Piston Aeroplane Differences Training Quiz **Model: _____**

	Name	Licence Type	Licence number
Applicant			
Instructor			

Result: Pass Fail
Date: 201__ --___--___

Applicant's Previous Experience

Total flight time	
Multi-Engine experience (if applicable)	
Similar models already flown (plus hours)	
Ratings (delete if not applicable)	Class Night Instrument Instructor (1/2/3)

Note: This quiz is intended to facilitate differences and familiarisation training for pilots who want to transition onto a new model within an existing class. With supplementary material, it can also be used for new class and type ratings. The instructor may decide to delete some questions, based on the type of aircraft and the applicant's previous experience. Additional questions should be added for models that have special characteristics (complex systems, unusual handling etc.)

The quiz can be done open book (i.e. with access to aircraft manuals etc.). The table below gives guidance on which sections have to be completed for different aircraft models:

Model characteristics	**Sections to be completed**				
	A	**B**	**C**	**D**	**E**
Light sport aeroplanes	●				
Simple single-engined fixed-gear aeroplanes	●				
Complex single-engined aeroplanes	●	●	●		
Pressurised single-engined aeroplanes	●	●	●		●
Multi-engined aeroplanes	●	●	●	●	
Multi-engined pressurised aeroplanes	●	●	●	●	●

Section A (for all aeroplanes)

Speeds:

1. Define each of the following terms. State whether each speed is applicable to the specific aircraft model, and name the speed if it is:

   V_{SO}, V_R, V_{FE}, V_{FO}, V_Y, V_X, V_A, V_{REF}, V_{MO}, V_{NE}

   How (if at all) is each of the speeds above marked on the Airspeed Indicator?

Procedures:

2. Explain the procedure to be used for landing at and taking off from short fields. Refer to speeds, flap settings and undercarriage operation.

3. Describe the procedure for the engine check before takeoff. Mention the rpm involved and any systems to be checked.

4. Which of the following are allowed? For each answer, state any applicable restrictions (mass, centre of gravity, flap settings etc.).

   Side-slipping, spinning, aerobatics.

5. How can the minimum engine temperature for takeoff be determined?

6. Provide a suitable takeoff briefing for this aircraft type, naming all items to be covered and the actual numbers for this aircraft.

Performance:

7. Assume that all the fuel tanks are filled to capacity. Can all the seats be filled with adults (96 kg each)? If so, how much luggage can be carried? If not, how many of the seats may be filled, and how much luggage may then be carried?

8. You are planning a 600 NM trip with all available seats filled up (adults, 96 kg each). The wind is calm. Is the aircraft within its Zero Fuel Mass limit? Will you be able to make it without refueling (assuming normal VFR reserves)? What power setting would you use? What altitude would you fly at?

9. You are planning a takeoff from Grand Central Airport (elevation 5327'). The temperature is 30°C. The wind is 320/15. What will the takeoff run be? What distance will be required to clear a 50' obstacle? Give the corresponding figures for landing. Comment on the comparison between the two.

Technical:

10. Are there electric fuel pumps? If so, when should they be used? Can they be operated continuously?

11. What type of engine is used?

    a. Manufacturer?
    b. Number of cylinders and spark plugs?
    c. Normally aspirated/supercharged/turbocharged?
    d. Carburetted or fuel-injected?
    e. Propeller: Fixed pitch or constant speed?

12. What device is used for stall warning (whistle, light, horn etc.)? Where is the stall sensor?

13. Which accessories and devices are driven by each of the following systems (if present)?

    Electrics, Hydraulics, Pneumatics, Suction.

14. Which fuel grades may be used?

15. Which oil grades may be used?

16. What are the recommended tyre pressures? Give answers both in kPa and PSI.

17. Draw a diagram of the fuel system. Indicate the position of drains, selectors and fuel pumps.

18. Which fuel tanks may be used for takeoff? Which fuel tanks may not be used for takeoff? Mention any specific maximum and minimum quantity restrictions.

Section B (for aeroplanes with constant-speed propellers only)

1. After takeoff, you notice that the rpm is about 10% above the red line. What action do you take?

2. If you suddenly have to apply power (such as recovering from an inadvertent spin), in which sequence should you apply the engine controls? Why?

3. If you wish to reduce power (such as after takeoff), in which sequence should you change the engine control settings? Why?

4. Why should the propeller control be cycled three times before takeoff if the engine is cold?

5. Is it possible to obtain the same power setting at low and high rpm? Explain.

6. In general, would you prefer to cruise at a low rpm or a high rpm? Why?

Section C (for aeroplanes with retractable undercarriage only)

1. Define the following terms, and name the actual speeds for this aeroplane:

   V_{LE}, V_{LO}

2. What indications are there that the wheels are securely down and locked? If the electrical system is turned off, how would you verify that the wheels are down and locked?

