NDB INTERCEPTS

DESCRIPTION: The aircraft is maneuvered to intercept and track a NDB "bearing from" or a "course to" solely by reference to flight instruments.

OBJECTIVE: To develop proficiency in intercepting and tracking a NDB "bearing from" or a "course to".

PROCEDURES:

1. Reset the heading indicator by reference to the magnetic compass.
2. Tune and identify the station.
3. Parallel the desired "bearing from" or "course to".
4. Note the number of degrees between zero (course to) or 180 (bearing from) on the ADF azimuth ring and the ADF pointer.
5. For a difference of 30 degrees or less, turn 45 degrees in the direction of pointer deflection from the nose or tail. For a difference of more than 30 degrees, turn 90 degrees in the direction of pointer deflection.
6. Maintain the intercept heading until course interception is imminent. Course interception has happened when the angle between the ADF pointer and the nose or tail of the aircraft is equal.
7. As the course is intercepted, turn on course and begin tracking procedures to correct for wind.

NOTE: AS PROFICIENCY IS GAINED AND FAMILIARITY WITH THE RELATIONSHIP BETWEEN INTERCEPT ANGLE, DISTANCE FROM THE STATION AND THE MAGNITUDE OF OFF COURSE DEVIATION IS DEVELOPED, INTERCEPT ANGLES OTHER THAN 45 AND 90 DEGREES SHOULD BE USED AS APPROPRIATE.

REFERENCES: Instrument Flying Handbook FAA-H-8083-15, FAA Instrument Rating Practical Test Standards

NDB TIME AND DISTANCE CHECK

DESCRIPTION: Time and distance to the station is calculated by flying a timed perpendicular course between two radials.

OBJECTIVE: To develop proficiency in orientation and use of NDB bearings in computing time and distance to the station.

PROCEDURES:

1. Reset the heading indicator by reference to the magnetic compass.
2. Tune and identify the station.
3. Turn the aircraft until the ADF pointer indicates a relative bearing of either 085 or 275 degrees.
4. Maintain this heading.
5. Note the time when the ADF pointer indicates a relative bearing of 090 or 270 degrees as appropriate.
6. Note the time when the ADF pointer has moved 10 degrees and is indicating a relative bearing of 100 or 260 degrees as appropriate.
7. Turn the aircraft to track direct to the station.
8. Compute the time and distance to the station using the following formulas:

Time to station (minutes) = Seconds for bearing change/Degrees of bearing change.
Distance to Station (NM) = Minutes for bearing change x TAS (kts)/Degrees of bearing change.

REFERENCES: Instrument Flying Handbook FAA-H-8083-15, FAA Instrument Rating Practical Test Standards

IFR DEPARTURE PROCEDURES

DESCRIPTION: The aircraft is maneuvered after takeoff to proceed on course as directed by ATC.

OBJECTIVES: To develop the skills and proficiency necessary to depart an airport in IFR conditions and transition to the enroute phase of flight.

PROCEDURES:

1. Prior to takeoff set the navigation and communication radios as needed to comply with the departure clearance.
2. Record the takeoff time.
3. After receiving takeoff clearance, follow the departure clearance and any special ATC instructions. If cleared for a "SID", refer to the chart for procedures.
4. When departing from an uncontrolled airport, adhere to the "**Clearance Void Time**" and contact ATC as appropriate.
5. Maintain geographic orientation.
6. Note the time passing designated checkpoints.
7. Intercept the appropriate enroute course.

REFERENCES: Instrument Flying Handbook FAA-H-8083-15, Aeronautical Information Manual

IFR ARRIVAL PROCEDURES (RADAR AND NON-RADAR)

DESCRIPTION: **RADAR**- The aircraft is vectored from the enroute phase to the final approach course at altitudes and headings assigned by ATC.

NON-RADAR- The pilot must navigate from the IAP to the FAF and execute the final approach without radar vectors.

OBJECTIVE: To develop the skills and proficiency necessary to transition from the enroute phase of a flight to the instrument approach with or without radar vectors.

