
**Rainier Flight Service LLC, located at Renton Municipal Airport and holding Air Agency Certificate No. 1RFS, is owned and operated as:**

**Rainier Flight Service**
**790 W Perimeter Rd, Unit B**
**Renton, WA 98057**

# 1. Takeoffs, Landings and Go-Arounds

**Objective**
To develop the pilot's proficiency on normal and crosswind takeoffs and landings, short-field takeoffs and landings, soft-field takeoffs and landings, 180° power-off accuracy approaches and landings, go-arounds, and airport traffic patterns.

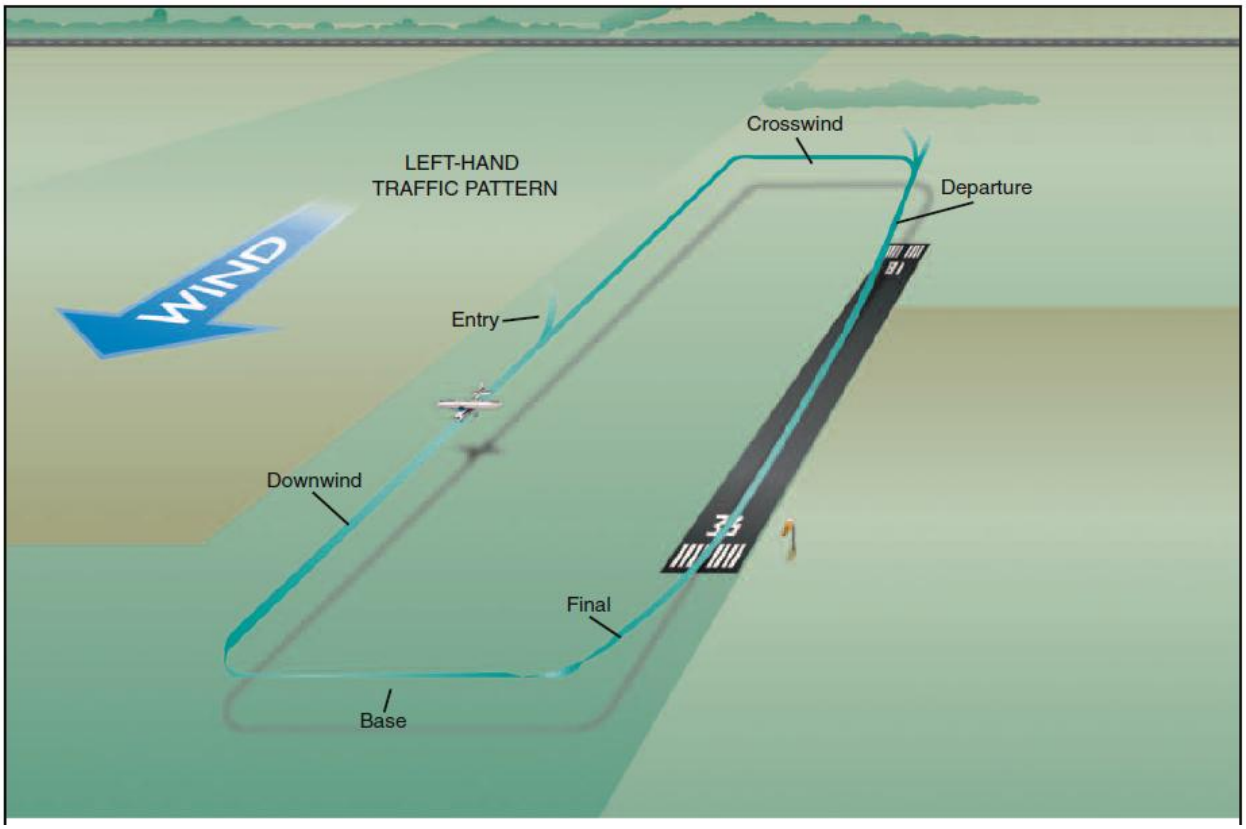
**References**
- AC 90-66A: Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports without Operating Control Towers
- FAA-H-8083-3A: Airplane Flying Handbook
- Cessna Model 152 Pilot's Operating Handbook
- Cessna Model 172S Pilot's Operating Handbook
- Practical Test Standards

## 1.1 MANEUVER: Airport Traffic Pattern

**Objective**
To develop the pilot's knowledge of the rules and procedures involved with airport traffic patterns.

**Description**
A traffic pattern has rules and procedures designed to assure that air traffic flows into and out of an airport in an orderly manner. It is established appropriate to the local conditions, including: the altitude to be flown, the wind direction, the direction and placement of the pattern, and the procedures for entering and leaving the pattern. Pilots should make all turns to the left, unless otherwise indicated.

**Teaching Considerations**
- Division of attention.
- Compliance with ATC instructions.
- Adequate spacing between other traffic operating in the traffic pattern.
- All legs of the traffic pattern should be approximately 3/4 mile from the runway.
- Wind drift correction/ground track considerations.
    - Application of ground reference maneuvers to traffic pattern operations.
- Appropriate radio calls at controlled/uncontrolled airports.
- Use of the Airport/Facilities Directory (A/FD) for airport operations.
- Wind shear and wake turbulence.



**Set-up**

- Determine the Traffic Pattern Altitude (TPA).
- Determine the wind direction, runway, traffic pattern direction, and any existing traffic using any or all of the following:
    - ATIS, ASOS, windsock, etc.
    - Radio communication.
    - Airport overflight at 500 feet above the TPA. Do not descend to TPA until well clear of the pattern.
- Enter the traffic pattern at a 45° angle to the downwind leg at TPA.
- The downwind leg should be approximately 3/4 mile from the runway.
- Apply proper wind correction angle for a ground track parallel to the runway.
- Initiate Before Landing Checklist by mid-field downwind or 2 miles from the runway threshold if entering on base or final leg.
- Select aiming point using the following prioritized criteria.
    - Abeam visual glideslope indicator (PAPI, VASI).
    - Aiming point marking (1,000 foot marker).
    - At least 200 feet beyond threshold, within first 1/3 of the runway.

**Execution**

- Maintain recommended approach speeds throughout the pattern.
    - Pattern entry 90 KIAS
    - Downwind 80 KIAS
    - Abeam the aiming point 80 KIAS 10° flaps or as appropriate
    - Base 70 KIAS 20° flaps or as appropriate
    - Final 61 KIAS (+5/-0) Flaps FULL or as appropriate

NOTE: Change in airspeed should be continual throughout the traffic pattern.
NOTE: If landing with zero flaps, final approach speed should be increased by 9 KIAS.

- Abeam the aiming point - reduce power setting.
- The base leg begins 45° from the aiming point.
- Coordinate final turn to rollout on the runway centerline.
- Establish a stabilized approach by 200 feet AGL.
    - A stabilized approach is:

Check – All checklists are complete
F – Flight path correct (on centerline)
L – Landing configuration correct
A – Airspeed proper
P – Power setting appropriate for aircraft configuration
S – Sink rate is not abnormal (on glidepath)

NOTE: Changing conditions require adjustments of speed and flap settings, i.e. wind gust factors, ATC.

- Complete Before Landing Checklist prior to 200 feet AGL.
- If landing with the flaps up, increase approach speed by 9 KIAS.
- If a stabilized approach is not attained by 200 feet AGL, a go-around must be conducted.

**Closed Traffic Procedures**

- Continue on the upwind leg until reaching a point beyond the departure end of the runway and within 300 feet of TPA.
- Continue with specified traffic pattern procedures listed above.
- If leaving the pattern, the pilot should continue straight ahead or depart by making a 45° left turn (right turn for right hand pattern) after reaching TPA.

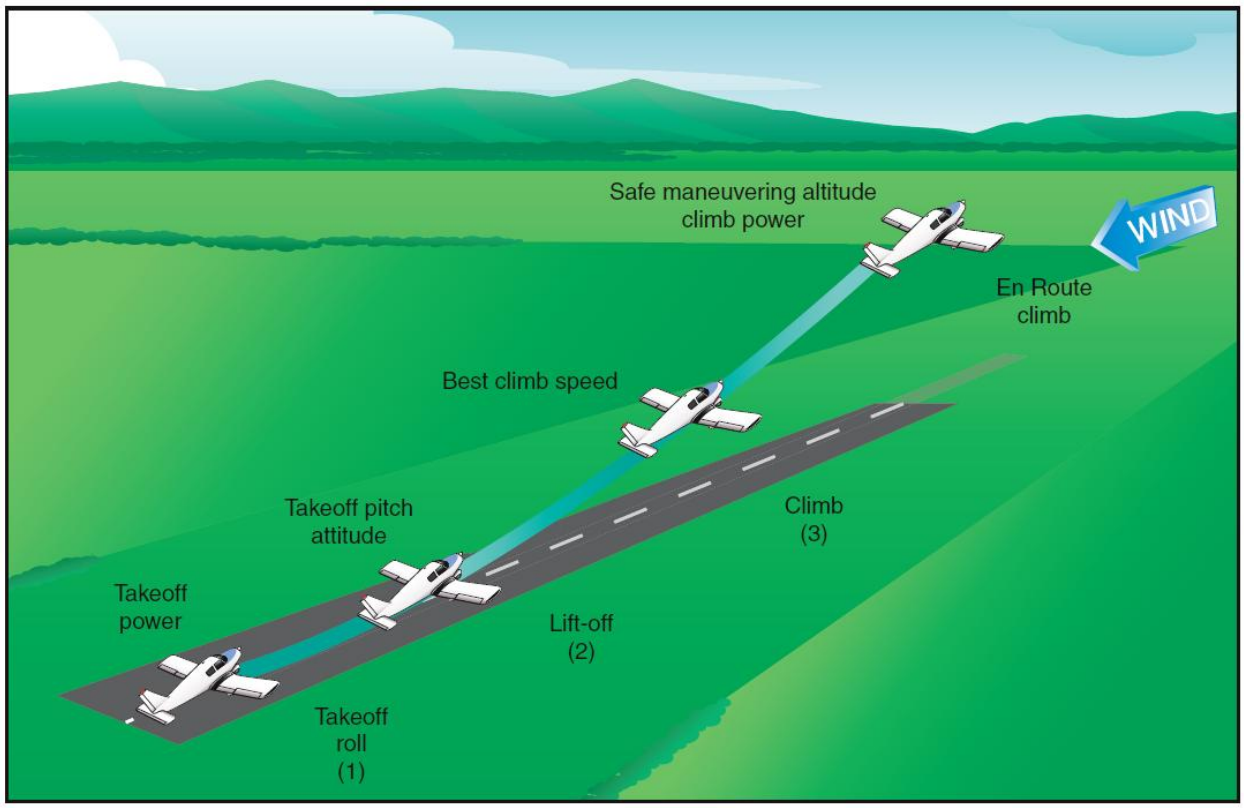
NOTE: When operating at a tower-controlled airport, ATC may alter standard traffic pattern operations.

## 1.2 MANEUVER: Normal/Crosswind Takeoff and Climb

**Objective**
To develop the pilot's proficiency on normal and crosswind takeoffs, and climbs.

**Description**
The takeoff and climb involves the movement of the airplane from its starting position on the runway to the point where a positive climb to a safe maneuvering altitude has been established.

**Teaching Considerations**
- PAVE Checklist
- Planning and orientation.
    - Runway length, width, and surface condition.
    - Effect of density altitude.
    - Appropriate climb airspeed.
- Calculation and use of takeoff performance data.
- Common errors as per the Airplane Flying Handbook and the CFI PTS.
- Aborted takeoff before and after liftoff.
- Wind shear and wake turbulence.
- Importance of completing checklists.
- Methods for checking for traffic used in a high wing aircraft.



**Set-up**

- Set the wing flap setting to 0°.
- Adjust the mixture, obtaining maximum engine performance for the existing conditions (full rich below 3,000 feet, leaned for best power above 3,000 feet pressure altitude).
- Review takeoff performance capabilities and consider obstructions and conditions.
- Verify the final approach and takeoff path are clear of other aircraft.
- Align the airplane on the runway centerline.
- Verify that the heading indicator is aligned with the runway heading.
- Confirm that the runway heading corresponds with the intended runway of use.
- Apply aileron deflection properly for crosswind conditions.

**Execution**

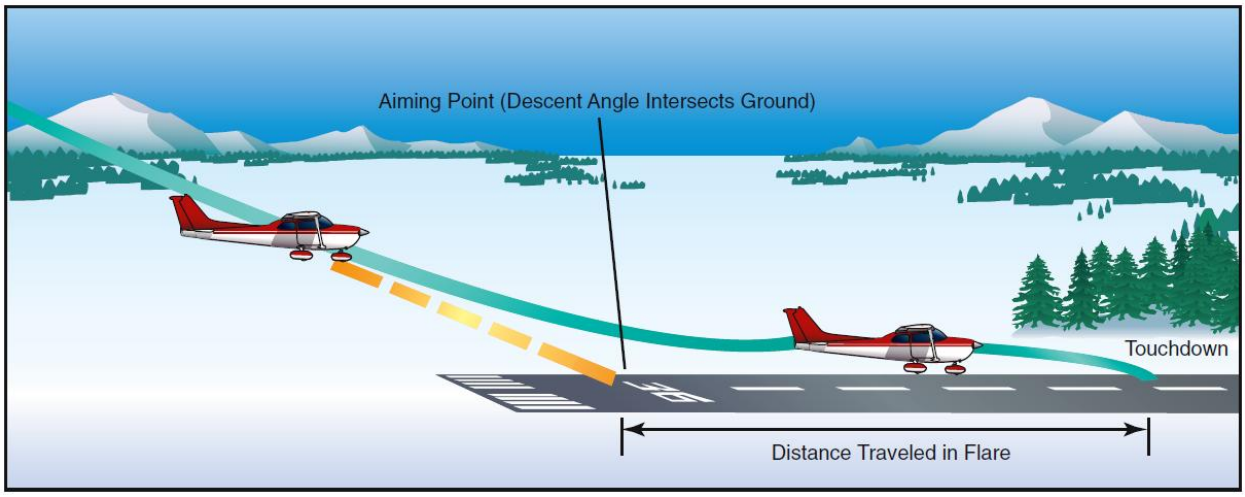
- Advance the throttle smoothly to maximum power.
- Check engine instruments and annunciators.
- Adjust aileron deflection during acceleration.
- Liftoff at computed airspeed.
- Establish the pitch attitude for and accelerate to VY or appropriate speed for altitude.
- Maintain directional control and proper wind drift correction throughout the takeoff and climb.
- At 1,000 feet AGL verify the climb flow pattern/checklist complete.

## 1.3 MANEUVER: Normal/Crosswind Approach and Landing

**Objective**
To develop the pilot's proficiency on normal and crosswind approaches and landings.

**Description**
The landing involves the transition from the airport traffic pattern to the end of the landing roll.

**Teaching Considerations**
- Planning and orientation.
  - Runway length, width, and surface condition.
  - Effect of density altitude on landing distance.
  - Obstructions or hazards.
  - Landing performance data and limitations.
- Common errors as per the Airplane Flying Handbook and the CFI PTS.
- Wind shear or wake turbulence.
- Effect of flaps on approach and landing.
- Effective use of brakes consistent with safety.
- Timely execution of go-around, if necessary.
- Importance of completing checklists.
- Importance of adjusting seat to appropriate position.
- Appropriate speed for turning off the runway.



**Set-up**

- Establish the recommended approach and landing configuration and airspeed (see Airport Traffic Pattern).
- Select an aiming point using the following prioritized criteria.
    - Abeam visual glideslope indicator (PAPI, VASI).
    - Aiming point marking (1,000 foot marker).
    - At least 200 feet beyond threshold, within first 1/3 of the runway.

**Execution**

- Apply proper crosswind correction for landing.
- Establish a stabilized approach by 200 feet AGL.
    - A stabilized approach is:

Check – All checklists are complete
F – Flight path correct (on centerline)
L – Landing configuration correct
A – Airspeed proper
P – Power setting appropriate for aircraft configuration
S – Sink rate is not abnormal (on glidepath)

NOTE: Flight control inputs on final are used to maintain an already stabilized approach path.
NOTE: Changing conditions require adjustments of speed and flap settings, i.e. wind gust factors, ATC.

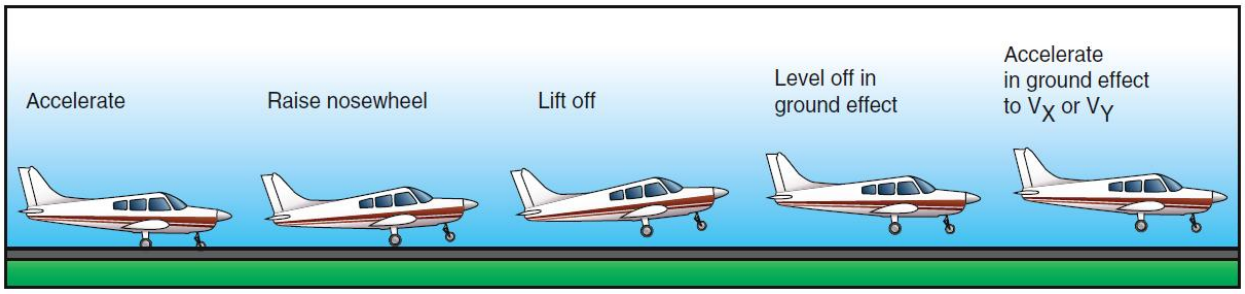
- If landing with the flaps up, increase approach speed by 9 KIAS.
- Begin the round out at approximately 10–20 feet above the ground, smoothly transitioning to a landing pitch attitude and decrease airspeed.
- Touchdown on main gear first at approximate stalling speed with no drift and with the airplane's longitudinal axis aligned with the runway/landing path.
- Maintain centerline using proper crosswind technique.

## 1.4 MANEUVER: Soft-Field Takeoff and Climb

**Objective**
To develop the pilot's ability to obtain maximum performance from the airplane while performing a soft field takeoff.

**Description**
Takeoffs and climbs from softy field require the use of operational techniques for getting the airplane airborne as quickly as possible to eliminate drag caused by tall grass, soft turf, mud, snow, etc.

**Teaching Considerations**
- Planning and orientation.
  - Runway length, width, and surface condition.
  - Effect of density altitude.
  - Appropriate climb speed.
- Common errors as per the Airplane Flying Handbook and the CFI PTS.
- Aborted takeoff before and after liftoff.
- Wind shear and wake turbulence.
- Importance of completing checklists.
- Methods for checking for traffic used in a high wing aircraft.



**Set-up**

- Review takeoff performance capabilities, considering obstructions and conditions.
- Select the wing flap setting to 10°.
- Adjust the mixture, obtaining maximum engine performance for the existing conditions (full rich below 3,000 feet, leaned for best power above 3,000 feet pressure altitude).
- Verify the final approach and takeoff path are clear of other aircraft.
- Position the airplane on the takeoff path without coming to a complete stop.
- Verify that the heading indicator is aligned with the runway heading.
- Confirm that the runway heading corresponds with the intended runway of use.
- Apply aileron deflection properly for crosswind conditions.
- When departing with an aft CG loading, elevator trim should be adjusted slightly nose down.

**Execution**

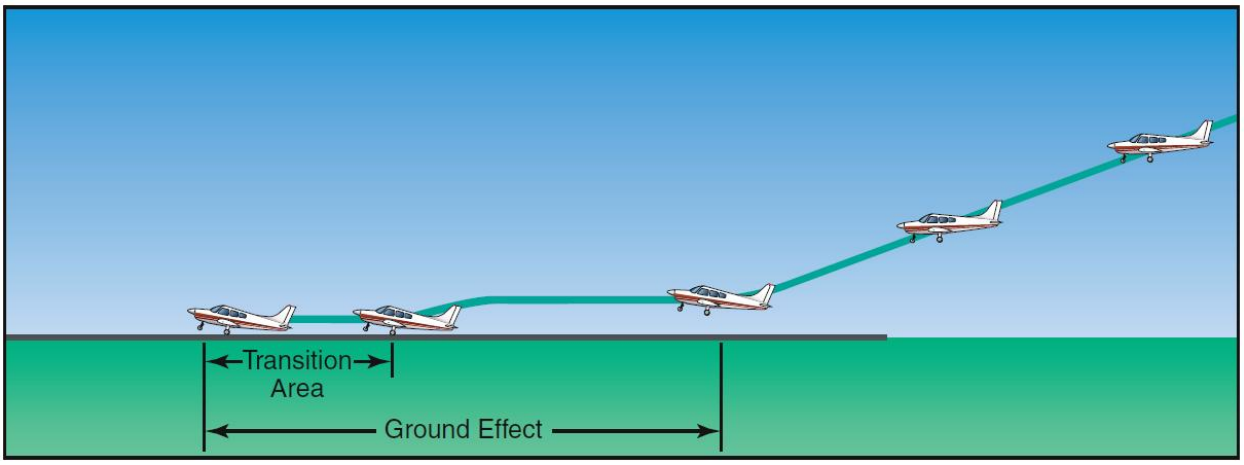
- Advance the throttle smoothly to maximum power.
- Check engine instruments and annunciators.
- Adjust aileron deflection during acceleration.
- Adjust and maintain a pitch attitude that transfers the weight from the wheels to the wings as rapidly as possible.
- Liftoff at the lowest possible airspeed and remain in ground effect while accelerating to VX or VY, as appropriate.
- Establish the pitch attitude for VX or VY, as appropriate, and maintain selected airspeed during the climb.
- Retract the wing flaps to up, when the airspeed is above 60 KIAS, at a safe altitude and after a positive rate of climb is established.
- Maintain directional control and proper wind drift correction throughout the takeoff and climb.
- At 1,000 feet AGL verify the climb flow pattern/checklist complete.

## 1.5 MANEUVER: Soft-Field Approach and Landing

**Objective**
To develop the pilot's ability to obtain maximum performance from the airplane while performing a soft field landing.

**Description**
Approach and landings to soft-fields require the pilot to control the airplane in a manner that the wings support the weight of the airplane as long as practical. This minimizes drag and stresses imposed on the landing gear by the rough or soft surface.

**Teaching Considerations**
- Planning and orientation.
  - Runway length, width, and surface condition.
  - Effect of density altitude on landing distance.
  - Obstructions or hazards.
  - Landing performance data and limitations.
- Common errors as per the Airplane Flying Handbook and the CFI PTS.
- Wind shear or wake turbulence.
- Effect of flaps on approach and landing.
- Timely execution of go-around if necessary.
- Importance of completing checklists.
- Importance of adjusting seat to appropriate position.



**Set-up**

- Establish the recommended approach and landing configuration and airspeed (see Airport Traffic Pattern).
- Select an aiming point using the following prioritized criteria.
    - Abeam visual glideslope indicator (PAPI, VASI).
    - Aiming point marking (1,000 foot marker).
    - At least 200 feet beyond threshold, within first 1/3 of the runway.

**Execution**

- Apply proper crosswind correction for landing.
- Establish a stabilized approach by 200 feet AGL.
    - A stabilized approach is:

Check – All checklists are complete
F – Flight path correct (on centerline)
L – Landing configuration correct
A – Airspeed proper
P – Power setting appropriate for aircraft configuration
S – Sink rate is not abnormal (on glidepath)

NOTE: Flight control inputs on final are used to maintain an already stabilized approach path.
NOTE: Changing conditions require adjustments of speed and flap settings, i.e. wind gust factors, ATC.

