



Cessna 310 R

Multi Engine

Instruction Manual

and

Maneuvers Guide

American Air Service

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Multiengine Flight Training

Depending on the student's background, the multi engine training will typically require 2 - 3 hours ground training and approximately 8 - 10 hours flight training for a VFR only rating. To prepare for a IFR multi engine rating up to four more hours are necessary.

Training Syllabus

Ground School

- Powerplants
- Propellers
- Aircraft Systems
- Aerodynamics
- Weight and Balance
- Performance
- Emergency Procedures

Flight Lesson 1: 1.5 hours ground and pre flight briefing, 2.0 hours of flight:

- a) Preflight inspection, cockpit checkout and lesson briefing
- b) Start up, taxi, run up, normal take off and climb.
- c) Stalls, climb power and approach configuration, straight ahead and in turn.
- d) Slow flight, clean and flaps down, straight ahead and turns.
- e) Steep turns.
- f) Engine out drills, straight ahead at approach speed
- g) Normal traffic pattern and landing.

Flight Lesson 2: 0.2 hours pre flight briefing, 2.0 hours flight:

- a) Start up, taxi, run up, normal take off and climb
- b) Engine out drills, all phases of flight.
- c) Traffic patterns, twin engine, normal and maximum performance.
- d) Traffic patterns with engine failures at different points in the pattern and engine out landings.
- e) Aborted take offs.
- f) Stalls, slow flight and steep turns (Review of lesson 1)

Flight lesson 3: 0.3 hours preflight briefing, 2.0 hours of flight:

Note: Multiengine ground school and discussion of Vmc to be completed before this flight!

- a) Startup, taxi, runup, normal take off and climb
- b) Vmc demonstration
- c) Engine failure in cruise, troubleshooting procedure
- d) Feathering, securing dead engine
- e) Demonstration of effects of airspeed and configuration on performance
- f) Engine restart
- g) Traffic patterns with engine failures (Review on lesson 2)

Flight lesson 4 (VFR only rating): 0.2 hours of preflight briefing, 2.0 hours of flight:

- a) Review on all maneuvers and procedures
- b) Preparation for flight test

Flight Lesson 4 (VFR+IFR rating): 0.2 hours of preflight briefing, 2.0 hours of flight:

- a) Engine failure drills under the hood.
- b) Twin engine ILS approach
- c) Single engine ILS approach
- d) Twin engine NDB or VOR approach
- e) Review on all maneuvers and procedures

Flight Lesson 5 (VFR+IFR rating): 0.2 hours of preflight briefing, 2.0 hours of flight:

- a) Single engine ILS approach
- b) Twin engine NDB or VOR approach
- c) Single engine NDB or VOR approach
- d) Preparation for flight test

Abbreviated Checklist for instruction purposes:

Engine Runup (should be committed to memory)

- | | |
|-----------------------|--|
| 1. Brakes | SET |
| 2. Throttles | 1700 RPM |
| 3. Alternators | CHECK |
| 4. Vacuum System | CHECK 4.75 to 5.25 inches HG |
| 5. Magnetos | CHECK 150 RPM maximum drop, with a maximum differential of 50 RPM |
| 6. Propellers | CHECK feathering; return to high RPM
(Do not allow RPM to fall below 1000 RPM!) |
| 7. Engine Instruments | CHECK green arc |
| 8. Throttles | 1000 RPM |

Normal Takeoff

- | | |
|---|---|
| 1. Wing Flaps | UP |
| 2. Smoothly apply Power to | FULL THROTTLE and 2700 RPM |
| 3. Mixtures | LEAN for field elevation (see Figure 5-27) |
| 4. Engine Instruments | CHECK |
| 5. Air Minimum Control Speed | 80 KIAS |
| 7. Elevator Control | Raise Nosewheel at 83 KIAS |
| 8. Lift-Off | 92 KIAS (ref. to Section 5 for speeds at reduced weight) |
| 9. When positive Rate-of-Climb and out of usable Runway | APPLY BRAKES and GEAR UP |
| 10. Airspeed | ACCELERATE to 107 KIAS (best Rate-of-Climb ME) |
| 11. At or above 500 ft AGL | <u>U</u> ndercarriage up (check no lights)
<u>P</u> ower to 24.5 ins.MAP/2500 RPM
<u>S</u> witches - Auxiliary Fuel Pumps OFF |
| 12. Mixtures | LEAN (see Figure 5-27) |
| 13. Cowl Flaps | AS REQUIRED |

Maximum Performance Takeoff (Short Field Takeoff)

