again. For most seaplanes, the takeoff run is usually much longer than the landing run. Before landing, the pilot should also consider the wind and surface conditions expected when it is time to leave. If the seaplane lands into a stiff breeze on water with small waves, it might be more difficult to leave the next morning when winds are calm and the water is glassy. Conversely, if the seaplane lands in the morning when the air temperature is low, departure in the hot afternoon might mean a significant loss in takeoff performance due to the density altitude.

It is especially important to carefully inspect the landing area for shallow areas, obstructions, or other hazards. After touchdown is not the time to discover factors that make a confined landing area even smaller or less usable than originally supposed. Evaluation of the landing area should include approach and departure paths. Terrain that rises faster than the seaplane can climb is an obvious consideration, both for the eventual takeoff as well as in case of a go-around during landing. If climbout over the terrain is not easily within the seaplane's capabilities, be certain there is sufficient room to make a gentle turn back over the water for climb.

### GO-AROUND

Whenever landing conditions are not satisfactory, execute a go-around. Potential conflicts with other aircraft, surface vessels or swimmers in the landing area, recognition of a hazard on the water, wind shear, wake turbulence, water surface conditions, mechanical failure, or an unstabilized landing approach are a few of the reasons to discontinue a landing attempt. Climb to a safe altitude while executing the go-around checklist, then evaluate the situation, and make another approach under more favorable conditions. Remember that it is often best to make a gentle climbing turn back over the water to gain altitude, rather than climbing out over a shoreline with rising terrain or noise-sensitive areas. The go-around is a normal maneuver that must be practiced and perfected like any other maneuver.

### EMERGENCY LANDING

Emergency situations occurring within gliding distance of water usually present no landing difficulty. Although there is some leeway in landing attitude, it is important to select the correct type of landing for the water conditions. If the landing was due to an engine failure, an anchor and paddle are useful after the landing is completed.

Should the emergency occur over land, it is usually possible to land a floatplane with minimal damage in a smooth field. Snow covered ground is ideal if there are no obstructions. The landing should be at a slightly flatter attitude than normal, a bit fast, and directly into the wind. If engine power is available, landing with a small amount of power helps maintain the flatter attitude. Just before skidding to a stop, the tail will begin to rise, but the long front portions of the floats stop the rise and keep the seaplane from flipping over.

A night water landing should generally be considered only in an emergency. They can be extremely dangerous due to the difficulty of seeing objects in the water, judging surface conditions, and avoiding large waves or swell. If it becomes necessary to land at night in a seaplane, seriously consider landing at a lighted airport. An emergency landing can be made on a runway in seaplanes with little or no damage to the floats or hull. Touchdown is made with the keel of the floats or hull as nearly parallel to the surface as possible. After touchdown, apply full back elevator and additional power to lessen the rapid deceleration and nose-over tendency. Do not worry about getting stopped with additional power applied after touchdown. It will stop! The reason for applying power is to provide additional airflow over the elevator to help keep the tail down.

In any emergency landing on water, be as prepared as possible well before the landing. Passengers and crew should put on their flotation gear and adjust it properly. People sitting near doors should hold the liferafts or other emergency equipment in their laps, so no one will need to try to locate or pick it up in the scramble to exit the seaplane. Unlatch all the doors prior to touchdown, so they do not become jammed due to distortion of the airframe. Brief the passengers thoroughly on what to do during and after the landing. These instructions should include how to exit the seaplane even if they cannot see, how to get to the surface, and how to use any rescue aids.

## POSTFLIGHT PROCEDURES

After landing, lower the water rudders and complete the after-landing checklist. The flaps are usually raised after landing, both to provide better visibility and to reduce the effects of wind while taxiing. It is a good practice to remain at least 50 feet from any other vessel during the taxi.

