Basic Floatplane Skills

1. Pre-Flight Inspection

Pre-flight inspection of a floatplane is generally similar to that of a land plane. The major difference is the inspection of the floats.

Floats, wires, attachment gear and ropes must be thoroughly checked for holes, buckling, damaged fittings and extensive wear. Any damage should be reported to your instructor to determine a course of action.

The **floats** themselves should be inspected before each flight for possible leakage. Water is heavier than fuel at 8 lbs per gallon. Water in the float compartments can adversely affect water handling and flight characteristics including a shift in the aircraft's center of gravity. Individual compartments should be pumped out through the built-in bilge pump-outs by a hand-operated bilge pump. Always count the number of 'strokes' in order to estimate the amount of water present. The step compartment will typically contain the most water because it is constructed with the most seams and rivets. For the EDO 2960 floats on our aircraft, more than 10 strokes in a compartment should be reported to your instructor.

The **water rudders** are located at the rear of the floats and should be inspected for movement and connection to the air rudder and for their ability to be raised for flight. Thoroughly inspect the cables, pulleys and connectors for freedom of movement and signs of wear.

2. Evaluating Wind and Water Conditions

Wind and water conditions should be noted prior to start-up and taxiing. Before leaving the dock or ramp, the pilot should evaluate water and surface conditions, wind velocity and wind direction to determine the combined effects on taxiing and take-off maneuvers. Remember, the focus of the floatplane pilot should remain OUTSIDE the aircraft from start-up until it is shutdown and safely secured at the end of the flight! It is best to have a plan in mind BEFORE you get into situations that might catch you off-guard.

Some **tips** for evaluating wind and water conditions:

- A **band of slick flat water** to the shore line will determine the direction of the wind. The width of the band will give an indication of the strength.
- Less than **two wave lengths** over the length of the float is generally considered too rough for take off.
- The presence of **whitecaps** generally indicates wind in excess of 9-12 knots.
- **Smoke or steam** is a good indicator of wind direction.
- **Tethered vessels** or docks generally 'weather-cock' into the wind.
- **Tree leaves** will show their silvery sides to the direction of the wind.
- The best indication is the **wind sock**, found at most seaplane bases.
- Look at the movement of floating object in the water to determine the direction and velocity of the current. (Remember, it may not always be downstream, if also affected by tides!)

3. Engine Start, Taxi and Run-Up

Many variables apply to the actions immediately preceding the actual starting of the engine. If a dock attendant is available, he/she can hold the aircraft pointed to open water until the engine has started. If no helper is available and circumstances demand that the aircraft is suitably restrained until the engine has started, release can be made by releasing a rope which is threaded around a ring or cleat and the end held by the pilot until the engine has started. If it is necessary to let the aircraft drift away from the dock, then surrounding obstructions such as other aircraft, boats etc. will dictate the procedure to be followed. The pilot should at all times have a clear plan of what to do in case the engine does not start to minimize the likelihood of damaging the aircraft. If the aircraft is

turned out by a helper in a fast flowing river, the aircraft should be turned to a 30 or 45 degree angle to the current and the engine started. If for any reason the engine does not start the only way to get the aircraft back to the dock in a safe manner is to let the current move the nose of the aircraft down stream and at the same time move the tail of the aircraft up stream. This has to be done in a rapid manner as to minimize the down stream movement of the aircraft and the possibility of the aircraft colliding with another vessel or aircraft.

Engine run-up should not be attempted down-wind for the obvious reason of engine cooling and propeller spray pick-up, and can be done during the take-off run. Use the taxi time to inspect your take-off area while the engine is warming sufficiently for the run-up. It is important that you maintain awareness and lookout of the area during run-up, since the plane will be moving and visibility will be impaired by the nose-high attitude. Check each item separately, then return your focus outside to assure that you are tracking straight and the area remains clear.

For most piston engines, the run-up is accomplished before completing the pre-takeoff checklist (unless done on the take-off run). Check to see that the engine is sufficiently warm (CHT/oil pressure/temp), apply full back pressure on the controls and select 1700 rpm. When stabilized, check each mag separately and return selector to both. There should not be a drop of more than 150 rpm with a spread not more than 75 rpm between them. Cycle the prop 3 times (for first flight of the day) to circulate the oil, apply carb heat (check for an rpm drop or increase in carb air temp) and slowly reduce the throttle to full idle, assuring that the engine continues to run smoothly, then advance the throttle back to taxi speed (<=1000RPM).