PROCEDURES:

RADAR ENVIRONMENT

1. Fly the altitude and course assigned by ATC. If cleared for a "STAR", refer to the chart for procedures.
2. Set navigation frequencies and courses needed to complete the approach.
3. On base leg or within 30 degrees of the final approach course, initiate the pre-landing checklist and slow to initial approach speed (unless otherwise directed by ATC), 100 KIAS with flaps extended 10 degrees (18" MP/2300 RPM).
4. Upon receiving approach clearance, intercept the final approach course and execute the approach procedure.

NOTE: THE PILOT MUST MAINTAIN GEOGRAPHIC ORIENTATION WHILE BEING VECTORED FOR THE APPROACH.

NON-RADAR ENVIRONMENT-WITH PROCEDURE TURN

1. Set navigation/communication frequencies and the course prior to reaching the IAF.
2. Slow to 100 KIAS, (17" MP/2300 RPM), and initiate the **"Approach checklist"** when within 3 minutes of the IAF.
3. After crossing the IAF, follow the procedural track, descend to the prescribed altitude and execute the procedure turn at the appropriate distance.
4. Upon completion of the procedure turn, intercept the final approach course and execute the approach procedure.

NON-RADAR ENVIRONMENT -NO PROCEDURE TURN

1. Set navigation/communication frequencies and the course prior to reaching the IAF.
2. After crossing the IAF, intercept the procedural track and slow to 100 KIAS, perform the **"Gear down before landing checklist"**, extend the flaps to 25 degrees (17" MP).
3. Intercept the final approach course and execute the approach procedure.

REFERENCES: FAA Instrument Pilot Practical Test Standards, Aeronautical Information Manual

HOLDING PROCEDURES

DESCRIPTION: The aircraft is maneuvered to enter a standard or non-standard holding pattern using the AIM recommended entry procedure. Wind correction is applied to keep the aircraft in protected airspace and on the inbound course. The straight and level legs are timed in order to establish the desired inbound leg length.

OBJECTIVE: To develop the skill and proficiency to enter and become established in a published or non-published holding pattern.

PROCEDURES:

1. Determine the type of entry to use based on the aircraft heading upon arrival over the holding fix.
2. Slow to 100 KIAS (17" MP/2300 RPM), and lean the mixture when within 3 minutes of the holding fix.
3. Upon crossing the holding fix, execute the appropriate entry as recommended by the AIM and report to ATC as appropriate.
4. Establish the inbound wind correction angle as soon as possible.
5. Start outbound timing when abeam the fix or at the completion of the outbound turn if the abeam point cannot be determined.
6. Adjust the outbound heading (normally 3x the inbound wind correction angle) so that course intercept occurs at the completion of the inbound turn.
7. Adjust outbound timing so that the inbound leg is one minute long.
8. Begin timing inbound at the completion of the inbound turn.
9. Leave holding according to ATC instructions.

DME HOLDING - DME holding is the same as above except that the legs are measured in miles. Timing is not required but wind correction must be applied. If the inbound course is towards the navaid, the fix distance is 16 nm and the leg length specified is 4 nm, the end of the outbound leg will be reached at 20 nm. If the inbound course is away from the navaid, the end of the outbound leg will be 12 nm.

REFERENCES: FAA Instrument Rating Practical Test Standards, Instrument Flying Handbook FAA-H-8083-15, Aeronautical Information Manual

RADAR VECTORS

DESCRIPTION: The aircraft is maneuvered and turns are made to specific headings as instructed by ATC. Any instructions that are incorrect, unsafe, or not clear are questioned and revised as necessary.

OBJECTIVE: To develop proficiency in following ATC instructions and resolving incorrect unsafe or unclear instructions.

PROCEDURES:

1. Reset the heading indicator by reference to the magnetic compass as needed (at least once every 15 minutes).
2. Be alert for radio calls directed by ATC to your aircraft.
3. Maintain geographic orientation.
4. Turn immediately as heading instructions are received.
5. Acknowledge all instructions using proper phraseology.
6. Question any instruction that is incorrect, unsafe, or not clear.
7. Maintain assigned headings accurately.