After landing, secure the seaplane to allow safe unloading, as well as to keep winds and currents from moving it around. Knowing a few basic terms makes the following discussions easier to understand. Anchoring uses a heavy hook connected to the seaplane by a line or cable. This **anchor** digs into the bottom due to tension on the line, and keeps the seaplane from drifting. **Mooring** means to tie the seaplane to a fixed structure on the surface. The seaplane may be moored to a floating buoy, or to a pier, or to a floating raft. For this discussion, **docking** means securing the seaplane to a permanent structure fixed to the shore. To **beach** a seaplane means to pull it up onto a suitable shore surface, so that its weight is supported by relatively dry ground

rather than water. **Ramping** is defined as using a ramp to get the seaplane out of the water and onto the shore.

## ANCHORING

Anchoring is the easiest way to secure a seaplane on the water surface. The area selected should be out of the way of moving vessels, and in water deep enough that the seaplane will not be left aground during low tide. The holding characteristics of the bottom are important in selecting an appropriate anchorage. The length of the anchor line should be about seven times the depth of the water. After dropping the anchor with the seaplane headed into the wind, allow the seaplane to drift backward to set the anchor. To be sure the anchor is holding, watch two fixed points somewhere to the side of the seaplane, one farther away than the other, that are aligned with each other, such as a tree on the shore and a mountain in the distance. If they do not remain aligned, it means that the seaplane is drifting and dragging its anchor along the bottom. The nautical term for when two objects appear directly in line, one behind the other, is "in range" and the two objects are called a range.

When choosing a place to anchor, think about what will happen if the wind shifts. Allow enough room so that the seaplane can swing around the anchor without striking nearby obstacles or other anchored vessels. Be certain the water rudders are retracted, as they can interfere with the seaplane's ability to respond to wind shifts.

If anchoring the seaplane overnight or for longer periods of time, use a heavier anchor and be sure to comply with maritime regulations for showing an anchor light or daytime visual signals when required. [Figure 6-8]

When leaving the seaplane anchored for any length of time, it is a good idea to secure the controls with the elevator down and rudder neutral. Since the seaplane can rotate so that it always faces into the wind, this forces the nose down and reduces the angle of attack, keeping lift and wind resistance at a minimum.

## MOORING

Mooring a seaplane eliminates the problem of the anchor dragging. A permanent mooring installation consists of a heavy weight on the bottom connected by a chain or cable to a floating buoy with provisions for securing mooring lines. Approach a mooring at a very low speed and straight into the wind. To keep from overrunning the mooring, shut down the engine early and let the seaplane coast to the mooring. If necessary, the engine can be started again for better positioning.

Never straddle a buoy with a twin-float installation. Always approach while keeping the buoy to the outside of the float to avoid damage to the propeller and underside of the fuselage. Initial contact with the buoy is usually made with a boat hook or a person standing on the deck of one float.

While approaching the mooring, have the person on the float secure one end of a short line to the bottom of a float strut, if one is not there already. Then taxi the seaplane right or left of the mooring so that the float on which the person is standing comes directly alongside the buoy. The free end of the line can then be secured to the mooring.

Exercise extreme caution whenever a person is assisting in securing the seaplane. There have been many instances of helpers being struck by the propeller. On

