**DELAWARE STATE UNIVERSITY FLIGHT MANEUVERS STANDARDIZATION MANUAL**

**RECORD OF CHANGE PAGE**

All Instructors are required to possess the latest edition of the FMSM. Upon receipt of revisions to the FMSM, insert the new information into your Manual and affix your signature to the signature page found below. Your signature indicates that you:

1. Have received the updated documents
2. Reviewed the revised content

A revision bar will extend the full length of new or revised text and/or illustrations added on new or existing pages. This Bar will be located adjacent to the applicable revised area on the outer left margin of the page. All revised pages will carry the date of the revision on the applicable page.

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INTRODUCTION

The DSU Flight Standardization Manual is designed to standardize procedures for all flight maneuvers required by the current Training Course Outline. This manual should be used in conjunction with the FAA Airplane Flying Handbook (FAA-H-8083-3A) FAA Practical Test Standards (PTS), Aeronautical Information Manual (AIM), and the DSU Flight Operations Manual.

Safety is always our primary concern! Both the instructor and student must work together to ensure that every training flight is conducted at the highest level of operational safety. Throughout the student’s training, the flight instructor is responsible for emphasizing the performance of effective visual scanning and collision avoidance procedures. Most maneuvers listed in this manual require visual reference to the horizon while simultaneously interpreting instrument indications. However, fully utilizing outside visual references is critically important in developing a good habit pattern for collision avoidance and maintaining a safe flying environment.

BE SAFE – FLY SAFE!

Pitch attitudes and power settings contained in this manual represent approximate values and are provided simply as a means of assisting the pilot in attaining desired performance. Also, note that the airspeed(s) in the Arrow section of this manual are listed for the PA-28R-200 in MPH and for the PA-28R-201 in KIAS.

The Aviation Program encourages and welcomes your comments and suggestions to improve the quality of this manual. All recommendations should be submitted to the Chief Flight Instructor in writing. Please include a complete example of the suggest change with your revision recommendation.
PIPER WARRIOR AND WARRIOR II
PA-28-151 AND PA-28-161

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TRAFFIC PATTERN ARRIVAL

1-4

45° Entry Leg

5

Crosswind Leg

Departure Leg

Final Leg

Base Leg

Downwind Leg
TRAFFIC PATTERN ARRIVAL

Ref: FAA-H-8083-3A (Airplane Flying Handbook)
    Aeronautical Information Manual (AIM)

Objective: To develop the ability to safely and efficiently arrive at an uncontrolled
          airport, or after arrival, the procedure to utilize for traffic pattern
          operations.

1. Complete the Descent Checklist
2. At least 10 nm from the airport, attempt to determine the active runway

If the runway in use cannot be determined:

3. Over fly the airport at 1000’ above traffic pattern altitude to observe traffic, wind
direction indications, wind socks to determine a runway to use.

    NOTE
    Remain vigilant for other traffic

4. At least 2 nm from the runway enter the traffic pattern at traffic pattern altitude on
   a 45° entry to the downwind, maintaining a one-half mile distance from the
   runway on the downwind leg
5. Complete the appropriate approach and landing procedures checklist

    NOTE
    The above procedures assume an ideal pattern situation. Other traffic, ATC, local
    traffic pattern restrictions and noise abatement procedures, obstacles, etc., may
    require a modification of these procedures. In all cases, the pilot shall exercise
    good judgment and maintain positive airplane control

Standards
Private:
   Maintains proper spacing from other aircraft
   Maintains orientation with landing runway
   Maintains traffic pattern altitude ± 100 and ± 10 KIAS
Commercial:
   Maintains proper spacing from other aircraft
   Maintains orientation with landing runway
   Maintains traffic pattern altitude ± 50 and ± 10 KIAS
TRAFFIC PATTERN DEPARTURE
TRAFFIC PATTERN DEPARTURE

Ref: FAA-H-8083-3A (Airplane Flying Handbook)
Aeronautical Information Manual (AIM)

Objective: To safely depart an airport after takeoff or integrate into the flow of traffic when remaining in the traffic pattern.

For Non-Tower Operations:

Departing the Pattern
Continue straight out for at least 2 miles before turning on course or
After reaching pattern altitude, exit the pattern with a 45° turn in the direction of the traffic pattern
Complete the climb checklist when appropriate

Remaining in the pattern
Commence a turn to the crosswind leg when beyond the departure end of the runway and within 300' of pattern altitude (600' at 33N)

NOTE
The above procedures assume an ideal pattern situation. Other traffic, ATC, local traffic pattern restrictions and noise abatement procedures, obstacles, etc., may require a modification of these procedures. In all cases, the pilot shall exercise good judgment and maintain positive airplane control

Standards
Private:
- Maintains proper spacing from other aircraft
- Maintains orientation with landing runway
- Maintains traffic pattern altitude ± 100 and ± 10 KIAS
Commercial:
- Maintains proper spacing from other aircraft
- Maintains orientation with landing runway
- Maintains traffic pattern altitude ± 50 and ± 10 KIAS
CLEARING TURNS

Ref: Aeronautical Information Manual (AIM), Section 4

Objective: To exercise conscientious and continuous surveillance of the airspace in which the airplane is being operated.

1. Complete the Maneuvers Checklist

First 90° clearing turn:
2. Visually scan the area to the left and to the right of the aircraft
3. Select a visual landmark off the wing tip in the direction of the turn to be executed as a 90° reference point to roll onto
4. Enter into a 30° bank turn in the direction of the visual landmark
5. Continuously scan the area above, below and ahead of the flight path
6. After 90° of turn has been completed, rollout to wings level on the selected landmark

Second 90° clearing turn:
7. Visually scan the area to the left and right of the aircraft
8. Select a visual landmark off the wing tip in the direction of the turn to be executed as a 90° reference point to roll onto
9. Enter a 30° bank turn in the same or opposite direction
10. Continuously scan the area above, below and ahead of the flight path
11. After 90° of turn has been completed, rollout wings level on the selected landmark

NOTE
After completion of the second clearing turn and with no conflicting traffic observed, immediately commence the maneuver to be performed.
NORMAL TAKEOFF AND CLimb

REF: FAA-H-8083-3A (Airplane Flying handbook)

Objective: To safely execute a takeoff under normal conditions

1. Complete the Before Takeoff checklists
2. Center aircraft on runway centerline with nose wheel straight ahead
3. Advance the throttle smoothly forward to 2000 RPM, check engine instruments
4. Advance throttle to full forward
5. Maintain aircraft on centerline
6. Call out “airspeed alive”
7. Accelerate aircraft to 53 KIAS call out “VR rotate” and increase control yoke back pressure to pitch up until the glare shield meets the horizon (approximately 10°)
8. Accelerate to 75 KIAS [VY] and climb on centerline, trim as necessary
9. At 1000’ AGL, decrease pitch to establish and maintain 87 KIAS climb
10. Execute a traffic pattern departure procedure
11. After leaving the traffic pattern, complete the climb checklist

IF REMAINING IN THE PATTERN

12. Accelerate to 75 KIAS [VY] and climb on centerline, trim as necessary
13. At 600’ AGL turn to crosswind
14. Continue climb to TPA (900 feet at 33N) and turn downwind, reduce power to 2100 RPM, trim as necessary

Standards:
Private: Airspeed VY +10/-5
Commercial: Airspeed VY ±5
**CROSSWIND TAKEOFF AND CLimb**

**REF:** FAA-H-8083-3A (Airplane Flying handbook)

**Objective:** To safely execute a takeoff in cross wind conditions

1. Complete Before Takeoff checklists
2. Note wind direction and velocity
3. Taxi aircraft on runway centerline utilizing all runway possible and positioning the flight controls for existing wind conditions (Full ailerons into the wind and neutral elevator)
4. Advance the throttle smoothly forward to 2000 RPM check engine instruments
5. Advance throttle to full forward
6. Maintain aircraft on centerline with rudder pedals
7. Call out “air speed alive”
8. During ground roll, decrease aileron input to keep wings level
9. Accelerate aircraft to 53 KIAS call out “$V_R$ rotate”
10. Accelerate to 75 KIAS [$V_Y$] and climb on centerline, trim as necessary
11. At 600’ AGL, decrease pitch to establish and maintain 87 KIAS climb
12. Execute a traffic pattern departure procedure
13. After leaving the traffic pattern, complete the climb checklist

**NOTE**
Maintain $V_Y$ (75 KIAS) if climb performance warrants

**IF REMAINING IN THE PATTERN**

14. Accelerate to 75 KIAS [$V_Y$] and climb on centerline, trim as necessary
15. At 600’ AGL turn to crosswind
16. Continue climb to TPA (900 feet at 33N) and turn downwind, reduce power to 2100 RPM

**Standards:**
- Private: Airspeed $V_Y +10/-5$
- Commercial: Airspeed $V_Y \pm 5$
**SHORT FIELD TAKEOFF**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To obtain maximum performance during takeoff and minimize the runway length required

1. Complete Before Takeoff checklists and set flaps to 25° (2nd notch)
2. Taxi aircraft on runway centerline utilizing all available runway and center nose wheel
3. Firmly depress the brake pedals to ensure holding the airplane in position during full power run-up
4. Advance the throttle forward to 2000 RPM, check engine instruments
5. Smoothly advance the throttle to full forward, check static power (2200-2250 RPM), and then release the brakes
6. Maintain directional control and runway centerline with the rudder pedals
7. Call out “air speed alive”
8. Accelerate aircraft to 52 KIAS (50 KIAS PA-28-161) call out “VR rotate”
9. Accelerate and climb at 63 KIAS (Vx) until obstacles are cleared or 50 ft. AGL
10. Decrease pitch and accelerate to 75 KIAS (Vy)
11. Once a positive rate of climb is established at 75 KIAS (Vy) incrementally reduce flaps to 0°
12. Climb out as normal

**Standards:**
- Private: Airspeed +10/-5
- Commercial: Vx +5/-0 K., then Vy ±5
**SOFT FIELD TAKEOFF**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To obtain maximum performance when taking off from a soft or rough surface runway.

1. Complete Before Takeoff checklists and set flaps to 25° (2nd notch)
2. Taxi toward the takeoff position with full back pressure on the yoke while using proper crosswind correction techniques
3. Without braking or stopping the airplane, smoothly and continuously apply full throttle, checking engine instruments and lifting the nose wheel clear of the runway as soon as possible (approximately 5-8°)
   
   **NOTE**
   Do not allow the airplane to pitch up excessively causing a tail strike

4. Maintain directional control and runway centerline with the rudder pedals
5. As the aircraft's nose begins to rise, release a little pressure on the yoke so that the aircraft does not become airborne prior to achieving adequate lift
6. As the main wheels lift off the runway, decrease pitch attitude to establish and maintain a level flight attitude while remaining in ground effect and:
7. **If no obstacles are present,** establish a positive rate of climb at 75 KIAS ($V_Y$) then slowly reduce flaps to 0°
8. **If obstacles are present,** accelerate to 63 KIAS ($V_X$) and after clearing obstacles and positive rate of climb is established at 75 KIAS ($V_Y$) slowly reduce flaps to 0°
9. Climb out as normal.

**Standards:**
- Private: $V_X$ or $V_Y +10/-5$
- Commercial: $V_X$ or $V_Y ±5$
MANEUVERING DURING SLOW FLIGHT

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To recognize changes in aircraft flight characteristics and control effectiveness at critically slow airspeeds in various configurations.

This maneuver may be done with or without flaps and maneuver recovery at or above 1500’ AGL

1. Complete the maneuvers checklist
2. Reduce throttle to 1700 RPM
3. Below $V_{FE}$ incrementally extend flaps to 40°
4. Maintain heading
5. Maintain altitude with power
6. Maintain airspeed with pitch
7. Establish airspeed at minimum airspeed, just above stall (Stall warning horn may be sounding continuously)
8. Execute climbs, descents and turns

**On Recovery:**

9. Apply full power while maintaining altitude
10. Return to normal cruise flight 2200-2300 RPM
11. Perform cruise checklist

**Standards:**

Private: altitude ±100 ft., heading ±10°, bank ±5°, airspeed +10/-0
Commercial: altitude ±50 ft., heading ±10°, bank ±5°, airspeed +5/-0
POWER OFF STALLS

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize the indications of an imminent or full stall during power off situations with the flaps down, and to make prompt, positive, and effective recoveries with a minimum loss of altitude.

1. Complete the maneuvers checklist and plan to recovery by 2500 feet AGL
2. Reduce throttle to 1700 RPM, maintain altitude, trim as necessary
3. Below $V_{FE}$ smoothly extend flaps in succession [10,25,40], maintain altitude
4. Maintain altitude until reaching 63 KIAS and then establish a stabilized descent (trimmed) at 63 KIAS to simulate a normal approach to landing
5. Descend 100 ft. and then reduce throttle to idle
6. Maintain altitude in straight flight or in turns with up to 20° bank. Airspeed will drop requiring additional back pressure to maintain altitude
7. On first indication of an imminent stall [stall horn, mushy controls, buffeting] or full stall call out “Stalling”
8. Simultaneously lower the nose slightly below horizon and apply full throttle
9. Reduce flaps to 25°
10. Establish $V_x$ and subsequently $V_Y$, look for positive rate climb
11. At $V_Y$ and a positive rate climb, retract flaps to 0° and climb to the starting altitude.
12. Return to normal cruise flight 2200-2300 RPM
13. Perform cruise checklist

Standards:
Private: Heading ±10°, Bank <20° ±10°.
Commercial: Heading ±10°, Bank <20° ±5°.
POWER ON STALLS

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize the indications of an imminent or full stall during power on situations and to make prompt, positive, and effective recoveries with a minimum loss of altitude.

1. Complete the maneuvers checklist and plan to recovery by 2500 feet AGL
2. Reduce throttle to 1700 RPM or idle, adjusting pitch to maintain altitude, trim as necessary
3. Maintain altitude until reaching 63 KIAS, then set full power and smoothly increase pitch to approximately 20°
4. On first indication of an imminent stall [stall horn, mushy controls, buffeting] or full stall call out “Stalling”
5. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entering into a spin
6. Simultaneously lower the nose slightly below horizon and apply full throttle
7. Adjust pitch to $V_Y$ and minimize altitude loss, trim as necessary
8. Return to normal cruise flight 2200-2300 RPM
9. Perform cruise checklist

Standards:
Private: Heading ±10°, Bank <20° ±10°.
Commercial: Heading ±5°, Bank <20° ±5°.
SECONDARY STALL

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize the effects of improper control usage inducing another stall after initiating a recovery from the initial stall.

This is a demonstrated flight maneuver

1. Complete the maneuvers checklist and plan to recovery by 2500 feet AGL
2. Reduce throttle to 1700 RPM, adjusting pitch to maintain altitude, trim as necessary
3. Perform a Power-Off or Power-On Stall, as directed
4. At the stall call out, “Stalling”, reduce the angle of attack to regain control effectiveness and apply full power
5. Maintain coordinated use of the ailerons and rudder to level the wings and prevent a spin
6. Immediately increase the pitch attitude to induce another (secondary) stall
7. At the stall, call out, “Stalling”, reduce the angle of attack to regain control effectiveness and apply full power
8. Maintain coordinated use of the ailerons and rudder to level the wings and prevent a spin
9. Lower the nose to the horizon
10. Return to normal cruise flight 2200-2300 RPM
11. Perform cruise checklist

Standards: Student will demonstrate a basic understanding of the maneuver
**ELEVATOR TRIM STALL**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To recognize the effects of not maintaining positive airplane control during a go-around/rejected landing.

This is a demonstrated flight maneuver.