REFERENCES: FAA Instrument Rating Practical Test Standards, Instrument Flying Handbook FAA-H-8083-15, Aeronautical Information Manual

VOR APPROACH

DESCRIPTION: The aircraft is established on the final approach course and, at the final approach fix or the beginning of the final approach segment, descent to the MDA or circling minimum is begun. The approach is terminated either with a landing or a missed approach as appropriate.

OBJECTIVE: To develop the skill and proficiency necessary to execute VOR approaches.

PROCEDURES:

1. Prior to reaching the IAF, select, tune, identify, and confirm the operational status of ground and aircraft navigation equipment to be used for the approach.
2. Review the instrument approach procedure to assure flying the proper course and altitude. Check proper setting of navigation and communication radios. Review the missed approach procedure or ATC instructions as appropriate.
3. Slow to 100 KIAS (17" MP/2300 RPM) after reaching one of the following positions as appropriate:
    - Crossing the initial approach fix.
    - Within 30 degrees of the final approach course.
    - Within 5 miles of the final approach fix.

NOTE: THESE ARE GUIDELINES DESIGNED TO GET THE AIRCRAFT PROPERLY SET UP FOR THE FINAL APPROACH. ATC REQUIREMENTS MAY DICTATE MODIFICATION OF THESE GUIDELINES

4. Complete a procedure turn appropriate.
5. Intercept the final approach course at the proper altitude and airspeed.
6. 2 miles from the final approach fix, perform the **"Gear down before landing checklist",** note the time and descend to the MDA or step-down fix as appropriate.
7. At 1000' AGL **"Blue line - GUMP".**
8. Leaving MDA extend flaps to 25 degrees.
9. At 400' AGL **"Gear down – stabilized".**
10. At 100' before minimums announce **"100 TO GO".**
11. Be alert for equipment malfunctions or course deviations that may require executing a missed approach.
12. Initiate a level off to stay at or above the MDA until the requirements listed in FAR 91.175 are met and a normal landing can be made.
13. If the requirements of FAR 91.175 cannot be met, execute the missed approach.

REFERENCES: FAA Instrument Rating Practical Test Standards, Instrument Flying Handbook FAA-H-8083-15, FAR and Aeronautical Information Manual

NDB APPROACH

DESCRIPTION: The aircraft is established on the final approach course and, at the final approach fix or the beginning of the final approach segment, descent to the MDA or circling minimum is begun. The approach is terminated either with a landing or a missed approach as appropriate.

OBJECTIVE: To develop the skill and proficiency necessary to execute NDB approaches.

PROCEDURES:

1. Prior to reaching the IAP, select, tune, identify, and confirm the operational status of ground and aircraft navigation equipment to be used for the approach.
2. Review the instrument approach procedure to assure flying the proper course and altitude. Check proper setting of navigation and communication radios. Review the missed approach procedure or ATC instructions as appropriate.
3. Slow to 100 KIAS (17" MP/2300 RPM) after reaching one of the following positions as appropriate:
    - Crossing the initial approach fix.
    - Within 30 degrees of the final approach course.
    - Within 5 miles of the final approach fix.

NOTE: THESE ARE GUIDELINES DESIGNED TO GET THE AIRCRAFT PROPERLY SET UP FOR THE FINAL APPROACH. ATC REQUIREMENTS MAY DICTATE MODIFICATION OF THESE GUIDELINES.

4. Complete a procedure turn as appropriate.
5. Intercept the final approach course at the proper altitude and airspeed.
6. At approximately 2 mile from the final approach fix, perform the **"Gear down before landing checklist"**, note the time and descend to the MDA or step-down fix as appropriate.
7. At 1000' AGL **"Blue line – GUMP"**.
8. Leaving MDA extend flaps to 25 degrees for straight in and flaps 0 degrees for circling.
9. At 400' AGL **"Gear Down – stabilized"**.
   Announce at 100' above minimums **"100 TO GO"**
10. Be alert for equipment malfunctions or course deviations that may require executing a missed approach.
11. Initiate a level off to stay at or above the MDA until the requirements listed in FAR 91.175 are met and a normal landing can be made.
12. If the requirements of FAR 91.175 cannot be met, execute the missed approach.

