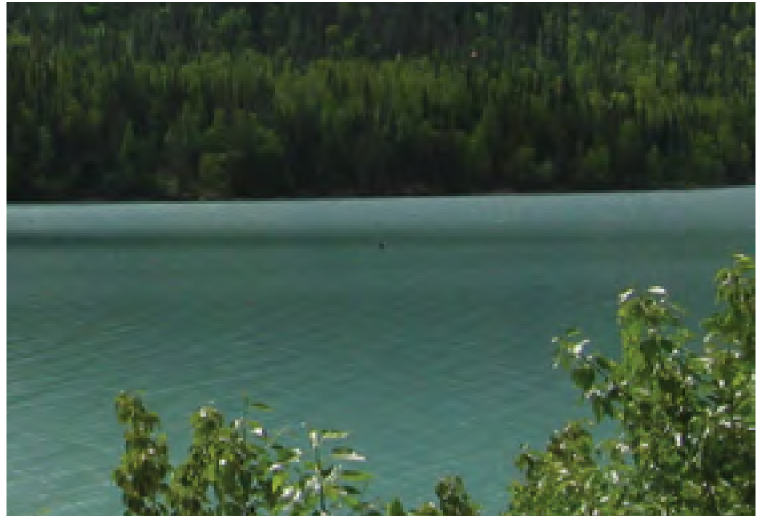
seaplane ops guide



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NOT ALL GLASSY WATER IS THE SAME

INTRODUCTION

This booklet is meant to promote safety by offering a review of selected seaplane topics. Some of the topics are intended for review at the beginning of the season to help us get back in the seaplane mindset after a period of winter inactivity. Other topics were selected because the accident record suggests that attention to these areas might prevent future mishaps.

LAUNCHING AND TAXI

Certainly before getting in a seaplane and casting it adrift to start the engine, we give some thought to what we're about to do and make a plan; we consider weathervaning, anticipating how the airplane will drift, what to do if the engine doesn't start, and have a paddle readily available in case the plan doesn't quite come together. This is also a good way to approach seaplane flying in general. Its good practice to anticipate the conditions, have a plan for how to best deal with them, and always be ready to adjust the plan as necessary. Seaplane flying takes place in an off-airport dynamic environment where there are a lot of things to keep ahead of, and before we push off from the dock, it is entirely up to us to plan how we can conduct the flight from start to finish within the limitations of the airplane and our own abilities.

TAKEOFF PERFORMANCE

Statistically, a lot of seaplane accidents occur on takeoff, and many of those have to do with inadequate takeoff performance for the waterway in question. Compared to wheelplanes, it is more difficult to reliably calculate takeoff performance in seaplanes. Seaplane performance is more sensitive to a larger number of variables, and the performance you experience at a given lake can change significantly from one flight to the next. While you don't have the luxury of calculating takeoff distance, you can anticipate how certain conditions will affect performance and over time develop a good feel for what your particular seaplane is capable of.

Drag - The seaplane is sensitive to water drag on the high-end of the takeoff run, and anything that increases the liftoff speed (and therefore drag) hurts takeoff performance.

Weight – Seaplanes are more sensitive to weight than are wheelplanes because extra weight increases the amount of water drag that must be overcome during the takeoff. Also, as a seaplane gets heavier, it becomes progressively more sensitive to weight. For example, adding 50 pounds to a light seaplane might have a small effect on takeoff distance, while adding the same 50 pounds to an airplane that is already heavy has a much larger effect on takeoff distance. This is especially true of underpowered early vintage seaplanes.

Wind - Because a headwind reduces liftoff water speed and reduces the amount of water drag the airplane must overcome, headwinds are especially helpful. For the same reason, tailwinds cause an especially large performance penalty in seaplanes. Since calm air usually coincides with high-drag smooth water, the absence of wind usually penalizes performance.

Water Surface - Smooth water produces more drag because the water is in continuous contact with the float hull. In choppy water, there is less water in contact with the float hull, and for that reason, less drag.