1. Complete the maneuvers checklist and plan to recovery by 2500 feet AGL
2. Reduce throttle to 1700 RPM, adjusting pitch and trim aircraft to maintain altitude
3. Below $V_{FE}$ (103 KIAS), extend flaps to 10°, adjust pitch and trim aircraft to maintain altitude
4. Extend the flaps to 25°, adjust pitch and trim aircraft to maintain altitude
5. Extend the flaps to 40°, adjust pitch and trim aircraft to maintain altitude
6. Maintain altitude until reaching 63 KIAS, and then establish a stabilized descent at 63 KIAS to simulate a normal approach to landing
7. Descend 100 feet and, apply full throttle, allowing the airplane to roll left and the pitch to increase to $V_X$ pitch attitude (approx. 12°) or at stall horn
8. Use enough forward yoke pressure to reduce the angle of attack and regain control effectiveness
9. Maintain coordinated use of the ailerons and rudder to level the wings
10. Adjust pitch to $V_Y$ attitude and retract the flaps to 25°, re-trim as necessary
11. Incrementally retract flaps as airspeed increases
12. Return to the altitude, heading, and airspeed specified

**Standards:**
Student will demonstrate a basic understanding of the maneuver
**CROSS-CONTROL STALL**

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize the effects of improper control flight control technique.

This is a demonstrated flight maneuver.

1. Complete the maneuvers checklist and plan to recovery by 2500 feet AGL
2. Reduce throttle to 1700 RPM, adjusting pitch and trim aircraft to maintain altitude
   **NOTE**
   Because of the possibility of exceeding VFE, flaps are not extended.
3. Maintain altitude until reaching 90 KIAS and then establish a stabilized descent at 90 KIAS to simulate a normal flaps up approach to landing
4. Descend 100 feet and simultaneously reduce power to idle and pick a reference point off the left or right wing tip
5. Turn towards the reference point using a 25-30° bank while:
6. Simultaneously applying excessive rudder pressure in the direction of the turn
7. Using opposite aileron to prevent over-banking while maintaining a constant 25-30° bank during the turn, and
8. Increasing elevator back-pressure to keep the nose from lowering, achieving 11-12° pitch up.
9. At imminent stall call out, “Stalling”, reduce pitch to regain control effectiveness, and apply full power.
   **NOTE**
   Completion of the maneuver should occur by the 90° reference point and before full deflection of the rudder and aileron.

10. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entering into a spin.
11. Adjust pitch to the VX attitude (11-12° Up) (re-trimming as necessary) and minimize altitude loss.
12. Return to the altitude, heading, and airspeed specified.

![Diagram of flight maneuvers](image)

**Standards:**
Student will demonstrate a basic understanding of the maneuver
ACCELERATED STALL

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To demonstrate that the stall is a function of angle of attack, weight, and load factor, rather than airspeed.

This is a demonstrated flight maneuver.

1. Complete the maneuvers checklist and plan to recover by 2500 feet AGL
2. Reduce throttle to 1700 RPM and decelerate at or below maneuvering speed (VA) adjusting pitch and trim aircraft to maintain altitude

   NOTE
   The flaps must be in the 0° (Up) position.

3. Establish a 45-50° bank to the left or right
4. After the bank and turn are established, smoothly and steadily increase elevator back-pressure.
5. As the airspeed reaches 20 knots above the un-accelerated stall speed (Vs1), firmly increase elevator back-pressure.
6. At imminent stall (buffet):
   a. Note the indicated airspeed, Call out, “Stalling”
   b. Reduce pitch to regain control effectiveness
   c. Add power as necessary.
7. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entry into a spin
8. Minimize altitude loss.
9. Return to the altitude, heading, and airspeed specified.

Standards:
Student will demonstrate a basic understanding of the maneuver
**STEEP TURNS**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To develop smoothness, coordination, orientation, division of attention, and control techniques while executing high performance turns.

1. Complete the maneuvers checklist and plan to recover by 1500 feet AGL
2. Establish airspeed below $V_A$, trim as necessary
3. Choose a prominent landmark or note the heading
4. Roll into a 45° bank (private) or 50° bank (commercial) and begin a 360° turn
5. Rolling through 30°, add power as necessary to maintain altitude and airspeed
6. Begin roll out 15°-20° before the originating landmark or heading
7. Roll wings level and then,
8. Immediately roll into a 360° turn in the opposite direction
9. Complete the maneuver and return to straight and level flight
10. Complete the cruise checklist

**Standard:**

- Private: Altitude ±100 ft., Airspeed ±10, Bank ±5°, Heading ±10°.
- Commercial: Altitude ±100 ft., Airspeed ±10, Bank ±5°, Heading ±10°
**CHANDELLES**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To develop the pilot’s coordination, orientation, planning, and feel for maximum performance flight, and to develop positive control techniques at varying airspeeds and attitudes.

1. Complete the maneuvers checklist and plan to recover by 1500 feet AGL
2. Establish airspeed below $V_A$, trim as necessary
3. Select a reference point directly off the left or right wing tip
4. Roll into a coordinated 30° bank turn and neutralize rudder and aileron.
5. After the bank is established, smoothly initiate a climbing turn and apply full power
6. While maintaining a 30° bank, continue increasing the pitch attitude at a constant rate so as to attain the highest pitch (approx. 13-15°) at the 90° point in the turn
7. At the 90° point in the turn, maintain pitch attitude by continuing to increase elevator backpressure (due to decreasing airspeed) and initiate a slow rate of rollout
8. Maintain a constant roll out rate with aileron while increasing right rudder and increasing back pressure to maintain pitch, plan to decrease bank 10° by each 30° of heading change
9. Arrive at the 180° point with airspeed about 5 KIAS above stall, wings level, and coordinated flight. Maintain pitch for about 3 seconds.
10. Begin slowly decreasing pitch attitude to level flight and increasing airspeed. No altitude loss.
11. Complete the Cruise checklist

**Standards:**
Commercial: Airspeed just above stall, Heading ±10°
LAZY EIGHT
**LAZY EIGHT**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To develop the pilot’s feel for varying control forces, and the ability to plan and remain oriented while maneuvering the plane with positive and accurate control.

1. Complete the maneuvers checklist and complete the maneuver by 1500 feet AGL
2. Select a forced landing area and set power to cruise below $V_A$
3. Select 45°, 90°, and 135° reference points on or out toward the horizon
4. From straight and level flight, initiate a shallow climbing turn by simultaneously increasing bank and pitch slowly, planning to achieve maximum pitch (approx. 13°-15°) and 15° bank angle at the 45° reference point. If the initial turn is to the left, a slight amount of right rudder and neutral aileron will be required to maintain coordination. If the initial turn is to the right, more right rudder will be required and slight opposite aileron at the 45° reference to prevent over-banking
5. From the 45° reference point allow the bank angle to continue increasing, and pitch to decrease so that at the 90° reference point the maximum bank angle (30°) is achieved and the pitch attitude is passing through level flight at minimum airspeed
6. From the 90° reference point, allow the pitch attitude to continue decreasing and initiate a slow decrease in bank angle while continuing a descending turn in the direction of the 135° reference point where the maximum pitch down attitude (approx. 13°-15°) should be achieved with a 15° bank angle
7. From the 135° reference point, continue decreasing the bank angle while allowing the pitch to increase so that the airplane returns to the entry airspeed and altitude by the 180° reference point
8. **NOTE**
   The airspeed should not exceed the entry airspeed during the turn from the 90° reference point to the 180° reference point
9. Proceed through the 180° point with no hesitation and begin a shallow climbing turn in the opposite direction, repeating the steps outlined above
10. Complete the maneuver at entry heading, airspeed and altitude
11. Return to normal cruise flight 2200-2300 RPM
12. Perform cruise checklist

**Standards:**
   Commercial: Bank angle ≤ 30°, Altitude ±100 ft., Airspeed ±10 KIAS
   Heading ±10°.
STEEP SPIRAL
**STEEP SPIRAL**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

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

1. Determine wind direction
2. Establish an altitude that will allow at least 3 -360° turns before rollout
3. Select a forced landing area where an emergency landing can be made if necessary
4. Approach a prominent reference point to spiral around so as to enter on downwind
5. Close throttle and adjust pitch to establish and maintain best glide speed (73 KIAS), trim as necessary
6. Maintain a constant radius around the reference point adjusting the bank angle as necessary not to exceed 60°

**NOTE**

Prolonged idle power may result in excessive engine cooling or spark plug fouling, especially during cold weather. The engine should be cleared periodically by briefly advancing the throttle to cruise power. This should be done with a headwind to minimize groundspeed variation

7. Complete at least three 360° turns
8. Complete the maneuver on entry heading

**NOTE**

Recover no lower than 1500’ AGL unless combining the maneuver with a simulated Emergency Approach and Landing

9. Return to normal cruise flight 2200-2300 RPM
10. Perform cruise checklist

**Standards:**

Commercial: Bank angle ≤ 60°, Altitude sufficient to complete three 360°, Airspeed ±10 KIAS, Heading ±10°
EMERGENCY DESCENT

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To descend the airplane as rapidly as possible, within the operating limitations of the airplane.

1. Complete the maneuvers checklist and complete the maneuver by 1500 feet AGL
2. Brief all passengers
3. Pick a visual landmark off the wing tip in the direction of turn
4. Throttle to Idle, reduce speed below maximum flap speed \(V_{FE}\), extend flaps to 40°
5. Simultaneously roll into a 30°-45° bank in direction of planned turn and adjust pitch to maintain 98 KIAS
6. Roll out on the 180° point in the turn and make shallow S-turns to continue checking for other traffic while descending
7. Approaching the target altitude, begin to level off by increasing pitch to reduce the descent rate
8. At target altitude, adjust pitch to maintain level flight
9. Set the aircraft for normal cruise flight
11. Return to normal cruise flight 2200-2300 RPM
12. Perform cruise checklist

Standards:
- Private: Airspeed, establishes appropriate airspeed, Maintains positive load factors during the descent
- Commercial: Airspeed ± 10 KIAS, Maintains positive load factors during the descent, Altitude, ± 100 feet
EMERGENCY APPROACH AND LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)
Piper Warrior Pilot’s Operation Manual (POH)

Objective: To execute a safe approach and landing in the event of an engine failure

NOTE
When simulating an engine failure, the Instructor Pilot will call out "Simulated Engine Failure"

1. Establish the best glide speed $V_G$ 73 knots, trim as necessary
2. Determine wind direction and select a suitable landing site, checking the area in the immediate vicinity of the aircraft’s position
3. Turn the airplane towards the selected landing site
4. Go through the Right to Left memorization checklist. (Carb heat on, Mixture, Throttle, Fuel pump, Primer, Magneto, Fuel Selector
5. If altitude permits, complete the emergency checklist
6. If engine restart is unsuccessful, maneuver the aircraft as necessary for the approach and landing
7. Squawk transponder code 7700 and transmit mayday on 121.5

NOTE
Prolonged idle power may result in excessive engine cooling or spark plug fouling, especially during cold weather. The engine should be cleared periodically by briefly advancing the throttle to cruise power. This should be done with a headwind to minimize groundspeed variation

NOTE
How to maneuver the aircraft for the pattern and the approach and landing will depend on many variables, including location of the closest suitable landing site to the aircraft’s current position, altitude, wind direction, landing direction, obstructions, etc. All variables must be considered when developing a maneuvering plan

7. When appropriate, maneuver the aircraft to arrive at a point abeam the point of intended landing at 1000’ AGL
8. Turn onto the base leg and determine if adjustment of the flight path of the base leg is necessary to conserve or dissipate altitude to ensure reaching the desired landing point
9. Complete the Power Off Landing checklist:
   a. Ignition – OFF
   b. Master Switch – OFF
   c. Fuel Selector – OFF
   d. Mixture – IDLE CUT-OFF
   e. Seat Belts and Harnesses – TIGHT
NOTE
Unless the approach is made to an airport runway, the simulated emergency approach and landing should be terminated as soon as it can be determined that a safe landing could have been made, or 500’ AGL, whichever occurs first.

Standards:
Private: Best Glide ±10 KIAS
Commercial: Best Glide ±10 KIAS

Adjust base as necessary to ensure landing
RECTANGULAR COURSE

Medium bank
More than 90° turn

Medium bank
Less than 90° turn

Shallow bank
Less than 90° turn

Steeper bank
More than 90° turn

Bank angle and degree of turn will vary based on wind speed.
**RECTANGULAR COURSE**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane.

1. Determine the wind direction
2. Perform Clearings turns and plan to execute the maneuver between 600-1000 feet AGL
3. Select a forced landing area
4. Establish and maintain a speed below $V_A$
5. Enter either left or right pattern on a 45° angle to the mid-field downwind leg
6. Establish a crab angle as necessary to maintain a uniform distance from the area boundaries for each leg of the maneuver

**NOTE**

The airplane should be flown parallel to and at a uniform distance ¼ to ½ mile away from the field boundaries

7. Begin the turn to next leg when airplane is abeam the corner of the area boundary
8. Vary the bank angle (not to exceed a 45° bank) to maintain a constant radius during the turns
9. Depart on a 45° from the downwind at the downwind turn boundary
10. Return to normal cruise flight 2200-2300 RPM
11. Perform cruise checklist

**Standards:**

Private: Airspeed ±10 KIAS, Altitude ±100
S-TURNS ACROSS A ROAD
S-TURNS ACROSS A ROAD

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To teach the student to maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane

1. Determine the wind direction
2. Perform clearing turns and maneuver must be executed between 600-1000 feet AGL
3. Pick an area that includes an emergency landing field
4. Establish and maintain a speed below $V_A$
5. Enter on a downwind heading
6. When directly over a reference line or road (highest groundspeed), roll into the steepest bank (not to exceed 45°) to initiate and maintaining a constant radius
7. As the turn continues (groundspeed decreases), begin to shallow the bank as necessary to continue maintaining a constant radius
8. Level the wings when crossing the reference point (lowest groundspeed) and immediately begin a turn back in the opposite direction
9. As the turn continues (groundspeed increases), begin to steepen the bank as necessary to continue maintaining a constant radius
10. Level the wings when crossing the reference point (highest groundspeed)

**NOTE**
The rollouts must be timed in order to be straight and level directly over and perpendicular to the reference line or road

11. Return to normal cruise flight 2200-2300 RPM
12. Perform cruise checklist

Standards:
- Private: Airspeed ±10 K., Altitude ±100 ft.
TURNS AROUND A POINT

1-5

Increasing Bank

9

Shallowest Bank

8

Decreasing Bank

6

Steepest Bank

10-12

DSU Flight Maneuvers
Standardization Manual
TURNS AROUND A POINT

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane.

1. Determine the wind direction
2. Perform Clearings turns and plan to execute the maneuver between 600-1000 feet AGL
3. Select a forced landing area
4. Establish and maintain a speed below $V_A$
5. Enter the maneuver at cruise speed on downwind to one side of the selected reference point at a distance equal to the desired radius of urn
6. On entry downwind (highest groundspeed) and abeam the reference point, roll into the steepest bank (not to exceed 45°) to initiate and maintain a constant radius
7. As the turn continues (groundspeed decreases), begin to shallow the bank as necessary to continue maintaining a constant radius
8. Directly upwind (lowest groundspeed), the bank should be at its shallowest
9. As the turn continues (ground speed increases), begin to steepen the bank as necessary to continue maintaining a constant radius
10. Complete two complete circles, or as directed, and depart on the entry heading
11. Return to normal cruise flight 2200-2300 RPM
12. Perform cruise checklist

Standards:
Private: Airspeed ±10 K., Altitude ±100 ft.
EIGHTS ON PYLONS
EIGHTS ON PYLONS

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane.

