

## Instructor Guide — Seaplane Rating

Transport Canada web site

May 1996

- [Introduction](#)
- [Part 1 — Organizing the Training](#)
  - [The Rating](#)
  - [Ground Training](#)
  - [Air Work](#)
  - [Amphibious Operations](#)
  - [Some Principles of Learning](#)
  - [Demonstration — Performance Method of Teaching](#)
  - [Control of the Aircraft](#)
  - [Awareness, Attitude, and Discipline](#)
  - [Recommending for the Rating](#)
  - [Some Headings Explained](#)
- [Part 2 — Planning and Preparation](#)
  - [Objective](#)
  - [Motivation](#)
  - [Estimating Aircraft Performance](#)
  - [Seaplane Bases, Rules, and Aids to Marine Navigation](#)
  - [Fuelling the Aircraft](#)
  - [Pre-Flight Inspection](#)
  - [Passenger Safety Briefing](#)
  - [Starting Engine](#)
  - [Completion Standards](#)
- [Part 3 — Water Handling](#)
  - [Objective](#)
  - [Motivation](#)
  - [Displacement Taxiing](#)
  - [Plowing Taxiing](#)
  - [Step Taxiing](#)
  - [Sailing](#)
  - [Docking](#)
  - [Beaching](#)
  - [Mooring](#)
  - [Abnormal Water Handling Situations](#)
  - [Completion Standards](#)
- [Part 4 — Take-off](#)
  - [Objective](#)
  - [Motivation](#)
  - [Normal Take-off](#)
  - [Glassy Water Take-off](#)
  - [Crosswind Take-off](#)
  - [Engine Failure After Take-off](#)
  - [Completion Standards](#)
- [Part 5 — Approach and Landing](#)
  - [Objective](#)
  - [Motivation](#)

- [Power-On Approach and Landing](#)
- [Power-Off Approach and Landing](#)
- [Crosswind Approach and Landing](#)
- [Approach and Landing Over an Obstacle](#)
- [Glassy Water Approach and Landing](#)
- [Recovering from Abnormal Landing Situations](#)
- [Completion Standards](#)
- [Part 6 — Advanced Exercises](#)
  - [Ramping](#)
  - [Short Run Take-off](#)
  - [Rough Water Take-off](#)
  - [Confined Area Take-off](#)
  - [Rough Water Approach and Landing](#)
  - [Step Turns](#)
  - [Fuelling From Barrels](#)
  - [Carrying External Loads](#)
  - [Basic Seaplane Training Resources](#)

## **Part 1 — Organizing the Training**

Anyone setting out to obtain a seaplane rating has only to look at a map of Canada to see the world they are about to open up for themselves. It is a world of lakes, rivers, channels, sounds, inlets, bays, reaches, bights, harbours, arms, and whatever else is used to name a body of water. Beyond the geography, there is the history. Much of the history of aviation in this country, and the history of a lot of communities, was written with seaplanes. Just as a good seaplane pilot learns to respect the geography, an appreciation of the history is a nice way to round out the education.

### **The Rating**

The seaplane rating is intended for the pilot who already holds a licence. In theory, this is quite straightforward as it simply involves converting a skilled pilot from one environment, namely land, to a new environment, which is water. The reality isn't quite that simple and trainers should keep certain things in mind. First, if the pilot seeking the rating isn't starting from a good level of skill, if they haven't remained current on landplanes or have let their proficiency decline since they last passed a flight test, then it may be difficult for them to achieve the seaplane rating in the minimum time. Second, if they want to fly professionally in seaplanes they will want to extend the training to gain skill and experience in more of the situations and maybe some of the types of aircraft they will actually encounter in a commercial operation. A good trainer can help them do this, but it takes more time. Third, seaplane operations demand superior judgment on the part of the pilot. This isn't to say that landplane operations don't require good judgment, too, because they do. But seaplane operations are different. They are often conducted far from resources that landplane pilots tend to take for granted, things like weather and flight planning, refuelling, and air traffic services. And handling a seaplane on the water involves more skill than handling a landplane on the ground.

### **Ground Training**

Although ground school is not a requirement for the float rating, many of the items listed under "Essential Background Knowledge" in the flight exercises can be presented in a general ground

training session before the flying begins. Whether or not this approach is taken, the background knowledge that is necessary to support the learning of the flight exercises on a given trip must be understood before going flying. Here are some of the items that could be included in a ground training session:

1. Review the training program. Providing an overview of the training for the seaplane rating will not only let the student know what to expect, but what will be expected of the student.
2. Float terminology. Terms like deck, bulkhead, mooring cleat, keel, bumper, chine, skeg, step, bilge, water rudder, spreader bar, and bracing wire will be new to most students.
3. Using the Water Aerodrome Supplement.
4. Using equipment such as float pumps, inflatable safety vests, survival kit, first aid kit, anchor, and ropes.
5. Determining seaplane performance.
6. Hydrodynamics of a float aircraft.
7. Right-of-way rules for water operations.
8. Local traffic procedures, including any special use airspace.

### **Air Work**

The fact that this guide does not have a section dedicated to air work doesn't mean that air work is excluded from seaplane training. Some will be needed. Allow sufficient time in level flight for the student to become familiar with the flight characteristics in normal manoeuvres, and then review some more advanced handling, such as steep turns and stalls. Also, forced landings, including engine failures after take-off, should be reviewed, since the options available to a seaplane are different and the glide performance of the aircraft might be quite different from types previously flown.

### **Amphibious Operations**

Trainers who do checkouts on amphibious aircraft know that some special attention is needed for these aircraft. For one thing, these are airplanes with retractable landing gear. More complex systems mean more things to think about. Particular attention must be given to aircraft performance and to weight and balance. **The use of a checklist is very important** (some operators use green pages for land operations and blue pages for water operations). Aircraft systems must be well understood, especially the landing gear system, including emergency extension and retraction procedures.

### **Advantages**

- Water surfaces can become too rough or freeze over making a land operation necessary.
- Some shorelines, due to the rocky nature or lack of protection from wind and swells, make it impossible to moor or beach a seaplane but a nearby airstrip could be used.
- Easily stored in an airport hangar for protection.
- Water operations are restricted to daylight but an amphibious aircraft can depart the water just before dark and operate as a landplane after departure.
- More landing facilities available, and more maintenance and fuel facilities.

### **Disadvantages**

- Retractable gear are expensive to obtain and to maintain.
- Useful load will usually be reduced by one to two passengers.
- There is a slight speed loss.
- Insurance costs increase because of the risk of landing in the water with the wheels down.
- If the aircraft is a flying boat design, these tend to porpoise more readily during take-off and landing.

### **Some Principles of Learning**

There are some general principles of learning that should be kept in mind when conducting any training, seaplane training included. A useful reference is the Transport Canada *Flight Instructor Guide* (TP 975E), especially the first part on learning and learning factors. The Guide sets out a series of "learning factors" that are presented here in a manner that emphasizes their application to in-flight training.

*The student must be ready to learn (readiness).*

On one level, this reminds the trainer to watch for signs that the student may not be feeling well or may be under stress that could affect the training. If so, it may be better to postpone the lesson. Care must be taken to motivate the student by explaining what is going to be done during the flight, why the different tasks must be mastered, and how they fit into the overall program of training for the rating. But readiness to learn also means that the student must have the knowledge required to undertake the flight lesson in order to fully benefit from the time spent in the air (or on the water). For example, if you wanted the student to learn how to step taxi, the term "step" must be understood before going flying, or if the aim was to learn how to do a forced landing, the student would first have to understand the procedure to be applied.

*Teach it right the first time (primacy).*

First impressions can be very powerful. This is good, so long as the impression is a good one. Therefore, any demonstration of a manoeuvre should be flown as accurately as possible under the existing conditions. However, some of the most important teaching is done outside the context of a formal lesson, which is to say that your conduct as a pilot must be exemplary because your approach to flying, good or bad, will have a strong influence on your student. Instructors must always guard against complacency. An exercise or situation an instructor may have experienced many times is often the first time the student will have seen it.

*Go from known to unknown, simple to complex, easy to difficult (relationship).*

Students seeking a seaplane rating have already mastered many skills, such as landing, so you can build on these known skills to help them learn new ones. Let them achieve some mastery of normal landings before moving to more advanced situations, such as rough water or crosswind landings. Be sure they have mastered the small "component" tasks before trying the whole task. For example, docking won't be easy if they haven't first learned displacement taxiing.

