Seaplane Course (Airplane Single-Engine Sea)

Course Objectives

The course objective is to provide the student with the knowledge, skills, and aeronautical experience necessary to safely function as pilot-in-command in a single-engine sea airplane.

Course Completion Standards

The student will demonstrate through oral examinations and flight test that he/she meets the knowledge, skills, and experience required to safely function as pilot-in-command of a single-engine sea airplane.

Enrollment Requirements

The student is required to have, at the time he/she is enrolled in the training course, the following:

1. At least a Private Pilot-Single Engine Land certificate.
2. Hold a valid Medical Certificate.
3. Be able to read, speak, and understand the English language.

Graduation Requirements

To complete the SES Course the student must:
1. Meet the enrollment requirements.
2. Complete the flight and ground school lessons.
3. Pass the flight check

Ground Lesson 1

Objectives

During this lesson the student will gain an understanding of float installation, attachment hardware, nomenclature of parts and their functions, and design of floats along with float plane safety.

Content

1. Float Installation
2. Attachment Hardware
3. Nomenclature of Float Parts
4. How Floats Work
5. Float-plane Safety

References

1. Float-plane Video
2. Printed Material
   A. Seaplane Operations Handbook, FAA-H-8083-23
   B. Excerpted from (old)FAA Flight Training Handbook AC 61-21A

Completion Standards

During class session the ground instructor will determine that the student understands float installation, attachment hardware, nomenclature of parts and their functions, and design of floats along with float plane safety.

Ground Lesson 2

Objectives

During this lesson the student will gain an understanding of the contents of the aircraft flight manual including the applicable supplements specific to the aircraft being flown.

Content

1. General - Airplane & Systems
2. Limitations
3. Emergency Procedures
4. Normal Procedures and Checklist Usage
5. Performance
6. Weight & Balance
7. float plane Supplement

References

1. Airplane Flight Manual (excerpts)
2. Float plane Supplement (excerpts)
3. Float plane Normal Checklist

Completion Standards

During class session the ground instructor will determine that the student understands the contents of the aircraft flight manual including the applicable supplements specific to the aircraft being flown.

Ground Lesson 3

Objectives

During this lesson the student will gain an understanding of the preflight inspection of a seaplane, starting and departing the shore or ramp along with the procedures and rules of taxiing.

Content

1. Preflight Inspection
2. Launching or Push-back
3. Starting Out
4. Taxing
   A. Displacement
   B. Step
5. Turns
   A. Displacement
   B. Plowing
   C. Inertia
   D. Step
6. Right of Way Rules: Water Operations

References

1. All Previous References

Completion Standards

During class session the ground instructor will determine that the student understands the preflight inspection of a seaplane, starting and departing the shore or ramp, along with the procedures and rules of taxing.

Ground Lesson 4

Objectives

During this lesson the student will gain an understanding of normal and crosswind takeoffs and landings, cruise flight operations and maneuvering.

Content

1. Takeoffs
    - A. Normal
    - B. Crosswind
    - C. Glassy water
    - D. Rough Water
    - E. Maximum Performance
2. Flying the float-plane
    - A. Performance
    - B. Stability
3. Landing Area Assessment
4. Landings
    - A. Normal
    - B. Crosswind
    - C. Glassy Water
    - D. Rough Water
    - E. Maximum Performance

References

1. All Previous References

Completion Standards

During class session the ground instructor will determine that the student understands normal, crosswind, glassy water, rough water and max performance takeoffs and landing and clim and cruise flight performance.

Ground Lesson 5

Objectives

During this lesson the student will gain an understanding of ramping, docking, mooring, beaching, approaching a buoy and sailing.

Content

1. Ramping
2. Docking
3. Mooring
4. Beaching
5. Approaching a buoy
6. Sailing
    A. Power Off
    B. Power On

References

1. All Previous References

Completion Standards

During class session the ground instructor will determine that the student understands ramping, docking, mooring, beaching, approaching a buoy, and sailing.

Flight Lesson 1

Objectives

The student will be introduced to basic flight maneuvers while operating a seaplane.