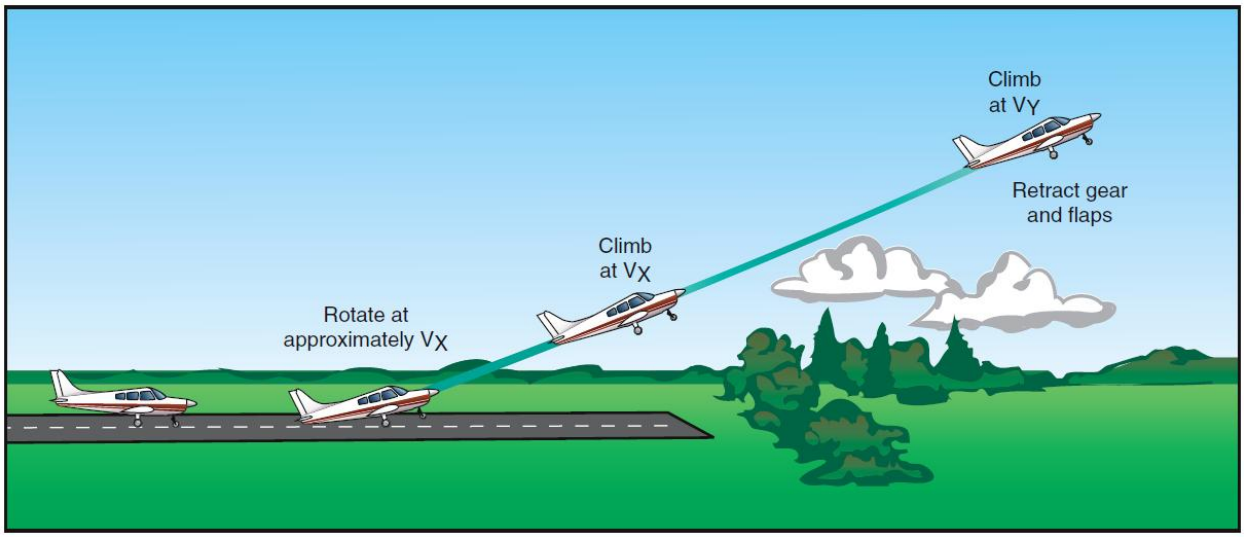
- Begin the round out at approximately 10–20 feet above the ground, smoothly transitioning to a landing pitch attitude.
- Use a slight amount of power to hold the airplane 1 to 2 feet off the surface in ground effect while gradually dissipating forward speed.
- Fly the airplane onto the ground and touchdown at the slowest possible airspeed with the weight fully supported by the wings.
- Touchdown on main gear first softly with no drift and with the airplane's longitudinal axis aligned with the runway/ landing path.
- Maintain centerline using proper crosswind technique.
- After touchdown hold sufficient back elevator pressure to keep the nose wheel off the surface.
- Power as required to keep airplane moving at a safe ground maneuvering speed.

## 1.6 MANEUVER: Short-Field Takeoff and Climb

**Objective**
To develop the pilot's ability to obtain maximum performance from the airplane while performing a short field takeoff and clearing all obstacles in the departure path safely.

**Description**
Takeoffs and climbs from fields where the takeoff area is short or restricted by obstructions require that the airplane be flown at the limit of its takeoff performance capabilities.

**Teaching Considerations**
- Planning and orientation.
  - Runway length, width, and surface condition.
  - Effect of density altitude.
  - Appropriate climb airspeed.
- Common errors as per the Airplane Flying Handbook and the CFI PTS.
- Aborted takeoff before and after liftoff.
- Wind shear and wake turbulence.
- Importance of completing checklists.
- Methods for checking for traffic used in a high wing aircraft.



**Set-up**

- Select the wing flap setting to 10°.
- Adjust the mixture, obtaining maximum engine performance for the existing conditions (full rich below 3,000 feet, leaned for best power when above 3,000 feet pressure altitude).
- Review takeoff performance capabilities considering obstructions and conditions.
- Verify the final approach and takeoff path are clear of other aircraft.
- Position the airplane for maximum runway availability and align it with the runway centerline.
- Verify that the heading indicator is aligned with the runway heading.
- Confirm that the runway heading corresponds with the intended runway of use.
- Apply aileron deflection properly for crosswind conditions.

**Execution**

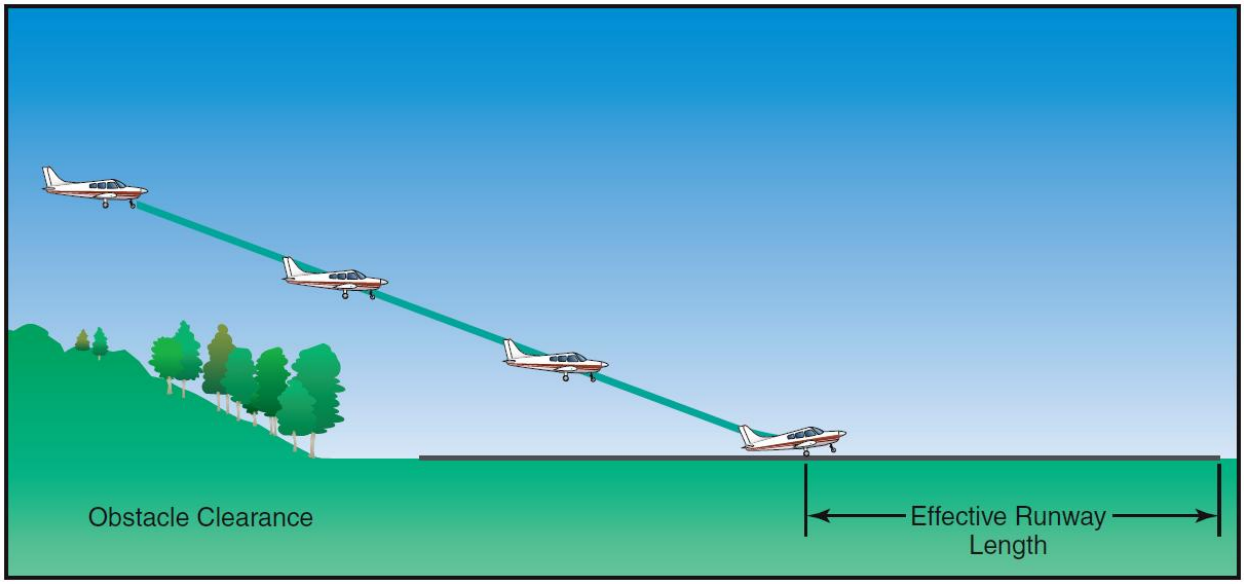
- Apply brakes and advance the throttle smoothly to maximum power.
- Check engine instruments and annunciators.
- Release brakes.
- Adjust aileron deflection during acceleration, as required.
- Liftoff at POH computed airspeed.
- Accelerate and climb at POH computed airspeed until obstacle is clear, or at least 50 feet AGL.
- After clearing the obstacle, establish the pitch attitude for and accelerate to VY during the climb.
- Retract the wing flaps to up, when the airspeed is above 60 KIAS, at a safe altitude and after a positive rate of climb is established.
- Maintain directional control and proper wind drift correction throughout the takeoff and climb.
- At 1,000 feet AGL verify the climb flow pattern/checklist complete.

## 1.7 MANEUVER: Short-Field Approach and Landing

**Objective**
To develop the pilot's ability to obtain maximum performance from the airplane while performing a short field landing and clearing all obstacles in the approach path.

**Description**
Approaches and landings to fields where the landing area is short or restricted by obstructions require that the airplane be flown at the limit of its landing performance capabilities.

**Teaching Considerations**
- Planning and orientation.
  - Runway length, width, and surface condition.
  - Effect of density altitude and required landing distance.
  - Obstructions or hazards.
  - Landing performance data and limitations.
- Common errors as per the Airplane Flying Handbook and the CFI PTS.
- Wind shear or wake turbulence.
- Effect of flaps on approach and landing.
- Effective use of brakes consistent with safety and controllability.
- Timely execution of go-around if necessary.
- Importance of completing checklists.
- Importance of adjusting seat to appropriate position.



**Set-up**

- Establish the recommended approach and landing configuration and airspeed (see Airport Traffic Pattern).
- Select an aiming point using the following prioritized criteria.
    - Abeam visual glideslope indicator (PAPI, VASI).
    - Aiming point marking (1,000 foot marker).
    - At least 200 feet beyond threshold, within first 1/3 of the runway.

**Execution**

- Apply proper crosswind correction for landing.
- Establish a stabilized approach by 200 feet AGL.
    - A stabilized approach is:

Check – All checklists are complete
F – Flight path correct (on centerline)
L – Landing configuration correct
A – Airspeed proper
P – Power setting appropriate for aircraft configuration
S – Sink rate is not abnormal (on glidepath)

NOTE: Flight control inputs on final are used to maintain an already stabilized approach path.
NOTE: Changing conditions require adjustments of speed and flap settings, i.e. wind gust factors, ATC.

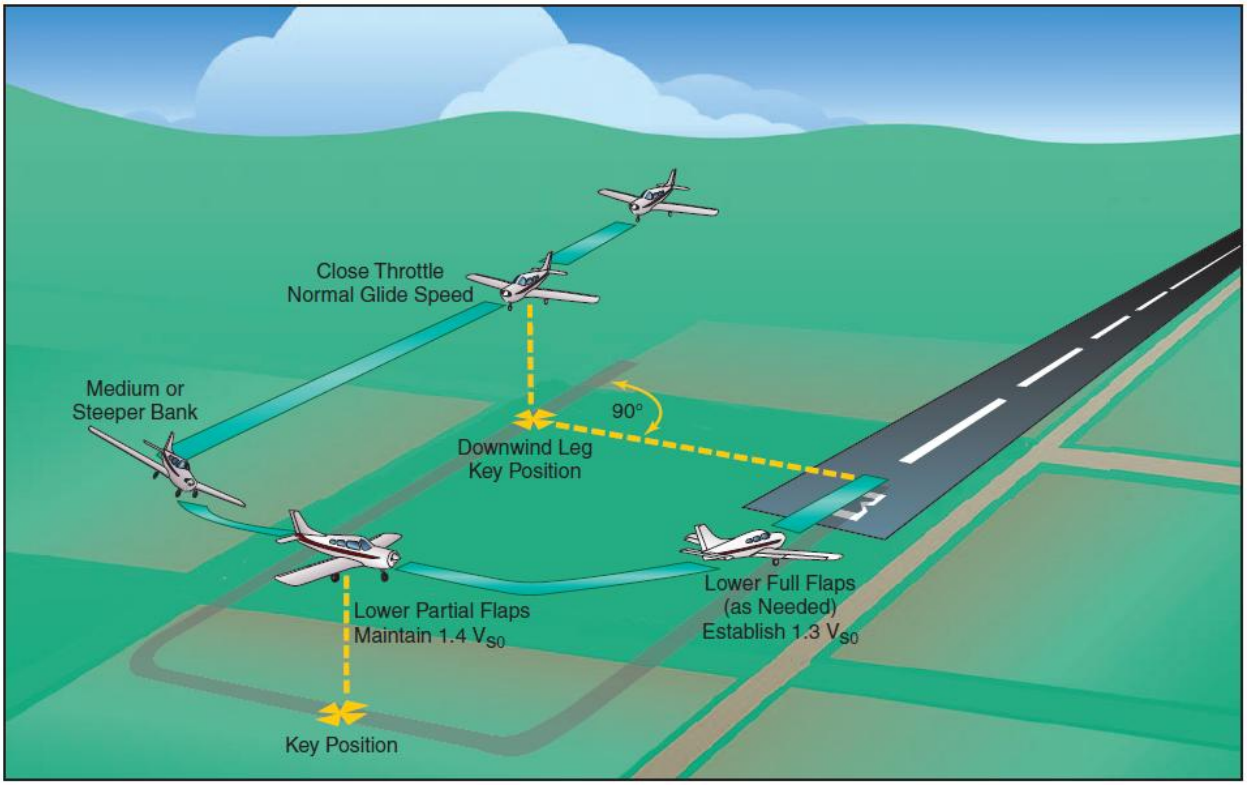
- Begin the round out at approximately 10–20 feet above the ground, smoothly transitioning to a landing pitch attitude.
- Touchdown on main gear first with no drift and with the airplane's longitudinal axis aligned with the runway/landing path.
- Maintain centerline using proper crosswind technique.
- Smoothly apply optimum disc and aerodynamic braking to stop in the shortest possible distance consistent with safety and controllability.

## 1.8 MANEUVER: 180° Power-Off Accuracy Approach and Landing

**Objective**
To instill in the pilot the judgment in estimating distances and glide ratios, and the procedures necessary for accurately flying the airplane without power to a safe landing.

**Description**
The 180° power-off approach is executed by gliding with the power off from a given point on a downwind leg to a preselected landing spot.

**Teaching Considerations**
- Planning and orientation.
  - Runway length, width, and surface condition.
  - Obstructions or hazards.
  - Landing performance data and limitations.
  - Ability to estimate distance and the required ability to maintain the proper glide while maneuvering the airplane.
- Common errors as per the Airplane Flying Handbook and the CFI PTS.
- Wind shear or wake turbulence.
- Effect of flaps on approach and landing.
- Effective use of brakes consistent with safety.
- Timely execution of go-around if necessary.
- Importance of completing checklists.
- Importance of adjusting seat to appropriate position.



**Set-up**

- The airplane must be on the downwind leg parallel to the landing runway, and no greater than 1,000 feet AGL.
- The airplane should be flown onto a downwind leg at the same distance from the landing surface as in a normal traffic pattern (see Airport Traffic Pattern).
- Select an aiming point using the following prioritized criteria.
    - Abeam visual glideslope indicator (PAPI, VASI).
    - Aiming point marking (1,000 foot marker).
    - At least 200 feet beyond threshold, within first 1/3 of the runway.

**Execution**

- Abeam the specified landing spot close the throttle.
- Establish the best glide airspeed.
- The approach path may be varied by positioning the base leg closer to or farther out from the approach end of the runway according to wind conditions.
- The turn from the downwind leg to the base leg should be a uniform turn with a medium or slightly steeper bank.
- The base-to-final turn should be planned and accomplished so that upon rolling out of the turn the airplane shall be aligned with the runway centerline.
- Apply proper crosswind correction for landing.
- Begin the round out at approximately 10–20 feet above the ground, smoothly transitioning to a landing pitch attitude.
- Maintain centerline using proper crosswind technique.

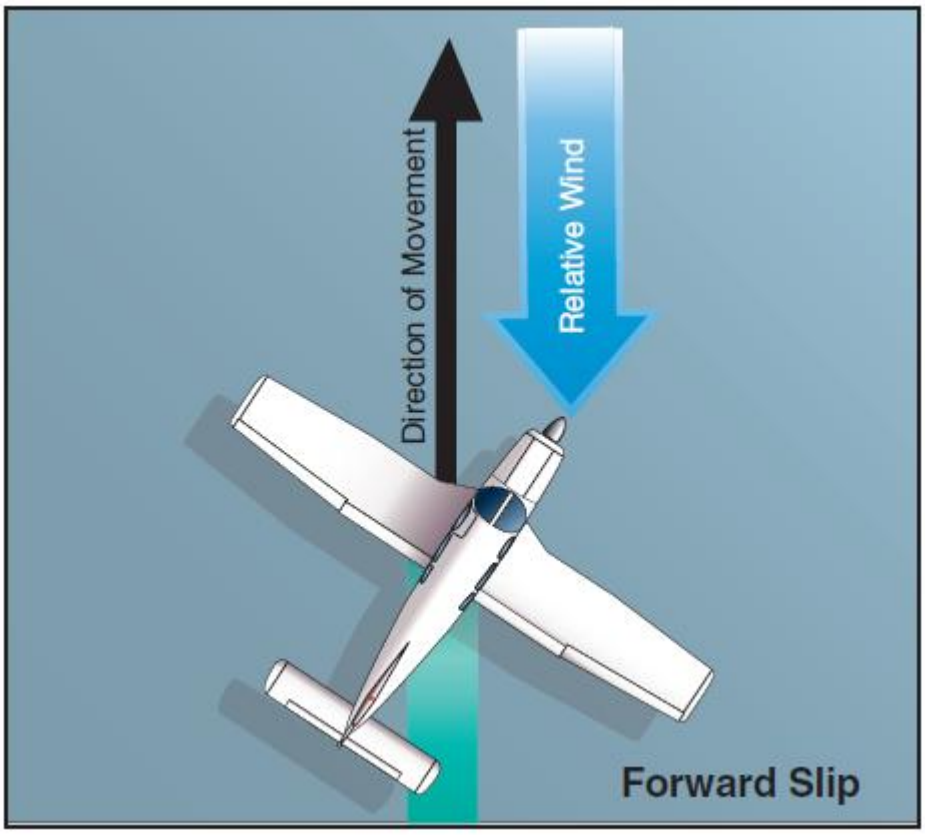
NOTE: Adjust best glide speed for flap configuration.

## 1.9 MANEUVER: Forward Slip to a Landing

**Objective**
To develop the pilot's proficiency at performing a forward slip to a landing.

**Description**
Forward slips are used to dissipate altitude without increasing airspeed.

**Teaching Considerations**
- Obstructions or hazards.
- Importance of maintaining airspeed.
- Aircraft limitations.




**Execution**
- Reduce throttle to idle.
- Establish the recommended approach and landing configuration and airspeed (see Airport Traffic Pattern).
- Lower upwind wing.
- Apply opposite rudder to prevent the airplane from turning in the direction of the lowered wing.
- Allow the nose of the airplane to be pointed away from the runway.
- Maintain a ground track aligned with the runway centerline.
- Once an acceptable altitude has been attained, the slip may be discontinued.
- Continue with a normal, short-field, soft-field, or power-off landing.

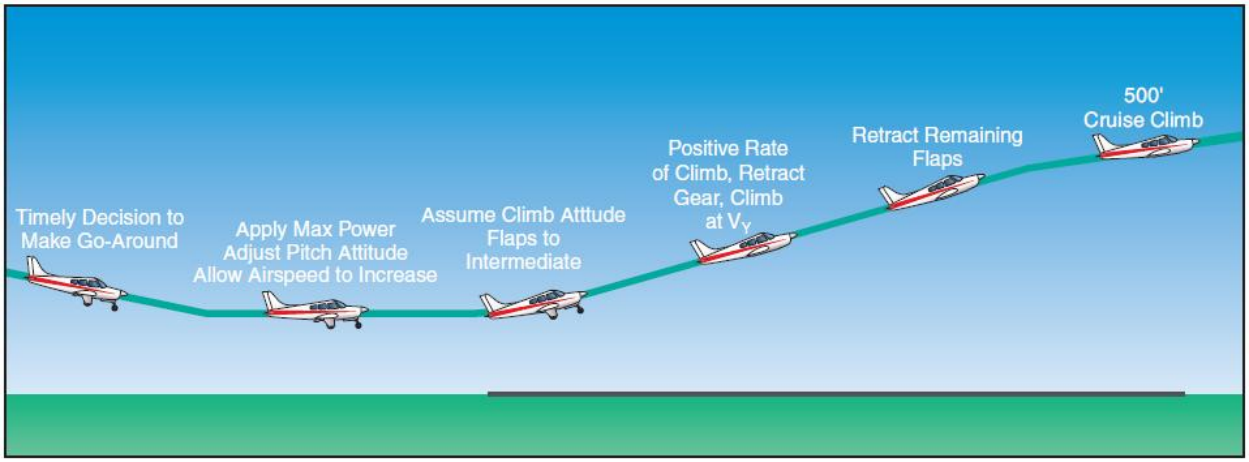
# This Page Left Blank

## 1.10 MANEUVER: Go-Around/Rejected Landing

**Objective**
To develop the pilot's ability to safely execute a go around from an unsafe landing.

**Description**
Whenever landing conditions are not satisfactory, a go-around is warranted. The go-around is not strictly an emergency procedure. It is a normal maneuver that may at times be used in an emergency situation. Although the need to discontinue a landing may arise at any point in the landing process, the most critical go-around will be one started when very close to the ground. A go-around/rejected landing must be executed if a stabilized approach is not achieved by 200 feet AGL.

**Teaching Considerations**
- An immediate go-around must be executed if any of the following condition are encountered:
  - Over/undershooting runway or aim point
  - Aircraft/Vehicle/People/Objects on runway
  - ATC instructions
  - High roundout
  - Late or rapid roundout
  - Excessive floating
  - Ballooning
  - Bouncing
  - Porpoising
  - Windshear
  - Any other factor placing successful landing in doubt.
- Prompt decision making.
- Anyone may make a call to abort a landing and must be adhered to.
- Failure to apply full power.
- Failure to control pitch to slow or stop descent.
- Wind shear or wake turbulence.
- Stall/spin awareness.
- Importance of completing checklists.



**Execution**

- Smoothly apply maximum power, level the wings, and transition to a climb pitch attitude that will slow or stop the descent.
- Retract the flaps to 20°, if fully extended.
- Establish a positive rate of climb, while accelerating to 60 KIAS.
- After reaching 60 KIAS, retract the flaps to up, while accelerating to VY or VX, as appropriate.
- Adjust trim as required.
- Maintain maximum power to a safe maneuvering altitude.

# 2. VFR Flight Maneuvers

**Objective**
To develop the pilot's proficiency on VFR flight maneuvers including: stalls, slow flight, ground reference maneuvers, and commercial maneuvers.

**References**
- AC 61-67C: Stall and Spin Awareness Training
- FAA-H-8083-3A: Airplane Flying Handbook
- Cessna Model 152 Pilot's Operating Handbook
- Cessna Model 172S Pilot's Operating Handbook
- FAA-H-8083-25A: Pilots Handbook of Aeronautical Knowledge
- Practical Test Standards

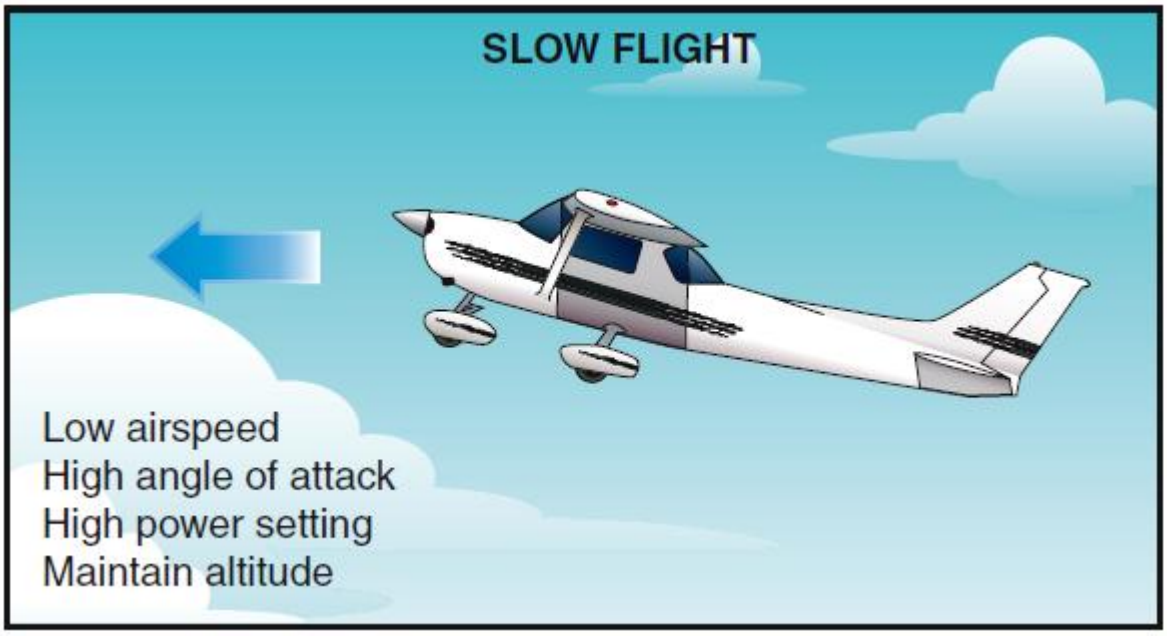
# This Page Left Blank

## 2.1 MANEUVER: Maneuvering During Slow Flight (Minimum Controllable Airspeed)

**Objective**
The objective of maneuvering during slow flight is to develop the pilot's sense of feel and ability to use the controls correctly, and to improve proficiency in performing maneuvers that require slow airspeeds.