4. Water Work

Taxiing comes in four modes: **normal (displacement)**, **plow**, **step & sailing**.

A. Normal Taxiing

The **normal taxi** mode is most often used; the control stick is kept all the way back to keep the propeller away from the bow waves and its spray. This is to ensure that water does not strike the rotating prop which can inflict severe damage to the propeller. **Downwind taxiing** aggravates the water spray pick-up because the wind will push the aircraft to a much faster speed as when taxiing into the wind. Therefore, when taxiing downwind, make sure the speed of the aircraft is kept as slow as possible. Great care must be taken when turning especially at high speeds and in a strong wind. The aircraft has the tendency to turn into the wind (weather-cock) when taxied across wind or downwind when control forces are relaxed. Centrifugal forces tend to roll the aircraft to the outside of the turn and the wind will always aggravate the rolling tendency. The combined forces could be enough to overturn the aircraft. Therefore, all turns into the wind should be with utmost care and slow speed.

B. Plow (Nose High) Taxiing

Taxiing in the nose high mode should be of short duration as the engine can quickly over heat. This mode of taxiing is used to assist turns from into wind to downwind, and for engine run-up purposes. For the run-up, hold the control column fully back and apply the power setting recommended by your Pilot Operating Handbook for engine run-up. Typically this is done during the take-off slide. When engine run-up checks are complete, take-off power is applied and the take-off is continued.

C. Step Taxiing

Step taxiing requires considerable skill and experience. To begin, the water rudders should be in the up position. The aircraft is placed on the step by holding the elevator control fully back and applying full power.

The nose will rise and the aircraft accelerates. When the nose stops rising, ease the control column forward to put the nose of the aircraft to a place just above the horizon and the aircraft accelerates further. Reduce power at this point to prevent the aircraft from becoming airborne. Turns on the step are made with the application of rudder and to counter the centrifugal force, the ailerons are turned with the turn as to keep the outside wing up and prevent aggravating the centrifugal tendencies of the aircraft. Turns of more than 30 degrees require a high level of skill and experience. Step taxiing is not to be attempted during the solo portion of the training.

D. Sailing

Sailing is the procedure used for moving the aircraft in a location where normal maneuvers are not possible because of crowding, room, wind or other conditions. Sailing is done with the help of wind, engine or paddle-power or a combination of these. In a light wind with the engine stopped, the floatplane moves backward in the direction of the wind. In a stronger wind with the engine idling, the aircraft moves backwards or toward the side in which the nose is pointed. The nose of the aircraft can be moved by course application of rudder and by using full application of aileron. The upwards movement of the aileron is less than the downward one, hence more exposed surface of the downward aileron and therefore, more sensitive to being effected by the wind.

When sailing use the air rudder and aileron drag to steer the aircraft. To sail straight backward, centralize all controls. Additional “sail” area may be acquired by lowering flaps or opening cabin doors.

Forces of current or tidal action will offset the effect of wind to a varying degree and should not be under-estimated. If the engine has been left running in the idle mode, its forward thrust can be reduced further by running on one magneto or applying carburetor heat. Do not operate the engine in this manner for too long as plug fouling can result.

Water rudders work in reverse in comparison to the air rudders, so the water rudders should normally be pulled up for sailing.

5. Take off

After the aircraft has been checked over, the passengers have been given a safety briefing, engine started, run up complete, the pilot completes the SCAMPFRS & maneuvers the seaplane into the wind. Retract the water rudders to start the take-off. Open the throttle to take-off power and pull the stick all the way back. As soon as the nose has come up as far as it will go, move the stick gently forward to a more or less neutral position. The aircraft will ‘climb-up’ onto the step as the centre of pressure (of the water) moves back along the floats. The aircraft may have a tendency to veer to the left at the moment when going onto the step, (this is due to the P-Torque effect of the engine). Plan your line up to use this aerodynamic force to your benefit. Use rudder to counteract this. The step attitude should be maintained as steadily as possible until take-off speed is reached, at which time the aircraft will typically fly off the water. An important technique to master is that of the most efficient planing angle of the floats. It is the angle at which the tails of the floats almost, but not quite, touch the water. Running the floats at a flatter angle tends to wet more of the forward bottom of the floats, thereby increasing resistance and slowing speed. It deserves careful attention during the early stages of float flying. In practice, having the nose too high is one of the most common mistakes made by novice pilots. The best take-off planing angle is the angle which produces the least amount of resistance. After the aircraft becomes airborne the nose should be lowered to accelerate in ground effect. This is to ensure a rapid transition through the slow flight range so a safe return to the water can be achieved in the event of an engine failure after take-off. Aim for 85 MPH and once achieved, set climb power. Passing 300', retract the flaps. Be mindful of performance. Turning, climbing and retracting flaps all at once can place the aircraft behind the power curve. Limit bank angle to 30 degrees or less and fly smoothly and accurately.