Content

1. Preflight discussion of all maneuvers to be performed
2. Introduction
    - A. Preflight inspection
    - B. Start and Taxi on Water
    - C. Normal Takeoffs and Climb out
    - D. Constant Altitude Turns
    - E. Stall Recognition and Recovery Procedures
        1. Power Off
        2. Power On
    - F. Maneuvering at Critically Slow Airspeed
    - G. System and Equipment Malfunctions
    - H. Landing Area Assessment
    - I. Normal Approach and Landing
3. Post-flight Discussion

References (for all Flight Lessons)

1. All Previous References
2. Applicable Practical Test Standards

Completion Standards

The student will display an understanding of the maneuvers and procedures introduced. The students performance will meet the standards outlined in the Practical Test Standards.

Flight Lesson 2

Objectives

The student shall review previously learned maneuvers and procedures to develop understanding and proficiency. In addition, he/she shall be introduced to water emergencies, determining wind and water conditions, taxiing, normal and rough water takeoffs, normal and rough water landings, go arounds, and emergency landings.

Content

Preflight Discussion

Review

A. Preflight Inspection
B. Start and Taxi on Water
C. Normal Takeoffs and Landings
D. Constant Altitude Turns
E. Stall Recognition & Recovery Procedures
F. slow Flight
G. System & Equipment Malfunctions
H. Landing Area Assessment

Introduction

A. Water Emergencies & Use of Equipment
B. Taxiing
    1. Displacement (Idle) Taxi & Effects of Wind
    2. Step Taxi & Positioning of Controls
C. Rough Water Takeoffs & Landings
D. Go Arounds
E. Emergency Approach & Landing

Post-flight Discussion

Completion Standards

The student will demonstrate an increased understanding and proficiency in previously learned maneuvers and procedures. The student will also demonstrate a basic understanding of new maneuvers and procedures introduced.

Flight Lesson 3

Objectives

The student shall review previously learned maneuvers and procedures to develop understanding and proficiency. In addition he/she shall be introduced to crosswind takeoffs and landings, plow and step turns, and glassy water takeoffs and landings.

Content

1. Preflight Discussion
2. Review
    - A. Taxiing
        1. Displaced (Idle)
        2. Step
    - B. Rough Water Takeoffs and Landings
    - C. Emergencies, including Go Arounds
3. Introduction
    - A. Crosswind Takeoffs and Landings
    - B. Turns
        1. Plow
        2. Step
    - C. Glassy Water Takeoffs & Landings
4. Post-flight Discussion

Completion Standards

The student will demonstrate an increased understanding and proficiency in previously learned maneuvers and procedures. The student will also demonstrate a basic understanding of new maneuvers and procedures introduced.

Flight Lesson 4

Objectives

The student shall review previously learned maneuvers and procedures to develop understanding and proficiency. In addition he/she shall be introduced to sailing, mooring, docking, ramping, beaching, approaching a buoy, and maximum performance takeoffs and landings.

Content

1. Preflight Discussion
2. Review
    - A. Crosswind Takeoffs and Landings
    - B. Turns
        1. plow
        2. Step
    - C. Glassy Water Takeoffs & Landings
3. Introduction
    - A. Sailing
    - B. Mooring
    - C. Ramping
    - D. Docking
    - E. Beaching
    - F. Approaching a Buoy
    - G. Maximum Performance Takeoffs and Landings
4. Post-flight discussion

Completion Standards

The student will demonstrate an increased understanding and proficiency in previously learned maneuvers and procedures. The student will also demonstrate a basic understanding of new maneuvers and procedures introduced.

Flight Lesson 5

Objectives

This lesson is a final review of all previously learned maneuvers and procedures. The student's readiness for the seaplane rating check flight will be evaluated, and all areas reviewed as necessary.

Content

1. Preflight Discussion
2. Review
    A. Step turns
    B. Glassy Water landings
    C. Docking
    D. Selected maneuvers & Procedures which the instructor feels necessary for review.
3. Post-flight Discussion

Completion Standards

The student will demonstrate an increased understanding and proficiency in the items done for review. These maneuvers shall prepare the student for the check-flight and will beet standards outlined in the Practical Test Standards for a Single Engine Sea Rating.

Flight 6 Seaplane Check flight

Objective

The student will perform all maneuvers and procedures as required in the Practical Test Standards for Airplane Single Engine Sea Rating.

Content

1. Preflight Discussion/Oral Test
2. Flight Check by examiner.
3. Post-flight Discussion
    A. Joining the Seaplane Pilot's Association
        1. Texas Seaplanes, will pay for 1/2 of the new seaplane pilot's first year's dues.