**Description**
This maneuver demonstrates the flight characteristics and degree of controllability of the airplane at its minimum flying speed. By definition, the term "flight at minimum controllable airspeed" means a speed at which any further increase in angle of attack, load factor, or reduction in power will cause an immediate stall.

**Teaching Considerations**
- Common errors as per the Airplane Flying Handbook and the CFI PTS.
- Relationship of configuration, weight, Center of Gravity (CG), maneuvering load, bank angle, and power to flight characteristics and controllability.
- Correlation of the maneuver to critical flight situations.
- Compensation for left turning tendencies.
- Region of reverse command/back side of the power curve.



**Set-up**

- Select an entry altitude that allows the recovery to be completed no lower than the Minimum Recovery Altitude.
    - MRA (Dual) 1,500 feet AGL
    - MRA (Solo) 2,000 feet AGL
- Clear area with two 90° turns.

**Execution**

- Gradually reduce the throttle from cruising position.
- While airspeed is decreasing, the position of the nose in relation to the horizon should be noted and raised as necessary to maintain altitude.
- As the airspeed reaches the maximum allowable for flap operation, flaps should be lowered and the pitch attitude adjusted to maintain altitude.
    - Flap setting as specified by the instructor; extend within flap operating range.
- Apply rudder as necessary to maintain coordinated flight.
- Establish and maintain an airspeed at which any further increase in angle of attack, increase in load factor, or reduction in power, would result in an immediate stall.
- Maintain heading and altitude while changing flap configurations.

**Recovery**

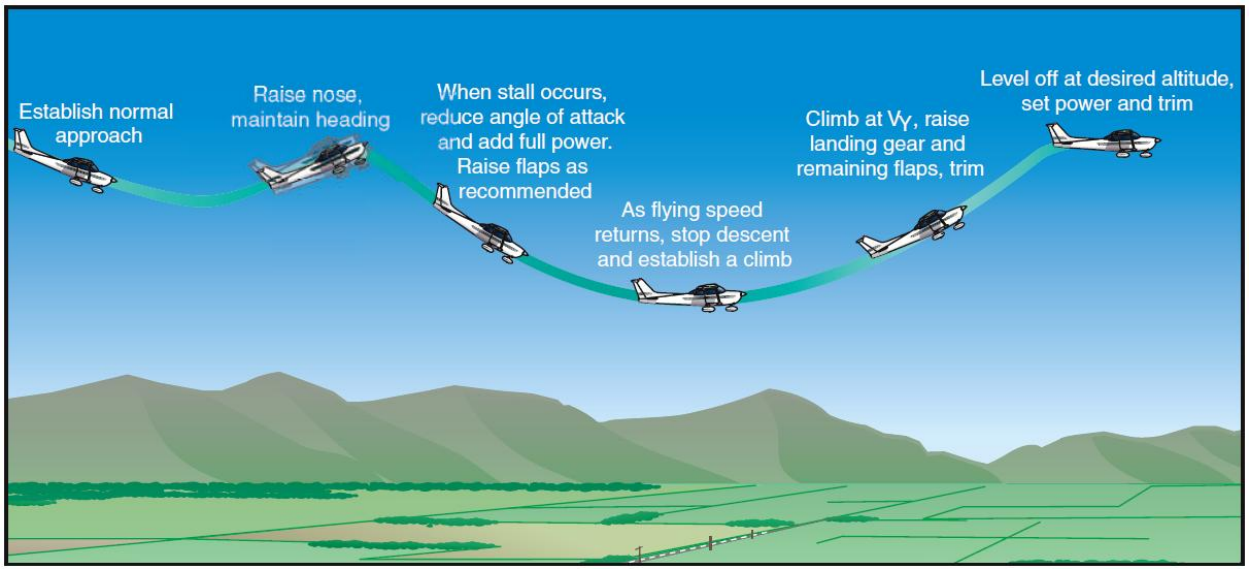
- Increase power to cruise setting.
- Maintain coordination.
- Retract wing flaps to 20°, while accelerating to 60 KIAS.
- After reaching 60 KIAS, retract the wing flaps to up, one increment at a time.
- Adjust pitch as necessary to maintain level flight.
- Return to cruise power setting when the airplane is in normal level flight.

## 2.2 MANEUVER: Power-Off Stalls – Full or Imminent

**Objective**
To familiarize the pilot with the conditions that produce power-off stalls, to assist in recognizing an approaching stall, and to develop the habit of taking prompt preventive or corrective action to minimize altitude loss.

**Description**
Power-off stalls are performed in normal landing configuration to simulate an accidental stall occurring during the approach to landing.

**Teaching Considerations**
- Common errors as per the Airplane Flying Handbook and the CFI PTS.
- Factors affecting stall speed:
  - Weight
  - Load factor
  - Center of gravity location
  - Configuration
- Stall/Spin awareness considerations:
  - Flight conditions where unintentional stall may occur and procedures for recovery.
  - Aerodynamic factors related to spins.
  - Awareness that an aircraft can stall at any airspeed and attitude.



**Set-up**

- Select an entry altitude that allows the recovery to be completed no lower than the Minimum Recovery Altitude.
    - MRA (Dual) 1,500 feet AGL
    - MRA (Solo) 2,000 feet AGL
- Clear area with two 90° turns.

**Execution**

The instructor shall specify full or imminent stall, bank angle, and flap setting.

- Reduce the throttle to idle.
- After reducing power, maintain a constant altitude in level flight while decelerating to 70 KIAS.
- Pitch the airplane down to establish a normal approach attitude.
- Set flaps - up to full, as specified.
- Establish a stabilized descent while maintaining a specified heading and/or bank angle.
- Establish and maintain a coordinated landing pitch attitude.

**Recovery**

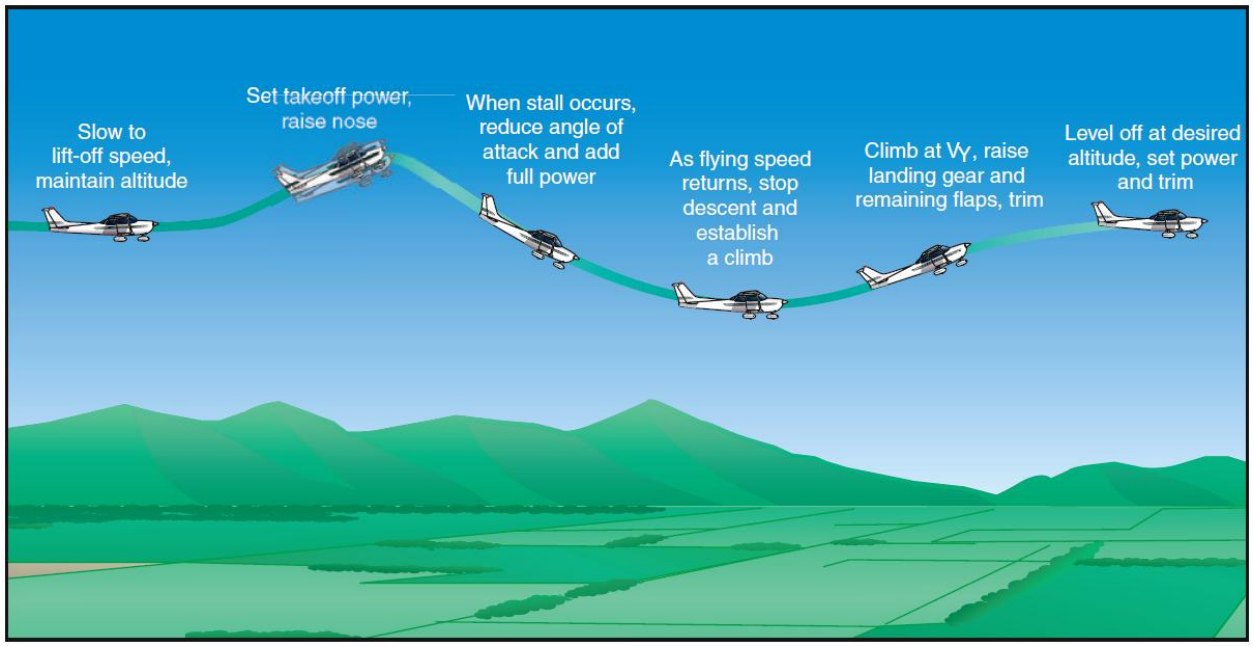
- Recognize stall indications and recover promptly with a minimum loss of altitude:
    - Reduce the angle of attack by releasing control wheel back pressure.
    - Advance the throttle to maximum power.
    - Level the wings.
    - Maintain coordinated flight.
- Retract the flaps to 20°, if fully extended.
- Establish a positive rate of climb, while accelerating to 60 KIAS.
- After reaching 60 KIAS, retract the flaps to up, one setting at a time, while accelerating to VY or VX, as appropriate.
- Return to cruise power setting when the airplane is in normal level flight.

## 2.3 MANEUVER: Power-On Stalls - Full or Imminent

**Objective**
To familiarize the pilot with the conditions that produce power-on stalls, to assist in recognizing an approaching stall, and to develop the habit of taking prompt preventive or corrective action to minimize altitude loss.

**Description**
Power-on stalls are performed in normal takeoff configuration to simulate an accidental stall occurring during takeoffs.

**Teaching Considerations**
- Common errors as per the Airplane Flying Handbook and the CFI PTS
- Factors affecting stall speed.
  - Weight
  - Load factor
  - Center of gravity location
  - Configuration
  - Power Setting
- Stall/Spin awareness considerations.
  - Flight conditions where unintentional stalls may occur and procedures for recovery.
  - Aerodynamic factors related to spins.
  - Awareness that an aircraft can stall at any airspeed and attitude.



**Set-up**

- Select an entry altitude that allows the recovery to be completed no lower than the Minimum Recovery Altitude.
    - MRA (Dual) 1,500 feet AGL
    - MRA (Solo) 2,000 feet AGL
- Clear area with two 90° turns.

**Execution**

The instructor shall specify full or imminent stall, and airplane configuration.

- Maintain a constant altitude in level flight while decelerating to POH computed lift-off speed.
- Set flaps - as specified by instructor.
- Apply full power and establish a normal coordinated climb attitude.
- Smoothly increase the pitch attitude to one that induces a full or imminent stall in straight climbing flight or a climbing turn (maximum bank angle is 20°).

**Recovery**

- Recognize stall indications and recover promptly with a minimum loss of altitude:
    - Reduce the angle of attack by releasing control wheel back pressure.
    - Level the wings.
    - Maintain coordinated flight.
- When airspeed is above 60 KIAS, retract the flaps to up while accelerating to VY or VX, as appropriate.
- Return to cruise power setting when the airplane is in normal level flight.

## 2.4 MANEUVER: Crossed-Control Stalls – Full or Imminent (CFI Applicants Only)

**Objective**
To develop the pilot's recognition of the approach to a cross-control stall, and timely airplane control recovery techniques.

**Description**
This type of stall occurs with the controls "crossed": aileron pressure applied in one direction and rudder pressure applied in the opposite direction. When excessive control wheel back pressure is applied, a cross-control stall may result.

**Teaching Considerations**
- Common errors as per the Airplane Flying Handbook and CFI PTS.
- Factors affecting stall speed:
    - Weight
    - Load factor
    - Center of gravity location
    - Configuration
    - Power setting
- Entry techniques:
    - Excessive pitch attitude to induce the stall.
    - Failure to recognize first indications of a stall.
    - Recognize difference between imminent/full stalls.
- Stall/Spin awareness consideration:
    - Flight conditions where unintentional stall may occur and procedures for recovery.
    - Aerodynamic factors related to spins.
    - Awareness that an aircraft can stall at any airspeed and attitude.

**Set-up**

- Select an entry altitude that allows the recovery to be completed no lower than the Minimum Recovery Altitude.
    - MRA (Dual) 1,500 feet AGL
    - MRA (Solo) 2,000 feet AGL
- Clear area with two 90° turns.

**Execution**

The instructor shall specify full or imminent stall.

- Set flaps to up.
- Reduce power to idle, maintain altitude, re-trim as airspeed approaches normal glide speed.
- When the glide is established, roll into a medium banked turn to simulate overshooting the centerline of a runway.
- During the turn, excessive rudder pressure should be applied in the direction of the turn, but the bank held constant by applying opposite aileron pressure.
- At the same time, increased control wheel back pressure is required to keep the nose from lowering.
- All of these control pressures shall be increased until the airplane stalls.

**Recovery**

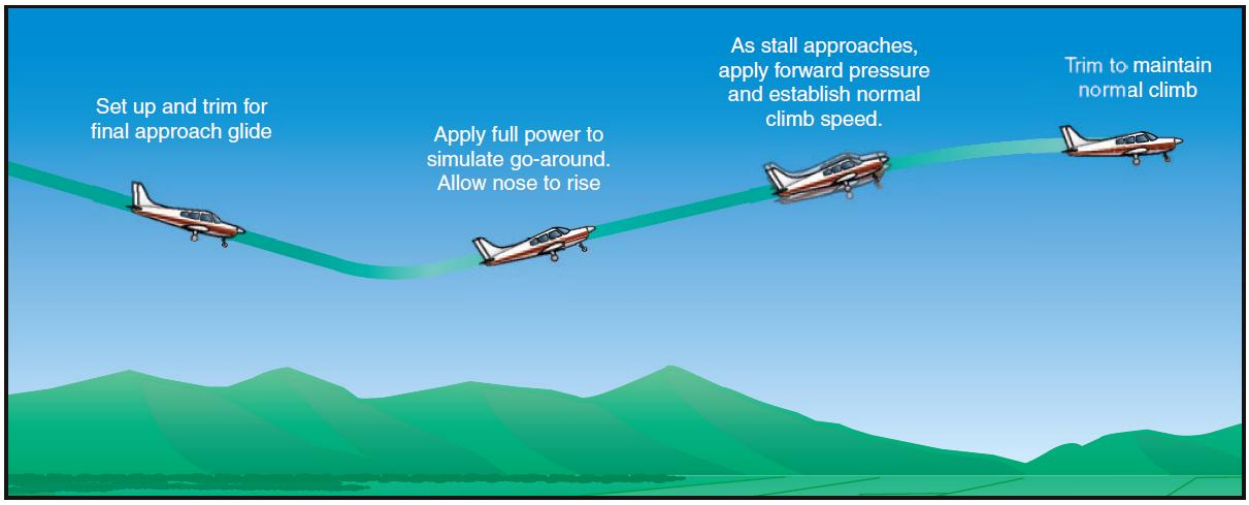
- Recognize stall indications and recover promptly with a minimum loss of altitude:
    - Reduce the angle of attack by releasing control wheel back pressure.
    - Advance the throttle to maximum power.
    - Level the wings.
    - Resume coordinated flight.
- Establish a positive rate of climb and accelerate to VY or VX, as appropriate.
- Return to cruise power setting when the airplane is in normal level flight.

## 2.5 MANEUVER: Elevator Trim Stalls – Imminent (CFI Applicants Only)

**Objective**
To teach the pilot the importance of making smooth power applications, overcoming strong trim forces, maintaining positive control of the airplane to hold safe flight attitudes, and using proper and timely trim techniques.

**Description**
This type of stall normally occurs during a go-around procedure from a normal landing approach or a simulated forced landing approach, or immediately after a takeoff and positive control of the airplane is not maintained.

**Teaching Considerations**
- Common errors as per the Airplane Flying Handbook and CFI PTS.
- Factors affecting stall speed:
  - Weight
  - Load factor
  - Center of Gravity location
  - Configuration
  - Power Setting
- Entry techniques:
  - Excessive pitch attitude to induce the stall.
  - Failure to recognize first indications of a stall.
  - Recognize difference between imminent/full stalls.
- Stall/Spin awareness consideration:
  - Flight conditions where unintentional stall may occur and procedures for recovery.
  - Aerodynamic factors related to spins.
  - Awareness that an aircraft can stall at any airspeed and attitude.



**Set-up**

- Select an entry altitude that allows the recovery to be completed no lower than the Minimum Recovery Altitude.
    - MRA (Dual) 1,500 feet AGL
    - MRA (Solo) 2,000 feet AGL
- Clear area with two 90° turns.

**Execution**

- Reduce the throttle slowly.
- Set flaps to Full: once within flap operating range.
- After reducing power, maintain a constant altitude in level flight while decelerating to 60 KIAS.
- Pitch the airplane down to establish normal approach attitude. Trim aircraft to maintain airspeed.
- Apply full power and establish a pitch attitude that induces an imminent stall.

**Recovery**

- Recognize stall indications and recover promptly with a minimum loss of altitude:
    - Reduce the angle of attack by applying forward control wheel pressure.
    - Level the wings.
    - Maintain coordinated flight.
- Re-trim the airplane as necessary to relieve control pressure.
- Retract the flaps to 20°, if fully extended.
- Establish a positive rate of climb, while accelerating to 60 KIAS.
- After reaching 60 KIAS, retract the flaps to up, one setting at a time, while accelerating to VY or VX, as appropriate.
- Return to cruise power setting when the airplane is in normal level flight.

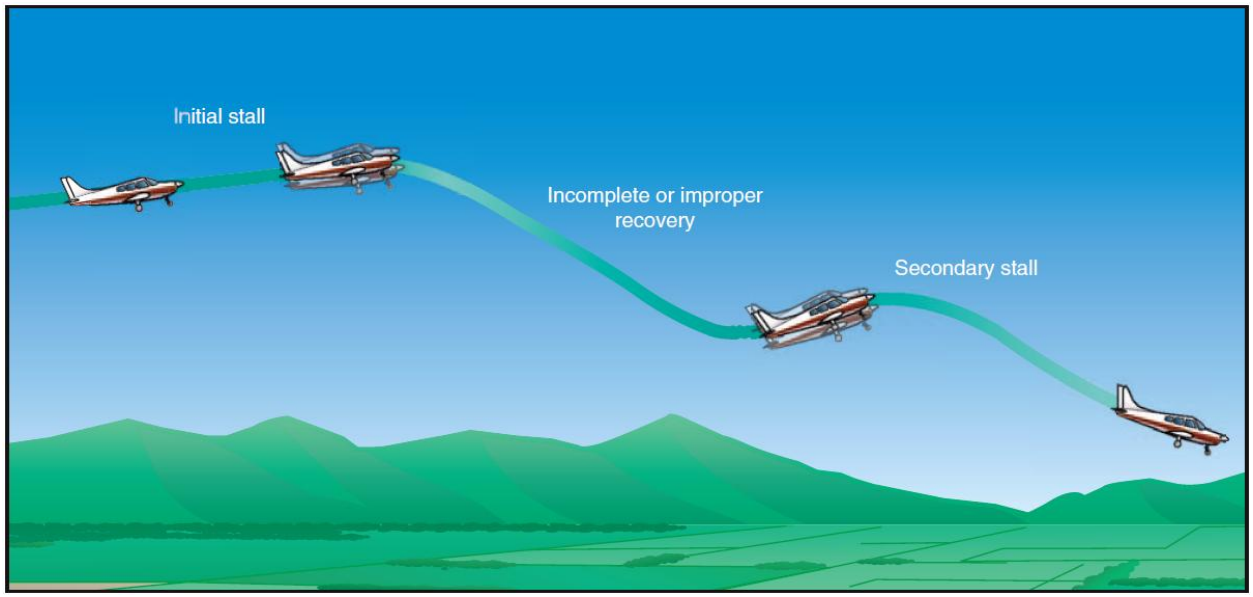
## 2.6 MANEUVER: Secondary Stalls – Imminent (CFI Applicants Only)

**Objective**
To develop the pilots awareness of the effect of improper stall recovery techniques and recognition of the approach to a secondary stall.

**Description**
This type of stall is caused by attempting to hasten the completion of a stall recovery before the airplane has regained sufficient flying speed.

**Teaching Considerations**

- Common errors as per the Airplane Flying Handbook and CFI PTS.
- Factors affecting stall speed:
  - Weight
  - Load factor
  - Center of Gravity location
  - Configuration
  - Power Setting
- Entry techniques:
  - Excessive pitch attitude to induce the stall.
  - Failure to recognize first indications of a stall.
  - Recognize difference between imminent/full stalls.
- Stall/Spin awareness consideration:
  - Flight conditions where unintentional stall may occur and procedures for recovery.
  - Aerodynamic factors related to spins.
  - Awareness that an aircraft can stall at any airspeed and attitude.



**Set-up**

- Select an entry altitude that allows the recovery to be completed no lower than the Minimum Recovery Altitude.
    - MRA (Dual) 1,500 feet AGL
    - MRA (Solo) 2,000 feet AGL
- Clear area with two 90° turns.

**Execution**

- Reduce the throttle to idle.
- After reducing power, maintain a constant altitude in level flight while decelerating to 70 KIAS.
- Pitch the airplane down to establish normal approach attitude.
- Set flaps up to full, as specified.
- Establish a stabilized descent while maintaining a specified heading and/or bank angle.
- Establish and maintain a coordinated landing pitch attitude.
- As the stall occurs, attempt to initiate recovery by applying full power and increasing control wheel back pressure in attempt to raise the nose.

**Recovery**

- Recognize secondary stall indications and recover promptly with a minimum loss of altitude:
    - Reduce the angle of attack by releasing control wheel back pressure.
    - Advance the throttle to maximum power.
    - Level the wings.
    - Maintain coordinated flight.
- Retract the flaps to 20°, if fully extended.
- Establish a positive rate of climb, while accelerating to 60 KIAS.
- After reaching 60 KIAS, retract the flaps to up, one setting at a time, while accelerating to VY or VX, as appropriate.
- Return to cruise power setting when the airplane is in normal level flight.

## 2.7 MANEUVER: Accelerated Stalls – Imminent (Demonstration Only)

**Objective**
The objective of demonstrating accelerated stalls is to learn how they may occur, to develop the ability to recognize such stalls immediately, and to take prompt and effective recovery actions.

**Description**
This stall is performed at best glide airspeed. Bank the aircraft to a minimum of 45°. After turn and bank are established, back-elevator pressure should be firmly increased until a definite stall occurs.

**Teaching Considerations**
- Common errors as per the Airplane Flying Handbook and CFI PTS.
- Factors affecting stall speed.
    - Weight
    - Load factor
    - Center of gravity location
    - Configuration
- Entry techniques.
    - Excessive pitch attitude to induce the stall.
    - Failure to recognize indications of a stall.
    - Recognize difference between imminent/full stalls.
- Stall/Spin awareness consideration.
    - Flight conditions where unintentional stall may occur and procedures for recovery.
    - Aerodynamic factors related to spins.
    - Awareness that an aircraft can stall at any airspeed and attitude.

**Set-up**

- Select an entry altitude that allows the recovery to be completed no lower than the Minimum Recovery Altitude.
    - MRA (Dual) 1,500 feet AGL
    - MRA (Solo) 2,000 feet AGL
- Clear area with two 90° turns.

**Execution**

- Establish and stabilize best glide airspeed while maintaining altitude.
- Set wing flaps to up.
- Enter the maneuver by establishing a bank of approximately 45° while increasing control wheel back pressure to maintain altitude.
- After the turn and bank are established, smoothly, firmly, and progressively increase the angle of attack until a stall occurs.

**Recovery**

- Recognize imminent stall indications and recover immediately with a minimum loss of altitude:
    - Reduce the angle of attack by releasing control wheel back pressure.
    - Advance the throttle to maximum power.
    - Level the wings.
    - Maintain coordinated flight.
- Establish a positive rate of climb while accelerating to VY or VX, as appropriate.
- Return to cruise power setting when the airplane is in normal level flight.

## 2.8 MANEUVER: Spins (Dual Flights Only)

NOTE: Instructors must be spin standardized prior to performance of this maneuver.

