FLIGHT SERVICES

Maneuvers Guide for Beechcraft Duchess (BE-76)

This guide is for the Beechcraft Duchess (BE-76).

All maneuvers should be executed at an appropriate location and altitude, specifically:

1. Altitudes allowing the completion of the maneuver no lower than 3,000 feet AGL.
2. No airborne engine failures lower than 400 feet AGL or slower than V_{sse} (71 KIAS).
3. No ground based engine failures at airspeeds greater than half the value of V_{mc} (65 KIAS) and runway width less than 75 feet.
4. Zero thrust settings in this aircraft is 8″ MP and RPM fully retarded (but not feathered).

Source: https://www.faa.gov/training_testing/testing/acs/commercial_airplane_acs_7.pdf

There are six simple power settings each pilot should remember:

1. Takeoff: Max MP / Max RPM
2. Climb power: 25″ MP, 2,300 RPM
3. Normal cruise: 23″ MP, 2,300 RPM
4. Slow cruise: 20″ MP, 2,300 RPM
5. Pattern / Landing: 18″ MP, 2,300 RPM
6. Clearing turns / Maneuver entry: 18″ MP, 2,300 MP

Pilots should always use the Airplane Flight Manual (AFM) and Pilot's Operating Handbook (POH) when the procedures vary from this guide.

Normal Takeoff

Objective: To takeoff and safely depart an airport.

ACS Standards
Private: V_y +10 / -5 KIAS
Commercial: V_y +10 / -5 KIAS
Instructor: V_y +10 / -5 KIAS

1. Hold the brakes.
2. Advance the throttle to 1,700 RPM and check the engine instruments.
3. Release the brakes and advance throttle full forward.
4. Rotate at 71 KIAS.
5. Confirm a positive rate of climb and level out about 20-25 feet AGL to accelerate to blue line (V_{yse}, 85 KIAS). When out of runway, or at blue line, retract landing gear.
6. Climb at blue line to pattern altitude and then accelerate to V_y (85 KIAS).
7. Reduce the throttle to 25" MP and the propeller to 2,500 RPM.
8. Accelerate to 100 KIAS for cruise climb.

Normal Landing

Objective: To arrive an airport and safety land.

ACS Standards
Private: V_{ref} +10 / -5 KIAS
Commercial: V_{ref} +10 / -5 KIAS
Instructor: V_{ref} +10 / -5 KIAS

1. Enter traffic pattern with throttle set at approximately 17" MP.
2. At midfield downwind, extend landing gear after confirming below V_{le} (140 KIAS).
3. Extend flaps to approach setting (4-5 seconds)
4. Trim for 100 KIAS on downwind and 90 KIAS on base.
5. On base, confirm GUMPS (fuel on main tanks, undercarriage is down and locked, mixture full forward, propeller control full forward, seatbelts fastened).
6. Extend flaps to full setting.
7. Maintain 85 KIAS on final then slow to 75 KIAS on short final.
8. When landing is assured, reduce throttles to idle.
9. Touch down with minimal float, full elevator back pressure, and apply light, smooth braking.

Short Field Takeoff

Objective: To perform a maximum performance takeoff and depart an airport with obstacles.

ACS Standards
Private: V_x +10 / -5 KIAS until 50 feet AGL, V_y +10 / -5 KIAS
Commercial: V_x +10 / -5 KIAS until 50 feet AGL, V_y +10 / -5 KIAS
Instructor: V_x +10 / -5 KIAS until 50 feet AGL, V_y +10 / -5 KIAS

1. Indicate "Using max available runway."
2. Hold the brakes.
3. Advance the throttle to 1,700 RPM and check the engine instruments while continuing to hold the brakes.
4. Advance the throttle to full power and release the brakes.
5. Rotate at 71 KIAS.
6. Confirm positive rate of climb and retract the landing gear.
7. Pitch to climb at 71 KIAS (V_x) until clear of obstacle (50 feet). *Tip: This is only for 2-3 seconds and don't apply back pressure too quickly or you'll get a stall indication*.
8. Accelerate to blue line (V_{yse}, 85 KIAS) until pattern altitude.
9. Reduce the throttle to 25" MP and the propeller to 2,500 RPM.
10. Accelerate to 100 KIAS for cruise climb.

Short Field Landing

Objective: To perform a maximum performance landing at an airport with a limited length runway or obstacles on the approach.