*Engage the student in meaningful activity (exercise).*

Careful planning of each flight lesson is needed to ensure that maximum training benefit is obtained from each hour of flight. Opportunities for correct practice of a task must be built into

the lesson. The practice must be of the correct task, or correct part of the whole task. If this is important for each dual flight, it is equally important for solo flights. Solo flights are not just opportunities to log time. Instructors must be sure their students understand what tasks must be accomplished with each solo flight.

*Dramatic or realistic things are long remembered (intensity).*

Realism is a good thing to build into the training, provided that it is done safely. For example, if you can, don't just simulate a glassy water landing, do the real thing. Think of all the situations the student might encounter once they get the rating and do as much as you reasonably can to prepare them for these situations.

*A student should feel satisfied for having taken part in the lesson (effect).*

Organize the lesson so there will be plenty of room for success. Show respect and courtesy toward the student. When you analyse student performance, point out the positive elements first and don't "nitpick".

*Last things learned and practised are remembered longest (recency).*

A pre-flight briefing immediately before the flight lesson can help the student recall some of the main points of the exercises that are going to be covered. In flight, review some of the exercises that may have been mastered earlier. This will reinforce good performance. Use a good post flight debriefing to review student performance, both strengths and weaknesses, to answer any questions and assign any study that might help the next lesson.

### **Demonstration — Performance Method of Teaching**

The demonstration — performance method of teaching a skill can be broken down in different ways (the Flight Instructor Guide lists five basic steps). Perhaps the simplest way to see this valuable technique is in four basic steps: explain, demonstrate, imitate, critique.

#### *Explain*

The instructor takes control of the aircraft for a brief explanation of the key points of the exercise. For this to work, any necessary ground instruction must have been completed before going flying. The explanation here mainly tells the student what to look for in the demonstration. This is no time for lengthy explanations or questions.

#### *Demonstrate*

The instructor, with the student following through on the controls, flies as accurate a demonstration of the manoeuvre as possible, calling attention to important details the student should notice.

#### *Imitate*

Let the student try it, but give enough verbal assistance to prevent large errors from developing. Don't ride the controls. Take control only if it is necessary to correct major errors and then hand control back to the student.

### *Critique*

The instructor takes control of the aircraft to point out strengths, weaknesses, and to give specific suggestions for improving. This is not a chance to catalogue all the errors that may have been made. Rather, focus on the most important errors and limit the critique to two or three main points. And if you can't give them any suggestion for improving then little will be gained in telling them about a mistake.

### **Control of the Aircraft**

When an instructor is teaching a manoeuvre, students can "follow through" on the controls by placing their hands and feet lightly on the controls so they can feel the control movements. They won't feel the control pressures, of course, but the follow through can help. When the student is flying, the instructor must avoid "riding" the controls as this will rob the student of the correct feel of control pressures. It could also lead to confusion as to who is flying the aircraft. An exception to this could arise in teaching landings, in which case the student should be made aware that you may provide some assistance rather than taking control.

Both the student and the instructor must be clear when a transfer of control is intended. For example, if the instructor wishes to give control to the student, the instructor says "You have control." When the student says "I have control," the transfer is complete. If the instructor wishes to take control, then the words "I have control" will start the transfer and when the student says "You have control", the transfer is complete.

### **Awareness, Attitude, and Discipline**

All pilots must learn to be aware of the environment in which they are operating. Seaplane pilots are no different in this respect except the environment in which they operate presents special challenges. And when they operate alone in the wilderness there are few resources on which to draw other than the knowledge, skill, and attitude they bring to the situation. All pilots, seaplane pilots included, must have the required knowledge and skill to accomplish their tasks. They must develop a high degree of situational awareness that is built on knowledge and skill and maintained through vigilance. They must have an attitude that values safety and that drives them to act on their situational awareness. Finally, they must have the discipline to deal with the situations and pressures they face. If these are qualities of first importance for a seaplane pilot then the job of the trainer is to be an exemplary pilot by demonstrating, always, these necessary qualities.

### **Recommending for the Rating**

Before recommending anyone for a seaplane rating, the instructor must ensure that the completion standards set out in this guide have been met. The necessary items must have been covered and the required performance demonstrated. In this sense, the instructor is also the flight test examiner, even though there is no formal flight test for the seaplane rating, and when they recommend someone for the rating they are certifying that they have done their job properly. Once the training has been completed, the instructor will have to guide the student

through the paperwork to get the rating, specifically the form "Flight Crew Licence — Application for Endorsement of a Rating (Form 26-0083)".

### **Some Headings Explained**

Information with respect to air exercises is presented under six headings: Objectives, Motivation, Essential Background Knowledge, Advice to Instructors, Air Instruction and Student Practice, and Completion Standards.

#### **Objectives**

Material under this heading outlines what the student is expected to learn.

#### **Motivation**

This explains why the student needs to learn particular skills. The instructor must ensure that the student knows why a given lesson is important, and where it fits into the overall training program.

#### **Essential Background Knowledge**

This is the minimum knowledge required for a student to benefit fully from the air instruction. One of your obligations as an instructor is to make sure students complete all the pertinent ground instruction before beginning air instruction.

#### **Advice to Instructors**

Advice to Instructors provides information that may help you in presenting or teaching a particular lesson.

#### **Air Instruction and Student Practice**

suggests exercises that will help the student to develop the skills needed to meet the lesson objectives.

#### **Completion Standards**

There is no flight test for the seaplane rating. Instead, the instructor is expected to certify that the student is competent to hold the rating. To help the instructor make this judgment, completion standards are given. The student must be able to perform the required exercises to the given performance standard before being recommended for the rating.

### **Part 2 — Planning and Preparation**

#### **Objective**

To facilitate the student learning:

- estimating aircraft performance

- seaplane bases, rules, and aids to marine navigation
- fuelling the aircraft
- pre-flight inspection
- passenger safety briefing
- starting engine

## **Motivation**

Pilots know that careful planning and preparation is the foundation for a successful flight, whether it is just flying circuits or a long cross-country flight. They must know how to prepare, of course, and they must be in the habit of good preparation.

## **Estimating Aircraft Performance**

### *Essential Background Knowledge*

Compare seaplane performance with landplane performance:

- lower centre of gravity
- pendulum effect
- pronounced yaw during roll and yaw effect due to keel surface
- longer take-off run
- more resistance due to the floats
- float attitude and float drag
- reduced rate of climb
- slower cruising speed
- greater rate of descent
- possible higher stalling speed compared to landplane

Explain how to assess variables:

- wind (front, back, from the sides, light and strong)
- temperature (high and low)
- air density (pressure, altitude, humidity)
- surface condition (rough, choppy, calm, swells)
- water currents
- tides
- surface contamination
- load and centre of gravity
- obstacles
- pilot experience
- apply correct rules
- correctly identify the proper lift off point before taking off
- identify the point for rejected take-off
- wind changes around islands, points, etc.

### *Instruction and Student Practice*

Demonstrate how to assess the variables that affect seaplane performance.

Demonstrate how to calculate seaplane weight and balance.

Demonstrate how to calculate seaplane performance.

## **Seaplane Bases, Rules, and Aids to Marine Navigation**

### *Essential Background Knowledge*

Explain how to locate and identify seaplane bases on charts and in the Water Aerodrome Supplement.

Explain how to identify operating restrictions at various seaplane bases, including areas not covered in the Supplement.

Explain the purpose and identification of marine navigation aids such as buoys, beacons, lights, and sound signals appropriate to aircraft operations.

Explain right-of-way rules pertinent to seaplane operations on the water.

### *Advice to Instructors*

- If you use 1:50,000 topographical maps in your operations, explain how to use them.
- Marine navigation aids are a study in themselves so limit the training to those aids that most apply to seaplane operations.

### *Instruction and Student Practice*

Demonstrate and have the student practise using charts and the Water Aerodrome Supplement.

Demonstrate and have the student practise seaplane operations in situations where some knowledge of marine navigation aids is required.

## **Fuelling the Aircraft**

### *Essential Background Knowledge*

Explain that if the aircraft is sitting in the water, a ground cable is not necessary, due to the excellent conductivity of water.

Explain that if the aircraft is amphibious and is on land, or is sitting on a dolly, the aircraft must be properly grounded.