**Objective**

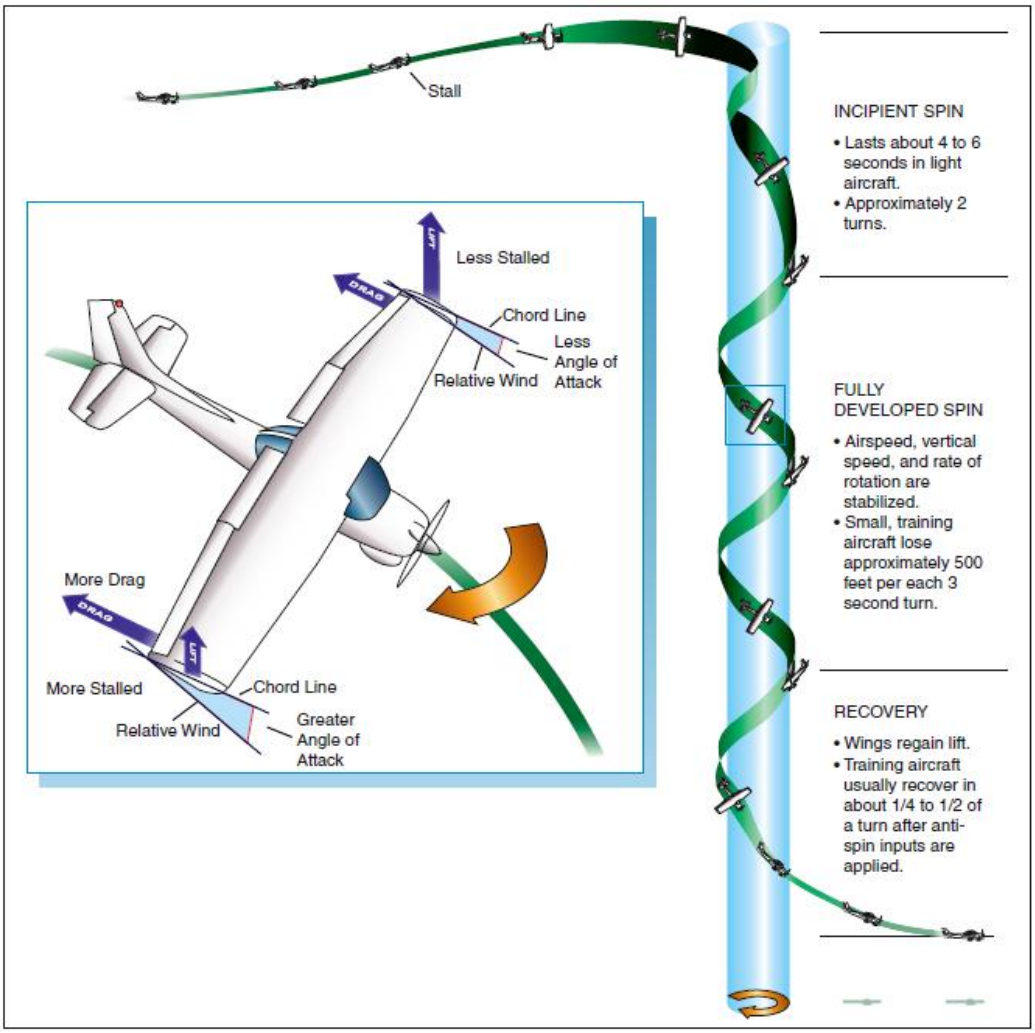
To familiarize the pilot with the conditions that produce spins, to assist in recognizing a spin, and to develop the habit of taking prompt preventive or corrective action to minimize altitude loss.

**Description**

A spin may be defined as an aggravated stall that results in what is termed "autorotation" wherein the airplane follows a downward corkscrew path. Spins are performed in flaps-up landing configuration to simulate an accidental stall occurring during the landing approach.

**Teaching Considerations**

- Situations that may result in a spin.
- Phases of a spin.
- Aerodynamics of a spin.
- Spin recovery procedures.
- Airplanes approved for the spin maneuver based on airworthiness category and type certificate.
- Differences between a spin and a spiral dive.



**Set-up**

- Select an entry altitude that allows the recovery to be completed no lower than the Minimum Recovery Altitude.
    - MRA (Dual) 4,000 feet AGL
- Clear area with two 90° turns.

**Execution**

- Select suitable ground reference points and altitude so as to allow a specified predetermined number of turns.
- Reduce the throttle to idle.
- After reducing power, maintain a constant altitude in level flight while decelerating to 70 KIAS.
- Pitch the airplane down to establish a normal approach attitude.
- Set flaps up.
- Establish a stabilized descent while maintaining a specified heading and/or bank angle.
- Establish and maintain a coordinated landing pitch attitude.
- As the airplane stalls, apply full aft elevator and apply full rudder in the direction of desired rotation.
- Maintain proper control deflections throughout the spin.
- Count revolutions by half turns.
- Spins shall be limited to two turns.

**Recovery**

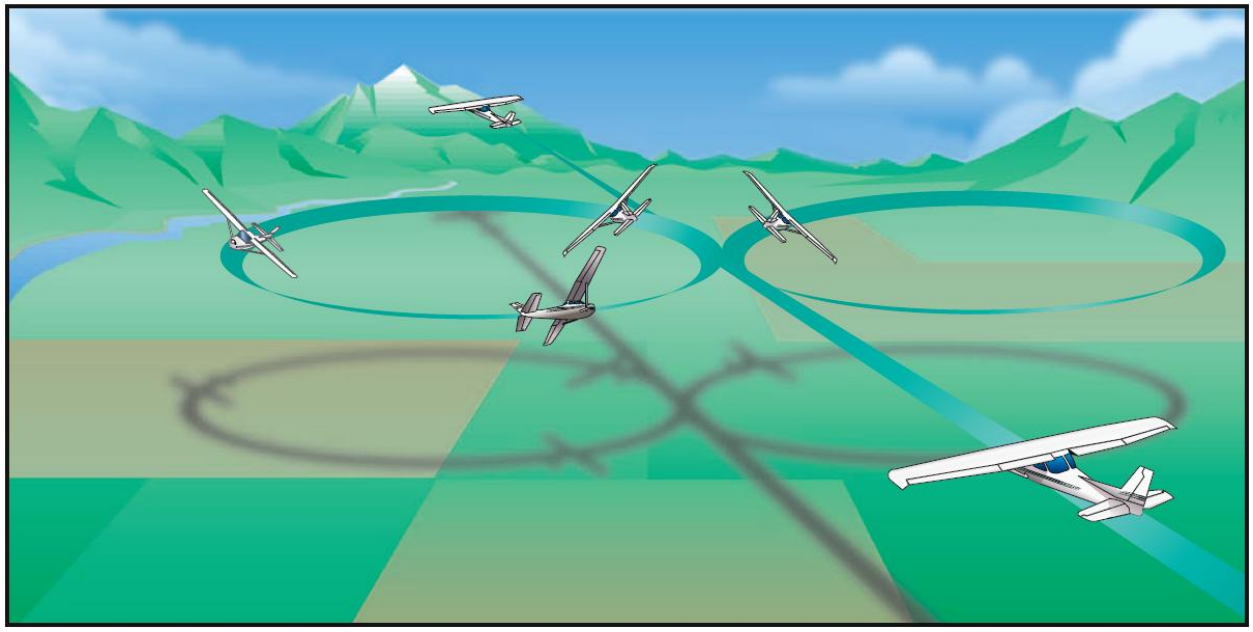
- Verify that throttle is in idle position and ailerons are neutral.
- Within 1/4 of a turn before the desired heading, apply and hold full opposite rudder to stop the rotation.
- Just after rudder reaches the stop, move the control wheel briskly forward far enough to break the stall.
- Hold these control inputs until rotation stops.
- As rotation stops, neutralize rudder, and make a smooth recovery from the resulting dive.

## 2.9 MANEUVER: Steep Turns

**Objective**
To develop the pilot's smoothness, coordination, orientation, division of attention, and control techniques while executing maximum performance turns.

**Description**
The steep turn maneuver consists of a turn in either direction, using a bank angle steep enough to cause an "over banking" tendency during which maximum turning performance is attained and relatively high load factors are imposed.

**Teaching Considerations**
- Common errors as per the Airplane Flying Handbook and the CFI PTS.
- Overbanking tendencies.
- Load factors caused by steep turns.
- Maneuvering speed in relationship to high load factors.
- Turning performance: radius vs. rate.
- Load factor and stall speed.
- Increase in induced drag requires an increase in power.



**Set-up**

- Select an entry altitude that allows the recovery to be completed no lower than the Minimum Recovery Altitude.
    - MRA (Dual) 1,500 feet AGL
    - MRA (Solo) 2,000 feet AGL
- Clear area with two 90° turns.
- Adjust power setting to attain an airspeed of 80 KIAS.

NOTE: During operations at density altitudes which lower the aircraft's performance capability, a lower speed may be used.

**Execution**

- Smoothly roll into a coordinated bank angle of 45° (private) or 50° (commercial).
- As the turn is being established, control wheel back pressure should be smoothly increased to increase the angle of attack.
- Adjust power to maintain airspeed and pitch to maintain selected altitude.

**Recovery**

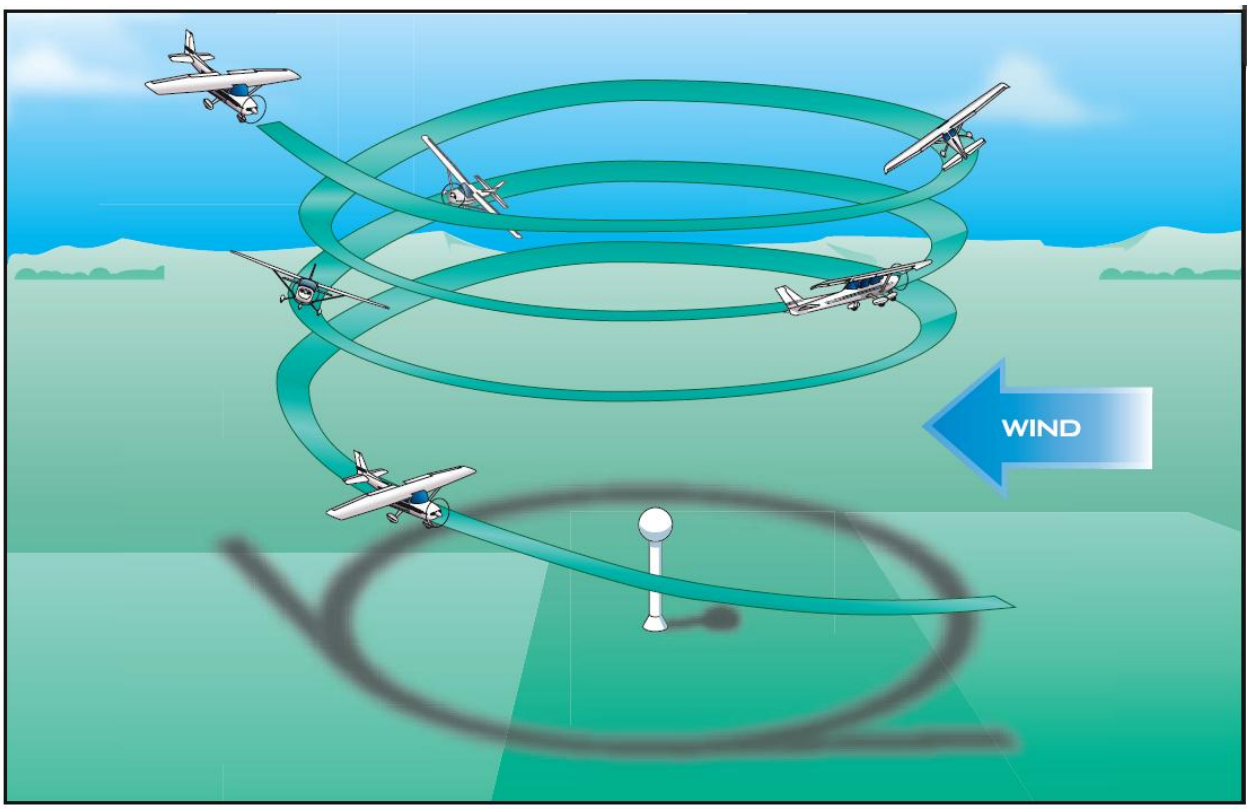
- Rollout on the entry heading by releasing control wheel back pressure, reducing power, and maintaining coordination.
- Return to cruise power setting when the airplane is in normal level flight.

## 2.10 MANEUVER: Steep Spirals

**Objective**
To improve pilot techniques for airspeed control, wind drift control, planning, orientation, and division of attention.

**Description**
A steep spiral is a constant gliding turn, during which a constant radius around a point on the ground is maintained similar to the maneuver, turns-around-a-point. The radius should be such that the steepest bank shall not exceed 60°.

**Teaching Considerations**
- Common errors as per the Airplane Flying Handbook and the CFI PTS.
- Suggested radius of turns is 1/4 to 1/3 mile from the reference point.
- Angle of bank shall not exceed 60°.
- Importance of communication if performing maneuver at an airport.
- Importance of monitoring engine temperatures.



**Set-up**

- Select an entry altitude that allows three 360° turns with the recovery to be completed no lower than the Minimum Recovery Altitude.
    - MRA 1,000 feet AGL, unless performing a simulated emergency landing to an approved airport as listed in the Safety Policies and Procedures manual.
- Clear area with two 90° turns.
- Select a suitable ground reference point.

**Execution**

- Reduce power to idle.
- Establish best glide airspeed.
- A gliding spiral should be started and a turn of constant radius and airspeed maintained around the selected spot on the ground.
- Correct for wind by using various angles of bank, not to exceed 60°, to maintain the constant radius.
- The engine should be periodically cleared by briefly advancing throttle to normal cruise power, preferably while headed into the wind.

**Recovery**

- Recover toward a definite object or specific heading which leads into a pattern over an area that could be used for a forced landing.

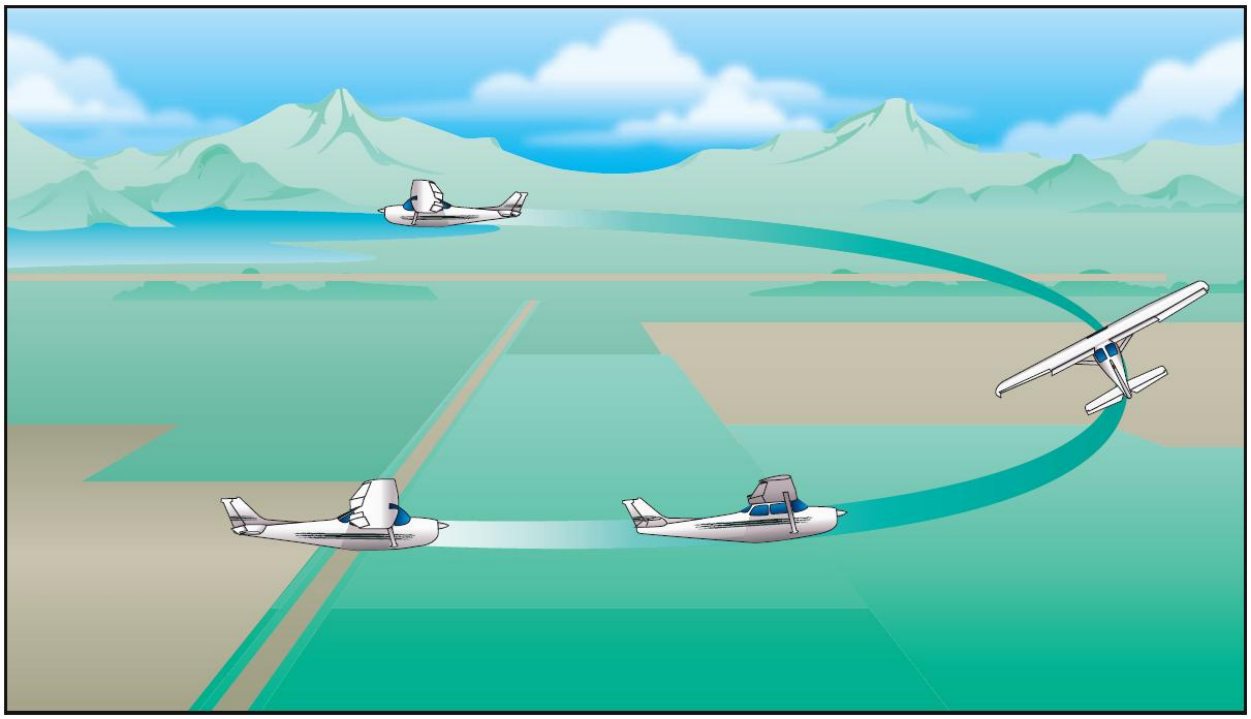
NOTE: If performed over an approved airport the maneuver can be continued to a 180° Power-Off Accuracy Approach and Landing.

## 2.11 MANEUVER: Chandelles

**Objective**
To develop the pilot's coordination, orientation, planning, and accuracy of control during maximum performance flight.

**Description**
A chandelle is a maximum performance climbing turn beginning from approximately straight-and-level flight, and ending at the completion of a precise 180° of turn in a wings-level nose-high attitude at the minimum controllable airspeed.

**Teaching Considerations**
- Common errors as per the Airplane Flying Handbook and the CFI PTS.
- Effect of airspeed on control effectiveness.



**Set-up**

- Select an entry altitude that allows the recovery to be completed no lower than the Minimum Recovery Altitude.
    - MRA (Dual) 1,500 feet AGL
    - MRA (Solo) 2,000 feet AGL
- Clear area with two 90° turns.
- Adjust power setting to attain VA.

NOTE: During operations at density altitudes which lower the aircraft's performance capability, a lower speed may be used.

**Execution**

- Establish a bank angle of approximately 30°.
- Smoothly apply full power while gradually increasing pitch to maintain a coordinated climbing turn to the 90° point with a constant bank angle.
- Execute a coordinated constant rate rollout from the 90° point to the 180° point, maintaining specified power and a constant pitch attitude.
- Complete rollout at the 180° point, just above stall speed and maintain that airspeed momentarily avoiding a stall.

**Recovery**

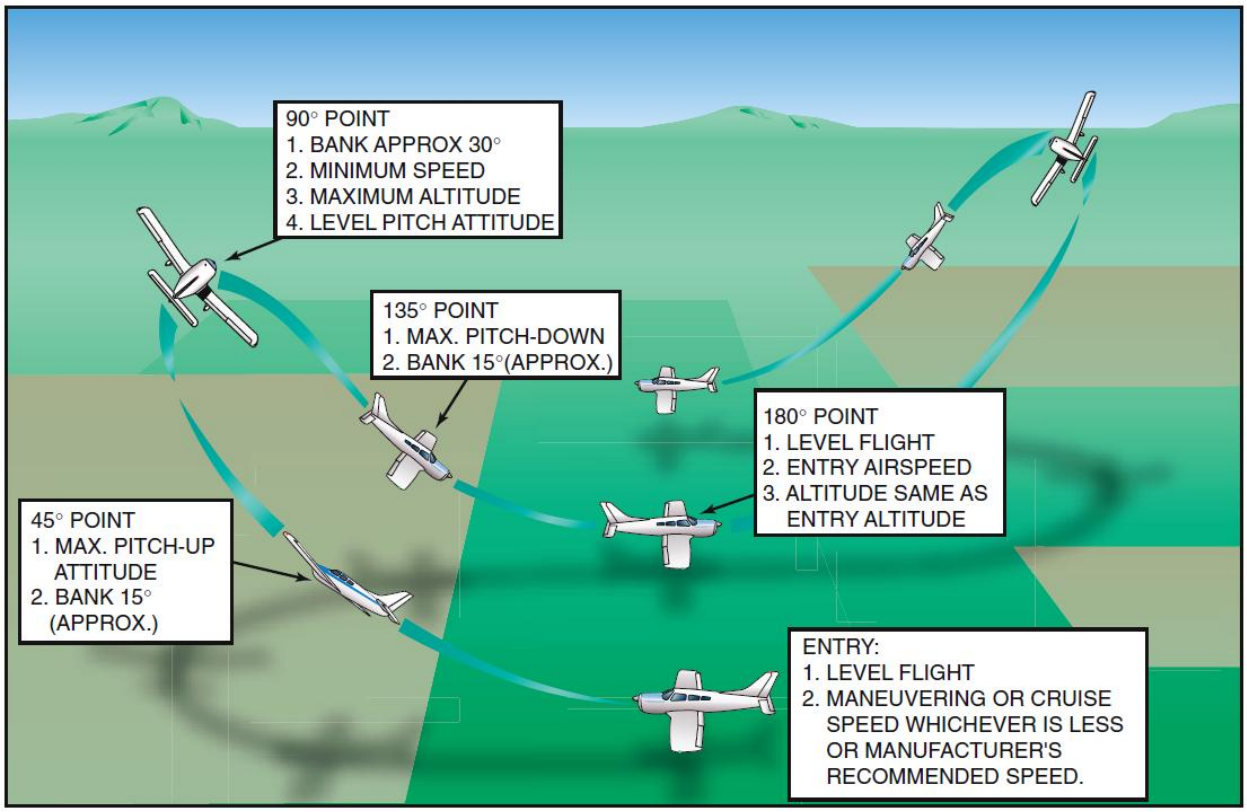
- Resume straight-and-level flight with a minimum loss of altitude.
- Return to cruise power setting when the airplane is in normal level flight.

## 2.12 MANEUVER: Lazy Eights

**Objective**
To develop perfect coordination of controls through a wide range of airspeeds and altitudes so that certain accuracy points are reached with planned attitude and airspeed. The maneuver helps develop subconscious feel, planning, orientation, coordination, and speed sense.

**Description**
Consists of two 180° turns in opposite directions, while making a climb and a descent in a symmetrical pattern during each of the turns.

**Teaching Considerations**
- Common errors as per the Airplane Flying Handbook and the CFI PTS.
- Effect of airspeed on control effectiveness.



**Set-up**

- Select an entry altitude that allows the recovery to be completed no lower than the Minimum Recovery Altitude.
    - MRA (Dual) 1,500 feet AGL
    - MRA (Solo) 2,000 feet AGL
- Clear area with two 90° turns.
- Adjust power setting to attain VA.

NOTE: During operations at density altitudes which lower the aircraft's performance capability, a lower speed may be used.

**Execution**

- Enter a coordinated climbing turn in the direction of the 45° reference point, attaining the maximum pitch-up attitude and approximately 15° of bank passing through that point.
- Continue the coordinated turn from the 45° reference point to the 90° reference point, decreasing the pitch attitude while increasing the bank to an angle of approximately 30°.
- Complete 90° of turn with the maximum angle of bank, minimum airspeed (5 to 10 knots above stall speed), maximum altitude and level pitch attitude with the longitudinal axis passing through the reference (horizon) point.
- Continue the coordinated descending turn from the 90° reference point to the 135° reference point, decreasing the pitch attitude to the lowest point and decreasing the bank to approximately 15°.
- Continue the coordinated turn from the 135° reference point to the 180° reference point, increasing the pitch attitude and decreasing angle of bank attaining level flight, original airspeed and altitude passing through the 180° reference point.
- Upon returning to the starting altitude and the 180° point, a climbing turn should be started immediately in the opposite direction toward the selected reference points to complete the second half of the eight in the same manner as the first half.
- Throughout the maneuver, power remains fixed.