ACS Standards
Private: V_{ref} +10 / -5 KIAS, touchdown within 200 feet of aiming point on centerline
Commercial: V_{ref} +10 / -5 KIAS, touchdown within 100 feet of aiming point on centerline
Instructor: V_{ref} +10 / -5 KIAS, touchdown within 100 feet of aiming point on centerline

1. Enter traffic pattern with throttle set at approximately 17" MP.
2. At midfield downwind, extend landing gear after confirming below V_{le} (140 KIAS).
3. Extend flaps to approach setting (4-5 seconds)
4. Trim for 100 KIAS on downwind and 90 KIAS on base.
5. On base, confirm GUMPS (fuel on main tanks, undercarriage is down and locked, mixture full forward, propeller control full forward, seatbelts fastened).
6. Extend flaps to full setting.
7. Maintain 85 KIAS on final then slow to 70-75 KIAS on short final, depending on weight (higher weight should use higher speed).
8. When landing is assured, reduce throttles to idle.
9. Touch down with minimal float, full elevator back pressure, and apply light, smooth braking.
10. Retract the flaps.

Steep Turns

Objective: To develop smoothness, coordination, orientation, division of attention, and control techniques while executing two maximum performance 360° turns.

ACS Standards
Private: Bank 45°, ±5°, altitude ±100 feet, airspeed ±10 KIAS
Commercial: Bank 50°, ±5°, altitude ±100 feet, airspeed ±10 KIAS
Instructor: Bank 50°, ±5°, altitude ±100 feet, airspeed ±10 KIAS

1. Execute clearing turns.
2. Heading bug the entry heading and note the entry altitude.
3. Set the throttles to approximately 18″ MP, the propeller to approximately 2,300 RPM and mixture appropriate to the density altitude. This should approximate 125 KIAS.
4. Confirm the landing gear and flaps are up.
5. Roll into a bank and increase pitch to maintain altitude within ± 100 feet.
6. Adjust throttles to help maintain altitude and trim off excess control pressures. *Tip: You may need as much as 20-21″ of MP.*
7. Begin your roll out at half your bank angle (approximately 25°) and roll out on desired heading within 10°. *Tip: Reduce the throttle as you roll out to avoid ballooning.*
8. Immediately begin a steep turn in the opposite direction using the same procedure.
9. Return to entry settings (18″ MP, 2,300 RPM)

Slow Flight

Objective: To demonstrate positive aircraft control, coordination, and proficiency while flying at an airspeed just above stall speed where any further increase in AOA or load factor would result in a stall.

ACS Standards
Private: Bank ±10°, altitude ±100 feet, heading ±10°, airspeed +10 / -0 KIAS
Commercial: Bank ±5°, altitude ±50 feet, heading ±10°, airspeed +5 / -0 KIAS
Instructor: Bank ±5°, altitude ±50 feet, heading ±10°, airspeed +5 / -0 KIAS

1. Execute clearing turns.
2. Heading bug the entry heading and note the entry altitude.
3. Set the throttles to approximately 18″ MP, the propeller to approximately 2,300 RPM and mixture appropriate to the density altitude.
4. Extend the landing gear once below V_{le} (140 KIAS).
5. Extend flaps to the full setting once below V_{fe} (120 KIAS) *Tip: You may need approximately 14-15″ of MP to do this. Don't let the aircraft climb as you extend flaps. You may wish to extend the flaps in segments to help stabilize your altitude.*
6. Adjust throttles setting and trim to maintain 70 KIAS, +5 / -0 KIAS. *Tip: You may need as much as 20-21″ of MP while operating in the region of reverse command.*
7. To recover, advance the throttles to 25″ MP.
8. Retract the landing gear.
9. Retract the flaps. *Tip: Similarly to extension, you may wish to do this in segments, so you don't descend.*
10. Return to entry settings (18″ MP, 2,300 RPM).

Power Off Stalls

Objective: To demonstrate recognition and recovery from a stall in the approach and landing configuration.

ACS Standards
Private: Bank not to exceed 20°, ±10°, heading ±10°, V_{yse} before Flaps 0°
Commercial: Bank not to exceed 20°, ±5°, heading ±10°, V_{yse} before Flaps 0°
Instructor: Bank not to exceed 20°, ±5°, heading ±10°, V_{yse} before Flaps 0°

1. Execute clearing turns.
2. Heading bug the entry heading and note the entry altitude.
3. Set the throttles to approximately 18″ MP, the propeller to approximately 2,300 RPM and mixture appropriate to the density altitude.
4. Extend the landing gear once below V_{le} (140 KIAS).
5. Extend flaps to the full setting once below V_{fe} (120 KIAS). *Tip: You may need approximately 14-15″ of MP to do this. Don't let the aircraft balloon as you extend flaps. You may wish to extend the flaps in segments to help stabilize your altitude.*
6. Reduce throttles to 10″ MP and maintain altitude while allowing airspeed to slow. *Tip: Trim as necessary to maintain altitude.*
7. **Maintain coordinated flight.**
8. Maintain attitude until the first indication of a stall (stall warning horn, airframe buffeting, etc).
9. To recover, reduce the angle of attack and lower the nose approximately 5°, while smoothly advancing the throttles to full power.
10. Retract the landing gear
11. Retract the flaps. *Tip: Similarly to extension, you may wish to do this in segments, so you don't descend.*
12. Accelerate to blue line (V_{yse}, 85 KIAS) and then pitch up to climb.
13. Return to entry settings (18″ MP, 2,300 RPM) once recovered.