Explain how to record when and how much fuel was put in the aircraft.

### *Advice to Instructors*

- Use only appropriate equipment, i.e. fuel pump with filter, felts, chamois, micro screen
- Avoid using plastic or teflon due to possibility of static

- When using a pump, always leave a space in between the bottom of the barrel and the metal pipe.
- If using a felt, do not hit or twist because this would break the fibres, which could in turn block the carburettor screen or injector.
- Always use the same side of either felt or shammy.
- If possible, use aluminum funnels equipped with micro screen.
- Always store this equipment in a clean and well-ventilated place.
- Point out that recording fuel put in the aircraft can be helpful if subsequent search and rescue is needed — helps define the search area.

### *Instruction and Student Practice*

Demonstrate and have the student practise fuelling the aircraft.

## **Pre-Flight Inspection**

### *Essential Background Knowledge*

Explain float terminology

- deck
- bulkheads
- mooring cleat
- keel
- bumper
- chine
- skeg
- step
- bilge pump opening
- water rudder and control cables
- spreader bar
- bracing wire
- V-brace
- splash guards
- propeller track danger marks
- ladder (some types)
- anchor storage (some types)
- dorsal fin, sea fin, ventral fin

Explain how to use aircraft manual for normal inspection.

Explain how to turn the aircraft around to accomplish a complete inspection.

Explain that in certain situations it may not be possible to do a full inspection of the aircraft due to its position at the dock.

Explain and demonstrate proper use of the equipment in the seaplane:

- float pump, spare pump hole balls
- inflatable safety vest

- rope
- appropriate survival kit and first aid kit
- axe, saw, funnel, felt
- aircraft documents & proper maps
- paddles
- anchor

Explain how to check the general condition of the float undercarriage.

Explain how to check for water and to pump each compartment of the float.

Explain how to check all cables and pulleys.

Explain how to check water rudder (freedom of movement left to right in relation to aircraft rudder, and up and down).

Explain how to check all lift struts and spreader bars.

Explain how to check that ropes are fastened to floats and not tangled in water rudder cables.

#### *Advice to Instructors*

- Check the pump operation and all drain parts on each compartment for proper function. For example, a pump operation that takes air, cracks on the float funnels, hose disconnect in the compartment.
- To have the student visualize the aircraft level.
- Since certain parts of the aircraft are not necessarily accessible for a pre-flight inspection (outside wing or tail section) have student rotate the aircraft from the dock when possible.
- Encourage student to wear inflatable safety vest.
- A glance at the heels of the floats can give an indication of possible leakage.
- A light hop on the back of the float checks the float fittings for condition.
- Check where floats sit in the water when the aircraft is empty and floats pumped.

#### *Instruction and Student Practice*

Demonstrate how to carry out a pre-flight inspection, including

- determination of fuel and oil for intended flight
- security of fuel and oil tank caps
- rotating the aircraft to inspect both sides

Have the student practise pre-flight inspections.

### **Passenger Safety Briefing**

#### *Essential Background Knowledge*

Explain how to conduct a passenger safety briefing:

- Boarding and leaving
  - approaching the seaplane
  - dock surface
  - steps for boarding and leaving
  - float surface, enter and exit
  - danger from the propeller
  - never walk ahead of the strut
  - position in the seaplane.
  - seat adjustment, if possible
  
- Safety equipment
  - inflatable safety vest
  - ELT
  - fire extinguisher
  - safety harnesses
  - first aid kit
  - survival kit
  
- Passenger comfort
  - passenger position in the seaplane
  - seat adjustment if possible
  - safety harness adjustment
  - smoking
  
- Emergency egress

*Advice to instructors*

- Point out the location and use of all safety equipment that the aircraft offers rather than emphasizing the possibility of an accident.

*Instruction and Student Practice*

Demonstrate and have the student practise passenger safety briefings.

**Starting Engine**

*Essential Background Knowledge*

Explain the importance of positioning the seaplane to avoid creating hazards.

Explain how to ensure a suitable taxi route is available after start.

Explain how to set the engine controls (before seaplane is untied).

Explain how to control seaplane movement after start.

Explain how to avoid excessive engine RPM and temperatures.

*Advice to instructors*

- Once a seaplane is untied, it's at the mercy of the wind and current. It's important to get going quickly so the plane doesn't drift into trouble.
- The student should know how to move the aircraft around the dock by hand and how to use the wind to help. This is an excellent time to introduce efficient use of dock space and how to rearrange all the aircraft.
- Have the students try different departure angles using both sides of the aircraft. Ensure that they try to depart with the dockside float against the dock, making the turn away difficult. Use a dock with some float protection or "bumpers".

### *Instruction and Student Practice*

Demonstrate and have the student practise starting the engine.

### **Completion Standards**

#### *Aircraft Performance*

The student shall be able to determine seaplane performance and limitations including:

- using available and appropriate performance charts, tables, and data
- computing weight and balance to ensure that weight and centre of gravity will be within limits during all phases of flight
- calculating seaplane performance, considering density altitude, wind, and other pertinent conditions
- describing the effect of atmospheric conditions on seaplane performance
- making a competent decision on whether the required performance is within the operating limitations of the seaplane

#### *Seaplane Bases, Rules, and Aids to Marine Navigation*

The student shall be able to:

- locate and identify seaplane bases on charts and in the Water Aerodrome Supplement
- identify operating restrictions at various seaplane bases
- explain the purpose and identification of marine navigation aids such as buoys, beacons, lights, and sound signals
- explain right-of-way rules pertinent to seaplane operation on the water
- generally confirm suitability of landing area visually

#### *Pre-flight Inspection*

The student shall be able to inspect the seaplane by following a checklist including:

- fuel quantity, grade, and type
- fuel contamination safeguards
- oil quantity, grade, and type
- fuel, oil, and hydraulic leaks
- flight controls and water rudders
- structural damage

- float or hull inspection, including water removal
- ice and frost removal
- tie down and control lock removal
- security of baggage, cargo, and equipment

### *Passenger Safety Briefing*

The student shall be able to brief passengers including instructions for:

- boarding and leaving
- passenger comfort
- the location and use of emergency exits, emergency locator transmitter, fire extinguisher
- smoking limitations
- use of seat belts
- items specific to the aeroplane type being used
- action to take in the event of an emergency landing
- other items for use in an emergency

### *Starting Engine*

The student shall be able to:

- position the seaplane to avoid creating hazards
- ensure a suitable taxi route
- determine that the area is clear
- adjust the engine controls
- control seaplane movement after engine start
- avoid excessive engine RPM and temperatures
- check engine instruments after engine starts

### *Fuelling the Aircraft*

The student shall be able to:

- use appropriate equipment
- identify the proper fuel grade and type
- filter the fuel, as necessary
- store equipment
- record when and how much fuel put in aircraft

## **Part 3 — Water Handling**

### **Objective**

To facilitate the student learning:

- displacement taxiing
- plowing taxiing
- step taxiing

- docking
- ramping
- sailing
- beaching
- mooring
- abnormal water handling situations

## **Motivation**

Handling a seaplane on the water requires a great deal of skill and judgment. What might one day be a simple beaching or docking could change greatly the next day depending on wind, water condition, available space, and the like. Because of the great variety of possible situations that can be encountered, mastery of water handling skills is essential.

## **Displacement Taxiing**

### *Essential Background Knowledge*

Explain the term **displacement taxi**. Should be able to sketch the float in the water and know the power required.

Point out local hazards to taxiing and docking such as rocks or shallows.

Explain the maximum RPM for displacement taxi and the risk of water damage to the propeller and the risk of engine overheating.

Explain how the water rudders affect the centre of resistance to lateral movement.

Explain the importance of good lookout for shallows or logs, and for other aircraft or for boats, swimmers, water-skiers, etc.

Explain the procedure for turns out of and into wind and associated hazards.

Review engine controls, ancillary controls and performance data.

Explain local traffic procedures, including prohibited, danger and practice areas.

Explain the use of aileron drag to assist turning.

Have the student explain the effect of wind on the aircraft, including the tendency to weathercock, how to prevent it, and how to use it.

### *Advice to Instructors*

- The objective is to TEACH the student how to handle the seaplane on the water. Do not assume that a new student knows anything about a seaplane. In an effort to assist the learning process, take time **on the ground** to explain carefully the exercises that you are about to do. High technology or a lengthy process is not required, a piece of paper with hand drawn diagrams and hand written notes will really help. The student will keep your

notes for reference and sometimes, even copy them to a more permanent record for future use. Use a parked aircraft as a teaching aid.

