

Figure 4-17. The downwind arc balances wind force with centrifugal force.

However, when taking off downwind, obtaining the airspeed means accelerating to a proportionately higher groundspeed. Naturally, the takeoff run is longer because the wings must first be accelerated to the speed of the wind, then accelerated to the correct airspeed to generate the lift required for takeoff. So far, this is identical to what occurs with a landplane during a downwind takeoff. But in addition, a downwind takeoff run in a seaplane is further lengthened by the factor of float drag. The speed of the floats in the water corresponds to the higher groundspeed required in a landplane, but the drag of the floats increases as the square of their speed. This increase in drag is much greater than the increase in rolling resistance of tires and wheel bearings in a landplane. A tailwind may lengthen the seaplane's takeoff distance much more dramatically than the same tailwind in a landplane.

Nevertheless, there are situations in which a downwind takeoff may be more favorable than taking off into the wind. If there is a long lake with mountains at the upwind end and a clear departure path at the other, a downwind takeoff might be warranted. Likewise, noise considerations and thoughtfulness might prompt a downwind takeoff away from a populated shore area if plenty of water area is available. In areas where the current favors a downwind takeoff, the advantage gained from the movement of the water can more than compensate for the wind penalty. Keep in mind that overcoming the current creates far more drag than accelerating a few extra knots downwind with the current. In all cases, safety requires a thorough knowledge of the takeoff performance of the seaplane.

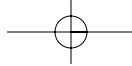
GLASSY WATER TAKEOFFS

Glassy water makes takeoff more difficult in two ways. The smoothness of the surface has the effect of increasing drag, making acceleration and lift-off more difficult. This can feel as if there is suction between the water and the floats. A little surface roughness actually helps break the contact between the floats and the water by introducing turbulence and air bubbles between water and the float bottoms. The intermittent contact between floats and water at the moment of lift-off cuts drag and allows the seaplane to accelerate while still obtaining some hydrodynamic lift, but glassy water maintains a continuous drag force. Once airborne, the lack of visual cues to the seaplane's height above the water can create a potentially dangerous situation unless a positive rate of climb is maintained.

The takeoff technique is identical to a normal takeoff until the seaplane is on the step and nearly at flying speed. At this point, the water drag may prevent the seaplane from accelerating the last few knots to lift-off speed. To reduce float drag and break the grip of the water, the pilot applies enough aileron pressure to lift one float just out of the water and allows the seaplane to continue to accelerate on the step of the other float until lift-off. By allowing the seaplane to turn slightly in the direction the aileron is being held rather than holding opposite rudder to maintain a straight course, considerable aerodynamic drag is eliminated, aiding acceleration and lift-off. When using this technique, be careful not to lift the wing so much that the opposite wing contacts the water. Obviously, this would have serious consequences. Once the seaplane lifts off, establish a positive rate of climb to prevent inadvertently flying back into the water.

Another technique that aids glassy water takeoffs entails roughening the surface a little. By taxiing around in a circle, the wake of the seaplane spreads and reflects from shorelines, creating a slightly rougher surface that can provide some visual depth and help the floats break free during takeoff.

Occasionally a pilot may have difficulty getting the seaplane onto the step during a glassy water takeoff, particularly if the seaplane is loaded to its maximum authorized weight. The floats support additional weight by displacing more water; they sink deeper into the water when at rest. Naturally, this wets more surface area, which equates to increased water drag when the seaplane begins moving, compared to a lightly loaded situation. Under these conditions the seaplane may assume a plowing position when full power is applied, but may not develop sufficient hydrodynamic lift to get on the step due to the additional water drag. The careful seaplane pilot always plans ahead and considers the possibility of aborting the takeoff.



Nonetheless, if these conditions are not too excessive, the takeoff often can be accomplished using the following technique.