- | | |
|--|---|
| 1. Wing Flaps | 15° |
| 2. Foot Brakes | APPLY and HOLD |
| 3. Smoothly apply Power to | FULL THROTTLE and 2700 RPM |
| 4. Mixtures | LEAN for field elevation (see Figure 5-27) |
| 5. Engine Instruments | CHECK |
| 6. Brakes | RELEASE |
| 7. Air Minimum Control Speed | 80 KIAS |
| 8. Elevator Control | Raise Nosewheel at 70 KIAS |
| 9. Lift-Off | 82 KIAS (ref. to Section 5 for speeds at reduced weight) |
| 10. When positive Rate-of-Climb and out of usable Runway | APPLY BRAKES and GEAR UP |
| 11. Airspeed | ACCELERATE to 85 KIAS (best Angle-of-Climb ME) |
| 12. After clearing obstacle | ACCELERATE to 107 KIAS (best Rate-of-Climb ME) and WING FLAPS UP |
| 13. At or above 500 ft AGL | <u>U</u> ndercarriage up (check no lights)
<u>P</u> ower to 24.5 ins.MAP/2500 RPM
<u>S</u> witches - Auxiliary Fuel Pumps OFF |
| 14. Mixtures | LEAN (see Figure 5-27) |
| 15. Cowl Flaps | AS REQUIRED |

Normal Landing

1. Descent Checklist complete before entering traffic pattern
2. Throttles 19" MAP
3. Propellers 2200 RPM
4. Speed REDUCE TO MAX. 158 KIAS
5. Wing Flaps 15°
6. Speed REDUCE TO MAX. 138 KIAS
7. By Midfield on Downwind
 - G**AS - MAIN TANKS
 - U**NERCARRIAGE - DOWN
 - M**IXTURES - AS REQUIRED
 - P**OWER - 19" MAP/2200 RPM
 - S**WITCHES - PUMPS ON
8. Abeam Touchdown Point
 - THROTTLES - 17" MAP
 - SPEED - 110 KIAS
 - CONFIRM - 3 GREEN LIGHTS
9. Final Approach
 - Wing Flaps - FULL DOWN
 - Trim to 93 KIAS
10. Short Final
 - Propellers - FULL FORWARD
 - Mixtures - RICH
 - RECHECK - 3 GREEN LIGHTS
11. Touchdown
 - ON MAINWHEELS FIRST
12. After Clear of Runway
 - Auxiliary Pumps - LOW
 - Cowl Flaps - OPEN
 - Wing Flaps - UP
 - Cabin Heater - SWITCH to FAN

Short Field Landing (Runway 08 Approach at Michelstadt)

1. Normal Procedures until Final
2. Final Approach
 - Wing Flaps - Full Down
 - Trim to 82 KIAS at 4200 lbs.
 - increasing to 93 KIAS at 5400 lbs. (see Fig. 5-26)
 - Hold Airspeed with trim and correct sink-rate with power!
 - You are on approach-slope, when the tree-tops are aligned with the runway-threshold!
3. Short Final Check
 - Before reaching the tree-line
4. Over the Obstacle (Trees)
 - Clear Trees with about 10 feet or less
 - IMMEDIATE THROTTLES TO IDLE
 - SLIGHTLY lower the nose until in GROUND-EFFECT
 - then start to FLARE-OUT.
5. Touchdown
 - With Mainwheels first AT THE THRESHOLD, don't let the airplane float into the runway.
 - Apply brakes smoothly and evenly when airplane has firmly settled down on the runway. **DO NOT LOCK THE BRAKES!**
 - Because of the downhill slope of the last third of the runway, you can not see the end. You can guess the remaining runway length by watching the yellow mid-runway markings.
6. After Clear of Runway
 - Normal after Landing Check

Balked Landing

1. Increase engine speed to 2700 RPM and apply full throttle if necessary.
2. Mixtures - AS REQUIRED for balked landing power setting.
3. Balked Landing Transition Speed - 85 KIAS
4. Landing Gear - RETRACT when positive Rate-of-Climb is established.
5. Wing Flaps - 15°
6. Trim airplane for climb.
7. Cowl Flaps - OPEN
8. Wing Flaps - UP as soon as all obstacles are cleared and a safe altitude and airspeed are obtained.

In the practical flight test the applicant has to show some or all of the following maneuvers:

As the Practical Test Standards (PTS) demand all maneuvers have to be completed not lower than 3000 feet AGL. Before executing any maneuver CLEAR THE AREA for other traffic!

Power on Stall (Climb Configuration)

1. Stabilize in **Normal Climb** or at **Approach Cruise**
2. Apply climb power (24.5" MAP/2500 RPM)
3. Gradually establish pitch attitude of 15° to 20° nose up, straight ahead or in a turn with a bank of 20°
4. Gradually but firmly increase right rudder to maintain coordinated flight while maintaining wings level or specified bank angle with ailerons
5. Recognize and announce the onset of the stall by identifying the first aerodynamic buffeting
6. Recover promptly as the stall occurs by immediately lowering the angle of attack, applying additional right rudder and leveling the wings

NOTE: Due to P-factor and torque the airplane will always tend to roll left as the stall occurs.

7. Recovery Procedure:
Pitch level, wings level (do not let the nose drop too far because of too much altitude loss)
After 1 Second pitch up to approx. 10° (airspeed at $V_x = 85$ KIAS)
When positive climb is established lower pitch to 5° and gradually accelerate to $V_y = 107$ KIAS
8. Re-establish approach cruise or normal climb as specified.