- Repetitive practise of each exercise is a must. Return to previously completed exercises for short periods.
- If possible, have the student view a spray-damaged propeller.
- While in displacement taxi in restricted areas, it is often handy to raise the water rudders to let the aircraft "pivot" into wind rather than follow an arc.
- Work with the wind, not against it. Skilful float pilots use the wind to their advantage.
- Have the student try taxiing with the water rudders up. This can lead to a sailing exercise even in very light winds. Present challenging docking problems but ones that can be successfully completed.
- To avoid a possible accident have the student practise exiting the aircraft while it is secured to the dock.
- Do not overlook taxiing downwind. With aircraft that are 'under floated' or nose heavy, demonstrate how excess speed can submerge the floats.
- While practising displacement taxiing, have the students make approaches to the dock but avoid actual docking until the displacement taxi is mastered. Have them use as slow a speed as possible that just maintains steerage.

### *Instruction and Student Practice*

Demonstrate and have the student practise displacement taxiing, including

- use of water rudders
- lookout
- turns into and out of wind
- engine handling
- use of ailerons
- weather cocking

## **Plowing Taxiing**

### *Essential Background Knowledge*

Explain the term **plowing taxi** and point out that it is normally used only for engine run-up or turning downwind if the wind is strong. Ask the student to sketch the float in the water and give the power required.

Explain how the plowing attitude causes the centre of buoyancy and the resistance to lateral motion to move aft, and why this is advantageous.

Review the effect of torque and slipstream so the student can appreciate why plowing turns are usually made to the left and not to the right.

Explain that, when turning from into wind to downwind, a turn can be started in the opposite direction to gain momentum.

### *Advice to Instructors*

- When applying power for take-off, step taxi and plowing turns the power should be applied briskly and without hesitating at the point where spray damage to the propeller may occur. Students will often hesitate at about 1500 RPM.
- In windy conditions, when using a plowing turn to turn out of wind, the windward wing will rise and the aircraft may only turn 90° to the wind. Surprisingly, **the aircraft may not turn back** into wind because the windward wing is now high enough that it is offsetting the fin and rudder! Power must be reduced to idle to regain control and avoid being blown over.
- Torque and slipstream make an aircraft turn left easier than right. Trying to follow a sharp bend to the right in a river while using full power to get up on the step, could lead to disaster. Some aircraft will barely turn to the right.
- Visibility is reduced when the nose is high so a good lookout should be made prior to commencing.
- If plowing taxi is prolonged the engine can overheat to the point of causing damage.

### *Instruction and Student Practice*

Demonstrate and have the student practise plowing taxiing for run-up and for turning downwind.

### **Step Taxiing**

#### *Essential Background Knowledge*

Explain the meaning of and uses for **step taxiing**. Ask the student to sketch the float position in the water and to explain the power required.

Explain the importance of lookout and space to do the exercise.

Explain that the pre-take-off check should be performed before commencing the high-speed taxi.

Explain the necessity to retract water rudders to prevent damage.

Explain the use of power and elevator to put the aircraft on the step.

Effect of power on direction, especially during the plowing phase and as the nose is lowered.

Explain that it is sometimes necessary to point aircraft out of wind prior to raising water rudders to maintain desired direction.

Explain the use of elevator to control attitude and power setting to maintain step speed.

Explain the importance of lookout for floating objects, boats that cannot hear the aircraft and may not be looking.

Explain that fairly high power and slow speed make it necessary to monitor engine temperatures.

Explain the use of ailerons and rudder to control effect of crosswind.

Explain the use of elevator and rudder to control the aircraft when the power is reduced.

Explain the aft movement of the centre of buoyancy and resistance to lateral motion in the plowing attitude.

Explain how to maintain speed below take-off speed.

#### *Advice to Instructors*

- Be prepared for over controlling of the elevator.
- Have the student make small adjustments of the elevator to find the attitude giving least drag.
- Monitor the student's lookout carefully.
- DEMONSTRATE the exercise before having the student do it.
- Check the student's judgment of distance and speed. Watch for a "tunnel vision" approach to the exercise.

#### *Instruction and Student Practice*

Demonstrate and have the student practise step taxiing, including

- use of power and elevator to put aircraft on the step
- controlling attitude and power to maintain speed
- lookout
- control of aircraft when power is reduced

### **Sailing**

#### *Essential Background Knowledge*

Define sailing and explain when it is used.

Explain the effect of wind and current.

Explain how the controls behave and respond when sailing.

Explain the effect of opening the aircraft doors.

Explain the effect of wing flaps on sailing.

Explain when and how the engine is used when sailing.

#### *Advice to Instructors*

- Sailing is the procedure used for moving the aircraft into a location where normal manoeuvres are not possible because of room, wind or other conditions. Sailing is done with the help of wind, current, engine or even paddle power. 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 directly backwards or at an angle towards the side the nose is pointed.

- Demonstrate how the nose of the aircraft can be moved by COARSE application of rudder and by using full application of ailerons.
- The downward deflection of the aileron is greater than the upward hence more drag on the downward aileron which will cause it's wing to move back.
- When sailing use the air rudder and aileron drag to steer the aircraft.
- Opening doors increases surface area exposed to wind and therefore a faster speed is obtained. The same results can be obtained by lowering the wing flaps.
- Explain that too fast a backward speed can cause water to ride up on the rear of the floats and tend to "pull" the back of the float under or fill up the pump out ports with water.
- Water rudders work in reverse to the air rudder and should be pulled up during this exercise.
- Show that with the engine idling, its forward thrust can further be reduced by the application of carburettor heat or by running on one magneto. Point out that this mode should only be of short duration as spark plug fouling will occur.

### *Instruction and Student Practice*

Demonstrate and have the student practise sailing, including

- engine handling
- use of flaps and doors
- use of rudder and ailerons
- controlling speed and direction

## **Docking**

### *Essential Background Knowledge*

Explain the location and use of ropes for docking.

Explain how to tie at least a double half hitch.

Explain how to approach the dock for parallel docking.

Explain the possibility of bow damage if the aircraft is nosed into the dock and the importance of using a very slow speed and shutting down early, if necessary, to nose in.

Explain the importance of allowing for the delay in engine stopping after idle cut-off is pulled.

Explain the danger of propeller strikes — passengers should not exit until the aircraft is tied to the dock. Risk of passengers waiting on the dock trying to help. Human nature to want to help should be discouraged.

Explain the problem of hazardous footing on some docks due to slime, bird droppings, ice, or debris.

Use caution and brief passengers.

Explain the tie down procedure for overnight. Four rope minimum. More if wind expected.

Explain the use of wing ropes (not available on many aircraft).

Explain "back eddies" that can happen near a dock, causing the aircraft to be pushed into the dock instead of slowing down.

Review the importance of being ready to exit the aircraft quickly, i.e. headset off, harness released, door open for docking and to not secure the belt until clear of the dock when departing.

### *Advice to Instructors*

- Have the students actually paddle the aircraft, making a 180-degree turn (in calm conditions) and paddling it to the dock or beach. Warn them to kneel and brace themselves to avoid falling in the water and to check pockets for items that may do the same.
- Allow plenty of practice docking. This exercise can be done even on days not suitable for flying. Use different docks if possible. When a lesson is finished dock three times instead of just once.
- Have the students turn the master and magnetos off on each docking and insist on a double check that they are off before leaving.
- Have the students cut the engine too early so steerage is lost before reaching the dock. Have them get out and attempt to paddle in. The instructor must ensure there is no danger to other aircraft during the exercise.
- In crowded areas, ensure that the student plans an exit route in case the docking doesn't work.
- Impress on the student just how fragile an aircraft is, and the cost of repairs.
- Docking in rough water conditions is not normally a problem but if the aircraft is not tied tightly to the dock, the floats can be damaged and ropes broken. There should be no slack in the ropes securing the aircraft to the dock. During a storm, all the ropes should be checked and tightened again, if necessary.
- If possible, cut the engine so that the propeller is not turning as the dock is approached, especially if people unfamiliar with floatplanes are on the dock.
- Try to present various docking situations to the student and consider having the student do 2 or 3 dockings when returning from each lesson.
- Allow the student to do solo docking early in the training. This is a good confidence-builder.
- Caution the student that passengers waiting on a dock sometimes try to help stop a seaplane by grabbing the wingtip. Although well intended, this only causes the aircraft to pivot.