A. Glassy Water Take-Off

When the water becomes as smooth as a mirror, the same technique as described above apply with the added and very important need, to establish a ‘positive rate of climb’ to prevent the aircraft from flying back into the water surface. A true glassy water take-off can be quite unnerving as the surface of the water is very hard to discern. A fixed reference point (like a rocky outcrop, point or dock) is very helpful in this situation. The float roll will greatly assist in breaking the hydrodynamic drag between the float and the water surface. Be extremely mindful with the close proximity of the wing tip to the water surface. Once airborne from a float roll, confirm a positive rate of climb, and transition into coordinated flight. Sometimes, a bit of wave action or wake can help to get the aircraft to become 'unstuck' in glassy conditions. The drag between the floats and the water surface is overcome by technique and skill.

B. Rough Water Take-Off

A rough water take-off is similar to a soft field take-off on land, the objective is to get out of the water as soon as possible at the lowest speed. Once the aircraft is on the step, a slightly nose up attitude should be maintained to ensure the floats take the impacts of the waves at the step compartment which is the strongest point of the floats. It is very important to ensure the rear of the floats are not dragging in the water and preventing the aircraft from accelerating. The proper attitude is a very subtle nose up position.

A rough water take-off can turn into a series of bounces from wave to wave. They are typically not very pretty. Sometimes the aircraft can be tossed into the air at minimum flying speed. Applying an extra amount of flap at that precise moment will usually keep the aircraft from stalling back onto the next wave. Again, the proper attitude is critical to avoid damaging the aircraft. Any inexperienced Pilot can blindly land in rough conditions. The experienced seaplane pilot protects the aircraft from exposure to rough conditions. Through experience, a pilot will learn when it is too rough. When this happens, you may opt not to go or search for a more sheltered area to conduct the take-off.

C. Cross-Wind Take-Off

A cross-wind take-off involves similar techniques as the normal take-off with the exception that the ailerons are kept fully into the wind to keep the upwind side of the aircraft from being lifted out of the water before flying speed has been reached.

You will often see float pilots ‘roll’ one float out of the water in a cross wind or heavy take-off condition. The reason for this is two-fold;

1. It keeps the aircraft positively on the water until a safe flying speed is reached and;
2. It effectively halves the resistance the aircraft is experiencing and expedites attaining flying speed.

It is half of the most important skill you will learn in your training (the cross-wind landing is the other half)

Carefully balanced use of aileron and rudder are required to properly perform this maneuver. NEVER lift the upwind float during the take-off! This can easily cause the aircraft to skip sideways on the water and possibly ‘ground loop’. You will meet some float pilots that consider this an effective way of getting off the water quicker. Quicker is not necessarily better, it is always prudent to avoid situations which make us vulnerable. Settling back on the water in a sideways drift can be very dangerous. When utilizing your crosswind technique, be mindful of how close to the water your upwind wingtip is.

D. Down-Wind Take-Off

It is important to note that a downwind take-off can typically double the take-off run, except in very light wind conditions, so should be avoided unless necessary for other reasons. This is an important consideration when trying to determine available space and water conditions. The difference in a downwind take-off compared to a normal take-off is that as soon as the water rudders are raised the aircraft will attempt to weather-cock into the wind. This can be overcome by coarse application of the air rudder. To make the air rudder more effective in the initial part of the take-off, the flaps can be kept up to prevent them from blanking the rudder. After the aircraft has begun to gain forward momentum and the air rudder is effectively controlling the direction for the take-off, flaps can then be lowered to the required position. Water rudders should be in the “up” position.

E. Aborted Take-Off

The aborted takeoff requires good judgment, timing and skill. A normal abort requires the power to idle and the stick back. An abort to avoid a collision or obstacle requires power to idle and a 'gentle' easing of the nose forward to dig the bows. Rudder control may be needed. Pilots must always have a point in mind where they must be airborne. A 'Go no Go' point. If the takeoff run is nearing its limit, pulling back on the stick prematurely will only dig the heels into the water, and drastically lengthen the take off run. If not becoming airborne as planned, abort the takeoff and consider the conditions, variables, or technical reasons this occurred.