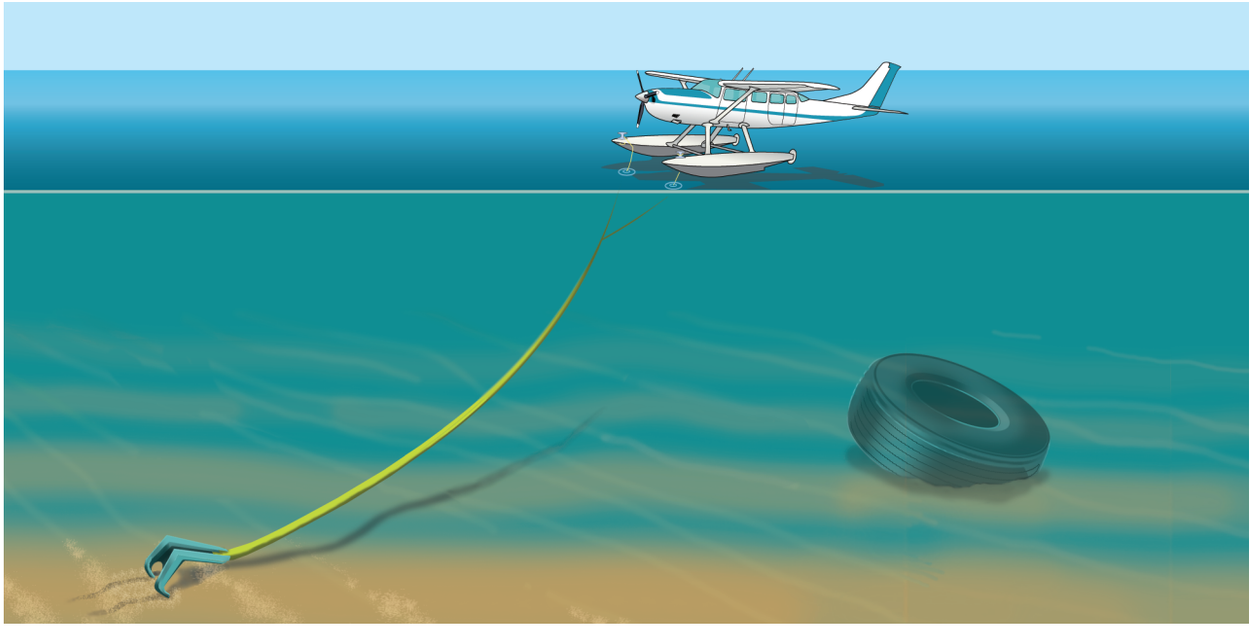

**Figure 6-8. Anchoring.**

most floatplanes, the floats extend well in front of the propeller arc. Eager to do a good job, an inexperienced helper might forget the spinning propeller while walking forward along the float.

## DOCKING

The procedure for docking is essentially the same as for mooring, except that approaching directly into the wind may not be an option. The keys to successful docking are proper planning of the approach to the dock, compensating for the existing environmental conditions, and skill in handling the seaplane in congested areas. Bear in mind that a seaplane is fragile and hitting an obstruction can result in extensive damage.

Plan the approach to the dock so as to keep the wind on the seaplane's nose as much as possible. While still well clear of the dock area, check the responsiveness of the water rudders and be sure the seaplane will be able to maneuver in the existing wind and current. If control seems marginal, turn away and plan an alternative method of reaching the dock. While approaching the dock, the person who will be jumping out to secure the seaplane should take off seatbelts and unlatch the door. When it is clear that the seaplane will just make it to the dock, shut down the engine and let the seaplane coast the remaining distance to encounter the dock as gently as possible. The person securing the seaplane should step out onto the float, pick up the mooring line attached to the rear float strut, and step onto the dock as the seaplane stops. The line should be secured to a mooring cleat on the dock. Use additional mooring lines if the seaplane will be left unattended. Be sure to complete any remaining items on the checklist, and to double-check that the mixture, magnetos, and master switch are in the off positions.

## BEACHING

Success in beaching depends primarily on the type and firmness of the shoreline. Inspect the beach carefully before using it. If this is impossible, approach the beach at an oblique angle so the seaplane can be turned out into deeper water if the beach is unsatisfactory. The hardest packed sand is usually near the water's edge and becomes softer where it is dry, further from the water's edge. Rocky shorelines are likely to damage the floats, especially if significant waves are rolling in. Mud bottoms are usually not desirable for beaching.

To protect them from damage, water rudders should be up before entering the shallow water near a beach. Sand is abrasive and erodes any protective coatings on the bottoms of the floats. If possible, beach the seaplane by sailing backward with the water rudders up. The aft bottoms of the floats do not dig into the sand as deeply as the forward bottoms, so backing onto a beach is not as hard on the floats as going in nose-first.

Do not leave the seaplane unattended unless at least a tail line is fastened to some solid object ashore. Moderate action of the water rapidly washes away the sand under the floats and lets the seaplane drift. An incoming tide can float a beached seaplane in just a few minutes. Likewise, a receding tide may leave a seaplane stranded 30 or 40 feet from the water in a few hours. Even small waves may alternately pick up and drop the seaplane, potentially causing serious damage, unless the seaplane is beached well out of their reach. Flying boat pilots should be sure to clear the main gear wells of any sand or debris that may have accumulated before departing.

