to perform a head count to ensure that everybody is safe. All crew members should get out of the water as soon as possible. Often times this is most quickly accomplished by getting on the upside down craft. The boat can be paddled and maneuvered upside down. If this is not possible, the crew should remain close to the boat so that they can assist with the righting of it. A designated team member (usually the helm) needs to climb on board the flipped boat. How this is achieved depends on the type of boat being used.

For a whitewater raft, it is possible to use the drain holes in the floor to get purchase and pull yourself back on to the boat. In some circumstances a pre-rigged system on the bottom of the boat may be in place by the boat handler. If this is not possible, the use of a flip-line or piece of cord can be used. A carabiners is used to clip one end to the side of the boat, either through the safety line, a carrying handle, or a D-ring. The other end of the flip-line can be attached to a paddle or something which is heavy, and can be thrown over the upturned boat. Once the line is over the boat, the quickest method of getting to the other side of the boat should be used.

Once on top, if the flip-line is already attached, this can be used to pull the boat back over. This takes a little practice. The easiest method involves keeping the legs straight and leaning back on the edge of the boat. If done correctly, it feels like the boat will land on top of you. Do not rush this stage as the boat may not come all the way over.

Unless a whitewater raft is used, consideration should be given as to where is best to climb onto the upturned boat. In an IRB without a motor, it is usually easier to climb aboard at the transom as this is lower.

As soon as possible, either on the upside down craft, or once the boat is the right way up and the crew back aboard, it is a good idea to get to shore or a safe eddy to regroup and sort out crew and equipment.

Specialist considerations of righting flipped powerboats are covered on the Rescue 3 SFRBO course.

Paddle boat flipping