6. Air Work

Steep turns should be done with a bank of about 45 degrees, within 100 feet of the starting altitude and ±10 mph airspeed. Remember to keep the ball in the middle at all times with the rudder. Increase power as required to maintain altitude. Steep turns are an excellent practice in coordinating all three flight controls and power application.

A steep turn is entered like any other turn, but as the angle of bank is increased beyond 30 degrees, you will need more power to maintain airspeed and altitude. A steep turn cannot be done by numbers only; it requires complete simultaneous coordination of all controls.

Slow flight is practiced to acquaint the pilot with the aircraft's characteristics when flying close to minimum control speed. Flying in the slow flight mode, particularly at low altitude and strong gusty conditions, could put the pilot in a critical situation. Therefore, you must monitor your flight instruments very closely in order to achieve coordinated flight and a safe margin of airspeed. Slow flight does amplify any errors in basic flying technique and therefore precise control of the aircraft is essential. If you find yourself behind the power curve, add power, reduce bank, and accelerate.

7. Inspection of the Landing & Take-Off Site

Careful inspection of the landing & take-off area cannot be over stressed. Keep in mind that the seaplane can be landed in an area that is considerably smaller than it can take-off in. Also remember to inspect more than one direction for departure as the wind may change while you are there. Special attention should be given to power lines, submerged obstacles, the dock or beach area, current, tides, glare, obstacles above the water, obstacles around the dock (like pilings, ramps or other vessels) etc. Special care should be given to water that is exceptionally clear as the depth is difficult to estimate. Preferably, the seaplane should be landed into the wind and away from or along the shore line. Observe the rules of the sea. Lateral, bifurcation, and cardinal markers indicate safe water. Inspections are typically flown between 500-800 feet. It is good airmanship and Fort Langley Air normal procedure, to overfly the landing area prior to each landing.

8. Landing, It's All in the Attitude!

Landing a seaplane is comparable to landing a tail wheel equipped aircraft. The main difference from standard tricycle gear trainers is the need to fly the aircraft on to the landing surface.

Float flying is often referred to as attitude flying. The key is to land the aircraft in the same attitude as you had for take-off. This usually requires power at first, until you become more practiced, eventually you will be able to land the aircraft without power in the proper attitude. You will demonstrate this skill during forced approaches where you will actually land the aircraft without power.

The critical portion of the landing is when you touch the water. Touch down on the step of the float. Forward of this, you will dig the bows. Aft of the step, you will kick the heels. Once on the water, bring the power to idle. The natural tendency is to relax your control input. In the seaplane, this is usually when the rodeo begins. You must maintain the attitude of the aircraft with back elevator. Use correct aileron and rudder to keep the aircraft straight. As the aircraft slows down, the center of pressure (of the water) slowly moves forward until the aircraft slides off the step and back into the normal taxi mode. A gentle forward pressure on the controls at this time is required to keep the aircraft from falling off the step and bouncing along on the back of the float. It should be a very gentle and soft landing.

b. Rough Water Landing

This landing is carried out with exactly the same subtle nose up attitude as the rough water take-off to ensure the strongest part of the undercarriage bears the brunt of the landing. As the aircraft slows maintain the higher than normal nose attitude so that the aircraft touches on the skeg of the float. This is slighty aft of the step and is structurally, the strongest part of the float. Bring the power to idle and hold the stick back until the aircraft settles into the taxi mode. Be ready with power for recovery from severe bounces. We do not subject the Cessna 180 to rough water. If white caps are less than 6 feet apart, this can indicate rough water. The experienced seaplane Pilot will come up with an alternative landing area or a diversion. Landing in rough water can result in a wave coming over the windshield and damage to the propeller and floats. Taking off from rough water is even harder on the aircraft. Anyone can land in rough water. Use your professionalism, training and skills to find calmer water.

c. Glassy Water Landing

Calm conditions known as glassy water are the most deceptive phenomenon known to the float pilot. It is an outright dangerous surface to land on if not completely comfortable with the procedures. The height above the water surface is impossible to estimate correctly, making it extremely difficult to judge the final few feet. Many experienced float pilots have been caught up in the deception. The most dangerous glassy water condition is when the water surface is clear. The pilot will be looking at the bottom of the river or lake and not at the surface of the water.