Completion Standards

The student will be able to perform all assigned maneuvers with smoothness and accuracy to meet the standards outlined in the Practical Test Standards for the issuance of an Airplane Single Engine Sea rating.

Single Engine Sea Study Notes

1. Taxiing on the Water

There are three types of water taxis we use with a float-plane.

1. Idle Taxi
2. Plow Taxi
3. Step Taxi

The float-plane stays afloat in idle and plow taxi due to the floats' buoyancy. The float-plane stays afloat in step taxi due to planing action (like water skis).

The checklist we use prior to idle, plow, or step taxi and take-off, landing, or sailing is the acronym "F.A.R.T.S."

F. Flaps and Flight Controls Checked
A. Area Clear
R. Water Rudder Up (or Down)
T. Trim Set
S. Stick Aft (or Forward)

The characteristics of the three water taxi types are summarized in the table below:

Type of Taxi	Flaps	Area	Water Rudders	Trim	Stick	Power	Ailerons
Idle	Zero	Clear	Down	Set	Aft or Fwd as Req'd	1000 RPM	Head Into Wind Tail Away from Wind
Plow	Zero	Clear	Down	Set	Aft	Full Power then 2000 RPM	Head Into Wind Tail Away from Wind
Step	Zero	Clear	Up	Set	Aft then as Required	Full Power and then about 2000 RPM	Required to keep wings level usually into Turn

Idle Taxi is generally considered to be the best form of taxiing because we have:

1. Good visibility
2. Good cooling
3. No spray problem

Plow Taxi is generally considered to be the least desirable form of taxiing because we have:

1. Bad visibility
2. Bad cooling
3. Potential spray problem

We use Plow Taxi Turn to turn from upwind to downwind when the wind is to strong to do so in Idle Taxi, when we need good control in confined maneuvering space, and/or for training purposes.

Plow Taxi Turn is accomplished as follows: (after F.A.R.T.S. checklist)

1. With engine idling, directly into the wind and water rudders down, use right rudder and left aileron into the wind, to cause the float-plane to turn right 15-20 degrees.
2. Continuing to hold aileron into the wind, reverse the turn by pushing full left rudder. As the float-plane nose passes through the wind being full power application for nose-up attitude, while holding full back stick, full left rudder, and aileron into the wind.
3. When established in the turn, reduce power slightly, while continuing to hold nose high. When established downwind, neutralize rudders and ailerons, and reduce power to idle. Hold forward stick in strong winds, or with tailing swells.

Step Taxi is used to travel long distances in a short time when the wind and waves are sufficiently calm to do so without banging the floats and fuselage too much. During Step Taxi we have :