Power On Stalls

Objective: To demonstrate recognition and recovery from a stall in the takeoff or departure configuration.

ACS Standards
Private: Bank not to exceed 20°, ±10°, heading ±10°, V_{yse} before Flaps 0°
Commercial: Bank not to exceed 20°, ±10°, heading ±10°, V_{yse} before Flaps 0°
Instructor: Bank not to exceed 20°, ±10°, heading ±10°, V_{yse} before Flaps 0°

1. Execute clearing turns.
2. Heading bug the entry heading and note the entry altitude.
3. Set the throttles to approximately 18″ MP, the propeller to approximately 2,300 RPM and mixture appropriate to the density altitude.
4. Verify the landing gear and flaps are retracted.
5. Retard the throttles to 10″ MP and allow the airspeed to slow to 80 KIAS. *Tip: This may mean the throttle warning horn sounds.*
6. Advance the throttles to 18″ MP and raise the nose of the aircraft to induce a stall. *Tip: Trim as necessary to reduce control pressure. The pitch angle may become quite extreme.*
7. **Maintain coordinated flight.**
8. Maintain attitude until the first indication of a stall (stall warning horn, airframe buffeting, etc).
9. To recover, reduce the angle of attack and lower the nose approximately 5°, while smoothly advancing the throttles to full power.
10. Accelerate to blue line (V_{yse}, 85 KIAS) and then pitch up to climb.
11. Return to entry settings (18″ MP, 2,300 RPM) once recovered.

VMC Demonstration

***Special care should be taken for this maneuver. Do not attempt on high density altitude days or very high altitudes (greater than 6,500 MSL). The instructor or examiner may artificially limit your rudder travel to increase safety margins.**

Objective: To determine the minimum controllable airspeed (V_{mc}) with one engine inoperative and to demonstrate proper recognition and recovery.

ACS Standards
Private: Heading ± 20°, V_{yse}
Commercial: Heading ± 20°, V_{yse}
Instructor: Heading ± 20°, V_{yse}

1. Execute clearing turns.
2. Heading bug the entry heading and note the entry altitude.
3. Close the cowl flap on the left engine and open the cowl flap on the right engine.
4. Set the throttles to approximately 18" MP, the propeller to the full forward and mixture appropriate to the density altitude.
5. Verify the landing gear and flaps are retracted.
6. Reduce the throttle on one engine (left) to idle to simulate an engine failure.
7. Configure the airplane for zero side-slip by running "The Drill." The right throttle should be configured for maximum power. The aircraft should **not** be configured for "Zero Thrust."
8. Using **only 5°** of bank and rudder, maintain heading.
9. Slowly, at approximately 1 knot per second, raise the nose of the aircraft, to reduce airspeed **until first indication of a loss of directional control**.
10. To recover, smoothly reduce the throttle on the operating engine and lower the nose.
11. Re-establish and maintain the bugged heading and accelerate to blue line (V_{yse}, 85 KIAS).
12. To recover, smoothly retard the throttles on the operating engine while advancing the throttle in the simulated failed engine.
13. Return to entry settings (18" MP, 2,300 RPM) once recovered.

Cruise Engine Failure and Full Shutdown/Secure

Objective: To demonstrate positive aircraft control with one engine inoperative in the cruise phase of flight.