1. Determine the wind direction
2. Perform clearing turns and determine the pivotal altitude

NOTE
To determine the pivotal altitude, use the following calculation:

\[
Pivotal \text{ Altitude} = \frac{(GS \text{ Knots})^2}{13} \quad \frac{(GS \text{ MPH})^2}{15}
\]

3. Select a forced landing area that will allow an emergency landing from any position in the maneuver
4. Establish and maintain an entry speed below \( V_A \)
5. Enter the maneuver on a 45° to the downwind and at a distance from the pylons that will require up to 30° angle of bank at the steepest point
6. At the position where the pylon appears to be just ahead of a line extending from the pilot’s eye and parallel to the airplane’s lateral axis, lower the upwind wing to place the pilot’s line of sight on the pylon
7. As the turn is continued, the groundspeed of the airplane will decrease as the wind changes from a tailwind to a crosswind. To keep the pylon on the reference line, the pilot must lower the altitude by pitching down. As the airplane continues to turn, the wind changes to a headwind, ground speed decreases, requiring a lower pivotal altitude to maintain the reference line on the pylon. The pilot adjusts by pitching down if necessary

NOTE
The effects of the wind on the airplane’s groundspeed should be anticipated so as to smoothly adjust pitch, where necessary, to maintain the line of sight reference with the pylon

8. As the airplane turns toward a downwind heading, plan to roll out to maintain a 45° ground track across the road /section line in straight and level flight for 3 to 5 seconds
9. Lead the roll in on the second pylon as in the first and maintain the reference point with pitch changes to continue the maneuver
10. Maintain division of attention away from the ground reference point to continue collision avoidance as well as inside the airplane to check flight instruments for accuracy and engine instruments for proper operation

Standards:
Commercial: Maximum bank angle 30-40°.
This maneuver is authorized only in the Tomahawk during spin training as required in the CFI-A Course.
SPIN AWARENESS


Objective: To develop awareness regarding the recognition of, entry into, and recovery from spins. This outline is presented to facilitate student/instructor discussion.

AERODYNAMICS
- Why does an aircraft spin, and why is it bad?
- Phases
  - Stall: pre-spin, uncoordinated stall
  - Incipient: first few unbalanced turns
  - Developed: balanced forces, though not necessarily “auto-rotating”
  - Recovery: control inputs might take one turn or more to take effect
- Effects of aileron inputs
- Effects of power and flat spins
  - Unrecoverable spins

CONSIDERATIONS
- Spin-prone situations
  - Base-to-final, slow uncoordinated flight
- Configurations which worsen spins
  - CG location: forward has easier entry and exit than aft
  - Weight; heavy is harder to enter, but harder to exit

AWARENESS
- Banked, opposite rudder, full aft elevator
- Enters developed phase after one to two turns
- Orientation by outside references
  - Tumbling gyros

RECOGNITION AND RECOVERY
- Wing drop during a stall indicates stall phase of a spin
- Recover by upsetting the aerodynamically balanced or balancing forces
  - Rudder opposite to counter the spin
  - Controls neutral, forward pressure to break stall
  - Rudder normal
  - Controls to maintain level flight
  - Throttle as required
  - Flat spins require throttle to idle and any forward cg changes possible
  - The pedal with the most resistance will recover the spin
  - Avoid over speeding in the recovery dive

AIRCRAFT
- Spin approval
- Aircraft category
NORMAL APPROACH AND LANDING
NORMAL APPROACH AND LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To safely and accurately establish and maintain a stabilized approach to a landing in a designated area.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Abeam the point of intended landing, reduce throttle to 1700 RPM
4. Below V_{FE} (103 knots) extend flaps to 10°
5. Maintain 85 KIAS and 300-500 ft./min descent
6. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
7. Extend flaps to 25° and slow the aircraft to 75 KIAS
8. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
9. When landing is assured, extend flaps to 40° establish and maintain 63 KIAS (+1/2 gust factor if appropriate). Trim as necessary

NOTE
The approach must be stabilized by 200 feet. If not, execute a go-around

10. At the round out, commence reducing power to idle, continuing the flare to touch down on the main wheels first, holding the nose wheel off with back pressure throughout the rollout; allow settling gently
11. Maintain directional control throughout the rollout, slowing sufficiently before turning onto a taxiway

Standards:
Private: Airspeed +10/-5 KIAS. Touch Down: 400 ft.
Commercial: Airspeed ±5 KIAS. Touch Down 200 ft.
CROSSWIND APPROACH AND LANDING
CROSSWIND APPROACH AND LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To safely and accurately establish and maintain a stabilized approach to a landing, correcting for a crosswind during the approach, touchdown, and rollout.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Abeam the point of intended landing, reduce throttle to 1700 RPM
4. Below $V_{FE}$ (103 knots) extend flaps to 10°
5. Maintain 85 KIAS and 300-500 ft./min descent
6. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
7. Extend flaps to 25° and slow the aircraft to 75 KIAS
8. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
9. When landing is assured, extend flaps to 40° establish and maintain 63 KIAS (+1/2 gust factor if appropriate). Trim as necessary

Note
In gusty wind conditions, consider using no more than 25° of flaps

The approach must be stabilized by 200 feet. If not, execute a go-around

10. Use the wing-low method (side slip) for drift control
11. At the round out, reduce power to idle and continue the flare to touch down on the upwind main wheel first, followed with the downwind main wheel touchdown while holding the nose wheel off with back pressure throughout the rollout; allow settling gently
12. Increase aileron deflection into the wind while maintaining directional control throughout the rollout, slowing sufficiently before turning onto a taxiway

Standards:
Private: Airspeed $+10/-5$ KIAS. Touch Down: 400 ft.
Commercial: Airspeed $\pm 5$ KIAS. Touch Down 200 ft.
SHORT-FIELD APPROACH AND LANDING
**SHORT FIELD APPROACH AND LANDING**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To safely and accurately establish and maintain a stabilized approach to a landing, obtaining maximum performance by stopping in a minimum distance.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Abeam the point of intended landing, reduce throttle to 1700 RPM
4. Below $V_{FE}$ (103 knots) extend flaps to 10°
5. Maintain 80 KIAS and 300-500 ft./min descent
6. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
7. Extend flaps to 25° and slow the aircraft to 70 KIAS
8. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
9. When landing is assured, extend flaps to 40° establish and maintain 57 KIAS (+1/2 gust factor if appropriate). Trim as necessary

**NOTE**

The approach must be stabilized by 200 feet. If not, execute a go-around

10. Before the roundout, begin smoothly reducing power, continuing the power reduction during the roundout while increasing pitch to maintain a constant glide path to the desired touchdown point

**NOTE**

Avoid closing the throttle rapidly, which may result in an immediate increase in the rate of decent and a hard landing

11. Touch down at minimum controllable airspeed, with the throttle at idle position, on the main wheels first, plan for minimum float
12. Immediately after touchdown, apply maximum aerodynamic braking
13. Applying heavy braking when nose wheel is on runway.

**Standards:**

Private: Airspeed +10/-5 KIAS. Within 200 ft. of intended landing point
Commercial: Airspeed ±5 KIAS. Within 100 ft. of intended landing point
SOFT-FIELD APPROACH AND LANDING
SOFT FIELD LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To develop the student’s ability to safely and accurately maintain a stabilized approach to land the airplane obtaining maximum performance by touching down at the slowest possible airspeed.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Abeam the point of intended landing, reduce throttle to 1700 RPM
4. Below VFE (103 knots) extend flaps to 10°
5. Maintain 80 KIAS and 300-500 ft./min descent
6. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
7. Extend flaps to 25° and slow the aircraft to 70 KIAS
8. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
9. When landing is assured, extend flaps to 40° establish and maintain 63 KIAS (+1/2 gust factor if appropriate). Trim as necessary

NOTE
The approach must be stabilized by 200 feet. If not, execute a go-around

10. At the round out, commence reducing power as necessary and initiating the flare to hold the airplane 1-2 feet off the surface in ground effect as long as possible to gradually dissipate forward speed, Power may be used to slow the rate of descent and soften the touchdown.
11. Touchdown on the main wheels first holding the nose wheel off with back pressure throughout the rollout
12. Taxi off runway without stopping and with the use of little or no brakes.

NOTE
Conduct all taxi operations with the control wheel fully aft. On softer surfaces, additional power may be needed to maintain taxi speed and to avoid becoming stuck. Avoid the use of brakes to prevent imposing a heavy load on the nose gear, causing the nose gear to “dig” into the soft surface.

Standards:
Private: Airspeed +10/-5 KIAS
Commercial: Airspeed ±5 KIAS

POWER–OFF 180° ACCURACY
APPRAOCOH AND LANDING

POWER-OFF 180° ACCURACY APPROACH AND LANDING
Ref: FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To demonstrate the judgment, technique, and skill necessary for accurately flying the airplane, without power, to a safe landing.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Abeam the point of intended landing, reduce throttle to idle, slowing to $V_G$ (73 KIAS), and then commence a descent at 73 KIAS, Trim as necessary
4. At a point appropriate for wind conditions, commence a turn to the base leg using a medium to steep bank angle (20°-30°)

**NOTE**
Establish and then adjust the base leg toward, perpendicular, or away from the intended touchdown point, considering altitude and wind conditions, so as to conserve or dissipate altitude as necessary to reach the intended touchdown point

5. On base leg, add flaps as necessary and maintain glide (73 KIAS). The base leg is not a fixed point on the ground and may be adjusted to accommodate varying conditions
6. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
7. When landing is assured, extend flaps to 40° establish and maintain 63 KIAS (+1/2 gust factor if appropriate). Trim as necessary

**NOTE**
The approach must be stabilized by 200 feet. If not, execute a go-around

8. At the round out, commence reducing power to idle, continuing the flare to touch down on the main wheels first, holding the nose wheel off with back pressure throughout the rollout; allow settling gently
9. Maintain directional control throughout the rollout, slowing sufficiently before turning onto a taxiway

**Standards:**
Commercial: Airspeed ±5 KIAS, Within 200 ft. of intended touchdown point

**GO-AROUND/REJECTED LANDING**
Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To develop the ability to safely transition at a critical time from the approach and landing phase to the climb.

1. Upon deciding to go-around:
   a. Power full forward (carb heat off)
   b. Flaps reduce to 25° immediately
   c. Pitch up slightly
   d. Climb at 63 KIAS (V\textsubscript{X})
   e. Obstacle cleared – flaps up incrementally
   f. Accelerate to 75 KIAS (V\textsubscript{Y})
2. Maintain directional control and proper wind-drift correction throughout the climb
3. Execute an appropriate departure procedure, or remain in the traffic pattern as appropriate
4. Complete the Go Around Checklist

Standards:
   Private: Airspeed +10/-5 KIAS
   Commercial: Airspeed ±5 KIAS
FORWARD SLIP TO LANDING
FORWARD SLIP TO LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To increase the descent rate on a final approach path without increasing airspeed.

1. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
2. Select an intended point of touchdown
3. Initiate the slip by simultaneously using down aileron into the wind and opposite rudder
4. Use an appropriate amount of bank and yaw to maintain a ground track that is aligned with the runway centerline, the nose should not be aligned with the ground track

NOTE
The amount of slip (sink rate) is determined by the bank angle; the steeper the bank—the greater the descent rate—the greater (steeper) the descent angle—the greater the need for opposite rudder up to the limit of rudder travel

5. Prior to the roundout, recover by simultaneously decreasing aileron and rudder deflections smoothly in time to land with the longitudinal axis of the airplane aligned with the runway centerline

Standards:
Private: Within 400 ft. of intended point of touchdown
**Warrior V-Speeds**

<table>
<thead>
<tr>
<th>Speed</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotation Speed ($V_R$)</td>
<td>53</td>
</tr>
<tr>
<td>Best Rate of Climb ($V_Y$)</td>
<td>75 (79 PA-161)</td>
</tr>
<tr>
<td>Best Angle of Climb ($V_X$)</td>
<td>63</td>
</tr>
<tr>
<td>Stall Speed Flaps ($V_{S0}$)</td>
<td>44</td>
</tr>
<tr>
<td>Stall Speed Clean ($V_{S1}$)</td>
<td>50</td>
</tr>
<tr>
<td>Maneuvering Speed ($V_A$)</td>
<td>88 – 111</td>
</tr>
<tr>
<td>Flaps Extended Speed ($V_{FE}$)</td>
<td>103</td>
</tr>
<tr>
<td>Never Exceed Speed ($V_{NE}$)</td>
<td>160</td>
</tr>
<tr>
<td>Best Glide Speed</td>
<td>73</td>
</tr>
<tr>
<td>Cruise Climb</td>
<td>87</td>
</tr>
</tbody>
</table>

**Speeds are for an aircraft operating at a gross weight of 2325**

\[
1.2 V_{S1} = 60 \quad 1.2 V_{S0} = 52 \quad 1.3 V_{S0} = 57 \quad V_{NO} = 126
\]

- Flap extended positions: 10, 25, 40
- Max Demonstrated Crosswind Component: 17 knots [\sin x (wind)]
- Max Gross Weight: 2325 lbs.
- Standard Empty Weight: 1331 lbs
- Engine Manufacturer: Lycoming
- Model: O-320
- Type: Horizontally Opposed, Air Cooled
- Displacement: 319 Cubic Inches
- Horsepower: 150 HP
- Rated Speed (RPM): 2700 RPM
- Oil
  - Max: 8 qts
  - Min: 2 qts (DSU Min - 5 qts.)
- Prop Length: 74 Inches
- Wing Span: 35 Feet
- Fuel Grade: 100LL (Blue)
- Quantity: 48 Gal. Usable \ 2 Gal. Unusable
- Tire Pressure
  - Main: 24 PSI
  - Nose: 30 PSI

**Electrical System**

- Battery: 12 Volts; 25 Amp Hour
- Alternator: 14 Volts; 60 Amps

There is an ammeter that measures the electrical load on the alternator.

**Fuel System**

There are 48 gallons of usable fuel and 2 gallons of unusable fuel, which gives us a total of 50 gallons. There is one engine driven fuel pump and one electric fuel pump in the event of engine driven fuel pump failure.
NOTE
Airspeeds for the PA-28R-200 (N402DS) are in MPH and airspeeds for the PA-28R-201 (N495DS) are in KIAS

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**NORMAL TAKEOFF AND CLimb**

**REF:** FAA-H-8083-3A (Airplane Flying handbook)

**Objective:** To safely execute a takeoff under normal conditions

1. Complete the Before Takeoff checklists
2. Center aircraft on runway centerline with nose wheel straight ahead
3. Advance the throttle smoothly forward to 2000 RPM, check engine instruments
4. Advance power to full forward
5. Maintain aircraft on centerline
6. Call out “airspeed alive”
7. Accelerate aircraft to 65 MPH/65 KIAS call out “\(V_R\) rotate”, increase control yoke back pressure to pitch up until the glare shield meets the horizon (approximately 10°) when positive rate climb call out “Positive rate – gear up”
8. Accelerate to 100 MPH/90 KIAS [\(V_Y\) Gear Up] and climb on centerline, trim as necessary
9. At 1000’ AGL, decrease pitch to establish and maintain 110 MPH/104 KIAS curse climb, set 25” MP and 2500 RPM
10. Execute a Traffic Pattern departure procedure
11. After leaving the traffic pattern, complete the climb checklist

**IF REMAINING IN THE PATTERN**

12. Accelerate to 100 MPH/90 KIAS [\(V_Y\) Gear Up] and climb on centerline, trim as necessary
13. At 600’ AGL turn to crosswind, set 25”MP and 2500 RPM
14. Continue climb to TPA (900 feet at 33N) and turn downwind, reduce power to 20” MP

**Standards:**
- Private: Airspeed \(V_Y\) +10/-5
- Commercial: Airspeed \(V_Y\) ±5
**SHORT FIELD TAKEOFF**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To obtain maximum performance during takeoff and minimize the runway length required

1. Complete Before Takeoff checklists and set flaps to 25° (2nd notch)
2. Taxi aircraft on runway centerline utilizing all available runway and center nose wheel
3. Firmly depress the brake pedals to ensure holding the airplane in position during full power run-up
4. Advance the throttle forward to 2000 RPM, check engine instruments
5. Smoothly advance the throttle to full forward, check static power, and then release the brakes
6. Maintain directional control and runway centerline with the rudder pedals
7. Call out “air speed alive”
8. Accelerate aircraft to 60-65 MPH/50-60 KIAS call out “VR rotate”
9. Accelerate to VX (85 MPH/65 KIAS), when positive rate climb call out “Positive rate – gear up” and climb on centerline, trim as necessary
10. When obstacle is clear or 50’ AGL, accelerate and climb at 100 MPH/90 KIAS [VY Gear Up]
11. Incrementally reduce flaps to 0°
12. At 1000’ AGL, decrease pitch to establish and maintain 110 MPH/104 KIAS curse climb, set 25” MP and 2500 RPM
13. Climb out as normal

**Standards:**
- Private: Airspeed +10/-5
- Commercial: VX +5/-0 K., then VY ±5
**SOFT FIELD TAKEOFF**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To obtain maximum performance when taking off from a soft or rough surface runway.