1. good visibility
2. Fairly good cooling
3. No spray problem

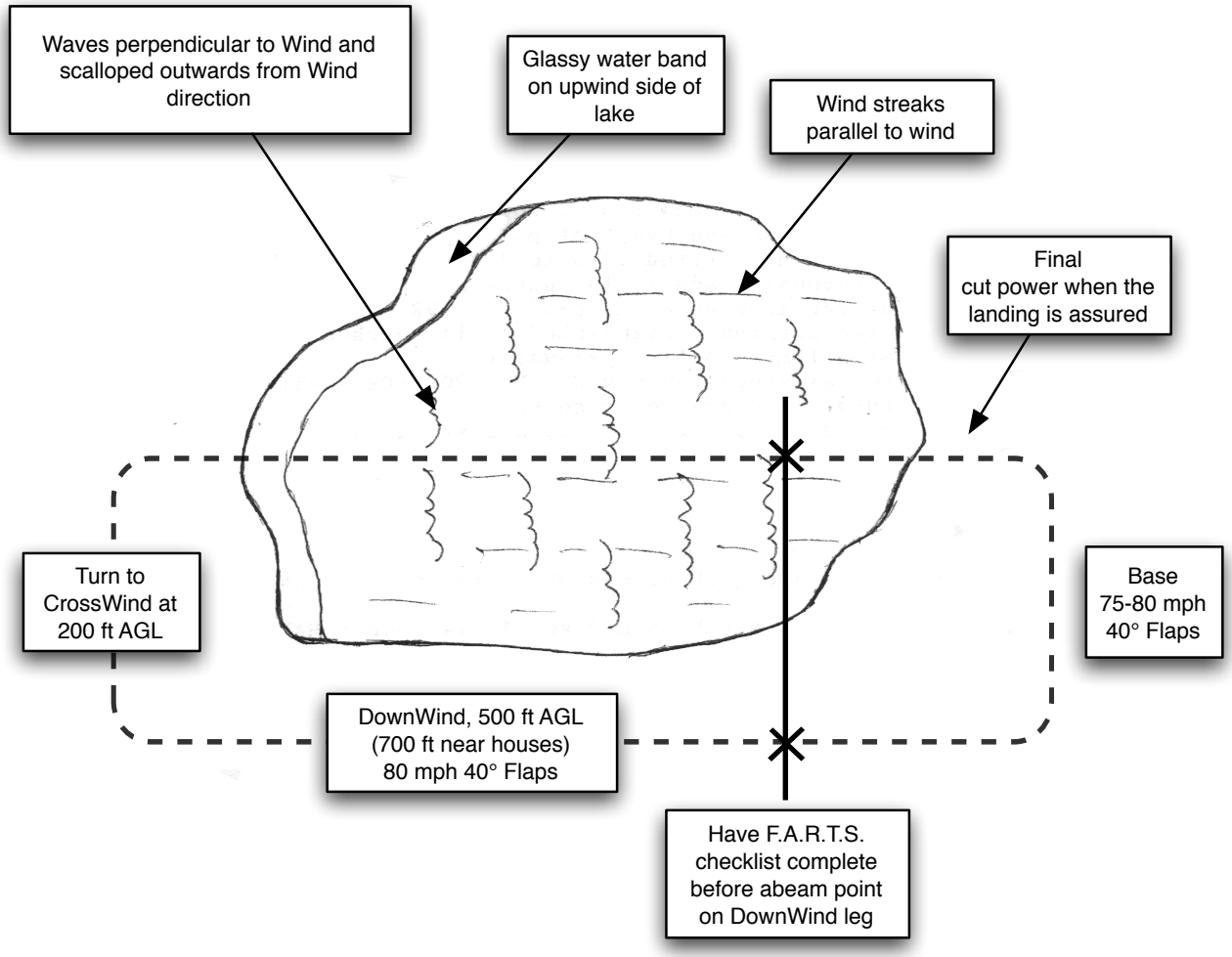
Step Taxi is accomplished as follows: (after F.A.R.T.S. checklist)

1. Point float-plane directly upwind or downwind
2. Add full power, full aft stick
3. When the nose has reached its highest point, start smoothly releasing back pressure on the stick, to allow the seaplane to accelerate onto the step. Then, adjust power to stay on the step, as per the table on the previous page. About 2100-2300 RPM, gps ground speed will be 35-40 knots.
4. Do not taxi any faster than necessary to stay on the step without porpoising.
5. Continue to make small stick and throttle corrections so as to maintain the float-plane on the step.

2. Traffic Pattern

Choose the longest runway on the water consistent with the wind direction. On landing, flare to minimum safe attitude (like the step taxi attitude, one ball nose up) when the bottoms of the floats are about 10 feet above the water. Do Not Touch Down in a Nose Low Attitude!!

Normal TakeOff is similar to Step Taxi, except full power is left on and as the float-plane accelerates on the step very slight back pressure is applied to hold the floats in the "sweet spot" until airborne.



3. Rough Water Operations:

TakeOff is the same as normal take-off except:

1. Use a slightly nose low attitude during the takeoff run (about 2 degrees lower to skim the tops of the waves without planting the bows in a wave).
2. Become airborne at minimum airspeed.
3. Use ground effect and accelerate to climb speed in normal climb attitude.

Landing is the same as normal landing except:

1. Set the power to 1200-1400 RPM after nose has come up during the 10 foot AGL flare.
2. Land at minimum airspeed, nose high on the back side a swell.
3. Power to idle and stick full aft on touchdown. Must avoid submerging the float tips in the next oncoming wave.