### *Instruction and Student Practice*

Demonstrate and have the student practise docking, including

- assessing the docking situation
- planning arrival

- engine handling
- moving aircraft by hand
- paddling the aircraft
- tie down procedures

## **Beaching**

### *Essential Background Knowledge*

Explain how to select a suitable area.

Explain how to assess surface condition, depth of water, rocks.

Explain how to determine what the wind, current and/or tide are doing.

Explain how to determine whether it is necessary to sail or paddle the aircraft to the beach.

Explain how to secure the aircraft after beaching and to consider turning the aircraft around in preparation for departure.

Review the shape of the float profile, i.e. deeper from step forward and shallow at the heel.

### *Advice to Instructors*

- When docking an aircraft on a natural beach, ascertain the nature of the shore BEFORE contact is made. If it is rocky there is danger of damaging the floats, especially if the wave action causes the aircraft to bob up and down. Sandy beaches are the best but even these will wear off paint and protective coatings if there is wave action. A sheltered area is best.
- With an onshore wind the best approach is to sail the aircraft backwards with the water rudders up (to prevent damage to them when contact with the bottom is made). This enables the pilot to walk off the rear of the floats without having to wade in the water. Also the aircraft is already positioned for departure.
- If the wind is off shore, approach slowly, checking for obstructions. The use of the paddle is sometimes indicated depending on the direction and strength of the wind.
- When the wind is parallel to the shore, taxi close until opposite desired area then use the engine to turn the nose into the shore and beach as soon as possible.

### *Instruction and Student Practice*

Demonstrate and have the student practise beaching, including

- assessing the beaching situation
- approaching and departing the beach
- tie down procedures

## **Mooring**

### *Essential Background Knowledge*

Have the student explain how to determine what the wind, tide and current are doing.

Explain how to secure the aircraft to a buoy:

- importance of a passenger briefing on what you are about to do and what the passenger is to do
- what type of tie-down is available on the buoy
- ropes available in the aircraft
- use of a bridle

Explain how to depart a buoy:

- importance of where buoy is in relation to aircraft
- deciding which direction is desirable for departure

#### *Advice to Instructors*

- Success in this only comes with practice. Always approach the buoy into wind and current at minimal speed. Shut down the engine and exit the aircraft WITH ROPE IN HAND.
- Once the aircraft is secured to the buoy, a bridle should be incorporated. A bridle is simply a rope from the front of each float in a "Y" configuration to the buoy. The longer the rope that forms the bottom of the "Y", the more effective it will be. Remember: a moored floatplane has a great deal of surface exposed to the breeze. This, and high waves and will exert considerable drag force on the mooring line. Under these conditions, an anchorage which has proven satisfactory for large pleasure craft may be found to be quite unsatisfactory for even a small floatplane.
- Brief the passenger on what you are about to do and, if they are knowledgeable, what you want the passenger to do. Warn about the danger of the propeller. Sometimes it is better to come alongside a buoy as if it were a dock and secure one line first before arranging a bridle.
- When departing a buoy in shallow water the buoy anchor could damage the float bottoms as the aircraft moves away, so always use caution in shallow water, position the buoy for departure so that it is off to one side. If necessary, bring out the paddle.

#### *Instruction and Student Practice*

Demonstrate and have the student practise mooring, including

- assessing the mooring situation
- approaching a buoy
- departing a buoy
- using a bridle

### **Abnormal Water Handling Situations**

#### *Essential Background Knowledge*

Explain how to recognize, prevent, and recover from porpoising.

Explain how to recognize an improper float attitude.

Explain how to recognize, prevent, and recover from submerging float.

Explain how to repair minor float component damage.

Explain that damaged struts or fuselage skin areas may mean more serious structural problems exist so "field" repairs should only be done under extreme emergency situations.

Explain that if a flight plan or flight itinerary is always filed, pressure to make emergency field repairs will be greatly reduced if it is known that help will soon be on the way.

Explain how to egress under water.

Explain that doors should not be expected to open until the cockpit has filled with water and the pressure on the doors has equalized.

#### *Advice to Instructors*

- Familiarity with the aircraft is very important for egress. Practise opening doors and windows with your eyes closed. It is extremely easy to become disorientated under water, especially if the water is muddy. The aircraft can be inverted on the bottom of a lake but since you can only see or feel the parts of the aircraft near you, you relate only to them and think you are upright. If that is the case, you will probably leave the aircraft and try to swim down into the mud!
- In the event of an upset, keep the left hand on the doorframe or handle and use the right hand to undo the seat belt. Open the door or window with the left hand and without letting go, follow that hand out of the aircraft.
- A thorough passenger briefing should be given on all flights.

#### *Instruction and Student Practice*

Demonstrate how to recognize, prevent, and recover from

- porpoising
- submerging float

Demonstrate how to carry out minor float repairs.

#### **Completion Standards**

##### *Taxiing (displacement, plowing, step)*

The student shall be able to:

- plan and follow the most favourable taxi route, considering existing winds, water currents, water conditions, and hazards
- control taxi speed
- position the controls for the existing wind conditions

- use water rudders effectively
- avoid excessive water spray on propellers
- taxi straight in displacement, plowing, and step positions
- perform 180 degree and 360 degree turns in displacement and plowing positions
- take proper action to prevent and correct porpoising or skipping

### *Sailing*

The student shall be able to:

- recognize the conditions and situations in which sailing would be used
- plan and follow the most favourable route toward a point, considering the effect of wind, water currents, water conditions, and hazards
- use flight controls, flaps, doors, water rudders, and power to change the desired course
- change direction from downwind to crosswind
- control seaplane speed as required for the conditions

### *Docking*

The student shall be able to:

- assess the docking situation, considering wind, water currents, obstructions, other aircraft, boats, and people on the dock
- depart the dock
- approach the dock in the proper direction and at a suitable speed
- plan an exit route
- dock the seaplane and ensure it is secure

### *Beaching*

The student shall be able to:

- select a suitable area for beaching, considering water depth, currents, tides, wind, and weather changes
- approach the beach in the proper direction and at a suitable speed, considering the beach condition
- beach the seaplane and ensure it is secure

### *Mooring*

The student shall be able to:

- depart a buoy
- assess a mooring situation, including wind, water currents, obstructions, other aircraft, and boats
- approach a buoy in the proper direction and at a suitable speed
- moor the seaplane and secure it using a bridle

## **Part 4 — Take-Off**

## Objective

To facilitate the student learning:

- normal take-off
- glassy water take-off
- crosswind take-off
- engine failure after take-off

## Motivation

Seaplanes do have one clear advantage over landplanes when taking off. They almost always take off into wind. But no two bodies of water are alike and the effect of changes in wind and water conditions mean a seaplane pilot must develop a high level of situational awareness to make good decisions about taking off. Then they need the skill to carry out what they have planned.

## Normal Take-off

### *Essential Background Knowledge*

Discuss the float design, theory and terminology of

- on the step
- minimum drag attitude or best planing attitude
- stages of take-off
- abnormal flight situations caused by improper float attitudes
- directional control dynamics — cause and effect
- review pitch/yaw relationships — anticipate

Explain the hydrodynamics of a float aircraft.

Review procedures to establish rejected take-off points.

Explain the difficulty of estimating the distance ahead, depending on the surrounding terrain.

Explain that one should anticipate the reduction of float drag at the point of lift off and expect a possible pitch up tendency depending on aircraft type and technique used.

Ask the student to review the use of  $V_x$  and  $V_y$ ; introduce speeds used for improved cooling as required.

Explain the procedures for power management.

Explain the normal practice of following the water until a safe altitude has been reached — to take advantage of good air for lift — to avoid unnecessary turns until 500' or more — to respect noise abatement procedures where appropriate — to always have an "out" in the event that engine problems develop.

Explain that there can be more debris on the water when the wind blows in a direction opposite to the prevailing wind, especially in areas where there is logging activity.

Explain that in mountainous or hilly terrain, the pilot's perception of the correct climb attitude may be altered.

Review how to read the water for wind direction, intensity and gustiness.

Review how the air will flow and where the best lift can be found, where downdrafts are likely. Explain that the dark areas or "cat's paws" can be a sign of severe descending air.