The glassy water landing is always a power-on landing and should be initiated about 100 to150 feet above the water. Land parallel and close to shore (don't worry about the wind as there is none) to maintain a reference above the water. Set flaps (usually 20-30 degrees) where maximum lift and minimum drag will be obtained and assume the landing attitude. The rate of descent should be controlled with power to around 50-100 feet per minute. Do not change the attitude. As the aircraft descends through the last 10 – 20 feet, its rate of decent will slow somewhat as it will come into ground effect and the touch-down will be made.

Maintain the attitude of the aircraft until the speed bleeds off and the aircraft settles into taxi mode. Glassy water landings usually consume a considerable landing area. This is why the worst case scenario for a seaplane pilot is a heavily loaded aircraft landing on a short lake in glassy conditions.

d. Emergency Landing

The floatplane may be landed on almost any surface encountered over land. The floatplane is even safe on soft or rough ground. Landings in grass have been done with no damage at all to the floats. Contact should be made as even as possible, rudders up. As soon as contact is made, the stick should be fully brought back and held there.

Should the pilot be forced to land on glassy water, the landing should be made as close to shore as possible. The height could hopefully be judged from a reference point on the shore line.

e. Cross Wind Landing

The cross-wind landing is accomplished by first eliminating the drift on your approach by flying crabbed into the wind. When you are close to the water, straighten the aircraft with rudder, lower the upwind wing and assume the landing attitude. This is the other half of the most important skill you will learn in your training.

in the landing attitude, you must land on the upwind float first, while keeping the aircraft straight and level. Maintain your coordinated control inputs. Touch down and the aircraft will slow and settle onto the step. Once in the normal taxi, methodically raise the flaps and lower the water rudders. When you hear someone refer to a pilot as having 'good hands and feet', this is what they mean.

f. Missed Approach

A Go around should be considered for every approach. Methodically and positively announce "Go Around", "set max power", pitch for climb and achieve Vy 85 MPH. Set climb power. At 300' begin to retract flaps as per a normal departure.
note: from a FLAP 40 approach the calls will be: "Go Around", "set max power", "Flap 20"
When retracting flap, anticipate a nose drop with back pressure. This nose drop can be very dangerous when close to the water. note: if needed, Vx climb is Flap 20 and 65 MPH.

9. After Landing. After touchdown, once off the step and in the plowing attitude, retract the flaps. This will spoil the lift and lessen the chance of the aircraft becoming airborne again. The water rudders can also be lowered to assist with directional control. There is absolutely no rush to do anything quickly. Ensure that the aircraft is off the step and in the displacement phase. Once Flaps are up and water rudders are down, run through your after-landing flow and prepare for the next phase of flying floats.

a. Docking

Docking a seaplane is not like parking a car. A seaplane has no brakes and the engine has to be shut down before the aircraft can come to a stop. Therefore, the last part of the docking maneuver is without power and brakes. The pilot shuts the engine off when he is certain that he can coast to the dock and steers the aircraft alongside.

Before approaching the dock, carefully check for pilings and other obstructions that could damage the wings or tail feathers. It is wise to plan the docking maneuver without help from passengers or uninformed people standing on the dock. Never allow a person to go out on the float with the engine running. People standing on a dock are always willing to help, but often do it the wrong way. If an effort is made to stop the aircraft by holding back on the wing tip, the aircraft will swing around and smash into the dock. Grabbing the strut can have a similar affect. When ready, shut down and get out on the float and take care of the docking yourself. Never rely on someone else to launch or catch you at a dock unless you are sure they know what they are doing. You and only you are responsible for the aircraft and what it plows into.

Approaching the dock in windy conditions should be done into the wind. The same counts for current, do not dock with the current, as you would eventually end up going as fast as the current with no speed through the water and therefore no rudder control.

Ensure your mooring lines are attached and not tangled. Consider which mooring line you will use. Stopping the aircraft with a mid ship mooring line is a good choice. Alternatively, the aft line can be used. The line that is used will have a resultant turning moment on the aircraft. Do not try to stop the aircraft with your muscle power. Get a wrap around a cleat or rail and bring the aircraft to a stop.

b. Securing the Aircraft

The best way to secure the aircraft (of course!) is to remove it from the water. If this is not possible, you must make sure that it is secured by two to four tie-downs, depending on conditions and length of time away from the plane. Before leaving the plane for any length of time, make sure the floats are pumped dry (if left in the water) and that it is safe from other vessels, wind, waves, currents, and tides – which could either leave you high-and-dry or float your plane away!