1. Complete Before Takeoff checklists and set flaps to 25° (2nd notch)
2. Taxi toward the takeoff position with full back pressure on the yoke while using proper crosswind correction techniques
3. Without braking or stopping the airplane, smoothly and continuously apply full throttle, checking engine instruments and lifting the nose wheel clear of the runway as soon as possible (approximately 5-8°)

**NOTE**
Do not allow the airplane to pitch up excessively causing a tail strike

4. Maintain directional control and runway centerline with the rudder pedals
5. As the aircraft’s nose begins to rise, release a little pressure on the yoke so that the aircraft does not become airborne prior to achieving adequate lift
6. As the main wheels lift off the runway, decrease pitch attitude to establish and maintain a level flight attitude while remaining in ground effect and:
7. **If no obstacles are present,** accelerate to 95 MPH/78 KIAS (VY) and climb when positive rate call out “Positive rate – gear up” and climb on centerline, trim as necessary, slowly reduce flaps to 0°
8. **If obstacles are present,** accelerate to 85 MPH/72 KIAS (Vx) and climb, when clear of obstacles and positive rate call out “Positive rate – gear up” and climb on centerline, trim as necessary, slowly reduce flaps to 0°
9. At 1000’ AGL, decrease pitch to establish and maintain 110 MPH/104 KIAS curse climb, set 25” MP and 2500 RPM
10. Climb out as normal.

**Standards:**
- Private \( V_x \) or \( V_Y \) +10/-5
- Commercial: \( V_x \) or \( V_Y \) ±5
MANEUVERING DURING SLOW FLIGHT

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize changes in aircraft flight characteristics and control effectiveness at critically slow airspeeds in various configurations.

This maneuver may be done with or without flaps and gear, recover at or above 1500’ AGL

1. Complete the maneuvers checklist
2. Reduce power to 15” MP then gear down below $V_{LE}$
3. Below $V_{FE}$ incrementally extend flaps to 40°
4. Maintain heading
5. Maintain altitude with power
6. Maintain airspeed with pitch
7. Establish airspeed at minimum airspeed, just above stall (Stall warning horn may be sounding continuously)
8. Execute climbs, descents and turns

On Recovery:

9. Apply full power while maintaining altitude
10. Reduce the flaps to 25°
11. At 85 MPH/72 KIAS, Gear up (if down)
12. Reduce flaps to 0° while maintaining altitude (if extended)
13. Return to cruise flight: 23” MP and 2400 RPM
14. Perform cruise checklist

Standards:

Private: altitude ±100 ft., heading ±10°, bank ±5°, airspeed +10/-0
Commercial: altitude ±50 ft., heading ±10°, bank ±5°, airspeed +5/-0
**POWER OFF STALLS**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To recognize the indications of an imminent or full stall during power off situations with the flaps down, and to make prompt, positive, and effective recoveries with a minimum loss of altitude.

1. Complete the maneuvers checklist and plan to recover by 2500 feet AGL
2. Reduce power to 15” MP then gear down below $V_{LE}$ and adjust pitch to maintain altitude, trim as necessary
3. Below $V_{FE}$ smoothly extend flaps in succession [10,25,40], maintain altitude
4. Maintain altitude until reaching 90 MPH/75 KIAS and then establish a stabilized descent (trimmed) at entry airspeed to simulate a normal approach to landing
5. Descend 100 ft. and then reduce power to idle
6. Maintain altitude in straight flight or in turns with up to 20° bank. Airspeed will drop requiring additional back pressure to maintain altitude
7. On first indication of an imminent stall [stall horn, mushy controls, buffeting] or full stall call out “Stalling”
8. Apply full throttle and lower the nose slightly below horizon
9. Reduce flaps to 25°
10. Establish $V_X$ and subsequently $V_Y$, look for positive rate climb then Gear Up
11. During the climb, slowly reduce flaps to zero and climb to starting altitude
12. Return to cruise flight: 23” MP and 2400 RPM
13. Perform cruise checklist

**Standards:**
- Private: Heading ±10°, Bank <20° ±10°.
- Commercial: Heading ±10°, Bank <20° ±5°.
POWER ON STALLS

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize the indications of an imminent or full stall during power on situations and to make prompt, positive, and effective recoveries with a minimum loss of altitude.

1. Complete the maneuvers checklist and plan to recover by 2500 feet AGL
2. Reduce power to 12” MP then gear down below $V_{LE}$ and adjust pitch to maintain altitude, trim as necessary
3. Maintain altitude until reaching 85 MPH/72 KIAS, then set power to 20” MP and smoothly increase pitch to approximately 20°
4. On first indication of an imminent stall [stall horn, mushy controls, buffeting] or full stall call out “Stalling”
5. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entering into a spin
6. Apply full throttle and lower the nose to the horizon
7. Adjust pitch to $V_Y$ and minimize altitude loss, look for positive rate climb then Gear Up
8. Return to cruise flight: 23” MP and 2400 RPM
9. Perform cruise checklist

Standards:
Private: Heading ±10°, Bank <20° ±10°.
Commercial: Heading ±5°, Bank <20° ±5°.
SECONDARY STALL

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize the effects of improper control usage inducing another stall after initiating a recovery from the initial stall.

This is a demonstrated flight maneuver

1. Complete the maneuvers checklist and plan to recover by 2500 feet AGL
2. Reduce Power to 15” MP then gear down below V_{LE}, (if performing a power off stall) adjust pitch to maintain altitude, trim as necessary
3. Perform a Power-Off or Power-On Stall, as directed
4. At the stall call out, “Stalling”, reduce the angle of attack to regain control effectiveness and apply full power
5. Maintain coordinated use of the ailerons and rudder to level the wings and prevent a spin
6. Immediately increase the pitch attitude to induce another (secondary) stall
7. At the stall, call out, “Stalling”, reduce the angle of attack to regain control effectiveness and ensure full power
8. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entering into a spin
9. Lower the nose to the horizon
10. Adjust pitch to V_{Y} and minimize altitude loss, look for positive rate climb then Gear Up
11. Return to cruise flight: 23” MP and 2400 RPM
12. Perform cruise checklist

Standards:
Student will demonstrate a basic understanding of the maneuver
**ELEVATOR TRIM STALL**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To recognize the effects of not maintaining positive airplane control during a go-around/rejected landing.

This is a demonstrated flight maneuver.

1. Complete the maneuvers checklist and plan to recover by 2500 feet AGL
2. Reduce power to 15” MP then gear down below $V_{LE}$, adjust pitch to maintain altitude, trim as necessary
3. Below $V_{FE}$ extend flaps to 10°, adjust pitch and trim aircraft to maintain altitude
4. Extend the flaps to 25°, adjust pitch and trim aircraft to maintain altitude
5. Extend the flaps to 40°, adjust pitch and trim aircraft to maintain altitude
6. Maintain altitude until reaching 85 MPH/75 KIAS, and then establish a stabilized descent to simulate a normal approach to landing
7. Use enough forward yoke pressure to reduce the angle of attack and regain control effectiveness
8. Maintain coordinated use of the ailerons and rudder to level the wings
9. Adjust pitch to $V_Y$ attitude and retract the flaps to 25°, look for positive rate climb then Gear Up, re-trim as necessary
10. Incrementally retract the flaps to 0°, re-trim as necessary
11. Return to cruise flight: 23” MP and 2400 RPM
12. Perform cruise checklist

**Standards:**
Student will demonstrate a basic understanding of the maneuver
**CROSS-CONTROL STALL**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To recognize the effects of improper control flight control technique.

This is a demonstrated flight maneuver.

1. Complete the maneuvers checklist and plan to recover by 2500 feet AGL
2. Reduce throttle to 15” MP then gear down below $V_{LE}$, adjust pitch and trim aircraft to maintain altitude

**NOTE**

**Because of the possibility of exceeding VFE, flaps are not extended.**

3. Maintain altitude until reaching 90 KIAS and then establish a stabilized descent at 90 MPH/75 KIAS to simulate a normal flaps up approach to landing
4. Descend 100 feet and simultaneously reduce power to idle and pick a reference point off the left or right wing tip
5. Turn towards the reference point using a 25-30° bank while:
6. Simultaneously applying excessive rudder pressure in the direction of the turn
7. Using opposite aileron to prevent over-banking while maintaining a constant 25-30° bank during the turn, and
8. Increasing elevator back-pressure to keep the nose from lowering, achieving 11-12° pitch up.
9. At imminent stall call out, “Stalling”, reduce pitch to regain control effectiveness, and apply full power.

**NOTE**

**Completion of the maneuver should occur by the 90° reference point and before full deflection of the rudder and aileron.**

10. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entering into a spin.
11. Adjust pitch to $V_T$ look for positive rate climb then Gear Up, re-trim as necessary
12. Return to cruise flight: 23” MP and 2400 RPM

**Standards:**

Student will demonstrate a basic understanding of the maneuver
ACCELERATED STALL

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To demonstrate that the stall is a function of angle of attack, weight, and load factor, rather than airspeed.

This is a demonstrated flight maneuver.

1. Complete the maneuvers checklist and plan to recover by 2500 feet AGL
2. Reduce throttle to 15" MP and decelerate at or below maneuvering speed ($V_A$) adjusting pitch and trim aircraft to maintain altitude

   NOTE
   The flaps must be in the 0° (Up) position.

3. Establish a 45-50° bank to the left or right
4. After the bank and turn are established, smoothly and steadily increase elevator back-pressure.
5. As the airspeed reaches 20 knots above the un-accelerated stall speed ($V_{St1}$), firmly increase elevator back-pressure.
6. At imminent stall (buffet):
   a. Note the indicated airspeed, Call out, “Stalling”
   b. Reduce pitch to regain control effectiveness
   c. Add power as necessary.
7. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entry into a spin
8. Minimize altitude loss.
9. Return to the altitude, heading, and airspeed specified.

Standards:
Student will demonstrate a basic understanding of the maneuver
**STEEP TURNS**

_Ref:_ FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To develop smoothness, coordination, orientation, division of attention, and control techniques while executing high performance turns.

1. Complete the maneuvers checklist and plan to recover by 1500 feet AGL
2. Establish airspeed below $V_A$, about 21” MP, trim as necessary
3. Choose a prominent landmark or note the heading
4. Roll into a 45° bank (private) or 50° bank (commercial) and begin a 360° turn
5. Rolling through 30°, add power as necessary to maintain altitude and airspeed
6. Begin roll out 15°-20° before the originating landmark or heading
7. Roll wings level and then,
8. Immediately roll into a 360° turn in the opposite direction
9. Return to cruise flight: 23” MP and 2400 RPM
10. Perform cruise checklist

**Standard:**

_Private:_ Altitude±100 ft., Airspeed ±10, Bank ±5°, Heading ±10°.
_Commercial:_ Altitude ±100 ft., Airspeed ±10, Bank ±5°, Heading ±10°.
**CHANDELLES**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To develop the pilot’s coordination, orientation, planning, and feel for maximum performance flight, and to develop positive control techniques at varying airspeeds and attitudes.

1. Complete the maneuvers checklist and plan to recover by 1500 feet AGL
2. Establish airspeed below $V_A$, about 21” MP, trim as necessary
3. Select a reference point directly off the left or right wing tip
4. Roll into a coordinated 30° bank turn and neutralize rudder and aileron.
5. After the bank is established, smoothly initiate a climbing turn and apply full power
6. While maintaining a 30° bank, continue increasing the pitch attitude at a constant rate so as to attain the highest pitch (approx. 13-15°) at the 90° point in the turn
7. At the 90° point in the turn, maintain pitch attitude by continuing to increase elevator backpressure (due to decreasing airspeed) and initiate a slow rate of rollout
8. Maintain a constant roll out rate with aileron while increasing right rudder and increasing back pressure to maintain pitch, plan to decrease bank 10° by 30° of heading change
9. Arrive at the 180° point with airspeed about 5 KIAS above stall, wings level, and coordinated flight. Maintain pitch for about 3 seconds.
10. Begin slowly decreasing pitch attitude to level flight and increasing airspeed. No altitude loss.
11. Return to cruise flight: 23” MP and 2400 RPM
12. Perform cruise checklist

**Standards:**

Commercial: Airspeed just above stall, Heading ±10°
LAZY EIGHT

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To develop the pilot’s feel for varying control forces, and the ability to plan and remain oriented while maneuvering the plane with positive and accurate control.

1. Complete the maneuvers checklist and complete the maneuver by 1500 feet AGL
2. Select a forced landing area and set power to cruise below $V_A$ about 21” MP, trim as necessary
3. Select 45°, 90°, and 135° reference points on or out toward the horizon
4. From straight and level flight, initiate a shallow climbing turn by simultaneously increase bank and pitch slowly planning to achieve maximum pitch (approx. 13°-15°) and 15° bank angle at the 45° reference point. If the initial turn is to the left, a slight amount of right rudder and neutral aileron will be required to maintain coordination. If the initial turn is to the right, more right rudder will be required and slight opposite aileron at the 45° reference to prevent over-banking
5. From the 45° reference point allow the bank angle to continue increasing, and pitch to decrease so that at the 90° reference point the maximum bank angle (30°) is achieved and the pitch attitude is passing through level flight at minimum airspeed
6. From the 90° reference point, allow the pitch attitude to continue decreasing and initiate a slow decrease in bank angle while continuing a descending turn in the direction of the 135° reference point where the maximum pitch down attitude (approx. 13°-15°) should be achieved with a 15° bank angle
7. From the 135° reference point, continue decreasing the bank angle while allowing the pitch to increase so that the airplane returns to the entry airspeed and altitude by the 180° reference point

NOTE
The airspeed should not exceed the entry airspeed during the turn from the 90° reference point to the 180° reference point

8. Proceed through the 180° point with no hesitation and begin a shallow climbing turn in the opposite direction, repeating the steps outlined above
9. Complete the maneuver at entry heading, airspeed and altitude
10. Return to cruise flight: 23” MP and 2400 RPM
11. Perform cruise checklist

Standards:
Commercial: Bank angle ≤ 30°, Altitude ±100 ft., Airspeed ±10 KIAS
Heading ±10°.
### STEEP SPIRAL

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

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

1. Complete the maneuvers checklist
2. Determine wind direction
3. Establish an altitude that will allow at least 3 -360° turns, rollout before 1500' feet AGL
4. Select a forced landing area where an emergency landing can be made if necessary
5. Approach a prominent reference point to spiral around so as to enter on downwind
6. Close throttle and adjust pitch to establish and maintain best glide speed (105 MPH/79 KIAS), trim as necessary
7. Maintain a constant radius around the reference point adjusting the bank angle as necessary not to exceed 60°

**NOTE**

Prolonged idle power may result in excessive engine cooling or spark plug fouling, especially during cold weather. The engine should be cleared periodically by briefly advancing the throttle to cruise power. This should be done with a headwind to minimize groundspeed variation

8. Complete at least three 360° turns
9. Complete the maneuver on entry heading

**NOTE**

Recover no lower than 1500’ AGL unless combining the maneuver with a simulated Emergency Approach and Landing

10. Return to cruise flight: 23” MP and 2400 RPM
11. Perform cruise checklist

**Standards:**

Commercial: Bank angle ≤ 60°, Altitude sufficient to complete three 360°, Airspeed ±10 KIAS, Heading ±10°
**EMERGENCY DESCENT**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To descend the airplane as rapidly as possible, within the operating limitations of the airplane.