### *Advice to Instructors*

- An introduction to, and closely supervised practise of attitude/drag relationships can be helpful. One method is to reduce power once on the step and first demonstrate, then allow the students to experiment with the range of attitudes. This will develop a feel for the aircraft and this will allow them to relate the feel and the visual clues to proper and improper float attitudes.
- The students' experience with proper float attitudes leads directly to many other exercises and may help avoid having the student inadvertently digging a float.
- On an aircraft with marginal directional control — and even for those with positive control — a review of the pitch/yaw relationship and the techniques used to enhance directional control is time well spent. (Slow pitch over, restricted use of flap etc). This will become important especially on take-off with a crosswind component or in confined areas.
- The point to transition from back pressure to the step phase can be recognized in a number of ways. When the nose has reached its maximum nose up attitude is likely the universal method. The float spray position can be used early in the training and can be helpful although this technique will not work in all aircraft types and it hampers the ability to ensure that a safe obstruction free path is maintained.
- When transitioning onto the step a variety of methods are employed depending on type, the environment and many other variables. "Rocking" the seaplane should be done with care.
- The ability to read the water, anticipate and handle the effects of the wind is an integral part of any complete float training program. The first few hours may be best spent under conditions of light steady wind but be sure to provide exposure to as many different conditions as practicable. In order to accomplish this, the training will have to take place at different times of the day.
- Water take-offs involve many variables, many not found on wheels. One should plan to use maximum take-off space. If it involves back tracking, do so over your proposed take-off path — this will help confirm that your take-off path is obstruction free.
- Lift-off may be as simple as maintaining the minimum drag angle until enough lift is produced and/or applying increased back pressure at the appropriate time.
- The far shoreline should be used as an attitude reference until climb speed is attained.
- A common rule-of-thumb is to double the distance you think is sufficient for take-off, especially when taking off toward a shore.

### *Air Instruction and Student Practice*

Demonstrate and have the student practise normal take-offs, including

- assessing the take-off situation
- before take-off check
- apply take-off power
- transition to the step
- attitude control
- lift-off
- climb
- after take-off check

## **Glassy Water Take-off**

### *Essential Background Knowledge*

Have the student review normal take-off items.

Discuss depth perception problems on take-off and after lift off.

Describe the difference in float drag compared to a normal water surface — the suction and stickiness associated.

Emphasize that the take-off distance required can be greatly extended and will not be reflected on most take-off performance charts. Therefore, select a take-off path that provides extra distance.

Discuss climb out path considerations — to keep a suitable reference nearby and to avoid a climb out over a large open stretch of water just in case you have an engine problem.

Emphasize how to establish, maintain and confirm a positive rate of climb after lift off

Explain that, when reducing power after take-off, it is important to wait until well clear of the surface.

### *Advice to Instructors*

- Every effort should be made to do glassy water training in real glassy water conditions, otherwise the exercise will have to be simulated. Real glassy water conditions are most often found in the early morning or late evening.

### *Air Instruction and Student Practice*

Demonstrate and have the student practise glassy water take-offs, including assessing the glassy water situation.

## **Crosswind Take-off**

### *Essential Background Knowledge*

Have the student review normal take-off items.

Have the student review determination of crosswind limitations.

Review reading the water and methods to determine wind intensity, direction and gustiness.

Explain how to minimize the effect of crosswind and how to select the best area for take off and climb out.

Point out similarities to a land plane and the differences. The control limitation on floats is easily reached, especially with a left hand cross wind.

Recognize that the left cross wind component added to the aircraft's natural tendency to yaw left on take off is a substantially greater problem than on a wheel aircraft. This may lead to directional control problems that may exceed the pilot and the aircraft's ability.

Review the aerodynamics and pitch/yaw relationships and methods of enhancing direction control.

Explain how to "roll" a float on take-off, including the timing and technique to be used and compensating for the yaw tendency resulting from the imbalance in float drag.

Explain that the downwind float should be lifted first.

#### *Advice to Instructors*

- Plan to retract water rudders on a heading that will result in the desired track by the time the throttle is advanced.
- This exercise can be worked into gradually by altering subsequent take off paths to increase the cross wind angle. Start with a small crosswind.
- Cross winds should be practised with both left and right hand components.
- As with most exercises, if possible, start with a steady light wind.

#### *Air Instruction and Student Practice*

Demonstrate and have the student practise crosswind take-offs including assessing the crosswind take-off situation.

### **Engine Failure After Take-off**

#### *Essential Background Knowledge*

Review the procedure for an engine failure after take-off.

Explain the importance of choosing a take-off lane that is clear of any obstacles for some distance beyond the intended lift-off point.

Explain that, unless the take-off area is very restricted, more options for landing are normally available straight ahead for the seaplane.

Explain the importance of flying the seaplane first rather than doing checks.

Explain that some seaplanes, such as those with radial engines, require an alert reaction to put the nose down immediately to preserve sufficient speed for a flare.

#### *Advice to Instructors*

- Assume that the engine will fail at the worst possible moment and mentally prepare for this occurrence.

#### *Air Instruction and Student Practice*

Demonstrate and have the student practise engine failures after take-off.

### **Completion Standards**

The applicant for the rating must be able to safely take off using the correct procedures for the actual conditions of water surface, wind, and available take-off distance.

The student shall be able to:

- complete the before take-off check
- select the recommended wing flap setting
- clear the area before take-off
- align the aircraft with the desired take-off path
- raise the water rudders
- advance the throttle smoothly to maximum allowable power
- avoid excessive water spray into the propeller
- establish and maintain the most efficient planing attitude and correct for any porpoising or skipping
- maintain directional control
- lift off correctly and accelerate to the appropriate climb speed
- retract the wing flaps as recommended or at a safe altitude
- maintain take-off power to a safe manoeuvring altitude
- maintain a straight track over the extended take-off path or remain over the water until at a safe altitude
- complete after take-off checklist

## **Part 5 — Approach and Landing**

### **Objective**

To facilitate the student learning:

- power-on approach and landing
- power-off approach and landing
- crosswind approach and landing
- approach and landing over obstacles
- glassy water approach and landing
- recovering from abnormal approach and landing situations

## **Motivation**

A pilot who already knows how to land on a runway has to develop new skills to approach and land a seaplane — the glassy water landing is one obvious example. Because of the diversity of the possible situations that could be encountered, the seaplane pilot requires not only skill in this exercise, but a high degree of situational awareness to decide what approach is needed and how and where to carry it out.

## **Power-On Approach and Landing**

### *Essential Background Knowledge*

Ask the student to review applicable approach and landing techniques for landplanes.

Explain how to inspect and assess the suitability of the approach, landing, and departure paths.

*Explain* the environmental factors that apply to approach and landing situations on water.

Explain the use of the shoreline ahead as an important attitude reference for landing.

Explain that the flare and landing are similar to nose wheel aircraft except some power may be required to ease the touchdown (no shock-absorbing undercarriage) and maintain elevator effectiveness.

Explain that most seaplanes will dig (pitch down) if landed in a level attitude especially if the water is glassy or only has a slight ripple. The pitch down is more severe if the airplane is loaded near its most forward centre of gravity.

Explain that the upper limits of the landing attitude are reached when the step and heel contact the water at the same time (not possible on some seaplanes). If the heel touches first the seaplane may pitch down suddenly.

Explain that the throttle should be closed and elevators kept up as soon as the seaplane touches the surface.

### *Advice to Instructors*

- It is important that you try to expose the student to various approach and landing situations to be sure they have the necessary skill under different conditions.
- Inexperienced seaplane students tend to flare too high on rough water and too low on water with only a slight ripple.
- The smoothest landings result if the nose is pitching up as the floats contact the water.
- Ensure that the student can recognize all essential environmental factors after an inspection of the proposed landing area.

### *Instruction and Student Practice*

Demonstrate how to assess the landing situation.

Demonstrate, while taxiing, the range of attitudes within which a seaplane is landed. This can be accomplished with small amounts of power and full up elevator.

Demonstrate that the

- power-on approach is the same as a landplane
- flare is accomplished at same height as a landplane
- hold-off is the same as for a nose wheel-equipped landplane. The nose should be kept up to ensure the smoothest landing.

Demonstrate how to maintain the correct landing attitude until the seaplane slows and the nose starts to pitch up. Follow through with full up elevator, slowly, to avoid slight pitch down when the seaplane comes off the step and resultant prop spray.