Practical Test Standard (PTS) for the maneuver is heading $\pm 10^\circ$ or in turning flight 20° bank $\pm 10^\circ$

Power off Stall (Landing Configuration)

NOTE: Even though the practical test standards refers to the maneuver as a Power Off Stall the airplane is configured in the landing configuration at a normal approach power setting.

1. Reduce throttle to 18-19" MAP and let the airplane decelerate to less than 158 KIAS
2. Wing Flaps - 15°
3. Reduce throttle to 15" MAP and decelerate to less than 138 KIAS
4. Landing Gear - DOWN
5. Wing Flaps - FULL DOWN
6. Further deceleration to stall speed by pitching up gradually (nose up about 5°)
7. Recognize and recover from stall at the first indication of buffeting and decay of control effectiveness by immediately reducing angle of attack, increasing power and leveling the wings
8. Recovery Procedure:
Full Power
Pitch level, wings level
Wing Flaps to 15°, with flap retraction pitch up to approx. 10° and initiate climb (airspeed at $V_x = 85$ KIAS)
When positive climb, gear up, lower pitch to 5° and gradually accelerate to $V_y = 107$ KIAS
With airspeed above 90 KIAS Wing Flaps UP
9. Return to entry airspeed, altitude and configuration

PTS heading $\pm 10^\circ$ or in turning flight 30° bank $+0/-10^\circ$

Maneuvering during Slow Flight

1. Trim Airplane for straight and level at a power setting of 19" MAP/2200 RPM
2. Reduce Throttles to 15" MAP
3. As airspeed bleeds off, trim nose up to hold altitude
4. At 90 KIAS - Throttles to about 17" MAP, to hold this airspeed and specified altitude
5. If Flaps have been deployed some more throttle is necessary
6. Turns, climbs and descents can be practiced in this configuration
7. Recovery: Add Throttle to 22" MAP, Pitch to maintain altitude
8. Retract Flaps if deployed and resume Cruise Flight

PTS altitude ± 100 ft (Private), ± 50 ft (Commercial); heading $\pm 10^\circ$; airspeed ± 5 KIAS
on turns: specified bank $\pm 10^\circ$; roll out on specified heading $\pm 10^\circ$

Steep Turns

NOTE: Steep Turns for Private Pilot Rating: 45° Bank; for Commercial Pilot Rating 50° Bank

1. Adjust Power to about 21" MAP/2300 RPM to obtain approximately 148 KIAS
2. Enter a 360° turn using either 45° or 50° bank
G-load is rapidly increasing above 25° bank. Roll to final bank angle with increasing pitch to compensate for G-load and to hold altitude.
3. Increase Throttles 1-3" MAP to hold airspeed constant.
4. Complete first 360° turn and roll out second 360° turn in other direction.
With roll out release back pressure as bank approaches level and apply more back pressure with again increasing bank.
5. Roll out on desired heading.
6. Throttles back to 21" MAP

PTS altitude ±100 ft; bank ±5°; airspeed ±10 KIAS; roll out on specified Heading ±10°

Minimum Control Speed Demonstration

1. Reduce Throttles to 19" MAP and trim to hold altitude
2. Audibly call out parameters:
 - a. Aft Center of Gravity
 - b. Flaps Up
 - c. Gear Up
 - d. Throttle Left Engine (critical) Idle
 - e. Props full forward - High RPM
 - f. Throttle Right Engine - Full Power
3. Establish Vyse 106 KIAS and 5° bank into good engine, 1/2 ball out - then gently slow airspeed by pitching up
Do not remove hand from right throttle. Gradually increase aileron and rudder as airspeed decreases.
4. At first sign of loss of directional control or stall simultaneously reduce angle of attack and partially reduce power on right engine to maintain control with a minimum loss of altitude (Pitch to about -5°).
5. At more than 92 KIAS smoothly apply full throttle on right engine (left remains simulated dead) and accelerate to 106 (Vyse).
6. Match Throttles at 18-19" MAP; Propellers back to 2200 RPM
7. Resume Cruise Flight

PTS heading within 20° of entry heading; airspeed during recovery at ±5 KIAS of Vyse

Single Engine Maneuvering (normally zero thrust engine)

1. Power to 19" MAP/2400 RPM and trim to hold altitude
2. Zero Thrust one engine (Propeller full forward, as much throttle to hold RPM on about 1950; see Fig. 3-3)
3. Adjust pitch trim for 106 KIAS and use rudder trim.
4. Demonstrate different phases of flight with different power on "good engine"
Turns into and away from "good engine"; Climbs and descents
5. Warm up inoperative engine beginning with 15" MAP for several minutes.
6. Resume Cruise Flight

During the Flight Test the examiner will fail one Engine (simulated) in different phases of flight or on takeoff.

The procedures to be followed are described in the emergency checklist.