REFERENCES: FAA Instrument Rating Practical Test Standards, Instrument Flying Handbook FAA-H-8083-15, FAR and Aeronautical Information Manual

ILS APPROACH

DESCRIPTION: The aircraft is established on the final approach course and, at the final approach fix or the beginning of the final approach segment, descent to the DH or circling minimum is begun. The approach is terminated either with a landing or a missed approach as appropriate.

OBJECTIVE: To develop the skill and proficiency necessary to execute ILS approaches.

PROCEDURES:

1. Prior to reaching the IAF, select, tune, identify, and confirm the operational status of ground and aircraft navigation equipment to be used for the approach.
2. Review the instrument approach procedure to assure flying the proper course and altitude. Check proper setting of navigation and communication radios. Review the missed approach procedure or ATC instructions as appropriate.
3. Slow to 100 KIAS (17" MP/2300 RPM) after reaching one of the following positions as appropriate:
   - Crossing the initial approach fix.
   - Within 30 degrees of the final approach course.
   - Within 5 miles of the final approach fix.

NOTE: THESE ARE GUIDELINES DESIGNED TO GET THE AIRCRAFT PROPERLY SET UP FOR THE FINAL APPROACH. ATC REQUIREMENTS MAY DICTATE MODIFICATION OF THESE GUIDELINES.

4. Complete a procedure turn as appropriate.
5. Intercept the final approach course at the proper altitude and airspeed.
6. ½ degree before intercepting the glide slope, perform the **"Gear down before landing checklist"**. Extend flaps to 25 degrees for a straight in approach and flaps 0 for circling. Note the time and descend to the DH or step-down fix as appropriate. Note the time crossing the outer marker.
7. At 1000' AGL **"Blue line – GUMP"**.
8. At 400' AGL **"gear down – stabilized"**.
9. Announce at 100' above minimums **"100 TO GO"**
10. Be alert for equipment malfunctions or course deviations that may require executing a missed approach.
11. Upon reaching the DH:
    - Make a normal landing if the previsions of FAR 91.175 are met, or,
    - Execute the missed approach.

REFERENCES: FAA Instrument Rating Practical Test Standards, Instrument Flying Handbook FAA-H-8083-15, FAR and Aeronautical Information Manual

TERMINAL APPROACH

DESCRIPTION: An instrument approach using a navigation aid located on the airport. Normally there is not a final approach fix associated with the approach. The approach may be conducted in either a radar or non-radar environment. Upon completing a procedure turn or being vectored to the final approach course, a descent to the MDA or circling minimum is begun when course guidance is assured. The approach is terminated either with a landing or a missed approach as appropriate. Final approach timing is not necessary since a missed approach is initiated at station passage.

OBJECTIVE: To develop the skill and proficiency necessary to execute terminal approaches.

PROCEDURES:

1. Prior to reaching the IAF, select, tune, identify, and confirm the operational status of ground and aircraft navigation equipment to be used for the approach.
2. Review the instrument approach procedure to assure flying the proper course and altitude. Check proper setting of navigation and communication radios. Review the missed approach procedure or ATC instructions as appropriate.
3. Slow to 100 KIAS (17" MP/2300 RPM) after reaching one of the following positions as appropriate:
    - Crossing the initial approach fix.
    - Within 30 degrees of the final approach course.
    - Within 10 miles of the final approach fix.

NOTE: THESE ARE GUIDELINES DESIGNED TO GET THE AIRCRAFT PROPERLY SET UP FOR THE FINAL APPROACH. ATC REQUIREMENTS MAY DICTATE MODIFICATION OF THESE GUIDELINES.