Have the student practise power-on approaches and landings.

### **Power-off Approach and Landing**

#### *Essential Background Knowledge*

Explain that the power-off approach is the same as for a landplane.

Explain that this is an essential skill for completion of a forced landing.

Explain how to ensure that the flare is completed at correct height.

Explain how to hold off as for a normal landing, carefully pitching nose up so that floats contact water in appropriate attitude.

#### *Advice to Instructors*

- This should be avoided during glassy water situations.

#### *Instruction and Student Practice*

Demonstrate that the power-off approach and landing is the same as for a landplane.

Have the student practise power-off approaches and landings.

### **Crosswind Approach and Landing**

#### *Essential Background Knowledge*

Explain that, during crosswind approach and landings, drift may be more difficult to see unless landing alongside the shoreline.

Explain that landing in a crosswind in high waves should be avoided in small seaplanes because of the impact on the floats and resultant heel over as the seaplane comes off the step in a nose-high attitude.

### *Advice to Instructors*

It is not uncommon for pilots new to seaplanes to have trouble seeing the drift. The relative motion in the absence of centre lines or runway edges is harder to detect.

### *Air Instruction and Student Practice*

Demonstrate that the crosswind approach and landing is the same as for a landplane.

Demonstrate that as a seaplane comes off the step and the nose pitches up, to anticipate a roll and yaw away from the wind.

Have the student practise crosswind approaches and landings.

## **Approach and Landing Over an Obstacle**

### *Essential Background Knowledge*

Explain that the approach is the same as for a landplane.

Explain that if it is windy, to anticipate greater turbulence and wind shear in smaller lakes surrounded by high terrain.

Explain the importance of using a constant approach angle to the point of intended round out.

### *Advice to Instructors*

- During glassy water conditions this type of approach should be regarded as an advanced exercise.

### *Air Instruction and Student Practice*

Demonstrate that the approach and landing over an obstacle is the same as for a landplane, including the use of a constant approach angle to the point of intended round out or flare.

Have the student practise approaches and landings over obstacles.

## **Glassy Water Approach and Landing**

### *Essential Background Knowledge*

Explain that most seaplanes will dig (pitch down) if landed in a level attitude especially if the water is glassy or only has a slight ripple. The pitch down is more severe if the airplane is loaded near its most forward centre of gravity.

Explain that the surface of glassy water is impossible to see and therefore approaches and landings must be planned alongside a shoreline wherever possible.

Explain that a glassy water landing may take as much as 3 to 4 times the normal distance.

### *Advice to Instructors*

- Have the student hold a constant attitude while decreasing and increasing rate of descent. Use the same technique for touch and go landings — hold a constant attitude throughout, use full power for take-off, reduce power to descend, increase power to flatten the descent, all in the landing attitude. This is one of the most important exercises that the student must master.
- No attempt should be made to land on glassy water in the middle of a lake. Always approach and land alongside the shoreline, if at all possible.
- If possible, have students practice flaring at 50 feet more or less above the surface in a light breeze (no turbulence) and practice attitude-power control until touchdown before glassy water is attempted.
- **Every effort should be made to do glassy water training in real glassy water conditions**, otherwise the exercise will have to be simulated. Real glassy water conditions are most often found in the early morning or late evening.
- Simulate the glassy water approach at altitude before attempting one on water.

### *Instruction and Student Practice*

Demonstrate how to assess the glassy water situation.

Demonstrate the glassy water approach and landing, including

- choosing the best approach path
- controlling descent
- cross-checking the shoreline
- touching down
- attitude and power after touchdown

Have the student practise glassy water approaches and landings.

### **Recovering from Abnormal Landing Situations**

#### *Essential Background Knowledge*

Review the technique for recovering from a bounce or flaring too high.

Explain how to recover from a dig.

Explain how to recover from porpoising.

Explain that a descent rate that may be acceptable for a landplane may cause a seaplane to bounce.

#### *Instruction and Student Practice*

Demonstrate how to recover from a bounce by maintaining landing attitude and applying power as required to control sink and landing again. If insufficient room then overshoot.

Demonstrate how to recover from a dig by applying immediate back pressure. Do not apply power. If back pressure is too severe and the aircraft comes out of the water then recover as for a bounce.

### **Completion Standards**

The applicant for the rating must be able to safely approach and land using the correct procedures for the actual conditions of water surface and depth, debris, wind, and terrain.

The student shall be able to:

- select the most suitable approach path and landing area considering surrounding terrain, water condition and depth, debris, and wind
- maintain the proper track on final approach
- establish the approach and landing configuration and power required
- maintain the recommended approach speed
- make smooth, timely, and correct control application during final approach and transition from approach to landing attitude
- contact the water at the recommended airspeed and with the correct pitch attitude
- remain on the step after touchdown or assume the idling position

### **Part 6 — Advanced Exercises**

*Note: The exercises in this section are not required in training for the basic seaplane rating. Rather, they are offered to enrich the training for those who are seeking to fly seaplanes commercially or who otherwise wish to expand their skills.*

#### **Ramping**

##### *Essential Background Knowledge*

Explain proper ramp construction. Various types of ramps i.e. cement or wooden surface and different types of trailers associated.

Explain that aircraft cannot be taxied up a cement ramp as the floats would be damaged so the trailer must be manoeuvred under the floats while the aircraft is still in the water. This trailer could be described as a "low bed" type and the aircraft weight is supported on the float keel so stress is placed on the float bottoms, eventually causing leaks.

Explain that where an aircraft can be taxied up a wooden ramp the trailer can be driven between the floats and raised hydraulically to support the aircraft's weight on the float spreader bars. The latter type is preferred because less stress is exerted on the float bottoms and the trailer is easily removed from under the aircraft and used with another aircraft.

Explain how to ramp:

- effect of wind and current on the approach to the ramp.
- effectiveness of the water rudders to maintain directional control.
- proximity to other aircraft or objects.

- correct use of throttle and aircraft controls.
- ensuring there is enough water at the ramp.
- use of tide tables.

Explain the importance of a way out if there is a problem.

Explain how to depart a ramp:

- effect of current and wind
- enough water at foot of ramp.
- use of tide tables.
- correct use of the throttle to prevent water damage and to overcome engine torque.
- how to avoid damage to the water rudders as the aircraft departs the ramp.

#### *Advice to Instructors*

- Ramping is another aspect of seaplane handling where there is usually only one way to get it right. Any current in the area is usually 90° to the lay of the ramp and the wind can be a factor. There is often a drop-off on either side of the ramp which means directional control is very important. Always have an "out" in case the ramping is misjudged. The line up to the ramping should be started a good distance away so the effect of wind, current and steering can be observed.
- Explain the local water depth requirement, currents and construction of the ramp.
- On departure from the ramp it is important to note wind and current combination. The effect of engine torque when powering off the ramp should be noted and correct handling of throttle to prevent water damage and overheating.
- Note proximity to other aircraft and objects prior to commencing.
- Always leave a way out if a problem occurs.
- Remember to lower water rudders at the correct time. The heels of the floats must clear the ramp and the water must be deep enough to avoid damage but they must go down soon enough to give steering away from obstacles.
- If ramping is assisted, ensure persons are competent to assist.
- ALWAYS BE AHEAD OF THE AIRCRAFT AND TRY TO ANTICIPATE WHAT IT IS GOING TO DO NEXT!

#### *Instruction and Student Practice*

Demonstrate how to assess the ramping situation.

Demonstrate and have the student practice ramping and departing a ramp.

#### **Short Run Take-off**

##### *Essential Background Knowledge*

Have the student review normal take-off items.

Have the student review the take-off performance charts — apply rules of thumb and recognize the many variables that will affect the figures. Most of the variables may substantially increase the published numbers.

Explain the manufacturer's approved procedures including flap settings, speeds and techniques. Emphasize the importance of following these procedures and not to be fooled into believing the "hangar" talk.

Review the environmental variables favouring good lift as well as the avoidance of obstacles and areas of downdrafts.

Review how to "read" the water.

#### *Advice to Instructors*

- It is almost always best to use a simulated short run area — a bay or an area restricted by islands — but always leave yourself an "out".
- Practise under varying environmental situations in the same area could go a long way to help the student learn that the variables have a huge effect.
- Avoid using just one area for your short field practise. Allow the advanced student to size up new situations and develop judgment by assessing the variables of the area.
- Allow the overconfident students to experiment using the many different techniques. Then in the same area use the normal technique to help them learn that "the harder you work the longer it takes" can be a very useful rule of thumb.