1. Complete the maneuvers checklist and complete the maneuver by 1500 feet AGL
2. Brief all passengers
3. Pick a visual landmark off the wing tip in the direction of turn
4. Throttle to Idle, propeller RPM maximum, gear down below maximum gear extension speed ($V_{LE}$), reduce speed below maximum flap speed ($V_{FE}$), extend flaps to 40°
5. Simultaneously roll into a 30°-45° bank in direction of planned turn and adjust pitch to maintain 105 MPH/79 KIAS
6. Roll out on the 180° point in the turn and make shallow S-turns to continue checking for other traffic while descending
7. Approaching the target altitude, begin to level off by increasing pitch to reduce the descent rate
8. At target altitude, adjust pitch to maintain level flight
9. Set the aircraft for normal cruise flight
10. Return to cruise flight: 23” MP and 2400 RPM
11. Perform cruise checklist

**Standards:**
- **Private:** Airspeed, establishes appropriate airspeed, Maintains positive load factors during the descent
- **Commercial:** Airspeed $\pm$ 10 KIAS, Maintains positive load factors during the descent, Altitude, $\pm$ 100 feet
EMERGENCY APPROACH AND LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)
Piper Warrior Pilot’s Operation Manual (POH)

Objective: To execute a safe approach and landing in the event of an engine failure

NOTE
When simulating an engine failure, the Instructor Pilot will call out “Simulated Engine Failure”

1. Establish the best glide speed $V_g$ 105 MPH/79 knots, trim as necessary
2. Determine wind direction and select a suitable landing site, checking the area in the immediate vicinity of the aircraft’s position
3. Turn the airplane towards the selected landing site
4. Go through the Right to Left memorization checklist. (Mixture, Props, Throttle, Fuel pump, Magnets, Fuel Selector)
5. If altitude permits, complete the emergency checklist
6. If engine restart is unsuccessful, maneuver the aircraft as necessary for the approach and landing
7. Squawk transponder code 7700 and transmit mayday on 121.5

NOTE
Prolonged idle power may result in excessive engine cooling or spark plug fouling, especially during cold weather. The engine should be cleared periodically by briefly advancing the throttle to cruise power.

How to maneuver the aircraft for the pattern and the approach and landing will depend on many variables, including location of the closest suitable landing site to the aircraft’s current position, altitude, wind direction, landing direction, obstructions, etc. All variables must be considered when developing a maneuvering plan

8. When appropriate, maneuver the aircraft to arrive at a point abeam the point of intended landing at 1000’ AGL
9. Turn onto the base leg and determine if adjustment of the flight path of the base leg is necessary to conserve or dissipate altitude to ensure reaching the desired landing point
10. Complete the Power Off Landing checklist:

NOTE
Unless the approach is made to an airport runway, the simulated emergency approach and landing should be terminated as soon as it can be determined that a safe landing could have been made, or 500’ AGL, whichever occurs first

Standards:
Private: Best Glide ±10 KIAS
Commercial: Best Glide ±10 KIAS
RECTANGULAR COURSE

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane.

1. Complete the maneuvers checklist
2. Determine the wind direction
3. Perform Clearings turns and plan to execute the maneuver between 600-1000 feet AGL
4. Select a forced landing area
5. Establish and maintain a speed below $V_A$ about 21” MP, trim as necessary
6. Enter either left or right pattern on a 45° angle to the mid-field downwind leg
7. Establish a crab angle as necessary to maintain a uniform distance from the area boundaries for each leg of the maneuver

NOTE
The airplane should be flown parallel to and at a uniform distance ¼ to ½ mile away from the field boundaries

8. Begin the turn to next leg when airplane is abeam the corner of the area boundary
9. Vary the bank angle (not to exceed a 45° bank) to maintain a constant radius during the turns
10. Depart on a 45° from the downwind at the downwind turn boundary
11. Return to cruise flight: 23” MP and 2400 RPM
12. Perform cruise checklist

Standards:
Private: Airspeed ±10 KIAS, Altitude ±100
**S-TURNS ACROSS A ROAD**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To teach the student to maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane

1. Complete the maneuvers checklist
2. Determine the wind direction
3. Perform clearing turns and maneuver must be executed between 600-1000 feet AGL
4. Pick an area that includes an emergency landing field
5. Establish and maintain a speed below $V_A$ about 21" MP, trim as necessary
6. Enter on a downwind heading
7. When directly over a reference line or road (highest groundspeed), roll into the steepest bank (not to exceed 45°) to initiate and maintaining a constant radius
8. As the turn continues (groundspeed decreases), begin to shallow the bank as necessary to continue maintaining a constant radius
9. Level the wings when crossing the reference point (lowest groundspeed) and immediately begin a turn back in the opposite direction
10. As the turn continues (groundspeed increases), begin to steepen the bank as necessary to continue maintaining a constant radius
11. Level the wings when crossing the reference point (highest groundspeed)

**NOTE**

**The rollouts must be timed in order to be straight and level directly over and perpendicular to the reference line or road**

12. Return to cruise flight: 23" MP and 2400 RPM
13. Perform cruise checklist

**Standards:**

Private: Airspeed ±10 K., Altitude ±100 ft.
TURNS AROUND A POINT

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane.

1. Complete the maneuvers checklist
2. Determine the wind direction
3. Perform Clearings turns and plan to execute the maneuver between 600-1000 feet AGL
4. Select a forced landing area
5. Establish and maintain a speed below $V_A$ about 21" MP, trim as necessary
6. Enter the maneuver at cruise speed on downwind to one side of the selected reference point at a distance equal to the desired radius of turn
7. On entry downwind (highest groundspeed) and abeam the reference point, roll into the steepest bank (not to exceed 45°) to initiate and maintain a constant radius
8. As the turn continues (groundspeed decreases), begin to shallow the bank as necessary to continue maintaining a constant radius
9. Directly upwind (lowest groundspeed), the bank should be at its shallowest
10. As the turn continues (ground speed increases), begin to steepen the bank as necessary to continue maintaining a constant radius
11. Complete two complete circles, or as directed, and depart on the entry heading
12. Return to cruise flight: 23” MP and 2400 RPM
13. Perform cruise checklist

Standards:
Private: Airspeed ±10 K., Altitude ±100 ft.
EIGHTS ON PYLONS

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane.

1. Complete the maneuvers checklist
2. Determine the wind direction
3. Perform clearing turns and determine the pivotal altitude

NOTE
To determine the pivotal altitude, use the following calculation:

\[
\text{Pivotal Altitude} = \frac{(\text{GS Knots})^2}{13} \quad \frac{(\text{GS MPH})^2}{15}
\]

4. Select a forced landing area that will allow an emergency landing from any position in the maneuver
5. Establish and maintain an entry speed below \( V_A \) about 21” MP, trim as necessary
6. Enter the maneuver on a 45° to the downwind and at a distance from the pylons that will require up to 30° angle of bank at the steepest point
7. At the position where the pylon appears to be just ahead of a line extending from the pilot’s eye and parallel to the airplane’s lateral axis, lower the upwind wing to place the pilot’s line of sight on the pylon
8. As the turn is continued, the groundspeed of the airplane will decrease as the wind changes from a tailwind to a crosswind. To keep the pylon on the reference line, the pilot must lower the altitude by pitching down. As the airplane continues to turn, the wind changes to a headwind, ground speed decreases, requiring a lower pivotal altitude to maintain the reference line on the pylon. The pilot adjusts by pitching down if necessary

NOTE
The effects of the wind on the airplane’s groundspeed should be anticipated so as to smoothly adjust pitch, where necessary, to maintain the line of sight reference with the pylon

9. As the airplane turns toward a downwind heading, plan to roll out to maintain a 45° ground track across the road/section line in straight and level flight for 3 to 5 seconds
10. Lead the roll in on the second pylon as in the first and maintain the reference point with pitch changes to continue the maneuver
11. Maintain division of attention away from the ground reference point to continue collision avoidance as well as inside the airplane to check flight instruments for accuracy and engine instruments for proper operation

Standards:
Commercial: Maximum bank angle 30-40°.
NORMA L APPROACH AND LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To safely and accurately establish and maintain a stabilized approach to a landing in a designated area.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Set power to 20” MP, gear down at mid-field
4. Abeam the point of intended landing, reduce throttle to 15” MP
5. Below VFE extend flaps to 10°
6. Maintain 105 MPH/95 KIAS and 300-500 ft./min descent
7. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
8. Extend flaps to 25° and slow the aircraft to 90 MPH/ 85 KIAS
9. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
10. When landing is assured, extend flaps to 40° establish and maintain 90 MPH/75 KIAS (+1/2 gust factor if appropriate). Trim as necessary

NOTE
The approach must be stabilized by 200 feet. If not, execute a go-around

11. At the round out, commence reducing power to idle, continuing the flare to touch down on the main wheels first, holding the nose wheel off with back pressure throughout the rollout; allow settling gently
12. Maintain directional control throughout the rollout, slowing sufficiently before turning onto a taxiway

Standards:
Private: Airspeed +10/-5 KIAS. Touch Down: 400 ft.
Commercial: Airspeed ±5 KIAS. Touch Down 200 ft.
**SHORT FIELD APPROACH AND LANDING**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To safely and accurately establish and maintain a stabilized approach to a landing, obtaining maximum performance by stopping in a minimum distance.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Set power to 20” MP, gear down at mid-field
4. Abeam the point of intended landing, reduce throttle to 15” MP
5. Below VFE extend flaps to 10°
6. Maintain 105 MPH/95 KIAS and 300-500 ft./min descent
7. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
8. Extend flaps to 25° and slow the aircraft to 90 MPH/85 KIAS
9. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
10. When landing is assured, extend flaps to 40° establish and maintain 83 MPH/72 KIAS (+1/2 gust factor if appropriate). Trim as necessary

**NOTE**

The approach must be stabilized by 200 feet. If not, execute a go-around

11. Before the roundout, begin smoothly reducing power, continuing the power reduction during the roundout while increasing pitch to maintain a constant glide path to the desired touchdown point

**NOTE**

Avoid closing the throttle rapidly, which may result in an immediate increase in the rate of decent and a hard landing

12. Touch down at minimum controllable airspeed, with the throttle at idle position, on the main wheels first, plan for minimum float
13. Immediately after touchdown, apply maximum aerodynamic braking
14. Applying heavy braking when nose wheel is on runway.

**Standards:**

Private: Airspeed +10/-5 KIAS. Within 200 ft. of intended landing point
Commercial: Airspeed ±5 KIAS. Within 100 ft. of intended landing point
SOFT FIELD LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To develop the student’s ability to safely and accurately maintain a stabilized approach to land the airplane obtaining maximum performance by touching down at the slowest possible airspeed.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Set power to 20° MP, gear down at mid-field
4. Abeam the point of intended landing, reduce throttle to 15° MP
5. Below VFE extend flaps to 10°
6. Maintain 105 MPH/95 KIAS and 300-500 ft./min descent
7. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
8. Extend flaps to 25° and slow the aircraft to 90 MPH/85 KIAS
9. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
10. When landing is assured, extend flaps to 40° establish and maintain 90 MPH/75 KIAS (+1/2 gust factor if appropriate). Trim as necessary

NOTE
The approach must be stabilized by 200 feet. If not, execute a go-around

11. At the round out, commence reducing power as necessary and initiating the flare to hold the airplane 1-2 feet off the surface in ground effect as long as possible to gradually dissipate forward speed, Power may be used to slow the rate of descent and soften the touchdown.
12. Touchdown on the main wheels first holding the nose wheel off with back pressure throughout the rollout
13. Taxi off runway without stopping and with the use of little or no brakes.

NOTE
Conduct all taxi operations with the control wheel fully aft. On softer surfaces, additional power may be needed to maintain taxi speed and to avoid becoming stuck. Avoid the use of brakes to prevent imposing a heavy load on the nose gear, causing the nose gear to “dig” into the soft surface.

Standards:
Private: Airspeed +10/-5 KIAS
Commercial: Airspeed ±5 KIAS
POWER-OFF 180° ACCURACY APPROACH AND LANDING

Ref:  FAA-H-8083-3A (Airplane Flying Handbook)

Objective:  To demonstrate the judgment, technique, and skill necessary for accurately flying the airplane, without power, to a safe landing.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Set power to 20" MP, gear down at mid-field
4. Abeam the point of intended landing, reduce throttle to idle, slowing to 105 MPH/95 KIAS and commence a descent. Trim as necessary
5. At a point appropriate for wind conditions, commence a turn to the base leg using a medium to steep bank angle (20°-30°)

NOTE
Establish and then adjust the base leg toward, perpendicular, or away from the intended touchdown point, considering altitude and wind conditions, so as to conserve or dissipate altitude as necessary to reach the intended touchdown point

6. On base leg, add flaps as necessary and maintain descent speed. The base leg is not a fixed point on the ground and may be adjusted to accommodate varying conditions
7. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
8. When landing is assured, extend flaps to 40° establish and maintain 90 MPH/75 KIAS (+1/2 gust factor if appropriate). Trim as necessary

NOTE
The approach must be stabilized by 200 feet. If not, execute a go-around

9. At the round out, commence reducing power to idle, continuing the flare to touch down on the main wheels first, holding the nose wheel off with back pressure throughout the rollout; allow settling gently
10. Maintain directional control throughout the rollout, slowing sufficiently before turning onto a taxiway

Standards:
Commercial: Airspeed ±5 KIAS, within 200 ft. of intended touchdown point
GO-AROUND/REJECTED LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To develop the ability to safely transition at a critical time from the approach and landing phase to the climb.

1. Upon deciding to go-around:
   a. Power full forward
   b. Pitch up slightly
   c. Flaps reduce to 25° immediately
   d. Positive rate, gear up
   e. Climb at 96 MPH/78 KIAS \(V_x\)
   f. Obstacle cleared – flaps up incrementally
   g. Accelerate to 100 MPH/90 KIAS \(V_Y\)

2. Maintain directional control and proper wind-drift correction throughout the climb
3. Execute an appropriate departure procedure, or remain in the traffic pattern as appropriate
4. Complete the Go Around Checklist

Standards:
Private: Airspeed ±10/-5 KIAS
Commercial: Airspeed ±5 KIAS
**ARROW V SPEEDS**

<table>
<thead>
<tr>
<th>Speed Category</th>
<th>PA-28R-200</th>
<th>PA28R-201</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotation ($V_R$)</td>
<td>65 MPH</td>
<td>65 KIAS</td>
</tr>
<tr>
<td>Best Rate of Climb ($V_Y$)</td>
<td>95 MPH</td>
<td>78 KIAS</td>
</tr>
<tr>
<td>Gear Up</td>
<td>100 MPH</td>
<td>90 KIAS</td>
</tr>
<tr>
<td>Best Angle of Climb ($V_X$)</td>
<td>85 MPH</td>
<td>72 KIAS</td>
</tr>
<tr>
<td>Gear Down</td>
<td>96 MPH</td>
<td>78 KIAS</td>
</tr>
<tr>
<td>Gear Up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stall Speed Flaps ($V_{S0}$)</td>
<td>65 MPH</td>
<td>55 KIAS</td>
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<tr>
<td>Stall Speed Clean ($V_{S1}$)</td>
<td>71 MPH</td>
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<tr>
<td>Maneuvering Speed ($V_A$)</td>
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<td>Flaps Extended Speed ($V_{FE}$)</td>
<td>125 MPH</td>
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<tr>
<td>Max. Gear Extend</td>
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<td>129 KIAS</td>
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<tr>
<td>Max Gear Retract</td>
<td>125 MPH</td>
<td>107 KIAS</td>
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<td>Never Exceed Speed ($V_{NE}$)</td>
<td>214 MPH</td>
<td>183 KIAS</td>
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<tr>
<td>Best Glide</td>
<td>105 MPH</td>
<td>79 KIAS</td>
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<tr>
<td>Cruise Climb</td>
<td>110 MPH</td>
<td>104 KIAS</td>
</tr>
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</table>

**Speeds are for an aircraft operating at gross weight**

<table>
<thead>
<tr>
<th>Aircraft Model</th>
<th>$1.2V_{S1}$</th>
<th>$1.2V_{S0}$</th>
<th>$1.3V_{S0}$</th>
</tr>
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<tbody>
<tr>
<td>PA-28R-200</td>
<td>83 MPH</td>
<td>66 MPH</td>
<td>72 MPH</td>
</tr>
<tr>
<td>PA-28R-201</td>
<td>72 KIAS</td>
<td>66 KIAS</td>
<td>72 KIAS</td>
</tr>
</tbody>
</table>

Flap extended positions: 10, 25, 40 degrees
Max Demonstrated Crosswind Component: 17 Knots \[\sin x\ (wind)\]
Max Gross Weight: 2650 lbs
Standard Empty Weight: 1531 lbs
Engine Manufacturer: Lycoming
Model: IO-360
Type: C1C and C1C6
Displacement: 361 Cubic Inches
Horsepower: 200 HP
Rated Speed (RPM): 2700 RPM
Oil
Max: 8 qts
Min: 6 qts
Prop Length: 74 Inches
Wing Span: 32.2 Feet
Fuel
Grade: 100LL (Blue)
Quantity: 48 Gal. Usable \ 2 Gal. Unusable
Tire Pressure
Main: 27 PSI
Nose: 30 PSI
Electrical System

Battery
Alternator

12 Volt’s; 25 Amp Hour
14 Volt’s; 60 Amps

There is an ammeter that measures the electrical load on the alternator.