**Recovery**

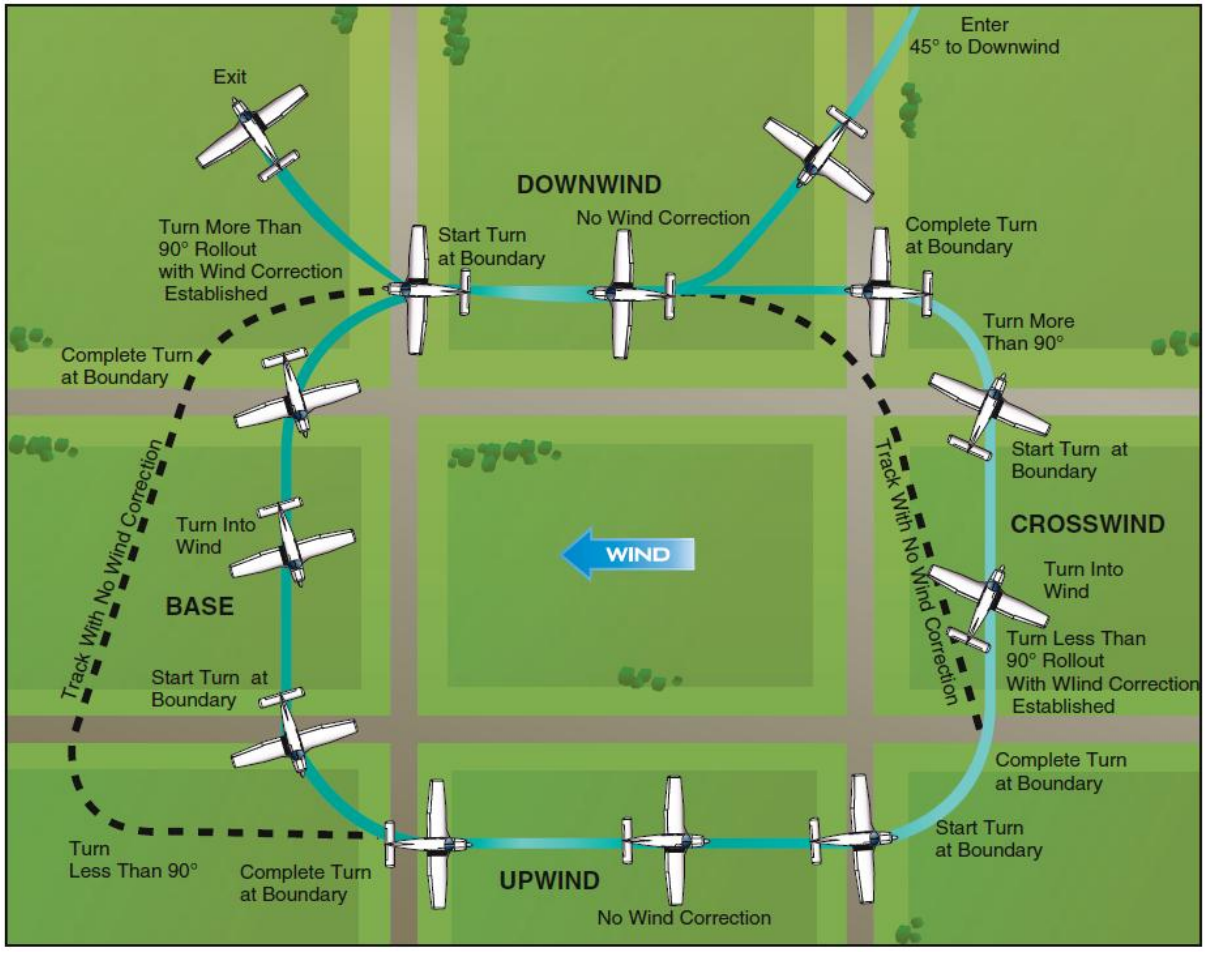
- Return to cruise power setting when the airplane is in normal level flight.

## 2.13 MANEUVER: Rectangular Course

**Objective**
To develop division of attention between the flight path and ground references while controlling the airplane and watching for other aircraft in the vicinity. Another objective is to develop recognition of drift toward or away from a line parallel to the intended ground track.

**Description**
The rectangular course is a training maneuver in which the ground track of the airplane is equidistant from all sides of a selected rectangular area on the ground.

**Teaching Considerations**
- Planning and orientation.
  - Noise abatement
  - Obstacle clearance
  - Emergency landing area
  - Configuration and airspeed
  - Selection of a suitable altitude
  - Selection of a suitable reference point and it's orientation to the wind
- Faulty technique.
  - Uncoordinated flight controls
- Common errors as per the Airplane Flying Handbook and the CFI PTS.



**Set-up**

- Select a suitable altitude for the maneuver (600 feet - 1,000 feet AGL).
- Clear area with two 90° turns.
- Adjust power setting to attain an airspeed of 80 KIAS.

NOTE: During operations at density altitudes which lower the aircraft's performance capability, a lower speed may be used.

**Execution**

- Select a square or rectangular field, the sides of which are approximately a mile in length.
- Plan the maneuver so as to enter a left or right pattern at an appropriate distance (1/4 to 1/2 mile) from the selected reference area, 45° to the downwind leg.
- Maintain a ground track that is equidistant from all sides of the reference area. The airplane should be flown parallel to and at a uniform distance from the field boundaries, not above the boundaries.
- Adjust power to maintain entry airspeed; pitch to maintain selected altitude.

**Recovery**

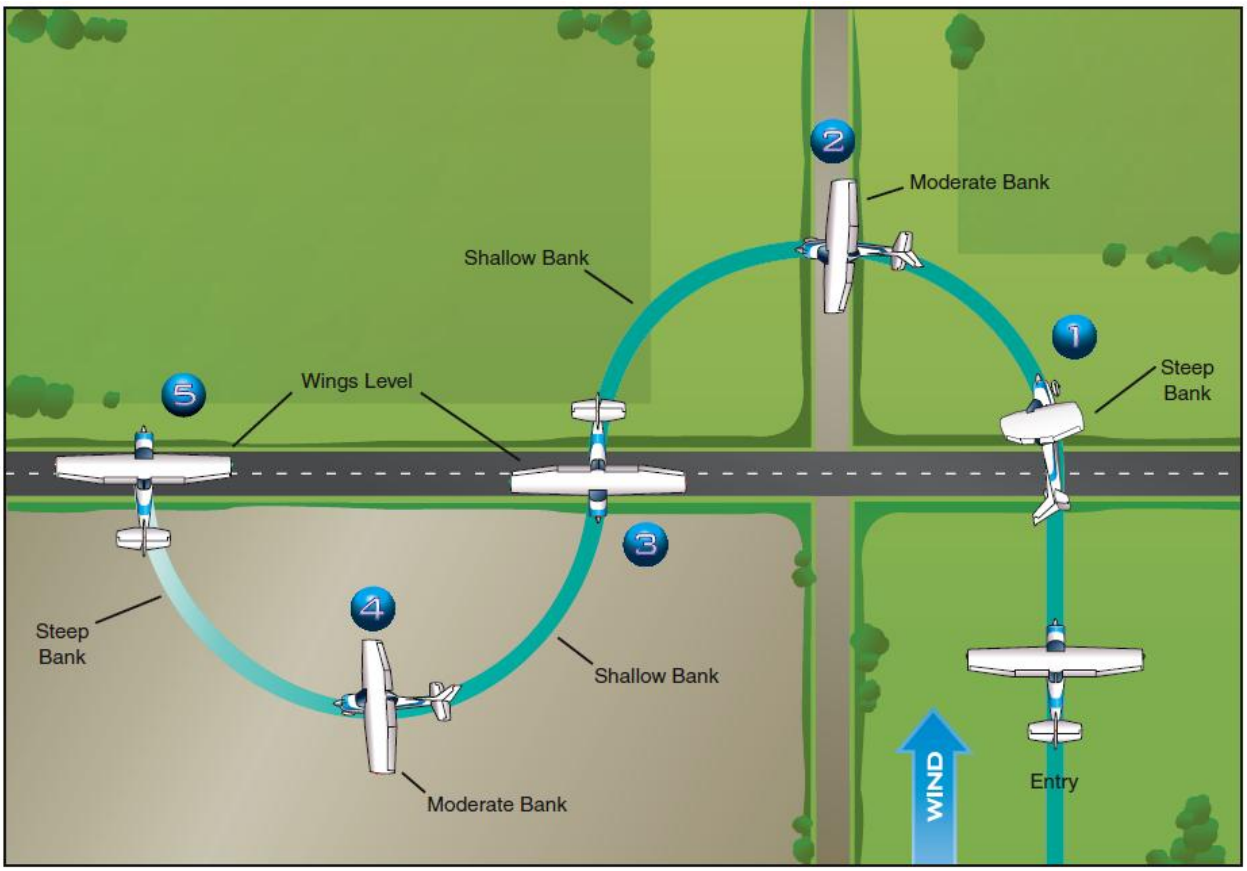
- Return to cruise power setting when the airplane is in normal level flight.

## 2.14 MANEUVER: S-Turns Across a Road

**Objective**
To develop the ability to compensate for drift during turns, orient the flight path with ground references, follow an assigned ground track, arrive at specified points on assigned headings, and divide the pilot's attention.

**Description**
The maneuver consists of crossing the road at a 90° angle and immediately beginning a series of 180° turns of uniform radius in opposite directions, re-crossing the road at a 90° angle just as each 180° turn is completed.

**Teaching Considerations**
- Planning and orientation.
  - Noise abatement
  - Obstacle clearance
  - Emergency landing area
  - Configuration and airspeed
  - Selection of a suitable altitude
  - Selection of a suitable reference point and it's orientation to the wind
- Faulty technique.
  - Uncoordinated flight controls
- Common errors as per the Airplane Flying Handbook and the CFI PTS.



**Set-up**

- Select a suitable altitude for the maneuver (600 feet –1,000 feet AGL).
- Clear area with two 90° turns.
- Adjust power setting to attain an airspeed of 80 KIAS.

NOTE: During operations at density altitudes which lower the aircraft's performance capability, a lower speed may be used.

**Execution**

- Select a suitable ground reference line that lies perpendicular to the wind.
- Enter perpendicular to the selected reference line on a downwind heading.
- Complete a series of 180° turns of uniform radius in opposite directions, re-crossing the reference line at a 90° angle just as each 180° turn is completed.
- Apply the necessary wind-drift correction to track a constant radius turn on each side of the selected reference line.
- To accomplish a constant radius ground track requires a changing roll rate and angle of bank to establish the wind correction angle. Both will increase or decrease as ground speed increases or decreases. Bank angle should not exceed 45°.
- Suggested radius of turns is 1/4 to 1/2 mile from the reference line.
- Adjust power to maintain entry airspeed and pitch to maintain selected altitude.

**Recovery**

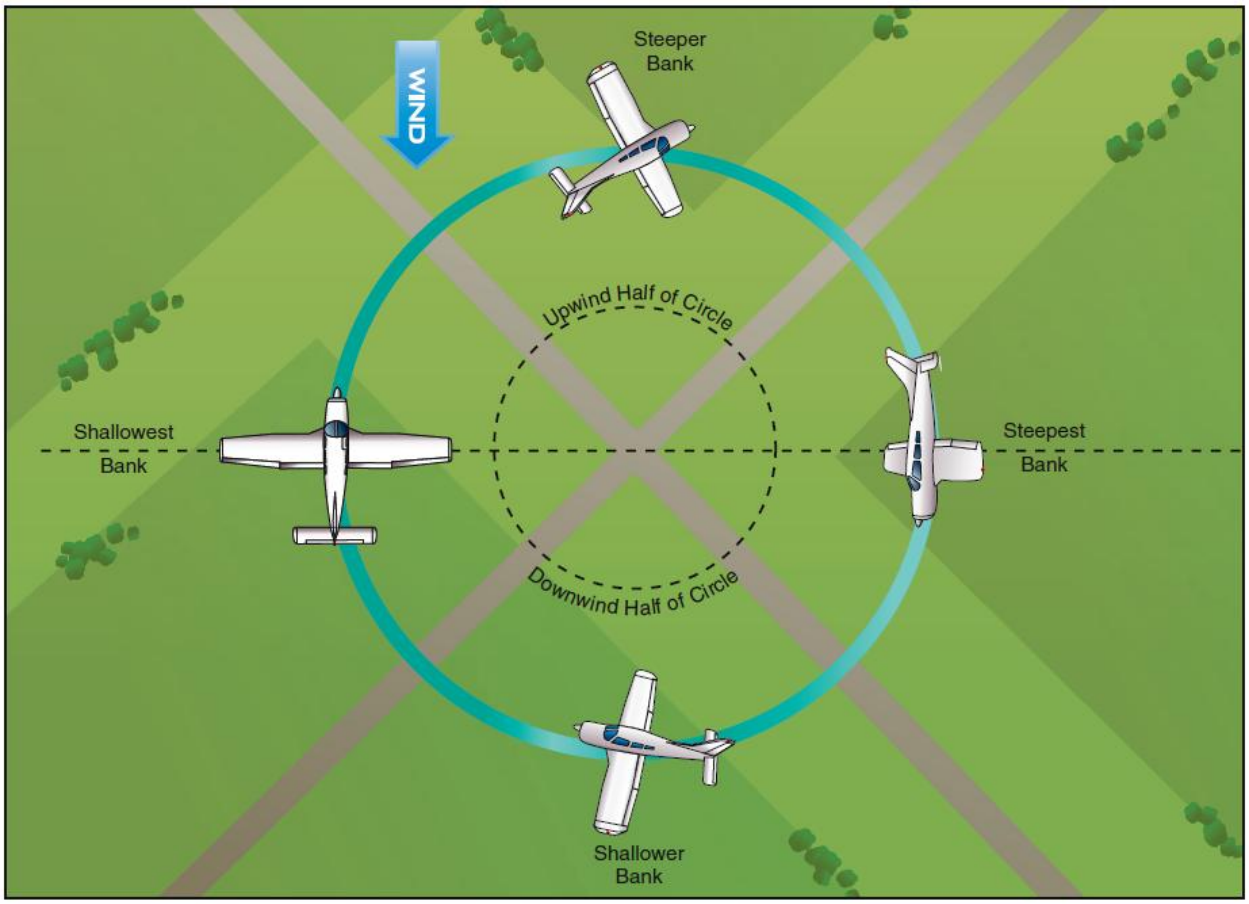
- Return to cruise power setting when the airplane is in normal level flight.

## 2.15 MANEUVER: Turns-Around-a-Point

**Objective**
To develop division of attention between the flight path and ground references and recognition of drift towards or away from a prominent ground reference point while maintaining a constant altitude.

**Description**
This maneuver involves flying the airplane in two or more complete circles of uniform radii or distance from a prominent ground reference point, using a maximum bank of approximately 45° while maintaining a constant altitude.

**Teaching Considerations**
- Planning and orientation.
  - Noise abatement
  - Obstacle clearance
  - Emergency landing area
  - Configuration and airspeed
  - Selection of a suitable altitude
  - Selection of a suitable reference point and it's orientation to the wind
- Faulty technique.
  - Uncoordinated flight controls
- Common errors as per the Airplane Flying Handbook and the CFI PTS.



**Set-up**

- Select a suitable altitude for the maneuver (600 feet – 1,000 feet AGL).
- Clear area with two 90° turns.
- Adjust power setting to attain an airspeed of 80 KIAS.

NOTE: During operations at density altitudes which lower the aircraft's performance capability, a lower speed may be used.

**Execution**

- Select a suitable ground reference point.
- Enter the maneuver left or right at a distance equal to the desired radius of the turn on a downwind heading.
- Suggested radius of turns is 1/4 to 1/2 mile from the reference point.
- Maintain proper ground track by correcting for wind.

**Recovery**

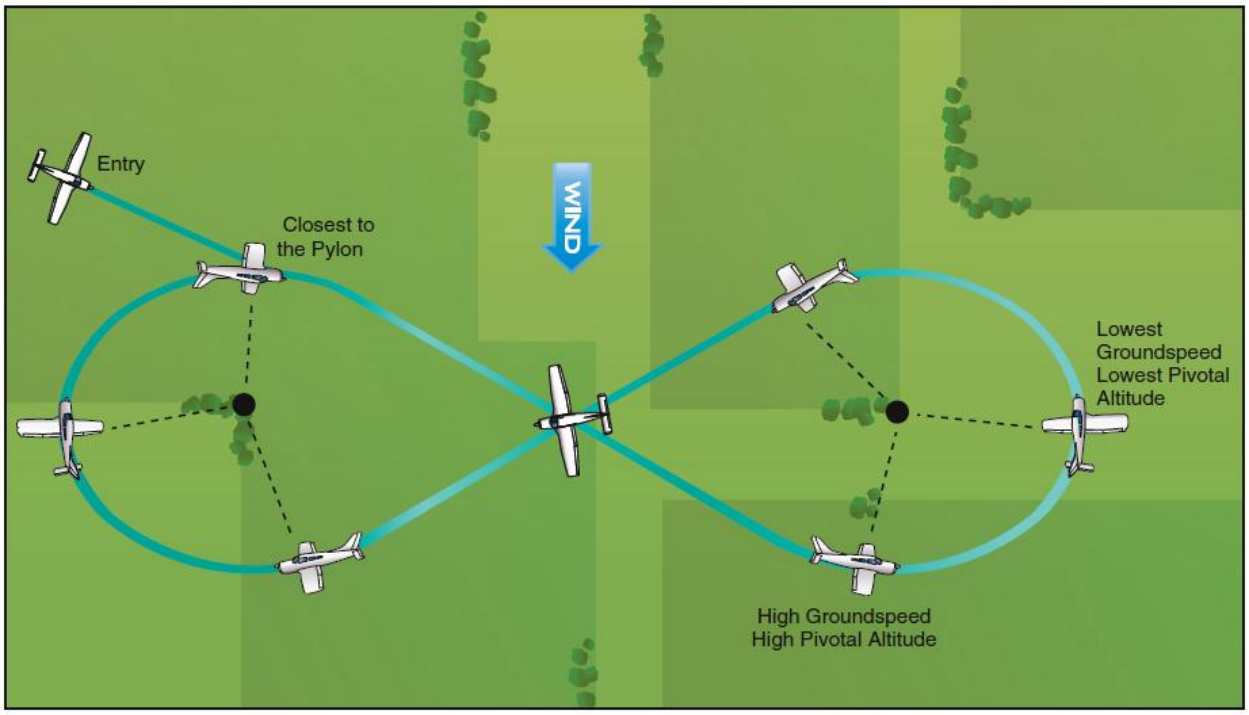
- Return to cruise power setting when the airplane is in normal level flight.

## 2.16 MANEUVER: Eights on Pylons

**Objective**
To develop the ability to maneuver the airplane accurately while dividing attention between the flight path and selected pylons on the ground.

**Description**
Involves flying the airplane in circular paths, alternately left and right, in the form of a figure "8" around two selected pylons on the ground. No attempt is made to maintain a uniform distance from the pylon. The airplane is flown at such an altitude and airspeed that a line parallel to the airplane's lateral axis, and extending from the pilot's eye appears to pivot on each of the pylons.

**Teaching Considerations**
- Planning and orientation.
  - Noise abatement
  - Obstacle clearance
  - Emergency landing area
  - Configuration and airspeed
  - Selection of a suitable altitude
  - Selection of a suitable reference point and it's orientation to the wind
- Faulty technique.
  - Uncoordinated flight controls
  - Use of rudder to maintain position on the pylon
- Common errors as per the Airplane Flying Handbook and the CFI PTS.



**Set-up**

- Select a suitable altitude for the maneuver.
- Clear area with two 90° turns.
- Adjust power setting to attain an airspeed of 80 KIAS.

NOTE: Pivotal Altitude should be calculated during preflight, (GS KIAS)² / 11.3 + Field Elevation = PA
NOTE: During operations at density altitudes which lower the aircraft's performance capability, a lower speed may be used.

**Execution**

- Select two points on the ground along a line which lies 90° perpendicular to the direction of the wind.
- Enter the maneuver by flying diagonally crosswind between the pylons to a point downwind from the first pylon so that the first turn can be made into the wind.
- As the airplane approaches a position where the pylon appears to be just ahead of the wingtip, the turn should be started by lowering the upwind wing to place the pilot's line of sight reference on the pylon.
- Adjust pivotal altitude as required to maintain the pilot's reference line on the pylon. As the airplane heads into the wind, a descent must be made to hold the reference line on the pylon.
- No correction should be made to counteract drifting during the turns.
- As the airplane turns downwind the rollout should be started to allow the airplane to proceed diagonally to a point on the downwind side of the second pylon. The rollout must be completed in the proper wind correction angle to correct for wind drift, so that the airplane will arrive at a point downwind from the second pylon the same distance it was from the first pylon.
- Start a turn in the opposite direction by lowering the upwind wing to again place the pilot's line of sight reference on the second pylon. The turn is then continued just as in the turn around the first pylon but in the opposite direction.
- Throughout the maneuver power remains fixed.

**Recovery**

- Return to cruise power setting when the airplane is in normal level flight.

## 2.17 MANEUVER: Pilotage and Dead Reckoning

**Objective**
To develop the pilot's ability to navigate on cross-country flights by reference to landmarks and computations.

**Description**
Picking suitable landmarks and making computations based on airspeed, course, and heading to be able to determine the position of the airplane at all times.

**Teaching Considerations**
- Select prominent landmarks that can be readily identified.
- Use of checkpoints.
- Definitions for obtaining flight information.
- Use of E6B to calculate ground speed, ETA and fuel burn.

**Execution**
- Follow a preplanned course by reference to landmarks.
- Identify landmarks by relating surface features to chart symbols.
- Navigate by means of pre-computed headings, ground speeds, and elapsed time.
- Correct and record the differences between preflight ground speed and heading calculations, and those determined enroute.

## 2.18 MANEUVER: Radio Navigation and Radar Services

**Objective**
To develop the pilot's ability to use radio navigation and radar services.

**Teaching Considerations**
- VHF Omnidirectional Range (VOR).
- Area Navigation (GPS/RNAV).
- Transponder (Mode C/Mode S).
- Avionics manuals.

**Execution**
- Demonstrate the ability to use an airborne electronic navigation system.
- Locate the airplane's position using the navigation system.
- Intercept and track a given course, radial or bearing, as appropriate.
- Recognize and describes the indication of station passage if appropriate.
- Recognize signal loss and take appropriate action.
- Use proper communication procedures when utilizing radar services.

## 2.19 MANEUVER: Diversion

**Objective**
To develop the ability to orient one's self with a chart and make rapid and reasonably accurate computations of headings and arrival time estimates.

**Teaching Considerations**
- Timely and appropriate selection of diversion destination.
- Accurate calculation of heading, ground speed, arrival time, and fuel consumption.
- In-flight communications with ATC and FSS.

**Execution**
- Select appropriate alternate airport and route.
- Make an estimate of heading, ground speed, arrival time, and fuel consumption to the alternate airport.
- Check NOTAMS and weather conditions.
- Change flight plan with FSS.

## 2.20 MANEUVER: Lost Procedure

**Objective**
To develop the pilot's ability to make sound decisions based on pilotage, dead reckoning, and radio navigation to assist in locating the aircraft's position.

**Teaching Considerations**
- Situational awareness.
- The 5 C's:
    - Confess to yourself that you are lost.
    - Climb to a more suitable altitude.
    - Communicate with the necessary ATC facility.
    - Conserve fuel.
    - Circle to maintain position.

**Execution**
- Select an appropriate course of action.
- Maintains an appropriate heading and climbs, if necessary.
- Identify prominent landmarks.
- Use navigation systems/facilities and or contact an ATC facility for assistance, as appropriate.

# 3. IFR Flight Maneuvers

**Objective**
The objective of this section is to develop the pilot's knowledge, ability, confidence, professionalism and competence in performing IFR flight maneuvers and the associated instrument approaches in an aircraft.

**References**
- Federal Aviation Regulations
- Aeronautical Information Manual
- FAA-H-8083-15A: Instrument Flying Handbook
- FAA-H-8261-1A: Instrument Procedures Handbook
- AC 61-134: General Aviation Controlled Flight Into Terrain Awareness
- Practical Test Standards
- RFS Safety Policies and Procedures
- Cessna Model 172S Pilot's Operating Handbook
- Cessna 172S Checklist

## 3.1 MANEUVER: Instrument Cockpit Check

**Objective**
During preflight, before and during taxi, and before takeoff, flight instruments, avionics, and navigation equipment are checked for currency and proper operation by following the established flow patterns/ checklists.

**Teaching Considerations**
- VOR check procedures
- GPS database currency
- Inspection dates
    - Altimeter
    - Pitot/Static
    - Transponder

**Execution**
- Ensure all required inspections have been completed.
- Determine that the flight instruments, avionics, and navigation equipment are in a condition for completion of a safe instrument flight.
- Perform the preflight, before taxi, taxi, run-up, and before takeoff flow patterns/checklist items.