C.G. - For a given load, moving the C.G. aft will slightly shorten the water run, and moving the C.G. forward reduces the amount of power required to get on the step (but lengthens water run). Neither effect is very pronounced and is most likely to be noticeable only when performance is marginal.

Temperature/Density Altitude - Hot days and/or high elevations create a greater performance penalty than they do for wheelplanes. As is the case with weight, as you get to higher density altitudes, the seaplane becomes progressively more sensitive to further increases.

One Float Takeoff – This maneuver is not likely to help significantly help performance in normal conditions with light or moderate loads. When performance becomes marginal, because of a heavy load or for other reasons, then the one-float technique will usually shorten the takeoff run. To maximize the efficiency of the one-float takeoff, lift the float only high enough to just clear the water.

Technique/Proficiency - This is a huge variable. It's amazing how much poor technique penalizes takeoff performance. Fortunately we can do something about this through ongoing practice and proficiency. Use every takeoff as an opportunity to fine-tune your ability to get the airplane off the water in the shortest distance possible. By habitually maximizing the efficiency of every takeoff, you'll put yourself at a real advantage when you have to get the best out of a marginal performance situation.

All the factors described here combine to determine your performance, and as you get closer to the airplane's limits, performance becomes progressively more sensitive to each factor. The absolute performance limit is reached when the airplane is not capable of getting on the step, at which point you'll have offload some weight.

If the length of a lake is a concern, you may be able to incorporate a step turn into your takeoff path to increase the usable runway length. At short lakes you can protect yourself with a pre-determined no-go point and stick to it. If you're not off the water by that point, abort the takeoff and do something to improve your situation, which usually means off-loading weight, shuttling lighter loads to a nearby larger lake, or waiting for a more favorable wind. When planning a trip, if you know performance will be an issue, sometimes you can time the flight for the best conditions, such as cool air in the morning, favorable breezes in the afternoon, or any other local weather patterns and conditions that might work to your advantage.

WEIGHT AND BALANCE

Since weight and balance are important to performance, it is worth noting that a glance at the waterline of the floats can give you a sense of the airplane's load. The height and angle of the waterline give a rough indication of weight and balance respectively. Of course looking at the floats isn't a substitute for keeping track of your load in the traditional manner, but it can call your attention that something is amiss with your load, especially when you're at a remote lake and do not have the benefit of known weights.

Throughout the day some water finds its way into the floats, and it is good situational awareness to know how much weight this adds to the airplane. If you know how much weight each stroke of the float pump delivers, you can easily measure this. The standard 2-foot float pump usually delivers about a pint of water per stroke, which happens to be one pound of water per stroke. To measure the output of your particular float pump, you can use a pint milk carton to estimate the weight of one pump stroke. In this way, you can anticipate how leakage will contribute to the airplane's weight throughout the day. Depending on which compartments take on water, you can also anticipate how it will affect the C.G.. By keeping track of this, you might find yourself pausing to pump your floats again before making that critical heavy takeoff from a short lake.

LANDING

We all know to avoid fast landing speeds and low pitch attitudes, but if you've been making wheel landings on wheels or skis all winter, this might take a little change of routine.

Landing a floatplane fast at a low pitch attitude results in greater hull drag, which tends to pitch the airplane even farther forward. As a floatplane pitches forward, the point where the floats pivot on the water also moves forward. When that pivot point moves ahead of the airplane's C.G., the floatplane will experience the same kind of yaw instability as do tailwheel airplanes. For this reason, when landing fast at low pitch attitudes, it is possible to have directional control problems and even waterloop the airplane. When landing with a nose-up attitude, the floats pivot at a point behind the C.G., and the airplane is directionally stable for the same reason that a nosewheel airplane is stable. One should always establish the proper landing attitude & airspeed well prior to touching down and control your descent rate with throttle.