If the seaplane is beached overnight or higher winds are expected, use portable tiedowns or stakes driven into firm ground and tie it down like a landplane. If severe winds are expected, the compartments of the floats can be filled with water. This holds the seaplane in very high winds, but it is a lot of work to pump out the floats afterward.

## RAMPING

For the purpose of this discussion, a ramp is a sloping platform extending well under the surface of the water. If the ramp is wood, the seaplane can be slid up or down it on the keels of the floats, provided the surface of the ramp above the water is wet. Concrete boat ramps are generally not suitable for seaplanes. Water rudders should be down for directional control while approaching the ramp, but raised after the seaplane hits the ramp.

If the wind is blowing directly toward the shore, it is possible to approach the ramp downwind with enough speed to maintain control. Continue this speed until the seaplane actually contacts the ramp and slides up it. Many inexperienced pilots make the mistake of cutting the power before reaching the ramp for fear of hitting it too hard. This is more likely to result in problems, since the seaplane may weathervane and hit the ramp sideways or backward, or at least need to be taxied out for another try. When approaching at the right speed, the bow wave of the float cushions the impact with the ramp, but if the seaplane is too slow or decelerating, the bow wave moves farther back along the float and the impact with the ramp may be harder. Many pilots apply a little power just prior to hitting the ramp, which raises the fronts of the floats and creates more of a cushioning bow wave. Be sure to hold the elevator control all the way back throughout the ramping. [Figure 6-9]

When the seaplane stops moving, shut down the engine and complete the appropriate checklist. Ideally, the seaplane should be far enough up the ramp that waves or swells will not lift the floats and work the seaplane