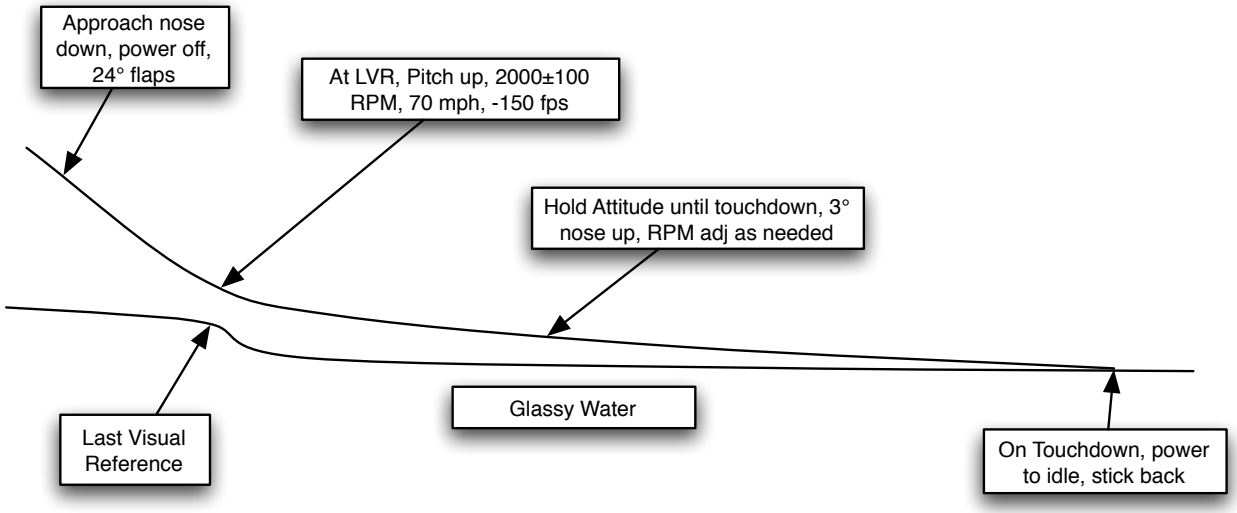
4. Glassy Water Operations

Take-off is the same as normal takeoff except:

1. Lift right float as take-off speed is approached(ailerons full left).
2. Rotate normally, (approximately 1 degree) and immediately level wings as right float lifts from the water.

Landing is the same as normal landing except:

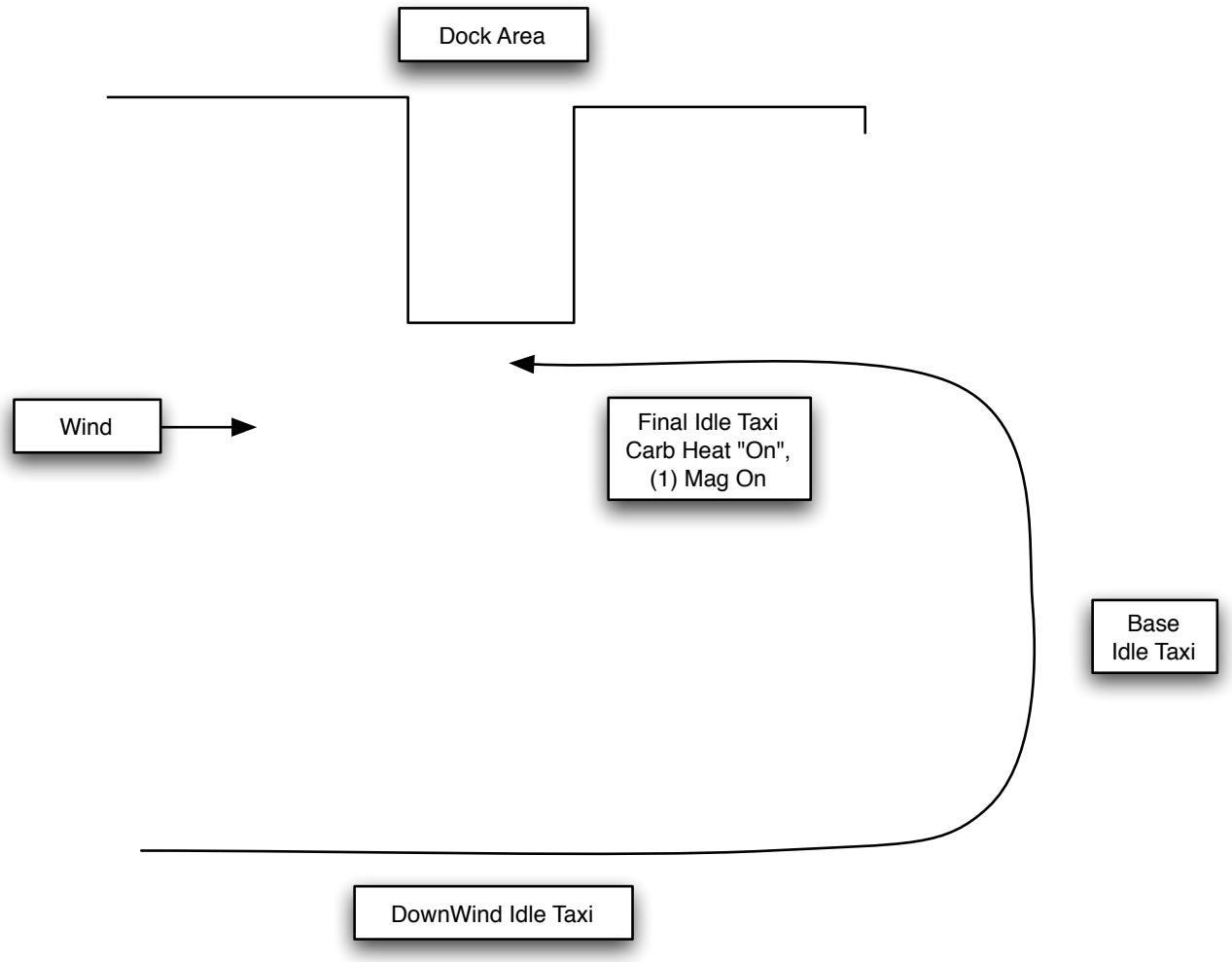
1. Choose a Last Visual Reference (LVR). Use 24 deg. flaps. (2nd notch)
2. Reduce power on downwind, opposite the LVR.
3. Maintain 80±3 MPH on base leg and final.
4. Approach the LVR power off, nose down.
5. Over or before the LVR (not past), establish the glassy water landing attitude. (3-4 degrees nose up,bottom of ball resting on horizon).
6. Simultaneously, set 2000±50 RPM, Prop Full RPM setting
7. do not continue nose low past the LVR.
8. Hold the attitude established until touchdown.
9. Do not attempt to flare visually.
10. Monitor airspeed (68-70 MPH), VSI -150 FPM Maximum, and attitude. (3-4 degrees nose up, bottom of ball resting on horizon) Trust from previous practice with airspeed 70 and power set to 2000 RPM and holding attitude correctly that aircraft will safely fly onto the water. Holding the correct attitude is of prime importance with airspeed secondary.
11. On touchdown, power to idle, and stick back, slowly, don't fly back off water.



Alternate "Kenmore" glassy water technique: When the MSL altitude is known, descend to surface altitude + 100 feet, establish 70 mph and -150 down rate, this is useful in congested areas where you don't or can't make a low approach over a shoreline as for example Lake Washington in Seattle, hence the use of the "Kenmore" glassy water technique.

5. Docking

Dock into the wind after making a traffic pattern on the water. Use carb heat "on" and 1 magneto on final.



Note: A slower taxi speed can be achieved by running on a single mag and/or adding Carb Heat. Caution, if the docking is aborted and a takeoff is planned be sure and return the engine to BOTH mags.

6. Power-Off Sailing

Checklist: F. Flaps and Flight Controls - Set
A. Area - Clear
R. Rudder (water) - Up
T. Trim - Set
S. Stick - As Required

Directional Control:
Aileron - In the direction that you want to go, right(back), left(back)
Rudder - Opposite the ailerons.