After the nose rises to the highest point in the plowing position with full back elevator pressure, decrease back pressure somewhat. The nose will drop if the seaplane has attained enough speed to be on the verge of attaining the step position. After a few seconds, the nose will rise again. At the instant it starts to rise, reinforce the rise by again applying firm back pressure. As soon as the nose reaches its maximum height, repeat the entire routine. After several repetitions, the nose attains greater height and speed increases. If the elevator control is then pushed well forward and held there, the seaplane will slowly flatten out on the step and the controls may then be eased back to the neutral position. Once on the step, the remainder of the takeoff run follows the usual glassy water procedure.

ROUGH WATER TAKEOFFS

The objective in a rough water takeoff is similar to that of a rough or soft field takeoff in a landplane: to transfer the weight of the airplane to the wings as soon as possible, get airborne at a minimum airspeed, accelerate in ground effect to a safe climb speed, and climb out.

In most cases an experienced seaplane pilot can safely take off in rough water, but a beginner should not attempt to take off if the waves are too high. Using the proper procedure during rough water operation lessens the abuse of the floats, as well as the entire seaplane.

During rough water takeoffs, open the throttle to takeoff power just as the floats begin rising on a wave. This prevents the float bows from digging into the water and helps keep the spray away from the propeller. Apply a little more back elevator pressure than on a smooth water takeoff. This raises the nose to a higher angle and helps keep the float bows clear of the water.

Once on the step, the seaplane can begin to bounce from one wave crest to the next, raising its nose higher with each bounce, so each successive wave is struck with increasing severity. To correct this situation and to prevent a stall, smooth elevator pressures should be used to set up a fairly constant pitch attitude that allows the seaplane to skim across each successive wave as speed increases. Maintain control pressure to prevent the float bows from being pushed under the water surface, and to keep the seaplane from being thrown into the air at a high pitch angle and low airspeed. Fortunately, a takeoff in rough water is generally accomplished within a short time because if there is sufficient wind to make water rough, the wind is also strong enough to produce aerodynamic lift earlier and enable the seaplane to become airborne quickly.

The relationship of the spacing of the waves to the length of the floats is very important. If the wavelength

is less than half the length of the floats, the seaplane is always supported by at least two waves at a time. If the wavelength is longer than the floats, only one wave at a time supports the seaplane. This creates dangerous pitching motions, and takeoff should not be attempted in this situation.

With respect to water roughness, consider the effect of a strong water current flowing against the wind. If the current is moving at 10 knots and the wind is blowing the opposite direction at 15 knots, the relative velocity between the water and the wind is 25 knots, and the waves will be as high as those produced in still water by a wind of 25 knots.

The advisability of canceling a proposed flight because of rough water depends on the size of the seaplane, wing loading, power loading, and, most importantly, the pilot's ability. As a general rule, if the height of the waves from trough to crest is more than half the height of the floats from keel to deck, takeoffs should not be attempted except by expert seaplane pilots. Chapter 8, Emergency Open Sea Operations, contains more information on rough water operations.

CONFINED AREA TAKEOFFS

If operating from a small body of water, an acceptable technique may be to begin the takeoff run while headed downwind, and then turning to complete the takeoff into the wind. This may be done by putting the seaplane on the step while on a downwind heading, then making a step turn into the wind to complete the takeoff. Exercise caution when using this technique since wind and centrifugal force are acting in the same direction and could result in the seaplane tipping over. The water area must be large enough to permit a wide step turn, and winds should be light.

In some cases, the water area may be adequate but surrounding high terrain creates a confined area. The terrain may also block winds, resulting in a glassy water situation as well. Such conditions may lead to a dangerous situation, especially when combined with a high density altitude. Even though landing was not difficult, careful planning is necessary for the takeoff. If the departure path leads over high terrain, consider circling back over the water after takeoff to gain altitude. If air temperatures have increased since landing, make the proper allowance for reduced takeoff performance due to the change in density altitude. Think about spending the night to take advantage of cooler temperatures the next morning. Although the decision may be difficult, consider leaving some cargo or passengers behind if takeoff safety is in question. It is far better to make a second trip to pick them up than to end your takeoff in the trees along the shore.