4. Complete a procedure turn as appropriate.
5. Intercept the final approach course at the proper altitude and airspeed.
6. Upon achieving proper on course indication and at the proper distance from the airport, perform the **"Gear down before landing checklist"**, extend flaps to 25 degrees for a straight in approach and flaps 0 for circling. Note the time and descend to the MDA or step-down fix as appropriate.
7. At 1000' AGL announce, **"Blue line – GUMP"**.
8. At 400' AGL announce, **"Gear down – stabilized"**.
9. Announce at 100' above minimums **"100 TO GO"**.
10. Be alert for equipment malfunctions or course deviations that may require executing a missed approach.
11. Initiate a level off to stay at or above the MDA until the requirements listed in FAR 91.175 are met and a normal landing can be made.
12. If the requirements of FAR 91.175 cannot be met, execute the missed approach at MAP.

REFERENCES: FAA Instrument Rating Practical Test Standards, Instrument Flying Handbook FAA-H-8083-15, FAR and Aeronautical Information Manual

ASR/PAR APPROACHES

DESCRIPTION: The aircraft is established on the final heading as assigned by ATC and at the desired approach speed. The descent to the MDA is begun when instructions are received from ATC. The approach is terminated either with a landing or a missed approach as appropriate.

OBJECTIVE: To develop the skill and proficiency necessary to execute radar instrument approach procedures.

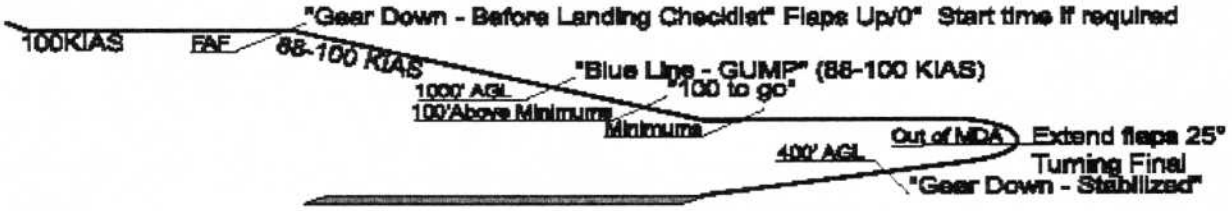
PROCEDURES:

1. Comply with heading and altitude instructions as assigned by ATC.
2. Slow to 100 KIAS (17" MP/2300 RPM) upon reaching a point 5 miles from the final decent point.
3. Upon receiving instructions from ATC to begin the final descent, perform the **"Gear down before landing checklist"**. Extend the flaps to 25 degrees and descend to the MDA, DH or step-down fix as appropriate.
4. At 1000' AGL announce **"Blue line – GUMP"**.
5. Course guidance is provided by ATC in the form of heading and turn instructions. If executing a PAR approach, glide slope instructions are provided by ATC.
6. At 400' AGL announce, **"Gear down – stabilized"**.
7. At 100' above minimums, announce **"100 to go"**.
8. Be alert for equipment malfunctions or course deviations that may require executing a missed approach.
9. Initiate a level off to stay at or above the MDA for the ASR approach or DH for the PAR approach until the requirements listed in FAR 91.175 are met and a normal landing can be made.
10. If the requirements of FAR 91.175 cannot be met, execute the missed approach at MAP.

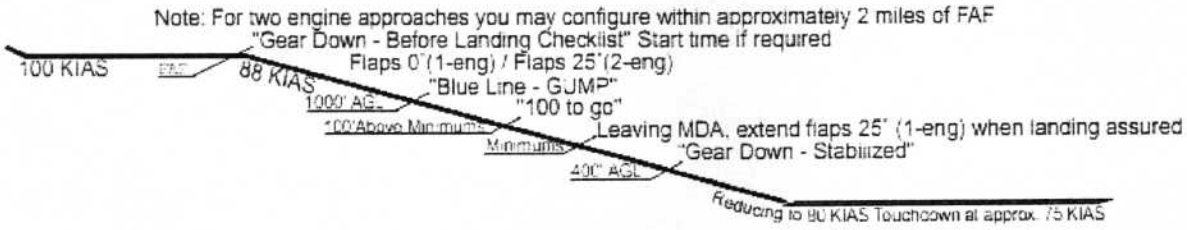
REFERENCES: FAA Instrument Rating Practical Test Standards, Instrument Flying Handbook FAA-H-8083-15, FAR and Aeronautical Information Manual

APPROACH DIAGRAMS

CIRCLING APPROACH TWO ENGINES ONLY PROFILE



NON-PRECISION ONE OR TWO ENGINE PROFILE



NO-GYRO RADAR VECTORING AND APPROACH PROCEDURE

DESCRIPTION: The aircraft is established on the final heading as assigned by ATC and at the desired approach speed. The descent to the MDA is begun when instructions are received from ATC. The approach is terminated either with a landing or a missed approach as appropriate.