3. What actions would you take if you select gear down and do not obtain the desired “down and locked” indication? What speed restrictions apply during the above procedure?

4. If you have to make a forced landing, what factors will influence your decision on whether to make a wheels-up or wheels-down landing? What would your decision be if you have to

ditch in the ocean? In this case, should you land into wind or at right angles to the wind?

5. Under what circumstances would you expect the landing gear to extend by itself? What are the implications on range and endurance if the landing gear does extend during cruise?

6. What warning devices are incorporated in the gear system? Can these warnings be overridden?

7. Is there anything unusual about this aircraft's handling i.r.o. gear retraction after an obstacle clearance takeoff? *Note: This question is particularly aimed at the Cessna retractable single-engine family (C172RG, C177RG, C182RG, C210).*

Section D (for multi-engine aeroplanes only)

1. Explain the following terms, and name the actual speeds for this type:

   V_{MCA}, V_1, V_2, V_{SSE}, V_{YSE}, V_{XSE}

   How (if at all) is each of the speeds above marked on the Airspeed Indicator?

2. Performance and control

   a. Explain briefly to what extent an engine failure will affect the performance of the aircraft. What percentage of maximum climb rate would you expect to lose if one engine fails? Refer to the influence of the altitude and the weight.

   b. Explain how and why an engine failure will affect the control of the aircraft.

   c. Which is the critical engine? Why?

   d. Will the aircraft maintain FL75 on a hot day if the critical engine fails? If not, what will the approximate drift-down range be in Gauteng (elevation around 5000')?

   e. Give an indication of the amount of drag caused by a windmilling propeller. Use a comparison to other drag-producing systems on the aircraft.

   f. Would the aircraft tend to roll if an engine fails? Why?

   g. If the left engine fails during a left turn, will the aircraft roll into or out of the turn?

   h. Explain how the critical speed is influenced by each of the following:

      Centre of gravity position; Weight; Power setting on operating engine; Altitude, Bank angle.

3. Procedures

   a. An examiner asks you to do a V_{MCA} demonstration. As we all know, it is impossible to demonstrate V_{MCA}. Why? Suggest and describe an alternative demonstration that might keep the examiner happy.

   b. Why could it be of advantage to apply some bank into the live engine? How much bank should be applied, and why is there a restriction?

   c. How will you identify the inoperative engine if engine failure is suspected? How will you verify its identity once you have made the diagnosis?

   d. Name the recommended power setting for zero thrust.

   e. What is the significance of the Asymmetric Committal Height? What height would you use for this purpose?

   f. Explain the procedure for feathering and unfeathering a propeller in flight.

   g. Name the actions to be taken after the failed engine's propeller has been feathered, before commencing cruise to the nearest landing site.

   h. You're taking off from a short runway, with tall trees near the end. The book says you should make it, with about 5% of the runway to spare. At about 10 feet off the ground, one engine fails. What do you do?

4. Systems

   a. Which of the following systems are duplicated?

      Electrical generation; Hydraulics; Suction; Pneumatics

   b. Explain how each system that is not duplicated may influence go/no-go decisions in the event of an engine failure. Refer to all the devices driven by that particular system.

   c. Your critical engine has failed, and you are flying only on one engine. Because you envisage a long flight ahead to the nearest suitable airport, you decide to select crossfeed. Which electric fuel pump would you use to ensure adequate fuel pressure during the selection change? And after you've changed tanks? *Hint: Carefully scrutinise the fuel system diagram, paying particular attention to the location of the fuel pumps.*

   d. Are there any restrictions on the use of crossfeed during landing?

Section E (for aeroplanes with pressurised cabins only)

1. What is the maximum operating altitude?

2. What is the maximum pressure differential?

3. What will the cabin altitude be at its maximum operating altitude?

4. What is the maximum altitude at which a sea-level cabin can be achieved? And an 8000' cabin?

5. You are planning to take off from an airfield at 5000' elevation, cruise at FL180 and land at sea level. To what altitudes should the controller be set during climb, cruise and descent to ensure maximum passenger comfort?

6. What is the maximum cabin climb or descent rate recommended for passenger comfort?

7. Give the emergency descent procedure. What is a safe cruising level after a pressurisation failure? How long will it take to get from maximum operating altitude to a safe cruising level if the pressurisation fails? Can the pilot survive this long without oxygen?

8. Explain what would happen if you are flying at FL180 and set the cabin to sea level.

9. Is it possible to pressurise the cabin on the ground? If so, under what circumstances? If not, why not?

10. Is there a limitation on pressurisation when landing? What?

11. Where is the air for the cabin pressurisation obtained?

12. How is the air heated and cooled before entering the cabin, to allow a comfortable environment?

13. How is the pilot warned if the cabin inadvertently depressurises (i.e. not an explosive decompression)?

14. How will a fuselage hole of 50 mm diameter affect the pressurisation?

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