Fuel System

There are 48 gallons of usable fuel and 2 gallons of unusable fuel, which gives us a total of 50 gallons. There is one engine driven fuel pump and one electric fuel pump in the event of engine driven fuel pump failure.
PIPER SENECA
PA-34-200

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NORMAL TAKEOFF AND CLIMB

REF: FAA-H-8083-3A (Airplane Flying handbook)

Objective: To safely execute a takeoff under normal conditions

1. Complete the Before Takeoff checklists
2. Center aircraft on runway centerline with nose wheel straight ahead
3. Advance the throttle smoothly forward to 2000 RPM, check engine instruments
4. Advance power to full forward
5. Maintain aircraft on centerline
6. Call out “airspeed alive”
7. Accelerate aircraft to 85 MPH call out “$V_R \text{ rotate}$”, increase control yoke back
   pressure to pitch up until the glare shield meets the horizon (approximately 10°)
   when positive rate climb call out “Positive rate – gear up”
8. Accelerate to 105 MPH [$V_Y$] and climb on centerline, trim as necessary
9. At 1000’ AGL, decrease pitch to establish and maintain 120 MPH cruise climb,
   set 25” MP and 2500 RPM
10. Execute a Traffic Pattern departure procedure
11. After leaving the traffic pattern, complete the climb checklist

IF REMAINING IN THE PATTERN

12. Accelerate to 105 MPH and climb on centerline, trim as necessary
13. At 600’ AGL turn to crosswind, set 25”MP and 2500 RPM
14. Continue climb to TPA (900 feet at 33N) and turn downwind, reduce power to 18”
   MP

Standards:

Private: Airspeed $V_Y +10/-5$
Commercial: Airspeed $V_Y \pm 5$
**SHORT FIELD TAKEOFF 0° Flaps**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To obtain maximum performance during takeoff and minimize the runway length required

1. Complete Before Takeoff checklists
2. Taxi aircraft on runway centerline utilizing all available runway and center nose wheel
3. Firmly depress the brake pedals to ensure holding the airplane in position during full power run-up
4. Advance the throttle forward to 2000 RPM, check engine instruments
5. Smoothly advance the throttle to full forward, check static power, and then release the brakes
6. Maintain directional control and runway centerline with the rudder pedals
7. Call out “air speed alive”
8. Accelerate aircraft to 80 MPH call out “$V_R$ rotate”
9. Adjust pitch to climb at 85 MPH
10. When obstacle is clear or 50’ AGL, accelerate to 90 MPH ($V_X$), when positive rate climb call out “Positive rate – gear up” and climb on centerline,
11. At 1000’ AGL, decrease pitch to establish and maintain 120 MPH cruise climb, set 25” MP and 2500 RPM
12. Climb out as normal

**Standards:**
Private: Airspeed +10/-5
Commercial: $V_X$ +5/-0 K., then $V_Y$ ±5
**SHORT FIELD TAKEOFF 25° FLAPS**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To obtain maximum performance during takeoff and minimize the runway length required

1. Complete Before Takeoff checklists
2. Extend to 25° flaps and trim slightly nose up
3. Taxi aircraft on runway centerline utilizing all available runway and center nose wheel
4. Firmly depress the brake pedals to ensure holding the airplane in position during full power run-up
5. Advance the throttle forward to 2000 RPM, check engine instruments
6. Smoothly advance the throttle to full forward, check static power, and then release the brakes
7. Maintain directional control and runway centerline with the rudder pedals
8. Call out “air speed alive”
9. Accelerate aircraft to 70 MPH call out “$V_R$ rotate”
10. Adjust pitch to climb at 85 MPH
11. When obstacle is clear or 50’ AGL, accelerate to 90 MPH ($V_X$), when positive rate climb call out “Positive rate – gear up” and climb on centerline,
12. Slowly reduce flaps to 0°, trim as necessary
13. At 1000’ AGL, decrease pitch to establish and maintain 120 MPH cruise climb, set 25” MP and 2500 RPM
14. Climb out as normal

**Standards:**

- Private: Airspeed $+10/-5$
- Commercial: $V_X +5/-0$ K., then $V_Y \pm 5$
REJECTED TAKEOFF

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize and properly react to engine failure during takeoff at varying airspeeds.

NOTE
This procedure shall be practiced at airfields with 150 ft. wide and 5000 ft. long runways. For training purposes, simulated engine failures shall be initiated before 50% V_{MC}

1. Throttles closed immediately
2. Stop straight ahead
3. Maintain aircraft control with rudders

If inadequate runway remains:
1. Throttles close immediately
2. Apply maximum braking (May simulate during training)
3. Master switch off (May simulate during training)
4. Fuel sectors off (May simulate during training)
5. Continue straight ahead, avoid obstacles as necessary
6. Maintain aircraft control with rudders

Standards:
Private: Maintains directional control and applies brakes as necessary
Commercial: Maintains directional control and applies brakes as necessary

NOTE
The following is provided for discussion and familiarizing purposes only

If adequate runway remains, gear down, and airspeed ≥ 100 MPH
1. Throttles close immediately
2. Stop straight ahead
3. Maintain aircraft control with rudders

If inadequate runway remains and airspeed ≥ 100 MPH
1. Maintain heading and airspeed
2. When climb is established, call out “positive rate – gear up”
3. Confirm inoperative engine and complete the Propeller Feather checklist
MANEUVERING DURING SLOW FLIGHT

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize changes in aircraft flight characteristics and control effectiveness at critically slow airspeeds in various configurations.

This maneuver may be done with or without flaps and gear, recover at or above 3000' AGL

1. Complete the maneuvers checklist
2. Reduce power to 15” MP then gear down below $V_{LE}$
3. Below $V_{FE}$ incrementally extend flaps to 40°
4. Maintain heading
5. Maintain altitude with power
6. Maintain airspeed with pitch
7. Establish airspeed at minimum airspeed, just above stall (Stall warning horn may be sounding continuously)
8. Execute climbs, descents and turns

On Recovery:

9. Apply full power while maintaining altitude
10. Reduce the flaps to 25°
11. At 90 MPH, Gear up (if down)
12. Reduce flaps to 0° while maintaining altitude (if extended)
13. Return to slow cruise: 20” MP and 2400 RPM
14. Perform cruise checklist

Standards:
Private: altitude ±100 ft., heading ±10°, bank ±5°, airspeed +10/-0
Commercial: altitude ±50 ft., heading ±10°, bank ±5°, airspeed +5/-0
# POWER OFF STALLS

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To recognize the indications of an imminent or full stall during power off situations with the flaps down, and to make prompt, positive, and effective recoveries with a minimum loss of altitude.

1. Complete the maneuvers checklist and plan to recovery by 3000 feet AGL
2. Reduce power to 15” MP then gear down below $V_{LE}$ and adjust pitch to maintain altitude, trim as necessary
3. Below $V_{FE}$ incrementally extend flaps to 40° maintain altitude
4. Maintain altitude until reaching 95 MPH and then establish a stabilized descent (trimmed) at entry airspeed to simulate a normal approach to landing
5. Descend 100 ft. and then reduce power to idle
6. Maintain altitude in straight flight or in turns with up to 20° bank. Airspeed will drop requiring additional back pressure to maintain altitude
7. On first indication of an imminent stall [stall horn, mushy controls, buffeting] or full stall call out “Stalling”
8. Level the aircraft (if in a turn), apply full throttle and lower the nose slightly below horizon
9. Reduce flaps to 25°
10. Establish $V_X$ and subsequently $V_Y$, look for positive rate climb then Gear Up
11. During the climb, slowly reduce flaps to zero and climb to starting altitude
12. Return to slow cruise: 20” MP and 2400 RPM
13. Perform cruise checklist

**Standards:**

Private: Heading ±10°, Bank <20° ±10°.
Commercial: Heading ±10°, Bank <20° ±5°.
POWER ON STALLS

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize the indications of an imminent or full stall during power on situations and to make prompt, positive, and effective recoveries with a minimum loss of altitude.

1. Complete the maneuvers checklist and plan to recovery by 3000 feet AGL
2. Reduce power to 13" MP then gear down below $V_{LE}$ and adjust pitch to maintain altitude, trim as necessary
3. Cowl flaps open if temperature at or above 30° F
4. Maintain altitude until reaching 95 MPH, then set power to 20" MP and smoothly increase pitch to approximately 20°
5. On first indication of an imminent stall [stall horn, mushy controls, buffeting] or full stall call out “Stalling”
6. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entering into a spin
7. Apply full throttle and lower the nose to the horizon
8. Adjust pitch to $V_Y$ and minimize altitude loss, look for positive rate climb then Gear Up
9. Return to slow cruise: 20" MP and 2400 RPM
10. Perform cruise checklist

Standards:
- Private: Heading ±10°, Bank <20° ±10°.
- Commercial: Heading ±5°, Bank <20° ±5°.
**STEEP TURNS**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To develop smoothness, coordination, orientation, division of attention, and control techniques while executing high performance turns.

1. Complete the maneuvers checklist and plan to recovery by 1500 feet AGL
2. Establish airspeed below $V_A$, about 20" MP, trim as necessary
3. Choose a prominent landmark or note the heading
4. Roll into a 45° bank (private) or 50° bank (commercial) and begin a 360° turn
5. Rolling through 30°, add power as necessary to maintain altitude and airspeed
6. Begin roll out 15°-20° before the originating landmark or heading
7. Roll wings level and then,
8. Immediately roll into a 360° turn in the opposite direction
9. Return to slow cruise 20" MP and 2400 RPM
10. Perform cruise checklist

**Standard:**
- Private: Altitude±100 ft., Airspeed ±10, Bank ±5°, Heading ±10°.
- Commercial: Altitude ±100 ft., Airspeed ±10, Bank ±5°, Heading ±10°
\[ \textit{V}_{MC} \textit{ DEMONSTRATION} \]

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook)

**Objective:** To demonstrate aircraft characteristics at minimum controllable airspeeds

1. Perform clearing turns and plan to recovery at or above 3000 feet AGL
2. Establish airspeed below \( V_A \), trim as necessary
3. Choose a prominent landmark or note the heading
4. Reduce throttle to 13\(^\circ\) manifold pressure
5. Below \( V_{FE} \) flaps may be extended to 25\(^\circ\)
6. Maintain altitude, cowl flaps open on planned operating engine and closed on planned inoperative engine
7. At \( V_{YSE} \) (105 MPH) power on the planned inoperative engine should be throttled back to idle as the operative engine power is advanced to the takeoff setting
8. Establish zero side slip at \( V_{YSE} \)
9. Increase pitch to 5\(^\circ\) and slow aircraft at 1 MPH/second
10. Recover at full rudder input or first indication of \( V_{MC} \)
11. Recovery:
   a. Pitch down and reduce power of operating engine
   b. At 90 MPH increase to full power on operating engine
   c. Pitch to \( V_{YSE} \)

**NOTE**

Do not decrease rudder pressure as the reduction and increase of power should take only seconds

12. Synchronize both engines by:
   a. Reduce power to 20\(^\circ\) manifold pressure on operating engine
   b. If temperature above 200\(^\circ\) F, increase inoperative engine power to match operating engine, if temperature is lower than 200\(^\circ\) F, increase power to 15\(^\circ\) manifold pressure until 200\(^\circ\) F, then match engine power
13. Perform cruise checklist

**Standards:**
   - Private: Heading <20\(^\circ\), \( V_{YSE} +10/-5 \)
   - Commercial: Heading <\(^\circ\), \( V_{YSE} \pm 5 \)
**DRAG DEMONSTRATION**

1. Perform clearing turns and plan to recovery at or above 3000 feet AGL
2. Establish airspeed below $V_A$ trim as necessary
3. Choose a prominent landmark or note the heading
4. Mixture rich, propeller full forward.
5. Reduce throttle to 13” manifold pressure
6. Maintain altitude, cowl flaps open on planned operating engine and closed on planned inoperative engine
7. At $V_{YSE}$ (105 MPH) power on the planned inoperative engine should be throttled back to idle as the operative engine power is advanced to the takeoff setting
8. Establish zero side slip and maintain $V_{YSE}$, note VSI
9. Simulate feather on inoperative engine (11” manifold pressure), note VSI
10. Gear down and pitch to maintain $V_{YSE}$, note VSI
11. Flaps down in increments to 40°, maintain $V_{YSE}$, note VSI
12. Reduce power to idle of inoperative engine, note VSI
13. Recover in opposite order while maintain $V_{YSE}$
14. Synchronize both engines by:
   a. Reduce power to 20” manifold pressure on operating engine
   b. If temperature above 200° F, increase inoperative engine power to match operating engine, If temperature is lower than 200° F, increase power to 15” manifold pressure until 200° F, then match engine power
15. Perform cruise checklist

**Standards:**
- Commercial: Maintain entry heading ±10°, $V_{YSE}$ ±5 MPH and altitude ±100 ft.
ENGINE FAILURE

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To properly recognize, apply appropriate procedures, and maintain aircraft flight during an inflight engine failure

NOTE
This procedure shall be performed at altitudes above 3000 ft. and near an airport that provides for safe single-engine landing. Engine failures may be initiated by use of fuel shut-off valve. Should the propeller fail to unfeather during engine restart, it shall be treated as an emergency.

1. Adjust pitch to VMC and maintain directional control
2. Mixture rich
3. Propellers full forward
4. Throttles full forward
5. Bank 5° into operating engine
6. Gear up
7. Flaps up
8. Verify inoperative engine: Retard throttle on inoperative engine, once verified, push throttle forward ¼”.
9. Complete the Propeller Feathering checklist

Standards:
Private: Altitude ± 100 feet, Heading ± 10°
Commercial: Altitude ± 100 feet, Heading ± 10°
EMERGENCY DESCENT

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To descend the airplane as rapidly as possible, within the operating limitations of the airplane.