7. Study Quiz

1. The best form of water taxi is?

2. The worst water taxi position is? Why

3. Which taxi turn is used in windy conditions? Why?

4. When making a step or plow turn, the turn that has the capability of capsizing a floatplane? Why?

5. The checklist we use in the Maule M7-235B Amphib before takeoff is?

6. The most dangerous condition for landing a floatplane is? Why?

7. What technique do we use for a glassy water takeoff?

8. What is it called when a floatplane turns into the wind at idle power?

9. Where should the stick be in idle and plow taxi?

10. Which form of taxi is used to cover long distances and save time?

11. What position should the water rudders be in during takeoff and landing? Why?

12. Describe the technique for power-off sailing:

13. Describe the technique for docking the floatplane:

14. Describe the technique for beaching the floatplane:

15. List three reasons why a floatplane porpoises:

Match the following:

16. Separates float compartments	A. Keel
17. Walking area on top of float	B. skeg
18. Reinforcement strip that connects side and bottom of float	C. bulkhead D. spray rail

19. Reinforcement strip on float bottom — E. step
20. Deflects water away from prop — F. chine
21. Least drag, best acceleration point — G. deck
22. When taxiing on water, what is the best way to determine the wind direction?
    a) narrow band of slick water next to the shore line.
    b) wind streaks.
    c) birds pointing into the wind
    d) letting the floatplane weathervane into the wind
23. When flying, what is the best indication of wind direction?
    a) narrow band of slick water next to the shore line.
    b) wind streaks.
    c) wave movements.
    d) shore line reference, such as smoke, etc.
24. Why does the floatplane turn downwind in the plow position?
    a) using the air and water rudders turns the floatplane.
    b) centrifugal force.
    c) center of buoyancy shifts forward.
    d) center of buoyancy shifts aft.
25. What method is used to stop severe porpoising?
    a) control pressure slightly back from neutral.
    b) control pressure slightly forward.
    c) power to idle, control pressure full aft.
    d) try to catch the porpoise by adjusting pitch and power.
26. The method for glassy water landings:
    a) pitch up at or before the LVR, then set power to glassy water setting.
    b) set power to glassy water setting, then pitch up over the LVR.
    c) land parallel to the shore line, using shore line as the LVR.

d) land the floatplane the same as soft field technique for land planes using the the surface of the water as LVR.

27. The gross weight of the M7-235B amphib? Land? Water?
28. Useful load is?
29. Fuel capacity is?
30. When do you transfer fuel from the aux tanks?
31. How can you determine if fuel is transferring from aux tanks?
32. When should the electric fuel boost pump be used?
33. Best rate of climb airspeed/flap configuration is?
34. Best angle of climb airspeed/flap configuration?
35. Best glide airspeed/flap configuration?
36. What certificates and documents have to be on board the floatplane?
37. What documents do you need to act as pilot-in-command?
38. How long is a second class medical valid?
39. List five ways to determine wind direction:
40. Who has the right-of-way, boats or floatplanes? Why?
41. White caps start to form on the top of waves at approximately?
42. Wind streaks start to form on the water surface at?
43. Who has the right-of-way, the floatplane taking off or the floatplane landing?
44. What is the color of the rotating beacon at a seaplane base, and what symbol is used for a seaplane base on a sectional chart?
45. As far as design, what is the most important area of the float? Why?
46. On floatplanes, what is the most important part of the preflight? Why?
47. What does the model number "2750" represent on a float?
48. How much of the floatplane's gross weight must each float support?
49. What is the prupose of the skeg?
50. If a 90° x-wind is encountered on takeoff, which is preferred, left or right x-wind? Why?
51. Far 91.115 states, in part that "aircraft on the water"?
52. How can a floatplane pilot determine which bodies of water can be landed upon?

53. List 5 items that a good floatplane pilot looks for when flying over a potential landing site?

54. Describe the technique for the plow turn and what force makes the floatplane turn downwind from the plow position? Why?

55. Should you turn into the wind in the plow position? Why?

56. Describe a maximum performance takeoff?

57. How much do the floats weigh?

58. Location of the battery?

59. Electrical system volts? Amps?

60. How much anchor rope is necessary to anchor in 10 feet of water?

61. What is the maximum flap setting for this floatplane?

62. Explain spin recognition and recovery techniques.

Study Quiz Answers

1. Idle - (except in high winds where you might bury a float in a turn)

2. Plow - Overheating, prop-spray, poor visibility

3. Plow Taxi Turn - Center of buoyancy moves aft reversing the weather-cocking

4. Upwind - Centrifugal force and the wind direction work together causing a capsizing effect. (You're leaning to the outside of the turn)

5. F.A.R.T.S.

6. Glassy Water - loss of depth perception. (that can't be learned) The calmness tends to make the pilot relaxed and complacent which makes the situation more dangerous.