PORPOISING

Porpoising is the pitch oscillation that can occur during takeoff or step taxi. At the beginning of the takeoff, when the pitch rises to its maximum height in the hump phase, failure to promptly relax the pitch to climb onto the step will cause the airplane to porpoise, starting with small oscillations that will grow larger if left uncorrected. You can remedy the situation by relaxing the pitch, and as the airplane climbs onto the step the porpoising will disappear. The other fix is to pull the power back to idle and abort the takeoff, which will also stop the porpoising.

Once you have completed the transition to the step, porpoising can again occur as a result of not maintaining the

Technique & Proficiency

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correct pitch attitude. Continued exposure to bow drag or stern drag, from being too nose-low or too nose-high on the step, will cause the airplane to porpoise. Again it will start out with small pitch excursions that will grow to a large oscillation if allowed to. This can occur during the takeoff run or during step taxi, and there are two ways to correct the problem; Making a single pitch correction that brings the airplane back to the minimum drag step attitude will cause the oscillations to stop, or reducing power and coming off the step will also take care of it.

For any kind of porpoise, if it has progressed to a point where you are uncomfortable with it, reducing power to idle and applying aft elevator is the easiest and simplest way to get out of it.

The above applies specifically to floatplanes; some of the causes and remedies for porpoising in monohull seaplanes are different.

AMPHIBIOUS SEAPLANES

With amphibious seaplanes comes the possibility of landing with the gear in the wrong position, and the really disastrous scenario is landing in the water with the wheels extended. A lot of experienced pilots have made this mistake, and we can't take it for granted that it won't happen to us. Certainly using the checklist is the first step in avoiding a mishap, but a lot of pilots have managed to accomplish the checklist incorrectly. Somehow the gear gets extended and the green lights that indicate gear-down fail to call attention to the hazard.

Thinking like a wheelplane pilot gets people in trouble here. Wheelplane pilots are conditioned to avoid landing gear-up, and they think of gear-down as the safe configuration. Amphib pilots make half of their landings gear-up and think of things a little differently. To the amphib pilot, the potential for disaster exists anytime the gear is extended. This configuration is contrary to the airplane's basic nature as a seaplane, and the only time it is appropriate is when you can look out the window at a runway that you are approaching. I call the nagging uneasiness that an amphib pilot feels anytime the gear is extended the amphib pilot's survival instinct, and I believe it serves us well by putting us on edge anytime the gear is extended. By thinking of gear-down as an inherently hazardous configuration, we are less likely to let that occur at an inappropriate time.

When we come to 'landing gear' on the before landing checklist, I believe in visually making a compatibility check; I make visual contact with the landing gear and then look ahead at the landing area to make sure they are compatible. If I see wheels hanging out, then I want to look ahead and see a runway. It's not a bad idea to verbalize this as well, saying 'gear down for the runway' or 'gear up for the water'. If anything is amiss, this makes it more likely that it will get your attention.

Getting the gear in the correct position on a particular flight is a very simple task, but it's a different matter to accomplish this simple task thousands of times under all different circumstances with the full range of distractions for the duration of our careers without ever making a single mistake. Doing this requires constant attention and discipline on our part. There are also electronic (switches and lights) amphibious checklists available from a number of vendors.

GLASSY WATER

Reduced depth perception in glassy water is a frequent factor in accidents, even among experienced pilots. A common mistake is failing to treat water as glassy. Glassy water exists in varying degrees and sometimes it's not entirely obvious whether you need to use a glassy water technique. Water should be considered glassy if it supports reflections. If you can see any reflections at all, your sense of height above the water will be compromised to some degree.

Not all glassy water is the same. There is perfectly glassy water, an absolutely flat surface that makes perfect mirror-like reflections. This condition completely eliminates depth perception and usually requires the full textbook glassy water procedure. There is also what might be called partially glassy water; a slightly wavy surface that supports distorted reflections and only partially compromises depth perception. In this case, you will probably have some sense of height above the water, but it might not be enough for a normal flare. It isn't until the smooth surface is broken into wind ripples that reflections are completely destroyed and you can count on good depth perception.