1. Complete the maneuvers checklist and complete the maneuver by 1500 feet AGL
2. Brief all passengers
3. Pick a visual landmark off the wing tip in the direction of turn
4. Throttles to Idle, propellers RPM maximum, gear down below maximum gear down speed (VLE), extend flaps to 40° when below maximum flap speed (VFE),
5. Simultaneously roll into a 30°-45° bank in direction of planned turn and adjust pitch to maintain 105 MPH
6. Roll out on the 180° point in the turn and make shallow S-turns to continue checking for other traffic while descending
7. Approaching the target altitude, begin to level off by increasing pitch to reduce the descent rate
8. At target altitude, adjust pitch to maintain level flight
9. Return to slow cruise: 20” MP and 2400 RPM
10. Perform cruise checklist

Standards:

Private: Airspeed, establishes appropriate airspeed, Maintains positive load factors during the descent
Commercial: Airspeed ± 10 KIAS, Maintains positive load factors during the descent, Altitude, ± 100 feet
NORMAL APPROACH AND LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To safely and accurately establish and maintain a stabilized approach to a landing in a designated area.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Set power to 18" MP and at mid-field, gear down, check three green one in the mirror
4. Abeam the point of intended landing, reduce throttle to 15" MP and 2500 RPM
5. Below VFE extend flaps to 10°
6. Maintain 110 MPH and 300-500 ft./min descent
7. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
8. Extend flaps to 25° and slow the aircraft to 105 MPH
9. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
10. When landing is assured, extend flaps to 40° establish and maintain 95 MPH (+1/2 gust factor if appropriate). Trim as necessary

NOTE
The approach must be stabilized by 200 feet. If not, execute a go-around

11. At the round out, commence reducing power to idle, continuing the flare to touch down on the main wheels first, holding the nose wheel off with back pressure throughout the rollout; allow settling gently
12. Maintain directional control throughout the rollout, slowing sufficiently before turning onto a taxiway

Standards:
Private: Airspeed +10/-5 KIAS. Touch Down: 400 ft.
Commercial: Airspeed ±5 KIAS. Touch Down 200 ft.
SHORT FIELD APPROACH AND LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To safely and accurately establish and maintain a stabilized approach to a landing, obtaining maximum performance by stopping in a minimum distance.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Set power to 18” MP and at mid-field, gear down, check three green one in the mirror
4. Abeam the point of intended landing, reduce throttle to 15” MP and 2500 RPM
5. Below VFE extend flaps to 10°
6. Maintain 110 MPH and 300-500 ft./min descent
7. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
8. Extend flaps to 25° and slow the aircraft to 105 MPH
9. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
10. When landing is assured, extend flaps to 40° establish and maintain 87 MPH (+1/2 gust factor if appropriate). Trim as necessary

NOTE
The approach must be stabilized by 200 feet. If not, execute a go-around

11. Before the roundout, begin smoothly reducing power, continuing the power reduction during the roundout while increasing pitch to maintain a constant glide path to the desired touchdown point

NOTE
Avoid closing the throttle rapidly, which may result in an immediate increase in the rate of decent and a hard landing

12. Touch down at minimum controllable airspeed with the throttle at idle position on the main wheels first, plan for minimum float
13. Immediately after touchdown, apply maximum aerodynamic braking
14. Applying heavy braking when nose wheel is on runway.

Standards:
Private: Airspeed +10/-5 KIAS. Within 200 ft. of intended landing point
Commercial: Airspeed ±5 KIAS. Within 100 ft. of intended landing point
**GO-AROUND/REJECTED LANDING**

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To develop the ability to safely transition at a critical time from the approach and landing phase to the climb.

1. Upon deciding to go-around:
   a. Power full forward
   b. Pitch up slightly
   c. Flaps reduce to 25° immediately
   d. Positive rate, gear up
   e. Climb at 90 MPH ($V_x$)
   f. Obstacle cleared – flaps up
   g. Accelerate to 105 MPH ($V_y$)

2. Maintain directional control and proper wind-drift correction throughout the climb
3. Execute an appropriate departure procedure, or remain in the traffic pattern as appropriate
4. Complete the Go Around Checklist

Standards:
   - Private: Airspeed +10/-5 KIAS
   - Commercial: Airspeed ±5 KIAS
**SINGLE ENGINE PRECISION APPROACH**

Ref: Pilot Operating Handbook (POH)

Objective: To safely and accurately establish and maintain a stabilized precision single engine approach to a landing

1. Complete the approach briefing, descent checklist, and the Single Engine Go-Around procedure prior to the IAF
2. Plan to cross the IAF at 120 MPH but not less than 105 MPH
3. Complete the approach and landing checklist, as much as possible, prior to the glide slope intercept
4. At glide slope intercept reduce power and trim as necessary
5. Establish a stable approach at not less than 105 MPH

**NOTE**
*Do not allow airspeed to exceed 120 MPH*

6. Prior to FAF complete the landing checklist, except flap and gear extension
7. When landing is assured, extend landing gear and lower wing flaps to 25°

**NOTE**
*A final approach speed of 105 MPH and the use of 25° rather than full wing flaps will place the airplane in the best configuration for a go-around should this be necessary*

Standards:
   - Private: Altitude within 100 ft.; Airspeed + 10/-0 MPH, Heading ±10°; < 3/4 scale deflection of CDI and glide slope
   - Commercial: Altitude within 100 ft.; Airspeed + 10/-0 MPH, Heading ±10°; < 3/4 scale deflection of CDI and glide slope
**SINGLE ENGINE GO-AROUND**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook), Pilot Operating Handbook (POH)

**Objective:** To develop the ability to safely transition at a critical time from the approach and landing phase to the single engine climb.

1. Upon deciding to go-around:
   a. Power operating engine full forward
   b. Flaps retract
   c. Positive rate, gear up
   d. Airspeed 105 MPH
   e. Trim as necessary
   f. Cowl flaps as required
2. Maintain directional control and proper wind-drift correction throughout the climb
3. Execute an appropriate departure procedure, or remain in the traffic pattern as appropriate
4. Complete the Go Around Checklist

**Standards:**
- Private: Airspeed +10/-5 KIAS
- Commercial: Airspeed ±5 KIAS
**SENeca V Speeds**

**Note**
Speeds are for an aircraft operating at a gross weight of 4200 lbs.

- **Rotation Speed (V_R)**: 85 MPH
- **Best Rate of Climb (V_Y)**:
  - Two engine (V_{YSE}): 105 MPH
  - Single engine: 105 MPH
- **Best Angle of Climb (V_X)**:
  - Two engine: 90 MPH
- **Stall Speed Flaps (V_{S0})**: 67 MPH
- **Stall Speed Clean (V_{S1})**: 73 MPH
- **Maneuvering Speed (V_A)**: 133/146 MPH
- **Flaps Extended Speed (V_{FE})**: 125 MPH
- **Max. Gear Extend (V_{LE})**: 150 MPH
- **Max Gear Retract (V_{LO})**: 125 MPH
- **Never Exceed Speed (V_{NE})**: 217 MPH
- **Minimum Controllable Single Engine Speed (V_{MC})**: 80 MPH
- **Safe engine failure speed for rejected takeoff before rotation**: 40 MPH
- **Cruise Climb**: 120 MPH
- **Maximum normal operating speed (V_{NO})**: 190 MPH

**Speeds are for an aircraft operating at a gross weight of 4200 lbs.**

\[1.2V_{S1} = 88\] \[1.2V_{S0} = 80\] \[1.3V_{S0} = 87\]

- Flap extended positions: 10, 25, 40
- Max Demonstrated Crosswind Component: 17 Knots
- Max Gross Weight: 4200
- Zero Fuel Weight: 4000
- Standard Empty Weight: 2200
- Engine Manufacturer: Lycoming
- Model: IO-360/LIO-360
- Type: C1E6
- Displacement: 361 Cubic Inches
- Horsepower: 200 HP
- Rated Speed (RPM): 2700 RPM
- Oil
  - Max: 8 qts
  - Min: 6 qts
- Prop Length: 76 Inches
- Wing Span: 38 Feet
<table>
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<tr>
<th>Fuel Grade</th>
<th>100LL (Blue)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>93 Gal. Usable \ 5 Gal. Unusable</td>
</tr>
</tbody>
</table>

**Tire Pressure**
- Main: 50 PSI
- Nose: 31 PSI

**Electrical System**
- Battery: 12 Volt’s; 35 Amp Hour
- 2 Alternators: 14 Volt’s; 60 Amps

There is an ammeter for each alternator that measures the electrical load.

**Fuel System**
There are 46.5 gallons of usable fuel on each side and 5 gallons of unusable fuel, which gives us a total of 93 gallons usable fuel. There are two engine driven fuel pumps and two electric fuel pumps for starting and engine driven fuel pump failure.
PIPER TOMAHAWK
PA-38-112

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NORMAL TAKEOFF AND CLimb

REF: FAA-H-8083-3A (Airplane Flying handbook)

Objective: To safely execute a takeoff under normal conditions

1. Complete the Before Takeoff checklists
2. Center aircraft on runway centerline with nose wheel straight ahead
3. Advance the throttle smoothly forward to 2000 RPM, check engine instruments
4. Advance power to full forward
5. Maintain aircraft on centerline
6. Call out “airspeed alive”
7. Accelerate aircraft to 53 KIAS call out “VR rotate” and increase control yoke back pressure to pitch up until the glare shield meets the horizon (approximately 10°)
8. Accelerate to 70 KIAS [VY] and climb on centerline, trim as necessary
9. At 600’ AGL, decrease pitch to establish and maintain 75 KIAS climb
10. Execute a Traffic Pattern departure procedure
11. After leaving the traffic pattern, complete the climb checklist

IF REMAINING IN THE PATTERN

12. Accelerate to 70 KIAS [VY] and climb on centerline, trim as necessary
13. At 600’ AGL turn to crosswind
14. Continue climb to TPA (900 feet at 33N) and turn downwind, reduce power to 2200 RPM

Standards:
- Private: Airspeed VY +10/-5
- Commercial: Airspeed VY ±5
SPINS

1-2  3  4  5-6  7  8  9-10
**SPINS**

**Ref:** FAA-H-8083-3A (Airplane Flying Handbook) AC 61-67C

**Objective:** To develop awareness regarding the recognition of, entry into, and recovery from spins.

1. Select an altitude to recover no lower than 3000' AGL
2. Perform clearing turns
3. Reduce power to 1500 RPM, adjusting pitch (trimming) to maintain altitude

**NOTE**

The use of power at the entry will assure more consistent and positive entries to the spin

4. At the first indication of stall (Entry phase)
5. Smoothly pull the elevator control (control yoke) to the full aft position
6. Just prior to reaching the stall “break”, apply rudder in the desired direction of spin rotation so that full rudder deflection is achieved almost simultaneously with reaching full aft elevator
7. As the spin is entered (Incipient phase), reduce the throttle to the idle position and ensure that the ailerons are in the neutral position

**NOTE**

Allow the spin to develop, and be fully recovered no later than three turns

8. Hold the elevator and rudder controls in full until the spin recovery is initiated (Developed phase)
9. To recover:
10. Verify that the throttle is in the idle position and the ailerons are in the neutral position
11. Apply and HOLD full rudder opposite to the direction of the rotation
12. Just after the rudder reaches the stop, move the control wheel
13. (yoke) briskly forward, far enough to break the stall
14. HOLD these flight control inputs until the rotation stops
15. As the rotation stops, neutralize the rudder and make a smooth recovery from the resulting dive
16. Return to normal cruise flight 2200-2300 RPM
17. Perform cruise checklist
NORMAL APPROACH AND LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To safely and accurately establish and maintain a stabilized approach to a landing in a designated area.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Abeam the point of intended landing, reduce throttle to 1700 RPM
4. Below VFE (89 knots) extend flaps to 21°
5. Maintain 85 KIAS and 300-500 ft/min descent
6. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
7. Slow the aircraft to 75 KIAS
8. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
9. When landing is assured, extend flaps to 34° establish and maintain 70 KIAS (+1/2 gust factor if appropriate). Trim as necessary

NOTE
The approach must be stabilized by 200 feet. If not, execute a go-around

10. At the round out, commence reducing power to idle, continuing the flare to touch down on the main wheels first, holding the nose wheel off with back pressure throughout the rollout; allow settling gently
11. Maintain directional control throughout the rollout, slowing sufficiently before turning onto a taxiway

Standards:
Private: Airspeed +10/-5 KIAS. Touch Down: 400 ft.
Commercial: Airspeed ±5 KIAS. Touch Down 200 ft.
TOMAHAWK V SPEEDS

NOTE
Speeds are for an aircraft operating at a gross weight of 1670

Rotation Speed (\(V_R\)) 53 KIAS
Best Rate of Climb (\(V_Y\)) 70 KIAS
Best Angle of Climb (\(V_X\)) 61 KIAS
Stall Speed Flaps (\(V_{S0}\)) 49 KIAS
Stall Speed Clean (\(V_{S1}\)) 52 KIAS
Maneuvering Speed (\(V_A\)) 103 KIAS
Flaps Extended Speed (\(V_{FE}\)) 89 KIAS
Never Exceed Speed (\(V_{NE}\)) 138 KIAS
Best Glide Speed 70 KIAS
Cruise Climb 75 KIAS

Speeds are for an aircraft operating at a gross weight of 1670

\[ 1.2V_{S1} = 62 \quad 1.2V_{S0} = 59 \quad 1.3V_{S0} = 64 \]

Flap extended positions 21, 34
Max Demonstrated Crosswind Component 15 knots
Max Gross Weight 1670 lbs
Standard Empty Weight 1108 lbs
Engine Manufacturer Lycoming
Model O-235
Type Horizontally Opposed, Air Cooled
Displacement 233 Cubic Inches
Horsepower 112 HP
Rated Speed (RPM) 2600 RPM
Oil Max. 6 qt
Oil Min. 2 qt (DSU Min - 4 qts)
Prop Length 72 Inches
Wing Span 34 Feet
Fuel Grade 100LL (Blue)
Quantity 30 Gal. Usable \ 2 Gal. Unusable
Tire Pressure
Main 26 PSI
Nose 26 PSI
Electrical System

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>12 Volt’s; 25 Amp Hour</td>
</tr>
<tr>
<td>Alternator</td>
<td>14 Volt’s; 60 Amps</td>
</tr>
</tbody>
</table>

There is an ammeter that measures the electrical load on the alternator.

Fuel System

There are 30 gallons of usable fuel and 2 gallons of unusable fuel, which gives us a total of 32 gallons. There is one engine driven fuel pump and one electric fuel pump.
**INSTRUMENTS**

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**INSTRUMENT TAKEOFF (ITO)**

**Ref:** FAA-H-8083-15 (Instrument Flying Handbook)

**Objective:** To develop the skills necessary to perform a takeoff solely by reference to the flight instruments.

1. Complete the Before Takeoff checklists
2. Center aircraft on runway centerline with nose wheel straight ahead
3. Set and check the heading indicator or Horizontal Situation Indicator (HSI) and align the “heading bug” to the runway heading, if applicable
4. Set and check the Attitude Indicator (AI)
5. Advance the throttle smoothly forward to 2000 RPM, check engine instruments
6. Advance power to full forward
7. Maintain aircraft on centerline
8. Call out “airspeed alive”
9. Accelerate aircraft to rotate speed and call out “\(V_R\) rotate”, referencing the attitude indicator, pitch up approximately 2-3\(^\circ\).
10. After liftoff, establish and maintain \(V_Y\), trim as necessary.
11. When positive rate climb call out “Positive rate – gear up”, if retract gear aircraft
12. At 500' AGL, decrease pitch to establish and maintain cruise climb airspeed, trim as necessary
13. Complete the climb checklist
VOR RADIAL INTERCEPT
VOR RADIAL INTERCEPT


Objective: To establish the airplane on a predetermined VOR radial.

NOTE
Ensure that the heading indicator and magnetic compass are aligned. Check the alignment at least once every 15 minutes.