7. Glassy Water Take Off
   Taxi in a circle to create wake which will expand across the surface
   Lift right float at ~50 MPH (but don't pull back yet)
   Rotate normally 60 MPH
   Level wings when both floats are out of the water
   Pay attention. Don't fly back into the water

8. Weathervane/Weathercock

9. Stick Back

10. Step Taxi

11. Up - The air rudder provides adequate directional control. (you would just bang them around)

12. Water Rudders Up (they would steer you the wrong direction) Stick in the direction you want to turn (follow your thumbs) Opposite Rudder

13. Plan, Evaluate, Slow, Slow by Flaps, into the Wind, Doors Open, Carb Heat, 1 Mag, Mags Off, Coast In, Air Horn, Fend Off with Oar (call the insurance co.!)

14. Inspect - Obstacles and Mud
   Sail In, if practical
   Taxi at 45° Angle (so you can change your mind)
   Cut Power - glide In
   Tides? - pull tail in on the beach
   Don't Leave Unattended
   Anchor

15. The stick is too far back or forward (digging in or dragging the tail of float) Pilot Induced Oscillations, Boat Wake, Aft C.G., Too low power setting on step taxi turn

16. C

17. G

18. F

19. A

20. D

21. E

22. D

23. A

24. D

25. C

26. A

27. 2750 lbs max gross weight water, 2705 max take off weight land, 2570 max landing weight land

28. 679 water, 634 land takeoff, 499 land landing

29. 85 gallons max, 43 gallons inboard, 42 gallons outboard

30. Transfer from Aux to Main when the Mains are slightly more than 1/4 (overfilling will force excess fuel overboard)

31. Illumination of transfer pump switch. Main fuel gauge goes up and the Aux fuel gauge goes down.

32. If fuel selector is on Left or Right Tank and it runs dry, turn the electric fuel boost pump on, also use.it during Full or Partial engine failure / Airstart

33. Best Rate 90 MPH - Flaps, First Notch 0°

34. Best Angle 75 MPH - Flaps, Second Notch 24°

35. Best Glide 83 MPH - Flaps, First Notch 0°

36. A.R.R.O.W. (Airworthiness Certificate, Registration, Radio Station License(outside US), Operating Manual, Weight and Balance

37. Pilot Certificate, Medical, Photo ID

38. One year as 2nd class

39. Idle with water rudders up, Glassy Area, Wind Streaks, Wind Sock - Flags, Smoke, Local ATIS

40. Boats have right-of-way (they typically do not know the rirght of way rules)

41. White Caps - 12 KTS
42. Wind Streaks 8-12 KTS
43. Seaplane taking off has Right-of-way
44. Yellow/White, Anchor
45. Step, Less Drag Area
46. Inspect Floats, You Sink!
47. The float displaces 2500 lbs of fresh water
48. Each float - 90% of Gross Weight
49. Skeg protects the rear of the step
50. Right x-wind, because with a left x-wind, you may run out of right rudder authority.
51. "will avoid impeding the navigation of any other vessel."
52. Overfly area for 20 sec at cruise power - Land/T.O.
53. Obstructions, Wind, Water Depth, Water Condition, Traffic - Boats/Planes, Currents
54. Plow Turn
    Stick back
    Start into wind with water rudders down
    At idle power, swing nose right(20°) then full left rudder
    As nose swings to left of wind, Add enough power to plow, nose high - tail low
    Continue Left rudder to turn - ailerons toward the wind
    When downwind, power off, ailerons neutral
55. No, Capsize
56. Max Performance Take Off
    - Place on the step
    - 24° Flaps
    - Lift Right float out of the water at ~50 MPH
    - Rotate to best angle(Vx) 75 MPH
    - At 100-200 ft, flaps to zero, accelerate to (Vy) 90 MPH
57. Floats Weigh ~450 lbs Total
58. Battery is located in tail cone
59. Electric system 14 Volts 50 Amps
60. 50-70 Feet depending on type of anchor

61. Max Flap 40° -7° full down (fast cruise or on ramp only)
0° 1st notch (climb, slow cruise)
24° 2nd notch (Takeoff & Glassy Water Ldgs)
40° 3rd notch (Normal & Rough Water Ldgs
48° 4th notch (not authorized for float-plane ops)

62. Rudder opposite, power to idle, aileron neutral, stick forward, neutralize rudder when spin stops, then recover wings level, power as necessary.