Of the varying degrees of glassy water, the partially glassy water can be the most insidious because it may lull you into thinking you can make a normal landing on it. While partially glassy water might not require the full, stabilized blind approach, it does deserve some consideration. If we choose to make a normal approach, we should at least approach the water with a cautiously nose-up attitude to make allowances for a little misjudgment. (Remember that the glassy water illusion makes it appear that we're higher than we actually are, causing us to touch down prematurely.) Any kind of reflections in our landing area should alert us to the glassy water hazard. The situation might not always call for the full glassy water procedure, but if there is any doubt about what to do, you can't go wrong with the full procedure.

When making the full textbook glassy water approach to a blind touchdown, you can protect yourself with two go-around points; the first one is crossing the shoreline. If you're not fully established in both airspeed and descent rate when you cross the shore onto the glassy water, then you're not prepared to touch down and you should go around and start over. Another go-around point should protect you from landing long or flying into the far shore of the lake. As you fly over the glassy water, focused on the gages and waiting for the touchdown, its easy to forget that the end of the lake is approaching. Keep the far shore in your scan, and have a go-around point, beyond which you don't have enough room to complete the landing.

Obstacles around some lakes, particularly short ones, make it impossible to fly the full glassy-water procedure. In some cases these lakes just aren't safe when the water is glassy, but sometimes you can modify your technique to fit the situation. For example, at Lake Hood, it works well to make a normal descent using the beginning of the west water-lane as an aim-point. Then as you get lower, using the shoreline on either side of the water lane for a height reference, transition to a nose-high attitude and use the edges of the water-lane in your peripheral vision to give you a rough sense of height as you feel-out the last several feet to the water. Fire Lake in Eagle River is another place where you can make a hybrid approach, starting out with a normal descent by land-reference, and then transition to a glassy-water attitude to feel out the last few feet.

In addition to smooth water, there are other conditions that compromise your depth perception. For example, on a drizzly day in flat light under a low stratus, it can be difficult to judge your height above the water even though there is some surface texture. Flying over the water through snow showers can be especially treacherous. A lot of pilots have inadvertently flown into the water in these conditions.

PRACTICE

It is a fact that we are at increased risk for accidents at the beginning of the seaplane season, when we are still regaining our proficiency on the water. A recurrent session with a good CFI is never a bad idea, and proficiency flights by yourself are extremely valuable as well. Regularly devoting some time to just doing takeoffs, landings and water work helps to maintain the edge that will serve you well in all your flying.

SAFETY

We usually think of safety in terms of preventing accidents, but we also have to acknowledge that an accident is always possible. For that reason, one of our responsibilities is to prepare ourselves to survive the aftermath of an accident.

After a seaplane accident, the airplane is likely to come to rest upside-down in the water. This can be a very disorienting situation, and many people who survived the initial crash have drowned because they could not find their way out of the airplane in time. The chances that you can get yourself and your passengers out of a capsized airplane are greatly improved by identifying and practicing a short sequence of egress actions with your eyes closed. Attending a dunk-tank session illustrates the problem, presents the solution and is good insurance for anyone.

In the aftermath of a seaplane accident, you are likely to have only what is on your person, so a float-vest with a few basic items in the pockets is not a bad idea. A watertight case for a cell-phone has been known to save the day. Some form of flight following should be an absolute matter of habit.

Remember that safety is a matter of responsibility to other people. Accidents cause untold grief for the people who care about you, put rescue personnel at risk, and often bring about restrictions that affect the rest of us.

Flying seaplanes is something that we should take seriously, but we should also enjoy it. We have some of the world's best seaplane flying in Alaska, and the more we develop our skills, the better we are able to take advantage of it. A healthy enthusiasm for seaplane flying promotes safety by keeping us engaged with what we're doing and driving us to get better at it. Work hard at it, but also have fun with it. Best wishes with your seaplane flying, and have a good season!

Special thanks to Burke Mees for his invaluable work in preparing the content of the Seaplane Ops Guide.

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but we also have to **acknowledge**
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Practice Safety

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