## 3.2 MANEUVER: Straight-and-Level

**Objective**
To develop the basic skill and knowledge of attitude instrument flying as it relates to straight-and-level flight.

**Description**
A standardized system by which the pitch, bank, and power control instruments are integrated to maintain desired altitude, heading, and airspeed.

**Teaching Considerations**
- Cross-check, instrument interpretation, and aircraft control.
- Fixation, omission, and emphasis errors.
- Over-controlling and failure to trim the aircraft.
- Primary and supporting, or control and performance methods.

**Execution**
Pitch
- Maintain altitude using the primary and supporting, or control and performance methods.
    - To return to the desired altitude, make an attitude change that results in a vertical speed rate that is approximately double the error in altitude not to exceed 200 feet per minute.
    - For errors less than 100 feet, increase/decrease the pitch attitude 2°.
    - For errors of more than 100 feet, increase/decrease the pitch attitude 4°.

Bank
- Maintain heading using the primary and supporting or control and performance methods.
- Make corrections to the desired heading by using an angle of bank no greater than the number of degrees to be turned. Limit bank corrections to an angle no greater than that required for a standard rate turn.

Power
- Set the power as necessary to maintain the desired airspeed.

## 3.3 MANEUVER: Change of Airspeed

**Objective**
To achieve the skill and knowledge of the elements relating to basic attitude instrument flying during changes of airspeed in straight-and-level flight and in turns.

**Description**
When power is changed to vary airspeed, the airplane tends to change attitude around all axes of movement. Therefore, control pressures will change in proportion to the change in power.

**Teaching Considerations**
- Cross-check, instrument interpretation, and aircraft control.
- Fixation, omission, and emphasis errors.
- Over-controlling and failure to trim the aircraft.
- Relationship between power, altitude, airspeed, and attitude.
- Primary and supporting, or control and performance methods.

**Execution**
- For changes in airspeed, vary the pitch, bank, and power in order to maintain the desired altitude, heading, and bank angle.
    - To increase airspeed, smoothly increase power to the approximate setting necessary to achieve the desired airspeed.
    - To reduce airspeed, smoothly decrease power to the approximate setting necessary to achieve the desired airspeed.
    - As the aircraft changes speed adjust pitch and trim as needed to maintain the desired attitude.

## 3.4 MANEUVER: Constant Airspeed Climbs and Descents

**Objective**
To achieve the skill and knowledge of the elements related to basic instrument flying during constant airspeed climbs and descents.

**Description**
A standardized system by which the pitch, bank, and power control instruments are integrated to maintain a constant airspeed climb or descent.

**Teaching Considerations**
- Cross-check, instrument interpretation, and aircraft control.
- Fixation, omission, and emphasis errors.
- Over-controlling and failure to trim the aircraft.
- Relationship between power, altitude, airspeed, and attitude.
- Primary and supporting, or control and performance methods.

**Execution**
- Add or reduce power as needed to initiate a climb or descent.
- Increase or decrease the pitch attitude to an approximate level that allows the airplane to climb or descend at the predetermined airspeed. The attitude indicator is the primary instrument for pitch during the transition period.
- To maintain a constant airspeed climb or descent, the primary instruments are:
    - Pitch – Airspeed tape.
    - Bank – HIS/DG during straight flight, turn indicator and bank angle indicator during a turn.
    - Power –Tachometer.
- Re-trim the aircraft to hold the appropriate attitude.
- To level off from a climb/descent lead the altitude by 10 percent of the vertical speed.
- Adjust the pitch on the attitude indicator for level flight and smoothly adjust power to achieve the desired airspeed.
- Re-trim the airplane.

## 3.5 MANEUVER: Constant Rate Climbs and Descents

**Objective**
To achieve the skill and knowledge of the elements related to basic attitude instrument flying while performing constant rate climbs and descents.

**Description**
A standardized system by which the pitch, bank, and power control instruments are integrated to maintain a constant rate climb or descent.

**Teaching Considerations**
- Cross-check, instrument interpretation, and aircraft control.
- Fixation, omission, and emphasis errors.
- Over-controlling and failure to trim the aircraft.
- Relationship between power, altitude, airspeed, and attitude.
- Primary and supporting, or control and performance methods.

**Execution**
- Add or reduce power as needed to initiate a climb or descent.
- Increase or decrease the pitch attitude to an approximate level that allows the airplane to climb or descend at the predetermined rate. The attitude indicator is primary for pitch during this transition period.
- To maintain a constant rate climb or descent, the primary instruments are:
    - Pitch – Vertical speed indicator.
    - Bank – HIS/DG during straight flight, turn indicator and bank angle indicator during a turn.
    - Power – Airspeed tape.
- Re-trim the aircraft to hold the appropriate attitude.
- To level off from a climb/descent lead the altitude by 10 percent of the vertical speed.
- Adjust the pitch on the attitude indicator for level flight and smoothly adjust power to achieve the desired airspeed.
- Re-trim the airplane.

## 3.6 MANEUVER: Turns to Headings

**Objective**
To achieve the skill and knowledge of the elements related to basic attitude instrument flying to establish a standard rate turn and rollout on predetermined headings.

**Description**
A standardized system by which pitch, bank, and power control instruments are integrated to turn to a specific heading.

**Teaching Considerations**
- Cross-check, instrument interpretation, and aircraft control.
- Fixation, omission, and emphasis errors.
- Over-controlling and failure to trim the aircraft.
- Relationship between power, altitude, airspeed, and attitude.
- Primary and supporting, or control and performance methods.

**Execution**
- To enter the turn, apply coordinated aileron and rudder pressure in the desired direction of the turn.
- A standard rate turn shall be maintained with a bank angle equal to 15 percent of the TAS.
- Use the bank angle indicator on the attitude indicator to bank approximately 15° then use the turn indicator to make small corrections for a standard rate turn by aligning the magenta indication of the turn indicator to the standard rate turn mark.
- Use the Skid/Slip indicator to maintain coordination. By keeping the black trapezoid at the top of the attitude indicator in line with the bank angle indicator a coordinated turn shall be maintained.
- To maintain a turn to a heading, the primary instruments are:
    - Pitch – Altitude tape.
    - Bank – Turn indicator.
    - Power – Airspeed tape.
- Adjust power and pitch as necessary to maintain the desired airspeed and altitude.
- For rollout, lead the desired heading by one-half the number of degrees of bank being used.
- Use the attitude indicator during rollout to return the aircraft to straight flight, reference the HSI/DG to rollout on the desired heading.
- On completion of the rollout adjust pitch, bank, power, and trim as necessary.

## 3.7 MANEUVER: Timed Turns to Magnetic Compass Headings

**Objective**
To achieve the skill and knowledge necessary to turn to a desired compass heading in the event of a HIS/DG failure.

**Description**
A turn in which the clock and the turn indicator (or bank angle indicator) are used to change heading a definite number of degrees in a given time.

**Teaching Considerations**
- Cross-check, instrument interpretation, and aircraft control.
- Fixation, omission, and emphasis errors.
- Over-controlling and failure to trim the aircraft.
- Relationship between power, altitude, airspeed, and attitude.
- Failure to compute the correct time.
- Compass errors.
- Primary and supporting, or control and performance methods.

**Execution**
- Determine the number of degrees to be turned and divide that number by 3 (i.e. 90°/3 = 30 seconds).
- Start the roll-in while noting the time on the clock, and hold the turn at the calibrated standard rate indication (or half-standard rate for small heading changes).
- If no standard rate indication is available use the bank angle indicator on the standby attitude indicator. A standard rate turn shall be maintained with a bank angle equal to 15 percent of the TAS.
- Begin the rollout when the computed number of seconds has elapsed. If the rates of roll-in and rollout are the same, the time taken during entry and recovery does not need to be considered in the time computation.
- Use the magnetic compass at the completion of the turn to check turn accuracy, taking compass deviation errors into consideration.
- Control pressures throughout the entry, turn, and recovery are the same as full panel turns to headings.
- To maintain a timed turn to a magnetic compass heading, the primary instruments are:
    - Pitch – Altimeter.
    - Bank – Attitude indicator.
    - Power – Airspeed indicator.

## 3.8 MANEUVER: Steep Turns

**Objective**
To achieve the skill and knowledge necessary to control the airplane with bank attitudes in excess of those normally used during instrument flight. To enable the pilot to react smoothly, quickly, and confidently to unexpected abnormal flight attitudes under instrument flying conditions.

**Description**
The steep turn maneuver consists of a turn in either direction, using a bank that results in a greater than standard rate turn.

**Teaching Considerations**
- Technique
    - Improper pitch correction during banking.
    - Power application, during roll in and rollout.
    - Rollout (suggested is 1/2 of the bank angle).
- Overbanking tendencies during high bank turns.
- Load factors caused by high bank turns.
- Maneuvering speed in relationship to high load factors.
- Increases in induced drag requiring an increase in power.
- Cross-check, instrument interpretation, and aircraft control.

**Set-up**
- Select an entry altitude that allows the recovery to be completed no lower than the Minimum Recovery Altitude.
    - MRA (Dual) 1,500 feet AGL
    - MRA (Solo) 2,000 feet AGL
- Clear area with two 90° turns.
- Adjust power setting to attain an airspeed of 80 KIAS.

NOTE: During operations at density altitudes which lower the aircraft's performance capability, a lower speed may be used.

**Execution**
- Rolls into a coordinated steep turn with approximately a 45° bank.
- To maintain a steep turn, the primary instruments are:
    - Pitch – Altimeter.
    - Bank – Attitude indicator.
    - Power – Airspeed.
- An increased rate of cross-check and slight adjustments of pitch, power and bank will be necessary to maintain airspeed and altitude.
- If desired, elevator trim may be used to help maintain the desired pitch attitude.

**Recovery**
- Rollout on the entry heading by releasing control wheel back pressure, reducing power, and maintaining coordination.
- Return to cruise power setting when the airplane is in normal level flight.

## 3.9 MANEUVER: Recovery from Unusual Flight Attitudes

**Objective**
To achieve the skill and knowledge to recover from both nose-high and nose-low unusual flight attitudes.

**Description**
An unusual attitude is any attitude not normally desired for instrument flight.

**Teaching Considerations**
- Cross-check, instrument interpretation, and aircraft control.
- Fixation, omission, and emphasis errors.
- Over-controlling and failure to trim the aircraft.
- Proper instruments to be used for recovery.
- Reviewing the airplane's load factor and airspeed limitations.
- Proper recovery techniques.

**Execution**
- Nose-high attitudes are recognized by an increase shown on the altimeter, and vertical speed indicator, and decrease in airspeed.
- Nose-low attitudes are recognized by a decrease shown on the altimeter, and vertical speed indicator, and an increase in airspeed.
- Nose-high
    - Increase power as necessary in proportion to the observed deceleration.
    - Apply forward control wheel pressure to lower the nose and prevent a stall.
    - Apply aileron and rudder pressure to resume coordinated straight flight.
- Nose-low
    - Reduce power to prevent excessive airspeed and loss of altitude.
    - Apply aileron and rudder pressure to resume straight flight.
    - Raise the nose to level flight attitude by applying smooth control wheel back pressure.

**Recovery**
- Return to cruise power setting when the airplane is in normal level flight.

## 3.10 MANEUVER: Air Traffic Control Clearances, Procedures, and Compliance

**Objective**
To achieve the necessary skills and knowledge to copy, correctly interpret, and comply with various types of ATC clearances.

**Teaching Considerations**
- Elements of an IFR clearance.
- Obtaining and canceling clearances.
- Use of standard phraseology.
- Failure to read back entire clearance.
- Correctly interpreting ATC clearances.
- Use of the G1000 play back feature (G1000).

**Execution**
- Contact the appropriate ATC facility and file the routing information at least 30 minutes before the desired departure time.
- Contact the appropriate ATC facility and request the clearance.
- Read back the clearance to ensure it is copied correctly.
- Correctly interpret and determine that it is possible to comply with the clearance.
- Using current and appropriate navigation publications, comply with the approved and accepted clearance. Upon arrival execute the appropriate approach procedure as requested or assigned.
- Monitor and communicate effectively at uncontrolled airports to obtain advance information and ensure collision avoidance.

## 3.11 MANEUVER: VOR Navigation

**Objective**
To achieve the necessary skill and knowledge to intercept and track VOR radials.

**Description**
The airplane is maneuvered onto a specific radial and maintains that radial by adjusting for wind.

**Teaching Considerations**
- VOR navaid facility operations and limitations.
- Operational errors as per the Instrument Flying Handbook.
- Partial panel operations.

**Execution**
- Tune and identify the desired VOR facility.
- Determine the aircraft's position relative to the VOR facility.
- Set the course to be intercepted and determine the intercept angle and heading.
- Turn to the intercept heading.
- Lead the turn to prevent overshooting the selected course.
- When established on the selected course, make the appropriate heading correction(s) to compensate for wind.

## 3.12 MANEUVER: GPS Navigation

**Objective**
To achieve the necessary skill and knowledge to intercept and track GPS courses.

**Description**
GPS navigation includes initialization, and maneuvering onto a specific bearing and maintaining that bearing by adjusting for wind.

**Teaching Considerations**
- GPS operations and limitations.
- Situational awareness.
- Determination of the proper intercept angle and lead points.
- Difference between track and heading as they relate to wind correction.
- GPS course sensitivity.
- Waypoint passage and sequencing.

**Execution**
- Verify operational status of GPS.
- Select appropriate radio navigation source and ensure proper annunciator display.
- Select desired waypoint(s) and input into GPS unit as appropriate.
- Determine the airplane's position relative to the GPS reference waypoint.
- Determine the desired course, intercept angle, and intercept heading and then turn to the selected intercept heading.
- Lead the turn to prevent overshooting the selected bearing.
- When established on the desired course, make the appropriate heading correction(s) to compensate for wind.

NOTE: Initialization/start-up procedures are outlined in the amplified checklist procedures.

## 3.13 MANEUVER: DME Arcs

**Objective**
To achieve the skill and knowledge required to intercept and track DME Arcs.

**Description**
Using distance information the airplane is flown at a constant distance from a navigation facility or waypoint.

**Teaching Considerations**
- Techniques for wind-drift correction.
- Arcing procedures: VOR vs. GPS.
- Determining the proper DME arc interception.
- Situational awareness.

**Execution**
- Establish appropriate airspeed. (Recommended airspeed is 100 KIAS.)
- Determine what radial/bearing the aircraft is currently on.
- Prior to reaching the DME arc, turn approximately 90° from the current radial/bearing. Lead the turn to prevent overshooting. A .5 Nautical miles lead is satisfactory for ground speeds of approximately 100 knots.
- When established on the DME arc, make appropriate heading correction(s) to compensate for wind-drift.
- Initiate the inbound turn for the intermediate/final approach segment, if applicable.

## 3.14 MANEUVER: Holding

**Objective**
To achieve the skill and knowledge required to enter and remain within a published or non-published holding pattern.

**Description**
Holding is a predetermined maneuver which keeps the aircraft within a specified airspace while awaiting further clearance from ATC.

**Teaching Considerations**
- Standard and non-standard holding patterns.
- Wind-drift and timing corrections.
- Published vs. non-published holding patterns.
- Various holding pattern entries.
- Situational awareness.

**Set-up**
- Begin slowing to the holding airspeed when within 3 minutes of the holding fix. (Recommended holding airspeed is 100 KIAS.)
- Determine the type of entry to be made to ensure the aircraft remains within the holding pattern airspace.

**Execution**
- After crossing the fix, execute the appropriate entry procedure.
- Comply with ATC reporting requirements.
- Use the proper timing criteria where applicable as required by altitude or ATC instructions.
- Use proper wind correction to maintain the desired pattern.
- Depart the fix in accordance with ATC instructions.

## 3.15 MANEUVER: Non-Precision Approach

**Objective**
To achieve the skill and knowledge necessary to transition from the enroute phase to the instrument approach and then to the landing with only horizontal guidance.

**Description**
A standard instrument approach procedure in which only horizontal guidance is provided.

**Teaching Considerations**
- NDB, VOR, LOC/LOC BC, GPS/RNAV, ASR, LDA, SDF approaches.
- ATC requirements, requests, and clearances.
- Approach charts and procedures.
- Importance of completing checklists.
- Airport/approach lighting.
- Appropriate approach airspeed.
- Situational awareness.
- Missed approach procedures.
- Wind shear and wake turbulence.
- Controlled Flight Into Terrain (CFIT).

**Set-up**
- Select, tune, identify, and confirm the operational status of the navigation equipment to be used.
- Set the proper course(s) with the OBS or for an ASR approach fly the assigned headings/altitudes. Establish the appropriate airplane configuration and airspeed prior to the FAF or in the absence of a FAF, upon commencing a descent to the minimum descent altitude.
- Comply with ATC clearances.

**Execution**
- Perform appropriate call-outs.
- Complete descent checklist prior to the IAF or intercepting the final approach course, if being radar vectored.
- Complete the Before Landing Checklist prior to the FAF.
- Fly the published approach procedure; in the case of an ASR follow ATC instructions.
- Establish a rate of descent and track that ensures arrival at the MDA prior to reaching the MAP.
- Maintain the MDA.
- Descent from the MDA should be made at the VDP.
    - Minimum descent height (an AGL altitude) divided by 300 gives the VDP.
- Complete the landing under visual conditions if:
    - Runway environment is visible.
    - Visibility requirements are met.
    - The aircraft is in a position to make a normal descent and landing.
- Execute the missed approach procedures at the MAP if visual contact with the runway environment is not established.

NOTES: Per 91.175 (c)(3)(i) - If runway is not in sight by 100 feet above TDZE a missed approach MUST be executed.

## 3.16 MANEUVER: Precision Approach

**Objective**
To achieve the skill and knowledge necessary to transition from the enroute phase to the instrument approach, and then to the landing with horizontal and vertical guidance.

**Description**
A standard instrument approach procedure in which both vertical and horizontal guidance is provided.

**Teaching Considerations**
- ILS, GPS/LPV, PAR approaches.
- ATC requirements, requests, and clearances.
- Approach charts and procedures.
- Importance of completing checklists.
- Airport/approach lighting.
- Appropriate approach speed and configuration.
- Situational awareness.
- Missed approach procedures.
- Wind shear and wake turbulence.
- Controlled Flight Into Terrain (CFIT).

**Set-up**
- Select, tune, identify and confirm the operational status of the navigation equipment to be used.
- Set the proper course(s) with the OBS; in the case of a PAR fly the assigned headings/altitudes.
- Establish the appropriate airplane configuration and airspeed prior to interception of the glideslope.
- Comply with ATC clearances.

**Execution**
- Perform appropriate call-outs.
- Complete descent checklist prior to the IAF or intercepting the final approach course if being radar vectored.
- Complete Before Landing Checklist prior to the FAF.
- As the glideslope (GS) is intercepted, establish the rate of descent required to maintain the glideslope to the decision altitude (DA).
- Complete the landing under visual conditions if:
    - Runway environment is visible.
    - Visibility requirements are met.
    - The aircraft is in a position to make a normal descent and landing.
- Execute the missed approach procedures at the decision altitude (DA) if visual contact with the runway environment is not established.

NOTES: Per 91.175 (c)(3)(i) - If runway is not in sight by 100 feet above TDZE a missed approach MUST be executed.

## 3.17 MANEUVER: Missed Approach Procedure

**Objective**
To achieve the skill and knowledge necessary to recognize situations that require execution of a missed approach and accomplish the appropriate missed approach procedure.

**Description**
A maneuver conducted by a pilot when an instrument approach cannot be completed to a landing.

**Teaching Considerations**
- Importance of a prompt execution of the missed approach procedure.
- Situational awareness.
- Conditions which require a missed approach:
    - Whenever the requirements for operating below DA or MDA are not met.
    - Whenever an identifiable part of the airport is not visible.
    - When so directed by ATC.
    - Whenever the approach exceeds PTS standards.
- How the missed approach procedure differs at various points in the approach segments
- Compliance with the published or alternate missed approach procedure.
- Regulations concerning takeoff and landing under IFR.
- Controlled Flight Into Terrain (CFIT).

NOTE: Execution of a missed approach procedure from an intermediate point between the FAF and MDA/ DA must be flown so as to remain within the protected approach corridor. Unless otherwise directed by ATC, climb out so as to remain on the approach centerline until reaching the missed approach point. At that time, the missed approach or climb-out track must be followed.

**Execution**
- Determine that the missed approach procedure is necessary.
- Apply climb power and establish a climb attitude.
- After a positive rate of climb has been established, retract flaps, if extended.
- Advise ATC of the missed approach and your intentions.

## 3.18 MANEUVER: Landing From a Straight-in Approach

**Objective**
To achieve the skill and knowledge necessary to transition from the DA, MDA, or VDP to a runway aligned with the final approach course.

**Description**
Upon achieving visual contact with the runway the airplane is maneuvered under visual flight conditions from the DA, MDA or VDP to touchdown.

**Teaching Considerations**
- Approach categories and criteria.
- Transition from approach airspeed and configuration to an appropriate landing airspeed and configuration.
- Regulations concerning takeoff and landing under IFR.
- Controlled Flight Into Terrain (CFIT).
- Importance of completing checklists.
- Wind shear and wake turbulence.

**Execution**
- Perform appropriate call-outs.
- Transition to and maintain a visual flight condition using a stabilized approach until touchdown.
    - A stabilized approach is:

Check – All checklists are complete
F – Flight path correct (on centerline)
L – Landing configuration correct
A – Airspeed proper
P – Power setting appropriate for aircraft configuration
S – Sink rate is not abnormal (on glidepath)

- Utilizes visual glideslope indicators, if available.

## 3.19 MANEUVER: Circling Approach Procedure

**Objective**
To achieve the skill and knowledge necessary to maneuver the airplane from the MDA or VDP and land on a runway not aligned with the instrument final approach course.

**Description**
A maneuver initiated by the pilot to align the aircraft with a runway for landing when a straight-in landing from an instrument approach is not possible or is not desirable.

**Teaching Considerations**
- Approach categories and criteria.
- Transition from approach airspeed and configuration to an appropriate landing airspeed and configuration.
- Situational awareness.
- Circling approach protected area and visibility criteria.
- Regulations concerning takeoff and landing under IFR.
- Controlled Flight Into Terrain (CFIT).
- Circling pattern considerations:
    - airport design
    - ceiling and visibility
    - wind direction and velocity
    - final approach course alignment
    - distance from the final approach fix to the runway
    - ATC instructions

**Set-up**
- Determine the circling airspeed considering airplane configuration and weather conditions.
- Determine the runway of intended landing and select the appropriate circling altitude for the approach category, and maneuvering capabilities of the airplane.
- Confirm the direction of traffic, pattern to be flown, and adhere to restrictions and instructions issued by ATC.

**Execution**
- Transition to and maintain a visual flight condition and circle to the appropriate runway.
- Maintain circling altitude until in a position from which a stabilized approach to a normal landing can be made. If the ceiling allows it, fly at an altitude that approximates the VFR traffic pattern altitude.
    - A stabilized approach is:

Check – All checklists are complete
F – Flight path correct (on centerline)
L – Landing configuration correct
A – Airspeed proper
P – Power setting appropriate for aircraft configuration
S – Sink rate is not abnormal (on glidepath)

- Utilizes visual glideslope indicators, if available.

## 3.20 Considerations for Instrument Flight

Takeoff, cruise, descent, and instrument arrivals
During all phases of flight the pilot must at all times be aware of the aircraft's position and attitude with regards to navigation and Controlled Flight Into Terrain (CFIT). The pilot must monitor ATC and comply with all clearance limits and requests. During VMC conditions the pilot should at all times maintain an active visual scan for collision avoidance.