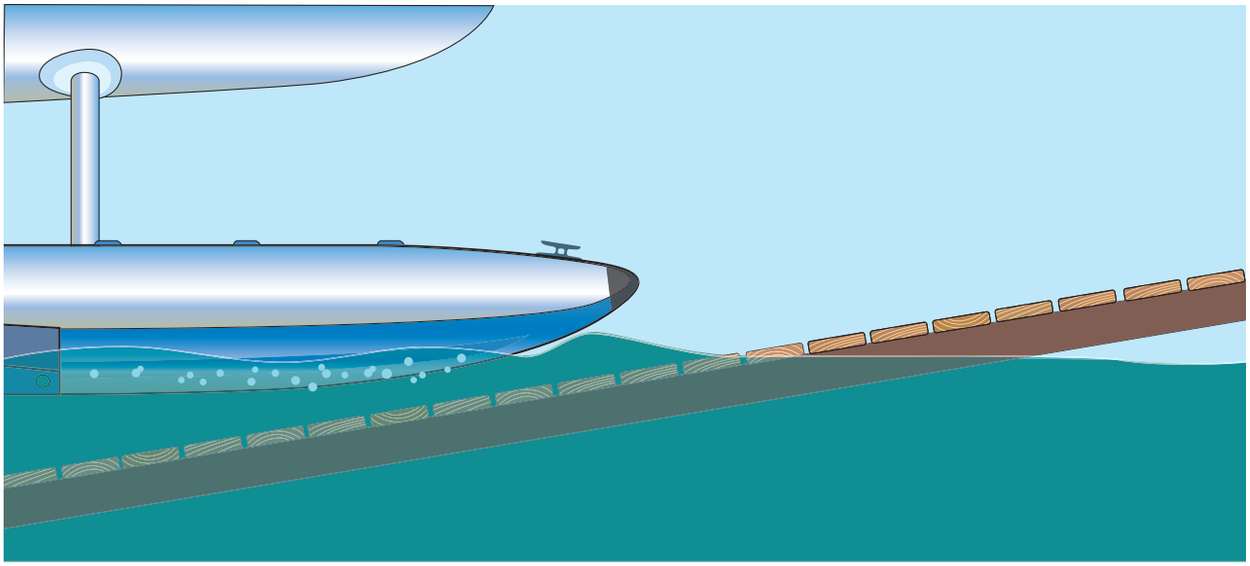

**Figure 6-9. The bow wave cushions the contact with the ramp.**

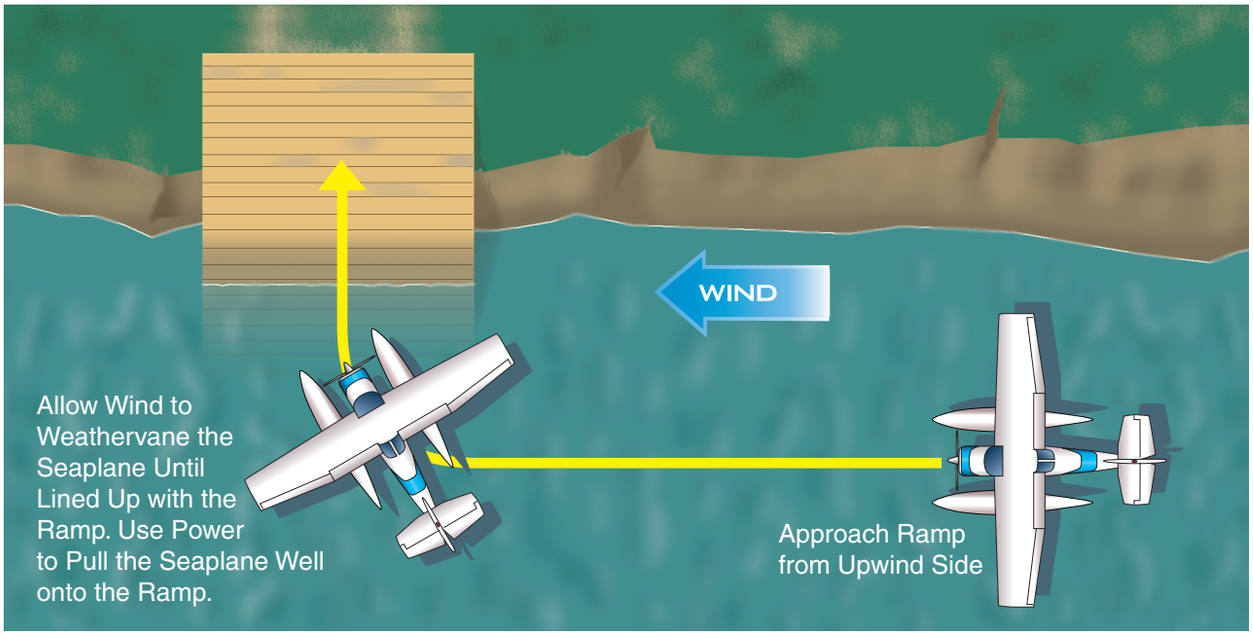


**Figure 6-10. Crosswind approach to a ramp.**

back into the water, but not so far up the ramp that shoving off is difficult. Ramps are usually quite slippery, so pilot and passengers must be very cautious of their footing when walking on the ramp.

The most difficult approach is when the wind is blowing parallel to the shore, and strong enough to make control marginal. If the approach is made into the wind, it may not be possible to turn the seaplane crosswind toward the ramp without excessive speed. In most cases, the best procedure is to taxi directly downwind until near the ramp, then close the throttle at the right point to allow weathervaning to place the seaplane on the ramp in the proper position. Then apply power to pull the seaplane up the ramp and clear of the water. This should not be attempted if the winds are high or the ramp is too slippery, since the seaplane could be blown sideways off the leeward side of the ramp. [Figure 6-10]

Experience and proficiency are necessary for ramping in strong winds. In many instances, the safest procedure is to taxi upwind to the ramp and near enough for a helper to attach a line to the floats. The seaplane may then be left floating, or pushed and pulled into a position where a vehicle can haul it up the ramp.

## SALT WATER

Any time the seaplane has been operated in salt water, be sure to flush the entire seaplane with plenty of fresh water to minimize corrosion.