TUNE, TURN, TWIST

1. Tune the appropriate VOR frequency and verify the identifier with the chart.
2. Turn the airplane to a heading to parallel the desired course and using all available navigation systems, determine aircraft position from the VOR.
3. Twist the Omni Bearing Selector (OBS) and center the Course Deviation Indicator (CDI) with a TO flag indication if inbound or a FROM flag indication if outbound from the VOR.
4. Determine the degree difference between the radial to be intercepted and the radial the aircraft is on.
5. Double the difference between the radials to determine the interception angle (intercept angle should not be less than 20°, or more than 90°).

NOTE
Distance between radials varies with distance from the VOR. For example: at 60 nm from the VOR distance between radials = 1 nm, at 30 nm = .5 nm, at 15 nm = .25 nm. Use appropriate intercept angle headings to prevent overshooting the desired course.

6. Turn to the resulting intercept heading and hold the heading constant until the CDI begins to center.
7. As the CDI begins to center, begin turning to the heading corresponding to the radial or course selected.
8. Track the radial inbound or outbound as appropriate.

NOTE
As proficiency increases, steps 2 and 3 may be eliminated.
VOR RADIAL TRACKING
**VOR RADIAL TRACKING**

**Ref:** FAA-H-8083-15 (Instrument Flying Handbook)

**Objective:** To track a VOR radial, making necessary corrections for the effects of wind.

1. After the course has been intercepted, maintain the heading that corresponds to the course selected.
2. If the CDI moves off center, re-intercept by beginning with a 20° intercept angle toward the deflection of the CDI.
3. Maintain the intercept heading until the CDI re-centers and then turn back to a new course equal to ½ of the intercept angle (10°)

**EXAMPLE**
The airplane has drifted to the right of the 360° radial (outbound). To re-intercept the radial, turn left to a heading of 340°. When the CDI re-centers, turn right to maintain a new Course Heading of 350° (10° Wind Correction Angle).

4. If the CDI again moves off center, re-intercept by beginning with a 10° intercept angle toward the deflection of the CDI.
5. Maintain the intercept heading until the CDI re-centers, and then turn back to a new course equal to ½ of the intercept angle (5°).

**EXAMPLE**
The airplane has again drifted right of the 360° radial (outbound). To re-intercept the radial, turn left to a heading of 340° (10° heading change). When the CDI re-centers, turn right turn to maintain a new Course Heading of 345° (5° heading change)

**NOTE**
Wind conditions may require the use of intercept angles greater than 20° to re-center the CDI indicator. However, using the “bracketing” procedure described above will still works in determining the appropriate wind correction to use.
MAGNETIC COMPASS TURNS


Objective: To make turns to specific headings solely by reference to the magnetic compass.

NOTE
Magnetic compass turning errors are approximately equivalent to the airplane’s latitude.

OSUN – Overshoot South, Undershoot North

1. Estimate the amount of turning error that corresponds to the heading to be flown.
2. Enter a standard rate turn in the desired direction.
3. When turning to a northerly heading, apply the corresponding rollout lead (± ½ the angle of bank) to the magnetic compass heading

EXAMPLE
At 35° N latitude and a 16° bank, a right turn to 360° requires a roll-out point of 317° (360-35-8), when turning left to 360°, the roll-out point is 043° (360+35+8)

When turning to a southerly heading, apply the normal rollout lag (± ½ the angle of bank) to the magnetic compass heading

EXAMPLE
At 35° N latitude and a 16° bank, a right turn to 180° requires a roll out point of 207° (180+35-8), when turning left to 180°, the roll out point is 153° (180-35+8)
**DME ARC**


Objective: To track a predetermined arc around a navigation aid at a certain distance using DME

1. Tune and identify the navaid and DME
2. Verify that the heading indicator or HSI is aligned with the magnetic compass
3. Complete the approach briefing and decent checklist prior to the IAF
4. Establish a track to the navaid frequently checking the DME readout
5. When ready to intercept the DME arc, use 0.5 NM lead for groundspeeds less than 150 KIAS and a proportionately greater leading turn for speeds greater than 150 KIAS

**EXAMPLE**
If using a 10 NM arc, start the turn to the arc at 10.5 NM if inbound or 9.5 NM if outbound from the navaid

If using a relative bearing (RB) pointer;
6. Turn to a heading that is 90° from the radial you are tracking and place the relative bearing (RB) pointer on the wingtip reference

**NOTE**
In a no wind condition pilots should be able to fly an exact circle around the facility by maintaining the relative RB pointer at the wingtip reference (if so equipped)

7. Verify the DME distance after the turn is completed and maintain a constant heading
8. Allow the bearing pointer to move 5° to 10° behind the wingtip reference, DME range will increase slightly
9. Turn toward the facility until the bearing pointer is 5° to 10° ahead of the wingtip reference and then maintain heading
10. Repeat steps 7 and 8 to maintain the approximate arc
11. To help maintain positional orientation and situational awareness, use the OBS to determine your position along the arc.

If using the Omni Bearing Selector (OBS)
12. Turn to a heading that is 90° from the station and center the CDI indicator. Then turn 10° toward the station and twist the CDI indicator 10° away from the station (if flying clockwise add 10, counter clockwise subtract 10)
13. Maintain heading until the CDI indicator centers then repeat step 12 until arriving at the lead radial or final approach course
14. At the lead radial, commence a turn to intercept the final approach course.
15. For arcs without a lead radial, commence a turn to an appropriate heading to intercept the final approach course, 5° to 10° prior to the final approach course.
**PRECISION APPROACH (ILS)**

**NOTE:** Each IAP (Instrument Approach Procedure) may have different IAFs (Initial Approach Fix). Not all IAPs require course reversal. For a particular IAP, course reversal may depend on IAF used.

By 3 minutes prior to IAF:
- Approach checklist complete
- 100 KIAS

At 500 Above DA:
- Begin altitude callouts
- Reduce power
- FLAPS 10
- 90 KIAS

Before Landing Checklist Complete

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**PRECISION APPROACH (ILS)**


**Objective:** To safely and accurately maneuver the airplane vertically and horizontally on a precision approach.

1. Complete the approach briefing and descent check list prior to the IAF
2. Reduce to final approach speed prior to glide slope intercept
3. At one dot below glide slope:
   a. Flaps 10°
   b. Extend landing gear (If retractable landing gear aircraft) and call out, “gear down and three green”,
   c. Complete the landing checklist
   d. Adjust power and trim as necessary

   **NOTE**
   Determine the initial rate of descent to maintain the glideslope by dividing groundspeed by 2, then multiply the result by 10 (e.g., 70 knots/2 = 35, 35 x 10 = 350 fpm). Extending the gear at glide slope intercept will assist in establishing a descent with little throttle movement

4. At the FAF perform the “5 Ts:
   a. **Time:** Note the time
   b. **Turn:** To track the inbound course
   c. **Twist:** Verify that the OBS is set to inbound course
   d. **Throttle:** Adjust throttle to maintain desired descent
   e. **Talk:** Make required reports
5. At 1000’ above decision altitude, call out, “1000’ above DA”
6. At 500’ above decision altitude, call out, “500’ above DA”

   **NOTE**
   The approach must be stabilized and the aircraft in the landing configuration by 500 feet

7. At 100’ above decision altitude call out, “100’ above DA”
8. Just prior to reaching decision altitude, confirm that visual reference(s) in accordance with FAR §91.175 are visible, before continuing the descent
9. With the runway in sight and the aircraft continuously in a position from which a descent to landing on the intended runway can be made at a normal rate of descent using normal maneuvers, Call out, “Runway in Sight”

   **NOTE**
   If no visual reference is in sight at decision altitude, or visual reference is lost when continuing the descent from the DA, call out, “missed approach”, and execute the published missed approach procedure or as directed.
NON-PRECISION APPROACH

PLAN VIEW

PROFILE VIEW
NON-PRECISION APPROACH


Objective: To safely and accurately maneuver the airplane vertically and horizontally on a non-precision approach.

1. Complete the approach briefing and descent checklist prior to; the procedure turn, IAF, or intercepting the final approach course (if vectored)
2. Determine the required descent rate for the approach:
   a. Subtract the Touchdown Zone Elevation (TDZE) from the FAF altitude
   b. Divide the result by the time inbound

   EXAMPLE
   With a FAF altitude of 1500’ MSL, TDZE is 50’ MSL, and estimated time inbound of two (2) minutes, the rate of descent is 725 FPM \(\frac{1500-50}{2} = 725\)

3. Just prior to reaching the FAF:
   a. flaps 10°
   b. Extend landing gear (If retractable landing gear aircraft) and call out, "gear down and three green",
   c. complete the landing checklist
   d. adjust power to maintain the desired rate of descent and trim as necessary

   NOTE
   Extending the gear will assist in establishing the desired descent rate with little throttle movement

4. At the FAF Perform the “5 Ts”:
   a. Time: Note the time.
   b. Turn: To track the inbound course.
   c. Twist: Verify that the OBS is set to inbound course.
   d. Throttle: Adjust throttle to maintain desired descent
   e. Talk: Make required reports.
5. At 1000’ above MDA, call out, “1000’ above MDA”
6. At 500’ above MDA, call out, “500’ above MDA”

   NOTE
   The approach must be stabilized and the aircraft in the landing configuration by 500 feet

7. At 100’ above MDA call out, “100’ above MDA”
8. If arriving at the MDA prior to reaching the time inbound, level the aircraft at or
above the MDA until reaching the missed approach point
9. Just prior to reaching the missed approach point, confirm that visual reference(s) in accordance with FAR §91.175 are visible before descending below the MDA
10. With the runway in sight and the aircraft continuously in a position from which a descent to landing on the intended runway can be made at a normal rate of descent using normal maneuvers, Call out, “Runway in Sight,”

**NOTE**
If no visual reference is in sight at decision altitude, or visual reference is lost when continuing the descent from the DA, call out, “missed approach”, and execute the published missed approach procedure or as directed.
**MISSED APPROACH PROCEDURE**


**Objective:** To comply with published missed approach procedures, or as directed by ATC, while maintaining airplane control.

1. At the missed approach point and without visual reference(s) as required by FAR §91.175 or if visual reference is lost when continuing the descent, call out, “missed approach
2. Simultaneously establish a level pitch attitude, apply full power and level the wings
3. Immediately reduce flaps one notch and establish a positive rate climb by easing into a $V_T$ climb. Verify positive rate climb and retract the landing gear (if applicable)
4. Accelerate to and maintain $V_T$ making small pitch adjustments, trim as necessary
5. When the aircraft is under complete control and safely established in a climb, call ATC and report “missed approach”
6. Execute the published missed approach procedure or as directed
7. At 500’ AGL transition to cruise climb
8. Complete the Climb Checklist.

**NOTE**

For missed approaches initiated prior to reaching the MAP, continue flying the published approach course to the MAP at or above MDA or DA before turning unless otherwise cleared by ATC. If the missed approach occurs from a circling approach, make an initial climbing turn toward the landing runway, and then maneuver to intercept the published missed approach course.

**NOTE**

While the missed approach is in essence a go-around executed on instruments, acceleration forces due to transition from descent into climb and addition of full power plus poor visual cues can cause serious sensory illusions.

A focused and rapid instrument crosscheck is necessary to safely carry out the missed approach procedure. Once committed to the missed approach in IMC, bear down on instruments and ignore outside visual cues to lessen the effects of sensory illusions.
CIRCLING APPROACH

Circling Approach Area Radii

<table>
<thead>
<tr>
<th>Approach Category</th>
<th>Radius (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.3</td>
</tr>
<tr>
<td>B</td>
<td>1.5</td>
</tr>
<tr>
<td>C</td>
<td>1.7</td>
</tr>
<tr>
<td>D</td>
<td>2.3</td>
</tr>
<tr>
<td>E</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Radii (r) defining size of areas, vary with the approach category


CIRCLING APPROACH


Objective: To safely and accurately maneuver the aircraft to a landing from an instrument approach procedure where the runway is not aligned with the approach course.

NOTE
Circling may be made while other aircraft operations are in progress at the airport. Standard left turns or ATC instructions must be considered when planning circling to land.

1. Maneuver on the shortest path to the base or downwind leg, as appropriate, considering existing weather conditions.
2. Remain within the circling visibility minima during the circling approach.
3. Remain at circling minimums until continuously in a position from which a normal descent rate to a landing on the intended runway can be made using normal maneuvering.
4. When descending from circling minimums:
5. Visually verify that the final approach is clear, and then turn to final
6. When landing is assured, set final flaps, establish and maintain final approach speed trim as necessary
7. Complete the appropriate landing procedure

NOTE
The approach must be stabilized by 200 feet. If not, execute a go-around

DSU Flight Maneuvers
Standardization Manual

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**TYPICAL HOLDING ENTRIES**

**NOTE**
While entry into a hold shall be one of the FAA recommended entries below, flight crews should keep in mind that that main priority in holding is to remain on the protected side of the hold and to follow ATC instructions. *Standard holding patterns* are turns to the right and always comply with holding patterns that are depicted on the chart.

![Standard Pattern Diagram]

**Direct Entry – approaching from Zone (c)**
Cross the holding fix and then initiate a turn to the outbound leg at a standard rate in the direction specified in the clearance, or as published (right turns, or standard, in the above diagram)

**Teardrop Entry – approaching from Zone (b)**
After initially crossing the holding fix, execute a standard rate turn to a heading 30° from the outbound heading, toward the holding side (dashed track beginning in the (b) zone). Remember that during the teardrop entry, the first turn inbound will be made in the same direction as the consequent turns in the hold.

**Parallel Entry- approaching from Zone (a)**
After initially crossing the holding fix, begin a standard rate turn to a heading outbound from the fix that parallels the inbound holding course. On crossing the fix, start timing so that at the expiration of one minute, or as specified by ATC, the aircraft initiates a standard rate turn toward the inbound holding course. If the aircraft flight path carries it across the holding course into the protected holding area. Complete the turn to a heading that will intercept the inbound holding course.
**HOLDING**


**Objective:** To develop the ability to plan and execute an appropriate hold entry and procedure while correcting for the effects of the wind, maintaining situational awareness, and positive aircraft control

1. Tune and identify the appropriate navaid(s)
2. Verify that the heading indicator or HSI is aligned with the magnetic compass
3. Determine the aircraft position relative to the holding fix
4. Determine the holding pattern entry relative to aircraft position (see previous page)
5. Within 3 minutes from the holding fix reduce to holding speed
6. When crossing the holding fix, perform the “5 Ts”:
   a. Time: Note the time.
   b. Turn: Standard rate to the entry heading.
   c. Twist: Verify that the OBS is set to inbound course
   d. Throttle: Maintain holding speed
   e. Talk: Report the time and altitude entering the hold

**NOTE**
Initial outbound leg is one (1) minute for altitudes at or below 14,000 feet MSL and 1 ½ minutes or altitudes above 14,000 MSL

7. Begin the outbound leg timing over or abeam the fix, whichever occurs later. If the abeam position cannot be determined, start timing when the turn to the outbound heading is completed

**NOTE**
When holding at a VOR, begin the turn to the outbound leg at the time of the first complete reversal of the TO/FROM indicator

8. Correct for winds in order to achieve the desired holding ground track and timing of the inbound leg:
9. On the outbound leg, triple the inbound drift correction (if inbound correction is 12° to the right, outbound correction should be 36°degrees to the left).
10. Increase or reduce the timing outbound (considering head or tail winds) to achieve the desired inbound leg timing
11. After one minute outbound or as adjusted, begin a standard rate turn towards the inbound course with at least a 30° intercept or as appropriate.
12. Start the inbound time at wings-level on the inbound course or on a heading to intercept the inbound course, whichever occurs first. Note the heading that maintains the course inbound
13. Adjust the outbound leg time to achieve a one-minute inbound leg time (e.g., 1 minute 15 seconds inbound = 45 seconds outbound)
14. After completing the hold, depart as instructed by ATC
15. Report time, position and altitude when leaving the hold
16. Resume cruise, or as appropriate.