Actual Instrument Conditions (IMC)
In actual instrument conditions, the pilot's primary responsibility is aircraft control and navigation while remaining alert for visual conditions. Upon reaching visual contact with the surface the Pilot should state, "Visual contact." Upon reaching a point at which the runway environment is clearly in sight, the pilot should state, "Approach lights/Runway in sight" (as appropriate). At this time the pilot should divide his/her attention between flight by reference to instruments and flight by visual reference. The pilot may transition to flight by visual reference alone at the point at which a safe approach is assured. During this time, the pilot should remain alert to changing visual conditions. In conditions in which a transition from the instrument approach to landing is not possible, the pilot should announce, "Missed approach" at the DA or MDA (as appropriate). "Missed approach" should be announced by the pilot at any other time a missed approach procedure is executed. (Example: Loss of visual reference while on a circling approach procedure, etc.)

Straight-in Approach: Landing Preparation and Briefing
The pilot should have the appropriate charts, and airport diagrams organized and readily available. Landing computations and the approach briefing should be accomplished during the low workload, low traffic phases of flight after current destination conditions are known. This is done preferably in the last few minutes of cruise but should be accomplished before leaving 2,000 feet AGL.

Circling Approach: Landing Preparation and Briefing
Brief the missed approach point and how, if it becomes necessary, it shall be executed from various positions of the circling approach pattern. The pilot must maintain visual contact with the airport at all times. If visual contact is lost, immediately execute the missed approach procedure. Brief (preferably before departure) the terrain features of the destination terminal area. If existing or forecast weather dictates a circling approach, and high terrain is a factor, consider using an alternate airport or delaying the flight. Discuss the inherent dangers of executing a circling approach if any of these conditions exist:

- Low visibility
- Night conditions
- Terrain
- Unfamiliar airfield
- Strong winds

Consider an alternate plan of action if necessary. Remember: Safely executed circling approaches are not last minute maneuvers. Know the destination weather, plan accordingly, and communicate with the crew. During some phases of a circling approach, the runway may not be visible to one of the crew. It is imperative to continuously communicate.

Missed Approach

The main objective for the Pilot is to execute the initial missed approach procedure, clean up the airplane and start to climb on course. In addition the pilot has the responsibility to tune and identify the appropriate navaids, set in the appropriate course for the missed approach procedure, and contact ATC with her intentions. Remember: Fly the airplane first, navigate second, and communicate with ATC last. The pilot shall brief what shall follow the missed approach procedure if it is initiated. (i.e. vectors for another approach, clearance to the alternate). Formulate a plan and fly it. Multiple approaches in deteriorating conditions is rarely a safe plan of action. Do not wait until the MAP to decide, have a plan and execute it. Before continuing to the alternate airport: the Pilot shall re-confirm weather conditions and ascertain that conditions are still suitable for a successful approach and landing and fuel reserves are adequate.

Holding Procedures

When notified of a "slowdown" or "hold" by ATC, the pilot should determine the nature of the hold (i.e. weather, traffic, airport closure). Understanding the reason for the hold will greatly aid in determining whether the clearance should be accepted. The pilot should monitor the fuel gauges and mentally note fuel used as well as fuel remaining. During extended holding, delayed arrival, or a situation that could jeopardize the safety of the flight arises, the pilot should determine the fuel remaining and make a calculated decision. Based on the fuel calculations, ATC must be notified when fuel reserves are deemed insufficient for the remaining flight. If the fuel remaining is insufficient, and the pilot is unable to receive priority, declare an emergency. Remember: an EFC usually is an indication of an extended hold. The pilot should obtain the latest alternate weather and have charts and approach plates organized and available in case a reroute becomes necessary.

# 4. Emergency Operations

**Objective**
To develop the pilot's knowledge of the elements related to emergencies, abnormal procedures, system and equipment malfunctions appropriate to the Cessna 152 and 172S. The pilot should be able to analyze various situations and take appropriate action for simulated emergencies and malfunctions in which they may encounter.

**Description**
This chapter outlines and explains in detail the various emergencies, abnormal procedures, system and equipment malfunctions appropriate to the Cessna 152 and 172S.

**Checklist Usage**
- The boxed items in the Emergency Procedures section of the Cessna Checklists are memory items. Memory items are items that must be committed to memory and completed without reference to the checklist. However, once the items have been completed, the checklist should be referenced to ensure proper completion.
- Non-boxed items are do-lists to be completed when time and altitude permit.

**References**
Airplane Flying Handbook
Cessna Model 152 Pilot's Operating Handbook
Cessna Model 172S Pilot's Operating Handbook
Cessna 172S Checklist – Emergency Procedures

## 4.1 EMERGENCY PROCEDURE: Emergency Approach and Landing

**Objective**
The objective of a simulated emergency landing is to develop the pilot's accuracy, judgment, planning, procedures, and confidence when little or no power is available.

**Description**
The airplane is flown from the point of simulated engine failure to where a safe landing could be made utilizing proper emergency cockpit procedures.

**Teaching Considerations**
- Stall and spin awareness.
- Best glide and configuration.
- Selecting a suitable landing area.
- Establishing a stabilized approach.
- The use and completion of appropriate Emergency Checklists.
- Wind effect on glide distance.
- Assessing priorities and division of attention.
- Common errors as per the Airplane Flying Handbook and the CFI PTS.

**Set-up**
- Establish and maintain best glide airspeed, with the appropriate configuration for the simulated emergency.
- Trim the airplane to maintain best glide airspeed.
- Select a suitable landing area within gliding distance.

**Execution**
- Plan and follow a flight pattern to the selected landing area while considering altitude, wind, terrain, obstructions, and other factors.
- Plan the approach to arrive at the downwind position abeam the selected landing area at 1,000 feet AGL.
- Follow the appropriate Emergency Checklist.
- Maintain positive control of the airplane.
- Fly the approach as close to a normal power-off 180° approach as possible.

**Recovery**
- Conduct a normal go-around procedure.
- Recoveries must be made no lower than 500 feet AGL unless a stabilized approach and landing can be made at an approved airport.
- Approach and landings at an approved airport during this maneuver can only be attempted on dual flights.

## 4.2 EMERGENCY PROCEDURE: Engine Failure - During Takeoff Roll

**Indications/Recognition**
A loss of power, annunciator illumination, or any abnormality before rotation constitutes a reason for a rejected Takeoff.

**Teaching Considerations**
- If simulating this emergency, it must be performed within the first 1/3 of the runway.
- Throttle – Idle - The throttle should be in the idle position to prevent un-commanded power increases or surges.
- Brakes – As Required - To stop the aircraft, to maintain directional control on the remaining runway, and to prevent movement if the engine were to restart.
- Engine – Shutdown if Necessary - If it is necessary to shut down the engine:
    - Flaps – Retract - This prevents the aircraft from inadvertent liftoff.
    - Mixture – Idle/Cut-Off
    - MAGNETOS Switch – Off
    - STBY BATT Switch (G1000) – Off
    - MASTER Switch (ALT & BAT) – Off

## 4.3 EMERGENCY PROCEDURE: Engine Failure - Immediately After Takeoff

**Indications/Recognition**
A loss of power, annunciator illumination, or any abnormality after rotation constitutes an engine failure immediately after takeoff.

**Teaching Considerations**
- Stall/spin awareness.
- Selecting a safe landing site.
- The use and completion of appropriate Emergency Checklists.
- Airspeed – Maintain Safe Airspeed - Maintain an airspeed, aircraft control, and situational awareness that allows for a safe landing.
- Engine – Shutdown - To prevent any further damage to the engine or the possibility of fire.
    - Mixture – Idle/Cut-Off
    - FUEL SHUTOFF Valve – Off
    - MAGNETOS Switch – Off
    - Flaps – As Required (FULL recommended)
    - STBY BATT Switch (G1000) – Off
    - MASTER Switch (ALT & BAT) – Off
- Cabin Door – Unlatch - This prevents the door from jamming closed if a rough landing should occur.
- Land – Straight Ahead

## 4.4 EMERGENCY PROCEDURE: Engine Failure - Flight

**Indications/Recognition**
A loss of power, engine roughness, and/or abnormal engine instrument readings could lead to an engine failure in cruise flight.

**Teaching Considerations**
- If the engine failure was caused by water in the fuel, it will take a short period of time to be used up. Fuel flow pressure indications will be normal.
- Maintain positive aircraft control and situational awareness throughout the emergency.
- The use and completion of appropriate Emergency Checklists.
- Airspeed – Best Glide
- FUEL SHUTOFF Valve – On - Engine failure could be caused by fuel starvation or contamination.
- Fuel Selector Valve (C172) – Both - Engine failure could be caused by fuel starvation from running one tank dry.
- FUEL PUMP Switch (C172) – On - A lack of fuel pressure may have caused the engine failure.
- Mixture – Rich (if restart has not occurred) - A too lean mixture can starve the engine of fuel, enriching the mixture ensures an adequate fuel flow.
- MAGNETOS Switch – Both (or Start if propeller is stopped) - If the propeller is windmilling, the engine will restart automatically within a few seconds. If the propeller has stopped (possible at low speeds), turn the ignition switch to START, advance the throttle slowly from idle and lean the mixture from full rich as required for smooth operation.
- Engine Instruments – Check - Check for an indication of the cause of the power loss.
- MAGNETOS Switch – Check - Turn the switch to L then R then back to Both. Loss of power or engine roughness could be caused by a bad magneto.
- FUEL PUMP Switch (C172) – Off - If the fuel flow indicator drops to zero (indicating an engine-driven fuel pump failure), return the fuel pump switch to the on position.
- Power not restored: Proceed to Power-Off Landing Checklist.
- Power restored: Land as Soon as Practical.

## 4.5 EMERGENCY PROCEDURE: Power-Off Landing

**Objective**
This procedure is appropriate if power is not restored after an engine failure inflight.

**Teaching Considerations**
- Undershooting and overshooting the selected emergency landing area.
- Plan the approach to arrive at the downwind position abeam the selected landing area at 1,000 feet AGL.
- The use and completion of appropriate Emergency Checklists.
- Airspeed – Best glide airspeed, ensures maximum power-off glide performance.
- Place to Land – Pilot Option - Select a suitable landing site as soon as possible while keeping glide distance in mind.
- Pilot & Passenger Seat Backs – Most Upright Position - This ensures that the seat belts and airbags are effective in restraining the occupants.
- Seats & Seat Belts – Secure - Belts/Harness should be secure to prevent injury.

If Time and Altitude Permit:
- Transponder – 7700 - ATC should recognize the squawk code and provide emergency assistance.
- Radio – Transmit - Transmit "MAYDAY, MAYDAY, MAYDAY" and state your position, altitude, persons on board, and intentions on 121.5 or the ATC frequency that is in use.
- ELT – On - This sends out the signal that allows rescue crews to locate the aircraft.

To reduce the chance of fire upon landing:
- Throttle – Idle
- Mixture – Idle/Cut-Off
- FUEL SHUTOFF Valve – Off
- MAGNETOS Switch – Off
- Flaps – As Required - Full flaps should be used to enable a touchdown speed that is as slow as possible. This helps minimize damage to the aircraft and reduce the risk of injury.
- STBY BATT Switch (G1000) – Off
- MASTER Switch (ALT & BAT) – Off
- Cabin Doors – Unlatch Prior to Touchdown - This prevents the door from jamming closed if a rough landing should occur.
- Approach Speed – Best Glide - The final approach speed should be best glide, appropriate for flap position, with the touchdown speed as slow as possible given the landing conditions.

## 4.6 EMERGENCY PROCEDURE: Precautionary Landing with Engine Power

**Objective**
This procedure is appropriate when landing off airport, with the engine still producing power.

**Teaching Considerations**
- Understanding of when a precautionary landing may be necessary.
- Stall and spin awareness.
- Selecting a suitable landing area.
- Establishing a stabilized approach.
- The use and completion of appropriate Emergency Checklists.
- Assessing priorities and division of attention.
- Pilot & Passenger Seat Backs – Most Upright Position - This ensures that the seat belts and airbags are effective in restraining the occupants.
- Seats & Seat Belts – Secure - Belts/Harness should be secure to prevent injury.
- Airspeed – Best Glide
- Flaps – 20° - This provides sufficient lift at the lower speeds used during an inspection of the intended off airport landing site.
- Selected Field – Fly over - Inspect for obstructions and terrain.
- Flaps – FULL - When on final approach.
- Airspeed – Approach Speed
- STBY BATT Switch (G1000) – Off
- MASTER Switch (ALT & BAT) – Off
- Cabin Doors – Unlatch Prior to Touchdown - This prevents the door from jamming closed if a rough landing should occur.
- Mixture – Idle/Cut-Off - This reduces the possibility of a fire in the event of a hard landing.
- MAGNETOS Switch – Off - This reduces the possibility of a fire in the event of a hard landing.
- Brakes – Apply heavily - Avoid brake lock up.

## 4.7 EMERGENCY PROCEDURE: Ditching

**Objective**
This procedure is appropriate if an emergency water landing is necessary.

**Teaching Considerations**
- Use of personal flotation devices and life rafts.
- Emergency egress procedures in case the aircraft capsizes inverted.
- The necessity of touching down at the established rate of descent and not in a landing flare.
- Transponder – 7700 - ATC should recognize the squawk code and provide emergency assistance.
- Radio – Transmit - "MAYDAY, MAYDAY, MAYDAY" on 121.5. Include the aircraft's location, pilot's intentions, and then squawk 7700 on the transponder.
- Heavy Objects – Secure or Jettison - Water landing impacts are generally harder than on land, therefore heavy objects can easily be thrown around the cabin.
- Pilot and Passenger Seat Backs – Most Upright Position - This ensures that the seat belts and airbags are effective in restraining the occupants.
- Seats & Seat Belts – Secure - Belts/Harness should be secure to prevent injury.
- Flaps – Pilot's Discretion - 20° or FULL at pilot's discretion.
- Power – 300 FPM Descent at 55 KIAS

NOTE: If no power is available, approach at best glide, appropriate for flap position.

- Approach
    - High Winds, Heavy Seas - Into the Wind
    - Light Winds, Heavy Swells - Parallel to the Swells
- Cabin Doors – Unlatch - This prevents the door from jamming closed in the event of high impact forces.
- Touchdown – Level attitude - at the established rate of descent.
- Occupants Heads – Cushion at touchdown (with folded coat) - Cushion at touchdown with folded coats, cushions, etc.
- ELT (C172) – Activate
- Airplane – Evacuate through the cabin doors - If necessary, open the window and flood the cabin to equalize pressure so doors can be opened.
- Life Vests & Raft – Inflate when clear of airplane - If a life vest is inflated when still in the cabin, the flotation of the vest may trap the occupant against the uppermost portion of the cabin.

## 4.8 EMERGENCY PROCEDURE: Engine Fire - Start

**Indications/Recognition**
- Flames and smoke coming from the engine cowl.
- Heat and the smell of smoke in the cockpit.

**Teaching Considerations**
- Proper priming technique.
- Proper starting technique.
- Determining electrical vs. engine fire.
- MAGNETOS Switch – Start, continue cranking - This causes the excess fuel in the induction system to be drawn into the cylinders.

If Engine Starts:
- Power – 1800 RPM For a Few Minutes
- Engine – Shutdown. Inspect For Damage.

If Engine Does NOT Start:
- MAGNETOS Switch – Start, Continue Cranking - This causes the excess fuel in the induction system to be drawn into the cylinders.
- Throttle – Full Open - This opens the throttle valve in the induction system, allowing for maximum airflow, drawing the fuel and fire into the cylinders.
- Mixture – Idle/Cut-Off - This stops the fuel flowing into the fuel injection system.
- FUEL SHUTOFF Valve – Off - This cuts off the fuel source for the fire and prevents the fire from spreading to the fuel tanks.
- FUEL PUMP Switch (C172) – Off - This prevents more fuel from being pumped to the fire.
- MAGNETOS Switch – Off
- STBY BATT Switch – Off
- MASTER Switch (ALT & BAT) – Off

If fire continues:
- Evacuate passengers and extinguish the fire using all available means.

## 4.9 EMERGENCY PROCEDURE: Engine Fire - Flight

**Indications/Recognition**
- Flames and smoke coming from the engine cowl.
- Heat and the smell of smoke in the cockpit.

**Teaching Considerations**
- Procedures for extinguishing a fire during flight.
- Location of nearest suitable airport/emergency landing location.
- Determining electrical vs. engine fire.

To prevent more fuel from being pumped to the fire:
- Mixture – Idle-Cut/Off
- FUEL SHUTOFF Valve – Off
- FUEL PUMP Switch (C172) – Off
- MASTER Switch (ALT & BAT) – Off
- Cabin Vents – Open
- CABIN HT/Air Control Knobs – Off (push full in) - Smoke and toxic fumes from the burning materials can enter the cabin through the environmental outlets.
- Airspeed – 100 KIAS - If the fire is not extinguished, increase glide speed to find an airspeed, within airspeed limitations, which provides an incombustible mixture.
- Forced Landing – Execute
- Proceed to Power-Off Landing Checklist.

## 4.10 EMERGENCY PROCEDURE: Cabin Fire

**Indications/Recognition**

- Flames or smoke from inside the cabin with no smell of burning wire insulation.

**Teaching Considerations**

- Determining electrical vs. engine fire.
- Use of fire extinguisher inflight (Halon).
- STBY BATT Switch (G1000) – Off
- MASTER Switch (ALT & BAT) – Off - To shut down the electrical system to end the source of the fire.
- Cabin Vents – Closed - This prevents drafts that may increase the fire's intensity.
- CABIN HT/Air Control Knobs – Off (push full in) - Smoke and toxic fumes from the burning materials can enter the cabin through the environmental outlets.
- Fire Extinguisher – Activate - The fire extinguisher should be used to eliminate the fire. Use caution when using the fire extinguisher.

NOTE: After the fire extinguisher has been used, ensure the fire has been extinguished before exterior air is used to remove smoke from the cabin.

- Cabin Vents – Open - This ventilates any toxic fumes from the fire and the halon from the extinguisher.
- CABIN HT/Air Control Knobs – On (pull full out) - This ventilates any toxic fumes from the fire and the Halon from the extinguisher.
- Land as Soon as Possible to inspect for damage.

## 4.11 EMERGENCY PROCEDURE: Wing Fire

**Indications/Recognition**
- Flames and/or smoke coming from the wing.

**Teaching Considerations**
- Procedures for extinguishing a fire during flight.
- Location of the nearest suitable airport/emergency landing location.
- LAND Light Switch (C172) – Off
- TAXI Light Switch (C172) – Off
- NAV Light Switch – Off
- STROBE Light Switch – Off
- PITOT HEAT Switch – Off
- Land as soon as possible, using flaps only as required for final approach & touchdown.
- Perform a sideslip to keep the flames away from the fuel tank and cabin.

## 4.12 EMERGENCY PROCEDURE: Electrical Fire - Flight

**Indications/Recognition**

- An electrical fire is noted through smoke, smell and heat in the cabin.
- Electrical fire produces a smell of wire insulation burning.

**Teaching Considerations**

- Determining electrical vs. engine fire.
- Use of fire extinguisher inflight (Halon).
- STBY BATT Switch (G1000) – Off
- MASTER Switch (ALT & BAT) – Off - To shut down the electrical system to eliminate the source of the fire.
- Cabin Vents – Closed - This prevents drafts that may increase the fire's intensity.
- CABIN HT/Air Control Knobs– Off (push full in) - Smoke and toxic fumes from the burning materials can enter the cabin through the environmental outlets.
- Fire Extinguisher – Activate - The fire extinguisher should be used to eliminate the fire. Use caution when using the fire extinguisher (i.e. Halon fumes are toxic).
- AVIONICS Switch (Bus 1 & 2)(G1000) – Off
- All Switches – Off (Except MAGNETOS)

NOTE: After the fire extinguisher has been used, ensure the fire has been extinguished before exterior air is used to remove smoke from the cabin.

When the pilot is sure that the fire is completely extinguished:

- Cabin Vents – Open - This ventilates any toxic fumes from the fire and the halon from the extinguisher.
- CABIN HT/Air Control Knobs – On (pull full out) - This ventilates any toxic fumes from the fire and the halon from the extinguisher.

If fire appears out and electrical power is necessary:

- Circuit Breakers – Do not reset - If any circuit breakers popped, it could mean that it was the cause of the fire. Resetting the circuit breaker could re-ignite the fire.
- MASTER Switch (ALT & BAT) – On - This restores power to the essential bus. If fire appears again turn the MASTER switch off and proceed without electrical power.
- STBY BATT Switch (G1000) – ARM
- AVIONICS Switch (BUS 1 & 2)(G1000) – On, One at a Time - Turn electrical components on one at a time as needed, checking for signs of a fire after each item.
- Land as Soon as Practical.

## 4.13 EMERGENCY PROCEDURE: HIGH VOLTS Annunciator On or Overvoltage

**Indications/Recognition**

- An abnormally high alternator output of more than 40 amps or the illumination of the HIGH VOLTS annunciator.

**Teaching Considerations**

- Importance of a proper instrument scan, including engine gauges.
- Reduction of electrical loads during operations using the battery only.
- MASTER Switch (ALT) – Off - Turning the alternator off protects the voltage regulator from damage. All electrical systems will now be powered by the battery and standby battery.
- Electrical Load – Reduce immediately as follows:
- AVIONICS Switch (BUS 1)(G1000) – Off
- PITOT HEAT Switch – Off
- BEACON Light Switch – Off
- LAND Light Switch – Off
- TAXI Light Switch – Off
- NAV Light Switch – Off
- STROBE Light Switch – Off
- CABIN PWR 12V Switch (C172) – Off
- Land as Soon as Practical – Make sure a successful landing is possible before extending the flaps. The flap motor is a large electrical load during operation.

NOTE (G1000): The main battery supplies electrical power to the main and essential buses until M BUS VOLTS decreases below 20 volts. When M BUS VOLTS drops below 20 volts, the standby battery system automatically supplies electrical power to the essential bus for a minimum 30 minutes.

NOTE (G1000): Select COM 1 MIC and NAV 1 on the audio panel and tune to the active frequency before setting AVIONICS BUS 2 to off. If COM 2 MIC and NAV 2 are selected when AVIONICS BUS 2 is set to off, the COM and NAV radios cannot be tuned.

- COM 1 & NAV 1 – Tune to the active frequency.
- COM 1 MIC & NAV 1 – Select - COM 1 MIC and NAV 2 will be inoperative once the AVIONICS BUS 2 switch is turned off.
- AVIONICS Switch (BUS 2) – Off (keep on if in clouds) - Keep the switch on if in IMC conditions.

NOTE (G1000): The following systems will not operate when the AVIONICS BUS 2 switch is set to off:

- Audio Panel
- COM 2
- NAV 2
- Transponder
- MFD
- Autopilot (if installed)

## 4.14 EMERGENCY PROCEDURE: Electrical Failure

**Indications/Recognition**
- A zero reading on the voltmeter indicating a loss of alternator output.
- LOW VOLTS Annunciator illuminated (C172).

**Teaching Considerations**
- Importance of a proper instrument scan, including engine gauges.
- Reduction of electrical loads during operations using the battery only.
- LOW VOLTS ANNUNCIATOR ILLUMINATED AT OR BELOW 1000 RPM
- Throttle – 1000 RPM minimum
- LOW VOLTS Annunciator – Check Off

LOW VOLTS ANNUNCIATOR REMAINS ILLUMINATED
- ON THE GROUND – DO NOT fly the aircraft - Have maintenance personnel inspect the electrical system prior to the next flight.
- IN THE AIR – Proceed to the Low Volts Annunciator Illuminated Above 1000 RPM Checklist

LOW VOLTS ANNUNCIATOR ILLUMINATED ABOVE 1000 RPM
- MASTER Switch (ALT only) – Off
- ALT FIELD Circuit Breaker – Check In
- MASTER Switch (ALT & BAT) – On - Turning off the ALT master switch and then turning it back on resets the overvoltage protection relay.
- LOW VOLTS Annunciator (C172) – Check Off
- M BUS VOLTS – Check for 27.5 volts (minimum)
- M BATT AMPS – Check charging (+)

IF LOW VOLTS ANNUNCIATOR REMAINS ILLUMINATED
- MASTER Switch (ALT) – Off. Turning the alternator off protects the voltage regulator from damage. All electrical systems will now be powered by the battery and standby battery.
- Electrical Load – Reduce immediately as follows:
- AVIONICS Switch (BUS 1)(G1000) – Off
- PITOT HEAT Switch – Off
- BEACON Light Switch – Off
- LAND Light Switch – Off
- TAXI Light Switch – Off
- NAV Light Switch – Off
- STROBE Light Switch – Off
- CABIN PWR 12V Switch (C172) – Off
- COM 1 & NAV 1 – Tune - Tune to the active frequency.
- COM 1 MIC & NAV 1 (G1000) – Select - COM 1 MIC and NAV 2 will be inoperative once the AVIONICS BUS 2 switch is turned off.
- AVIONICS Switch (BUS 2)(G1000) – Off (keep on if in clouds) - Keep the switch on if in IMC conditions.
- Land as Soon as Practical – Make sure a successful landing is possible before extending the flaps. The flap motor is a large electrical load during operation.