#### *Air Instruction and Student Practice*

Demonstrate how to assess the short run take-off situation.

Demonstrate and have the student practise short run take-offs.

### **Rough Water Take-off**

#### *Essential Background Knowledge*

Have the student review normal take-off items.

Explain how to determine if the take-off area is suitable for take-off without unnecessary stress on the aircraft.

Explain how to determine the best area for take-off and to consider the option of waiting for more favourable conditions.

Review the float hull design and which float attitude best handles large waves.

Review water spray damage on the propeller and how to minimize it by timing the power application for take off.

Discuss the potential for damage on the float structure, braces, airframe, electronics, etc.

Review methods of checking the V brace (if equipped) and float fittings for integrity on the pre-flight inspection.

#### *Advice to Instructors*

- The exercise should be covered, however, it is not necessary to do so at the maximum wave intensity. Most of the techniques employed can be effectively covered without finding conditions that test the aircraft's structural integrity. A heavy chop is likely sufficient.

#### *Air Instruction and Student Practice*

Demonstrate how to assess the rough water take-off situation.

Demonstrate and have the student practise rough water take-offs.

### **Confined Area Take-off**

#### *Essential Background Knowledge*

Have the student review normal take-off

Review the procedure for step taxiing

Explain abnormal flight situations

Review how to assess environmental factors.

#### *Advice to Instructors*

- This exercise is best covered in a simulated confined area.
- This exercise will go a long way in improving the overall control ability of your student and will reinforce the techniques used on many other exercises.

#### *Air Instruction and Student Practice*

Demonstrate how to assess the confined area take-off situation.

Demonstrate and have the student practise confined area take-offs.

### **Rough Water Approach and Landing**

#### *Essential Background Knowledge*

Explain the range of attitudes in which a safe landing can be accomplished under varying wave heights.

Explain the importance of using a power-assisted approach with half to full flap.

Explain that airspeed should be increased by half the wind speed if turbulence is indicated by "catspaws".

Explain that touchdown should be made with power on and in the step attitude or only slightly higher.

Explain that landing in a too nose-high attitude will cause the heel of the floats to touch first, slamming the forward portion into the water.

Explain that, once a few wave tops have been touched and the decision is made to complete the landing, power can be reduced and the aircraft held in the level or step attitude by gently applying forward elevator. This causes the float keels to cut the waves and increases drag on the forward float bottoms which decelerates the aircraft.

Explain the importance of avoiding landing in a nose high attitude.

Explain the importance of avoiding up elevator after the power is reduced and the aircraft is decelerating. This will cause the float bottoms to slam into the waves, pounding the aircraft unnecessarily.

Explain the importance of avoiding landing with power off. This reduces control over the sink rate and usually results in a nose high attitude at touchdown. To reject a landing with the power off would usually be as dangerous as remaining on the water.

Explain that, in an emergency such as an engine failure, increase the normal approach speed by as much as 20 knots and use this speed to help control the flare and sink rate. This should be practised on choppy water as most pilots will balloon during the flare on their first few attempts.

Explain that crosswind landings can overstress the float fitting attachment points as the initial wave contact is made on one float. Also, as the aircraft settles off the step (nose high attitude and low airspeed), the aircraft will roll with the waves and the windward wing will be picked up by the wind possibly swamping one float. The ailerons and rudder will be ineffective.

#### *Advice to Instructors*

- Since it is often difficult to judge whether the waves are too big until after touchdown, be prepared to reject the landing after touching about 3 to 5 wave tops. This means fairly high power should be carried after first contact with the water and in some aircraft not more than half flap is used. Application of take-off power should cause the aircraft to lift off the water without delay.
- Rough water landings are hard on the aircraft at the best of times. Not only is everything on the aircraft subjected to pounding from the waves but water spray is bound to strike the propeller to some degree. Spray will also be difficult to avoid during displacement taxiing. The fuselage of some aircraft will actually twist while turning in waves.
- Three goals must be met for a safe and efficient rough water landing. First, touch the waves gently in the step attitude or only slightly higher. Second, be prepared and able to reject the landing after touchdown. Third, keep the shock or pounding to a minimum.

- On any landing on rough water try to maintain an attitude that will keep pounding to a minimum. This attitude will vary depending on the size of the seaplane and the size of the floats.

#### *Instruction and Student Practice*

Demonstrate how to assess the rough water landing situation.

Demonstrate and have the student practise rough water approaches and landings.

### **Step Turns**

#### *Essential Background Knowledge*

Explain the procedure for step turns.

Explain the hydrodynamic drag on the floats and the capsizing tendency caused by the centrifugal force generated during the turn.

#### *Advice to Instructors*

- Before commencing step turns ensure the student is ready. Step turns should always be wide radius. The instructor must be alert to the student's use of rudder. The rate of turn will vary and must be controlled.
- Emphasize that we do step turns more as a training exercise. In actual practice they are used very little.
- Point out to the student that in training we may do 360° step turns but in actual practise they are seldom more than 180°.

#### *Instruction and Student Practice*

Demonstrate and have the student practice step turns.

### **Fuelling from barrels**

#### *Essential Background Knowledge*

Explain how to prevent contamination

- Do not use unsealed barrels unless you know when they were opened.
- Check date on barrels.
- Make sure that the barrels to be used are stored in a way that neither water or other residues may cover the caps.
- Place barrels in a shaded area to prevent high variations in temperature.
- Properly filter the fuel before use.

#### *Instruction and Student Practice*

Demonstrate and have the student practise fuelling from barrels.

## Carrying External Loads

### *Essential Background Knowledge*

Explain that external loads may only be carried on aircraft for which an airworthiness approval has been issued.

Explain that the limitations in the approved flight manual supplement must be observed.

Explain that heavy, asymmetric, external loads, such as lumber, can have a severe effect on aileron control authority.

Explain the importance of using duplicated means of securing the load to the airplane so that a single failure of a tie down or fitting does not result in the load coming loose.

Explain the effect of an external load on emergency egress in both the take-off and landing configurations.

Explain the effect of load placement on airflow. For example, placement so close behind the propeller that pressure builds up, causing "cavitation" so close to the static ports that the air data instruments are adversely affected or made unusable. Another example would be placement in the vicinity of any intake or exhaust port (cooling or heating air) such that the performance of the items is affected.

Explain, if possible, how to use appropriate external load equipment (canoe rack).

Explain the importance of arranging some loads, such as a boat or a canoe, so as to avoid significant amounts of water being trapped during a take-off run.

Point out that, in general, an outside load is not insured (if an accident occurs with such a load and it is proven that the accident is caused by this load, some insurance companies will not pay for this claim).

Explain how to secure load:

- clear of propeller
- respect width (between fuselage and the top of the float).
- respect weight
- aerodynamic shape of the load
- use safe and adequate cables, ropes or straps

Explain impact on performance:

- longer take-off distance due to drag
- slower climb
- lower cruising speed
- pronounced yaw
- possibility of load blanking out elevator or rudder

### *Advice to Instructors*

- It is the pilot's judgment and responsibility to accept or refuse the type of external load.
- Double or triple the weight depending on volume and/or aerodynamic of the load.
- Ensure that the load is fixed in the flight axis.
- In the case of a freight style canoe (one end flat), place the flat end in the front to reduce the drag.
- Check that the load does not come into contact with the water rudders or cables.
- In flight, keep a regular eye out on the load.
- Check engine instruments regularly (watch out for overheating).

### **Basic Seaplane Training Resources**

#### **Transport Canada**

1. Flight Training Manual (Catalogue No. T52-14/1994E)
2. Flight Instructor Guide (TP 975)
3. Human Factors in Aviation: Basic and Advanced Handbooks Seaplanes: A Passenger's Guide (TP 12365)
4. Aviation Safety Letter

#### **Transportation Safety Board**

1. Aviation Occurrence Reports

#### **Health Canada**

1. The Pilot's Guide to Medical Human Factors

### **Suggested Further Reading List**

1. Marin Faure Flying a Floatplane TAB Books
2. J.J. Frey How to Fly Floats EDO Float Corporation
3. Dale de Remer Water Flying Concepts IAP, Inc.
4. Pierre Rivest Bush Pilot