ACS Standards
Private: Bank ±10°, altitude ±100 feet, heading ±10°, airspeed V_{yse}
Commercial: Bank ±10°, altitude ±100 feet, heading ±10°, airspeed V_{yse}
Instructor: Bank ±10°, altitude ±100 feet, heading ±10°, airspeed V_{yse}

1. Stop the yaw and roll of the aircraft using rudder and aileron.
2. Establish a pitch attitude to achieve blue line (V_{yse}, 85 KIAS).
3. Mixtures full forward.
4. Propellers full forward.
5. Throttles full forward.
6. Retract landing gear.
7. Retract flaps.
8. Turn on fuel boosts to high setting (simulated).
9. Identify inoperative engine. *Tip: "Dead leg, dead engine".*
10. Bank into the operative engine up to 5°. *Tip: "Raise the dead."*
11. Verify the inoperative engine by slowly retarding the throttle of the suspected inoperative engine.
12. Verify fuel selectors and magnetos for the inoperative engine.
13. Feather the inoperative engine. *Tip: **Do not attempt** to troubleshoot the engine at this point - wait until the engine is secured. The troubleshooting process could distract you from maintaining airspeed or directional control of the aircraft. In addition, if the propeller spins down below approximately 800 RPM, locking pins will engage the propeller blades and it won't be possible to feather the propeller.*

11. Secure the inoperative engine by retarding the mixture to cut-off.
12. Turn the fuel pump off for the inoperative engine.
13. Turn the fuel selector off for the inoperative engine.
14. Turn the magnetos off for the inoperative engine.
15. Turn the alternator off for the inoperative engine.
16. Close the cowl flap on the inoperative engine and open the cowl flap on the operating engine.

Engine Restart In-Flight

Objective: To demonstrate the ability to safely restart an engine in flight.

1. Set the fuel selector to on.
2. Set the throttle to idle.
3. Set the alternator to on.
4. Advance the mixture to full rich (or appropriate for density altitude).
5. Turn the fuel pump on.
6. Set magneto to "Both."
7. Accelerate to above 100 KIAS.
8. Set the propeller to max RPM.
9. Turn the fuel pump off.
10. Maintain less than 15" MP and 2,000 RPM until CHTs reach 200° F.
11. Open the cowl flap.
12. Return to entry settings (18" MP, 2,300 RPM) once recovered.

Single Engine Landing

Objective: To approach an airport and land safely with one engine inoperative.

ACS Standards
Private: Stabilized approach, airspeed V_{ref} +10 / -5 KIAS
Commercial: Stabilized approach, airspeed V_{ref} ±5 KIAS
Instructor: Stabilized approach, airspeed V_{ref} ±5 KIAS

1. Enter traffic pattern with throttle set at an appropriate setting to maintain blue line (V_{yse} 85 KIAS) and zero side-slip.
2. **On final**, once the runway is made, extend the landing gear.
3. On short final, extend the flaps to the approach setting (approximately 5 seconds).
4. Confirm GUMPS (fuel on main tanks, undercarriage is down and locked, mixture full forward, propeller control full forward, seatbelts fastened).
5. Maintain blue line until landing is assured.
6. When landing is assured, reduce throttles to idle.
7. Touch down with minimal float, full elevator back pressure, and apply light, smooth braking.
8. Maintain directional control.

Engine Failure Prior to Rotation

Objective: To safely maintain control of the aircraft when an engine failure happens prior to rotation.

ACS Standards
Private: Maintain control of the aircraft on the runway
Commercial: Maintain control of the aircraft on the runway
Instructor: Maintain control of the aircraft on the runway

1. Set both throttles to the idle position and maintain directional control using rudder and smooth braking.

Engine Failure After Takeoff (EFATO)

Objective: To demonstrate safe and positive control of the aircraft after rotation and departure.

ACS Standards
Private: Bank ±10°, altitude ±100 feet, heading ±10°, airspeed V_{yse}
Commercial: Bank ±10°, altitude ±100 feet, heading ±10°, airspeed V_{yse}
Instructor: Bank ±10°, altitude ±100 feet, heading ±10°, airspeed V_{yse}

1. Execute "The Drill."
   a) Stop the yaw and roll of the aircraft using rudder and aileron.
   b) Establish a pitch attitude to achieve blue line (V_{yse}, 85 KIAS).
   c) Mixtures full forward.
   d) Propellers full forward.
   e) Throttles full forward.
   f) Retract landing gear.
   g) Retract flaps.
   h) Turn on fuel boosts to high setting (simulated).
   i) Identify inoperative engine. *Tip: "Dead leg, dead engine".*
   j) Bank into the operative engine up to 5°. *Tip: "Raise the dead."*
   k) Verify the inoperative engine by slowly retarding the throttle of the suspected inoperative engine.
   l) Verify fuel selectors and magnetos for the inoperative engine.
   m) Feather the inoperative engine. *Tip: **Do not attempt** to troubleshoot the engine at this point - wait until the engine is secured. The troubleshooting process could distract you from maintaining airspeed or directional control of the aircraft. In addition, if the propeller spins down below approximately 800 RPM, locking pins will engage the propeller blades and it won't be possible to feather the propeller.*
   n) Secure the inoperative engine by retarding the mixture to cut-off.
   o) Turn the fuel pump off for the inoperative engine.
   p) Turn the fuel selector off for the inoperative engine.
   q) Turn the magnetos off for the inoperative engine.
   r) Turn the alternator off for the inoperative engine.
   s) Close the cowl flap on the inoperative engine and open the cowl flap on the operating engine.
2. Execute a single engine landing.