NOTE (C172): Main battery life can be extended by setting the MASTER switch to off and operating the equipment on the ESS BUS from the standby battery. Turn on main battery later for operation of the flaps and lights.

NOTE (C172): The main battery supplies electrical power to the main and essential buses until M BUS VOLTS decreases below 20 volts. When M BUS VOLTS drops below 20 volts, the standby battery system automatically supplies electrical power to the essential bus for a minimum 30 minutes.

NOTE (G1000): Select COM 1 MIC and NAV 1 on the audio panel and tune to the active frequency before setting AVIONICS BUS 2 to off. If COM 2 MIC and NAV 2 are selected when AVIONICS BUS 2 is set to off, the COM and NAV radios cannot be tuned.

NOTE: The following systems will not operate when the AVIONICS BUS 2 switch is set to off:

- Audio Panel
- COM 2
- NAV 2
- Transponder
- MFD
- Autopilot (if installed)

## 4.15 EMERGENCY PROCEDURE: Emergency Descent

**Description**
An emergency descent is a maneuver for descending as rapidly as possible to a lower altitude or to reach the ground quickly for an emergency landing.

**Teaching Considerations**
- Aircraft limitations.
- Appropriate recovery altitude for simulated emergency descents.

**Set-up**
- Throttle – Idle - Reducing the throttle to idle allows a steep descent angle without building excessive airspeed.
- Mixture – Rich - The mixture should be set to the full rich position to prevent too lean a mixture during the descent.
- Bank – 30°- 45° - A steep bank greatly decreases the vertical component of lift, allowing the pilot to quickly establish a steep descent angle while maintaining positive load factors (G-forces) on the airplane.
- FUEL PUMP Switch (C172) – On - Turning on the electric fuel pump ensures adequate fuel pressure throughout the maneuver.
- Rollout – Upon Obtaining VNO - Upon reaching VNO, the wings can be returned to level for the remainder of the descent.

NOTE: In the event of an engine fire the mixture should be idle/cut-off and the fuel pump (C172) turned off.

## 4.16 EMERGENCY PROCEDURE: Spin Recovery

**Indications/Recognition**
- Stalled condition.
- One wing often drops, then the nose yaws in the direction of the low wing.
- Rolling about longitudinal axis.

**Teaching Considerations**
- Different phases of a spin.
- CG location.
- Overstressing the aircraft.
- Spin aerodynamics.
- Flight situations where unintentional spins may occur.

**Execution**
- Throttle – Idle - Throttle at idle aids in lowering the nose to recover from the stall.
- Ailerons – Neutral - Ailerons remain neutral as not to aggravate the spin.
- Rudder – Full Opposite Direction of Rotation - Use the turn coordinator and/or outside references to determine the direction of rotation. Full opposite rudder should stop the rotation of the spin.
- Control Wheel – Briskly Forward - Lower the nose to reduce the angle of attack to recover from the stalled condition.

When Rotation Stops:
- Rudder – Neutral - To prevent the aircraft from spinning in the opposite direction.
- Control Wheel – As Required - Use control wheel as required to pull out of the dive, recovering as required.
- Throttle – As Required - Resume normal cruise flight.

## 4.17 EMERGENCY PROCEDURE: Inadvertent Icing Encounter

**Indications/Recognition**
• Formation of ice on the windshield, wings, and stabilizers.

**Teaching Considerations**
- Definition of known icing conditions.
- Determination of where icing conditions may exist.
- Exit strategies in the case of an icing encounter.
- PITOT HEAT Switch – On. This prevents ice buildup on the pitot tube and subsequent loss of airspeed information.
- Maneuver – Exit icing conditions - Exit icing conditions by turning back or changing altitude to obtain an outside air temperature that is less conducive to icing.
- CABIN HT Control Knob – On (pull full out) - This prevents ice buildup on the windshield.
- Defroster Control Outlets – Open - This prevents ice buildup on the windshield.
- CABIN AIR Control Knob – Adjust - To obtain maximum defroster heat and airflow.

Watch for signs of induction air filter icing. A loss of engine RPM could be caused by ice blocking the air intake filter. Adjust the throttle as required to hold engine RPM. Adjust mixture as required for any change in power settings. If the induction air filter is blocked, a spring loaded alternate air door inside the cowling automatically opens. Use of alternate air results in an approximate 10 percent loss of power.

Plan a landing at the nearest airport. With an extremely rapid ice build-up, select a suitable off-airport landing site. With an ice accumulation of 0.25 inch or more on the wing leading edges, be prepared for significantly higher power requirements, higher approach and stall speeds, and a longer landing roll.

Leave flaps retracted. With a severe ice build-up on the horizontal tail, the change in wing wake airflow direction caused by flap extension could result in a loss of elevator effectiveness. Open the left window and, if practical, scrape ice from a portion of the windshield for increased visibility in the landing approach.

Perform a landing approach using a forward slip, if necessary, for improved visibility. Approach at 65 to 75 KIAS depending upon the amount of ice accumulation. Perform the landing in a level attitude.

Missed approaches should be avoided whenever possible because of the severely reduced climb capability.

## 4.18 EMERGENCY PROCEDURE: PFD - Loss of Air/Attitude Data (G1000)

**Indications/Recognition**

- In the event the PFD detects a loss of air data, the affected indicator is removed from the display and replaced with a red "X".
- In the event the PFD detects a loss of attitude data, the affected indicator is removed from the display and replaced with a red "X".

**Teaching Considerations**

- AHRS/ADC system and functions.
- Vacuum and pitot/static systems and functions.

Loss of Air Data:

- Standby Instruments (altitude, airspeed) – Monitor
- ADC /AHRS Circuit Breakers – Check In. If the circuit breakers are open, reset (close) the breakers. If the circuit breaker reopens, DO NOT reset.
- Exit IMC
- Land as Soon as Practical.

Loss of Attitude Data:

- Standby Attitude Indicator – Use for Attitude information
- Non-Stabilized Magnetic Compass – Use for Heading information
- ADC /AHRS Circuit Breakers – Check In. If the circuit breakers are open, reset (close) the breakers. If the circuit breaker reopens, DO NOT reset.
- Exit IMC
- Land as Soon as Practical.

## 4.19 ABNORMAL PROCEDURE: Fuel Flow Stabilization Procedures (C172)

**Indications/Recognition**

- Loss of fuel pressure.
- Rough sounding engine.
- Fuel flow fluctuations of 1 GPH or more, or power surges occurring.

**Teaching Considerations**

- Possible causes for loss of fuel pressure.
- Selecting the closest suitable airport or landing site.
- Selecting the opposite tank.
- FUEL PUMP Switch – On - Loss of fuel pressure may be the result of an engine driven fuel pump failure. Turning the electrical fuel pump on should restore the normal fuel pressure.
- Mixture – Adjust as required for maximum engine smoothness.
- Fuel Selector Valve – Select opposite tank - Loss of fuel pressure may be indicative of an empty fuel tank. Switching fuel tanks to one with fuel may restore the needed fuel pressure.

NOTE: It may take up to 10 seconds for the fuel to fill the lines.

- FUEL PUMP Switch – Off - After fuel flow has stabilized, the fuel pump switch can be turned off.

## 4.20 ABNORMAL PROCEDURE: Low Oil Pressure

**Indications/Recognition**
- Low reading on oil pressure gauge.
- Oil pressure annunciator may be illuminated.
- High oil temperature reading.

**Teaching Considerations**
- Reasons for partial or complete loss of oil pressure.
- Selecting the closest suitable airport or landing site.
- Annunciator Light (C172) – Check for Illumination
- Oil Pressure Gauge – Check - A low or zero reading on the oil pressure gauge could indicate a failure of the oil pump or loss of engine oil. An abnormal reading could also be the result of a faulty gauge. Always cross-check with the annunciator light (C172) and oil temperature gauge.
- Oil Temperature Gauge – Check - Failure of the oil pump, or a loss of oil results in an increase in oil temperature.
- Prepare for a power-off landing – The engine may stop suddenly without engine oil. Maintain altitude until such time as a dead stick landing can be accomplished. Don't change power settings unnecessarily, as this may hasten complete power loss. Depending on the circumstances, it may be advisable to make an off airport landing while power is still available.

## 4.21 ABNORMAL PR OCEDURE: High Oil Temperature

**Indications/Recognition**
- High temperature reading on the oil temperature gauge.
- Low reading on the oil pressure gauge.

**Teaching Considerations**
- Cooling techniques.
- Selecting the closest suitable airport or landing site.
- Reasons for partial or complete loss of oil pressure.
- Mixture – Rich - A lean cruise mixture can cause excessive heating of the engine resulting in high oil temperatures.
- Enriching the mixture can help cool the engine.
- Throttle – Reduce - High power setting can overheat an engine, especially if flying in hot ambient temperatures.
- Reducing the power can help cool the engine.
- Oil Pressure Gauge – Check - A low or zero reading on the oil pressure gauge could indicate a failure of the oil pump or loss of engine oil. Since oil is needed to cool the engine, a loss of it may result in high oil temperatures.
- This indication could also be the result of a faulty gauge.
- Oil Temperature – Check - If still reading high, a loss of oil pressure could be the reason.
- Prepare for a power-off landing - High engine oil temperature due to the loss of oil may cause the engine to stop suddenly. Maintain altitude until such time as a power-off landing is possible, should it be necessary. Don't change power settings unnecessarily, as this may hasten complete power loss. Depending on the circumstances, it may be advisable to make an off airport landing while power is still available.

## 4.22 ABNORMAL PROCEDURE: Engine Roughness

**Indications/Recognition**
- A loss in engine RPM.

**Teaching Considerations**
- Selecting the closest suitable airport or landing site.
- The effect of atmospheric conditions on engine performance.
- Mixture – Adjust for Maximum Smoothness - An excessively rich or lean mixture may cause a rough running engine. Adjusting the mixture for maximum smoothness may solve the problem.
- FUEL PUMP Switch (C172) – On - A faulty engine driven fuel pump can affect the fuel flow to the engine, causing it to run rough. Turning on the electric fuel pump should restore the normal fuel flow.
- FUEL SHUTOFF Valve – On
- Fuel Selector Valve (C172) – Switch Tanks - Fuel contamination, fuel line blockage, or fuel starvation can cause a rough-running engine. Switching to the other fuel tank may remedy the situation.
- Engine Gauges – Check - The engine gauges may reveal a cause of the rough running engine.
- MAGNETOS Switch – L then R then Both - A faulty magneto reduces the efficiency of the ignition process, resulting in a rough running engine.
- If operation is satisfactory on either magneto, proceed on that magneto at reduced power with mixture full rich to the nearest airport.
- If roughness persists – prepare for power-off landing.

## 4.23 ABNORMAL PROCEDURE: Open Door

**Indications/Recognition**
- In-flight, a noise or breeze coming from the sides of the cockpit and visually determining the door latch is not engaged. This usually happens shortly after takeoff.

**Teaching Considerations**
- Normally, open doors occur right after takeoff.
- If the door cannot be latched, find the nearest airport and land, latch the door and continue the flight.
- Fly the aircraft first.
    - A partially open door does not affect normal flight characteristics.
    - A normal landing can be made with the door open.
- Latch cabin doors is an item on both the Before Start and the Before Takeoff Checklists.
- Maintain situational awareness while attempting to latch the door.
- Airspeed – Reduce - The slipstream makes it difficult to close the door. Slowing down reduces the pressure differential, making it easier to close and latch the door.
- Cabin Vents – Close - Air entering the cabin vents increases the cabin pressure, which pushes out on the door.
- Window – Open - Slipstream past the storm window decreasing cabin pressure.
- Side Latch (If Open)(C172) – Pull on armrest and move latch handle to latched position.

## 4.24 ABNORMAL PROCEDURE: Loss of Vacuum Pressure

**Indications/Recognition**

- A loss of vacuum pressure would be noted by the illumination of the LOW VACUUM annunciator light (C172) as well as a low reading on the vacuum suction gauge.

**Teaching Considerations**

- Partial panel operations.
- Effects on instrument indications.
- Vacuum Indicator (VAC) – Check vacuum suction gauge and make sure vacuum pointer is in green band limits. If the vacuum pointer is out of the green band during flight or the gyro flag is shown on the attitude indicator, the attitude indicator must not be used for attitude information.

## 4.25 ABNORMAL PROCEDURE: Pitot/Static Blockages

**Indications/Recognition**

- The pitot/static instruments read incorrectly, seem frozen, or fall to zero.

**Teaching Considerations**

- Errors that occur when using an alternate static source.
- Partial panel operations.
- Effects on instrument indications.
- PITOT HEAT Switch – On - This melts any ice formation on the pitot tube.
- ALT STATIC AIR Valve (C172) – Open - This uses air from inside of the cabin to feed the instruments static air pressure.
- Cabin Vents – Closed
- CABIN HT/Air Control Knobs – On (pull full out)
- Flight Instruments – Scan/Monitor - Make sure to monitor all other flight instruments and fly the aircraft.
- Airspeed – Refer to POH - Airspeed Calibration, Alternate Static Source correction chart.

## 4.26 ABNORMAL PROCEDURE: Loss of Communications

**Indications/Recognition**

- Failure to communicate through the radio with outside sources.

**Teaching Considerations**

- Lost communications during VFR/IFR conditions.
- Alternate courses of action.
- Attempting to use different frequencies.
- Faulty push-to-talk switch: Trying the button on the other control wheel.
- Setting audio panel to speaker.
- Use of the hand-held mic.
- Radios – Switch
- Circuit Breakers – Check. If a breaker has popped, do not reset.
- Volume – Check and set to adequate level
- Transponder – Squawk 7600 - This alerts ATC to the communications failure.
- Proceed as required for VFR or IFR conditions.
- Alternate courses of action:
    - Attempt to use different frequencies.
    - Faulty push-to-talk switch; try the button on the other control wheel.
    - Set audio panel to speaker.
    - Use the hand-held mic.
    - Use your cell phone, if available.

## 4.27 ABNORMAL PROCEDURE: Landing with a Flat Tire

**Indications/Recognition**
- Uncommanded loss of directional control with accompanying vibrations.

**Teaching Considerations**
- Possible causes of a flat tire.

Main Gear Flat:
- Runway Orientation – Land on the side of the runway corresponding to the good tire.
- Approach – Normal - Use a normal landing approach.
- Flaps – FULL
- Touchdown – Good main tire first (hold airplane off flat tire as long as possible with aileron control)
- Directional Control – Maintain (using rudder and brake on the good wheel as required)
- Taxi – Stop the airplane and perform a normal engine shutdown.

Nose Gear Flat:
- Runway Orientation – Land on center of runway.
- Approach – Normal - Use a normal landing approach.
- Flaps – FULL
- Touchdown – Main gear first (hold nosewheel off the ground as long as possible)
- Nose Wheel Touchdown – Maintain full up elevator as the airplane slows to a stop.
- Taxi – Stop airplane and perform a normal engine shutdown.

## 4.28 Emergency Equipment and Survival Gear

**Objective**
To develop the pilot's knowledge of the elements related to emergency equipment and survival gear appropriate to the aircraft and environment encountered during the flight.

**Description**
This section outlines the available emergency equipment and survival gear located in the Cessna 152/172.

**Teaching Considerations**
- Additional personal gear. (i.e., cell phone, credit card)
- Required winter clothing.
- Survival Kit
- Emergency Locator Transmitter (ELT)

.

# 5. Glossary of Abbreviations and Terms

Abeam: An aircraft is "abeam" a fix, point, or object when that fix, point, or object is approximately 90 degrees to the right or left of the aircraft track. Abeam indicates a general position rather than a precise point.
A/FD - Airport/Facilities Directory: An FAA Publication containing information on all airports, communications, and NAVAIDs.
AGL - Above Ground Level: Actual height above the ground.
Aiming Point: During the landing procedure it is the point on the ground at which, if the airplane maintains a constant glidepath and was not flared for landing, it would strike the ground.
Angle of Attack: The acute angle between the chord line of the airfoil and the direction of the relative wind.
CRM - Crew Resource Management: The effective use of all available resources: human resources, hardware, and information. Human resources include all groups routinely working with the cockpit crew or pilot who are involved with decisions that are required to operate a flight safely. These groups include, but are not limited to:

- dispatchers
- cabin crewmembers
- maintenance personnel
- air traffic controllers (ATC)
- weather services

CRM is not a single *task*, but a set of competencies that must be evident in all tasks. The principles of CRM should be applied to all operations regardless of whether tasks are done as a single pilot or as part of a crew.
Dead Reckoning: Navigation solely by means of computations based on the time, airspeed, distance, and direction.
Discrepancy: The term for an inoperative or defective piece of equipment.
DME - Distance Measuring Equipment
ELT - Emergency Locator Transmitter: A small, self-contained radio transmitter that automatically, upon the impact of a crash, transmits an emergency signal on 121.5, 243.0, or 406.0 MHz.
EPU - External Power Unit: An external battery used to crank the engine without having to gain access to the aircraft's battery.
FAF - Final Approach Fix: The fix from which an IFR final approach to an airport is executed, and which identifies the beginning of the final approach segment. An FAF is designated on government charts by the Maltese cross symbol for non-precision approaches, and the lightning bolt symbol for precision approaches.
Flight Controls:

- Ailerons
- Elevator/Stabilator
- Rudders
- Trim
- Flaps

Fuel Pump: An engine driven or electrically powered pump used to supply positive fuel pressure. The electric fuel pump should be turned on before switching tanks, and should be left on for a short period thereafter.
Go-Around Point: The point at which if the aircraft has not touched down under control, a go-around should be executed. NOTE: A go-around can be executed at any point during the landing phase as deemed necessary by the PIC.
GPS - Global Positioning System: A satellite-based radio positioning, navigation, and time-transfer system.
IAF - Initial Approach Fix: The fix depicted on Instrument Approach Procedure charts where the Instrument Approach Procedure begins unless otherwise authorized by Air Traffic Control.

Instruments:

- Flight Instruments:
  - Airspeed Indicator
  - Attitude Indicator (gyro)
  - Altimeter
  - VSI - Vertical Speed Indicator
  - Heading Indicator (directional gyro)
  - Turn Coordinator and Inclinometer (ball)
  - Magnetic Compass
- Radio Navigation Instruments :
  - VOR/LOC - VHF Omni-Directional Range/Localizer
  - ADF - Automatic Direction Finder
  - NDB - Non-Directional Radio Beacon
  - GPS - Global Positioning System
- Engine Instruments:
  - Tachometer
  - Fuel Quantity
  - Engine Gauge, Oil Temp, Oil and Fuel Pressure

IFR - Instrument Flight Rules: Rules and regulations established by the Federal Aviation Administration to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends on reference to instruments in the cockpit, and navigation by reference to electronic signals.
KIAS - Knots Indicated Airspeed
Land as soon as possible: Land at the nearest available landing site. If no airport is within gliding distance, an off-airport landing should be made.
Land as Soon as Practical: Divert to the nearest suitable airport.
MAP - Missed Approach Point: A point prescribed in each instrument approach at which a missed approach procedure shall be executed if the required visual reference has not been established.
MCA - Minimum Controllable Airspeed: An airspeed at which any further increase in angle of attack, increase in load factor, or reduction of power, would result in an immediate stall.
MDA - Minimum Descent Altitude: The lowest altitude (in feet MSL) to which descent is authorized on final approach, or during circle-to-land maneuvering in execution of a non-precision approach.
MEL - Minimum Equipment List: An inventory of instruments and equipment that may legally be inoperative, with specific conditions under which an aircraft may be flown with such items inoperative.
MFD - Multifunction Display
MSL - Mean Sea Level
MRA - Minimum Recovery Altitude: The lowest altitude expressed in feet (MSL or AGL) to which descent is authorized.
OAT - Outside Air Temperature
PFD - Primary Flight Display
PIC - Pilot in Command: The pilot who has final authority and responsibility for the operation and safety of the flight. They have authority over all decisions, are authorized to take control when they feel it is necessary for safety or instruction, and are responsible for determining safe flight.
Pilotage: Navigation by reference to landmarks or checkpoints.
POH - Pilot's Operating Handbook
PIM - Pilot Information Manual
PTS - Practical Test Standards
Pylons: An identifiable point on the ground marking a prescribed turning point used in some ground reference maneuvers.
Rotation: The act of applying control wheel back pressure to raise the nose-wheel off the ground.
Sink Rate: The rate at which the aircraft is descending.
Slips: An intentional maneuver to decrease airspeed or increase the rate of descent, and to compensate for a crosswind on landing.

Forward Slip: This slip moves sideways, the nose points into the wind, and is used to quickly decrease altitude without increasing airspeed.
Side Slip: This slip moves forward, the nose is aligned with the ground track, and is used to apply a crosswind correction during landing.
Slow Flight: Flight at any airspeed that is less than cruise. The PTS requires demonstration at MCA to feel the effects of airspeeds and configurations found in takeoffs, climbs, descents, etc., at which any increase in angle of attack, load factor, or a reduction in power would result in an immediate stall.
SRM - Single Pilot Resource Management: Single-Pilot Resource Management refers to the effective use of ALL available resources: human resources, hardware, and information. It is similar to Crew Resource Management (CRM) procedures that are being emphasized in multi-crewmember operations except that only one crewmember (the pilot) is involved.
TPA - Traffic Pattern Altitude: The altitude to be flown on the downwind leg of an airport traffic pattern. The AIM recommends adding 1,000 feet AGL to the field elevation, but generally ranges from 600-1,500 feet AGL.
Touchdown Point: The desired point on the runway where the aircraft should touch the ground. This should be a minimum of 200 feet past the threshold and within the first 1/3 of the runway.
VFR - Visual Flight Rules: Flight rules adopted by the FAA governing aircraft using visual references, VFR operations specify the amount of ceiling and the visibility the pilot must have in order to operate according to the rules. When the weather conditions are such that the pilot cannot operate according to VFR, he or she must use instrument flight rules (IFR).
V-Speeds

- VSO - Stalling Speed in landing configuration.
- VS - Stalling Speed at a specified configuration.
- VX - Best Angle-of-Climb Speed. The airspeed that delivers the greatest gain of altitude in the shortest distance.
- VGLIDE - Best Glide Speed.
- VY - Best Rate-of-Climb Speed. The airspeed that delivers the greatest gain in altitude in the shortest possible time.
- VA - Maneuvering Speed. The maximum speed at which full available aerodynamic control will not overstress the airplane.
- VFE - Maximum Flap Extended Speed.
- VNO - Maximum structural cruising speed.
- VNE - Never Exceed Speed.

Wake Turbulence: Wingtip vortices that are created when an airplane generates lift. When an airplane generates lift, air spills over the wingtips from the high pressure areas below the wings to the low pressure areas above them. This flow causes rapidly rotating whirlpools of air called wingtip vortices or wake turbulence.
Wind Shear: A sudden drastic shift in wind speed, direction, or both that may occur in the horizontal or vertical plane.