Instrument Maneuvers

Single Engine Instrument Approach

Objective: To safely execute an instrument approach procedure and landing with one engine inoperative.

ACS Standards
Private: Heading ± 10°, altitude ± 100 feet, airspeed ± 10 KIAS, CDI ≤ ¾ scale deflection
Commercial: Heading ± 10°, altitude ± 100 feet, airspeed ± 10 KIAS, CDI ≤ ¾ scale deflection
Instructor: Heading ± 10°, altitude ± 100 feet, airspeed ± 10 KIAS, CDI ≤ ¾ scale deflection

1. Execute "The Drill."
   a) Stop the yaw and roll of the aircraft using rudder and aileron.
   b) Establish a pitch attitude to achieve blue line (V_{yse}, 85 KIAS).
   c) Mixtures full forward.
   d) Propellers full forward.
   e) Throttles full forward.
   f) Retract landing gear.
   g) Retract flaps.
   h) Turn on fuel boosts to high setting (simulated).
   i) Identify inoperative engine. *Tip: "Dead leg, dead engine".*
   j) Bank into the operative engine up to 5°. *Tip: "Raise the dead."*
   k) Verify the inoperative engine by slowly retarding the throttle of the suspected inoperative engine.
   l) Verify fuel selectors and magnetos for the inoperative engine.
   m) Feather the inoperative engine. *Tip: **Do not attempt** to troubleshoot the engine at this point - wait until the engine is secured. The troubleshooting process could distract you from maintaining airspeed or directional control of the aircraft. In addition, if the propeller spins down below approximately 800 RPM, locking pins will engage the propeller blades and it won't be possible to feather the propeller.*
   n) Secure the inoperative engine by retarding the mixture to cut-off.
   o) Turn the fuel pump off for the inoperative engine.
   p) Turn the fuel selector off for the inoperative engine.
   q) Turn the magnetos off for the inoperative engine.
   r) Turn the alternator off for the inoperative engine.
   s) Close the cowl flap on the inoperative engine and open the cowl flap on the operating engine.
2. Maintain localizer and step down altitudes (non-precision) or localizer and glideslope (precision).
3. Execute a single engine landing.

Commercial Maneuvers

Accelerated Stalls

Objective: To demonstrate stall recognition and recovery at high load factors (> 1G).

ACS Standards
Private: Heading ± 10° (straight), bank ± 10° (turn), altitude less than 200 foot loss
Commercial: Heading ± 10° (straight), bank ± 10° (turn), altitude less than 100 foot loss
Instructor: Heading ± 10° (straight), bank ± 10° (turn), altitude less than 100 foot loss

1. Execute clearing turns.
2. Heading bug the entry heading and note the entry altitude.
3. Set the throttles to approximately 18" MP, the propeller to approximately 2,300 RPM and mixture appropriate to the density altitude. *Tip: An entry speed of 100 KIAS should work well.*
4. Roll into 30° - 45° bank in the direction of your choosing.
5. **Maintain coordinated flight.**
6. Pull back firmly and briskly on the yoke.
7. Maintain attitude until the first indication of a stall (stall warning horn, airframe buffeting, etc).
8. To recover, reduce the angle of attack and lower the nose approximately 5°, roll wings level, while smoothly advancing the throttles to full power.
9. Accelerate to blue line (V_{yse}, 85 KIAS) and then pitch up to climb.
10. Return to entry settings (18" MP, 2,300 RPM) once recovered.

Instructor Maneuvers

Drag Demonstration

Objective: To demonstrate the associated drag penalties with different configurations of the aircraft during single-engine operations.

1. Execute clearing turns.
2. Heading bug the entry heading and note the entry altitude.
3. Simulate an engine failure on the critical engine **without feathering** the propeller and establish zero-side slip at blue line (V_{yse}, 85 KIAS). **Maintain blue line for the duration of the maneuver**.
4. Note the vertical speed.
5. Extend the landing gear.
6. Note the vertical speed.
7. Extend the flaps.
8. Note the vertical speed.
9. Retract the flaps.
10. Note the vertical speed.
11. Retract the landing gear.
12. Note the vertical speed.
13. Recover from the engine failure.
14. Return to entry settings (18″ MP, 2,300 RPM) once recovered.

Version	Date	Change
1.0	09/01/2025	Initial version