OBJECTIVE: To develop the skill and proficiency necessary to execute radar instrument approach procedures during operations with an inoperative heading indicator.

PROCEDURES:

1. Comply with heading and altitude instructions as assigned by ATC.
2. Slow to 100 KIAS (17" MP/2300 RPM) upon reaching a point 5 miles from the final descent point.
3. ATC will advise when to make a heading changes by issuing turn instructions such as "turn left", "stop turn".
4. Upon receiving instructions from ATC to begin the final descent, perform the **"Gear down before landing checklist"** extend the flaps to 25 degrees and descend to the MDA, DH or step-down fix as appropriate.
5. At 1000' AGL announce **"Blue line – GUMP"**.
6. Course guidance is provided by ATC in the form of heading and turn instructions. If executing a PAR approach, glide slope instructions are provided by ATC.
7. Be alert for equipment malfunctions or course deviations that may require executing a missed approach.
8. Initiate a level off to stay at or above the MDA for the ASR approach or DH for the PAR approach until the requirements listed in FAR 91.175 are met and a normal landing can be made.
9. If the requirements of FAR 91.175 cannot be met, execute the missed approach at MAP.

REFERENCES: FAA Instrument Rating Practical Test Standards, Instrument Flying Handbook FAA-H-8083-15, FAR and Aeronautical Information Manual

MISSED APPROACH PROCEDURES

DESCRIPTION: The aircraft is transitioned from an instrument approach to a climb and departure procedure.

OBJECTIVE: To develop the skill and proficiency necessary to recognize situations that require execution of a missed approach and then, to promptly accomplish the appropriate missed approach procedure.

PROCEDURES:

1. Recognize when a missed approach is required.
2. Perform the **"Go-Around / Missed Approach checklist"**.
3. Advance the throttles to the full takeoff power position.
4. Adjust the pitch attitude for a Vx or Vy climb (as appropriate). Trim as necessary.
5. Retract the flaps slowly to 0 degrees.
6. After achieving a positive rate of climb, retract the landing gear.
7. Open the cowl flaps.
8. After climbing 1000' MSL perform the **"After Takeoff checklist"** (24" MP/2500 RPM).
9. Adjust the trim as necessary.
10. Advise ATC that you are "missed approach" and what your intentions are.
11. Proceed as depicted on the approach chart or as directed by ATC.

REFERENCES: FAA Instrument Rating Practical Test Standards, Instrument Flying Handbook FAA-H-8083-15, FAR and Aeronautical Information Manual

CIRCLING APPROACH PROCEDURES

DESCRIPTION: The aircraft is maneuvered for a landing on a runway not aligned with the instrument approach course.

OBJECTIVE: To develop the skill and proficiency necessary to maneuver and land on a runway not aligned with the instrument approach final course.

PROCEDURES:

1. Recognize the landing environment while conducting an instrument approach.
2. Determine the safest route to fly to the landing runway considering wind, obstructions, traffic, visibility, and the ability to remain within the circling approach protected area.
3. Maintain the circling approach minimum until in a position to descend and make a normal landing.
4. Keep the airport and runway in sight at all times.
5. Continue to monitor the flight instruments during maneuvering and landing.
6. Be prepared to execute a missed approach if conditions deteriorate.

REFERENCES: FAA Instrument Rating Practical Test Standards, Instrument Flying Handbook FAA-H-8083-15, FAR and Aeronautical Information Manual

CLEARING TURNS

DESCRIPTION: The pilot will ascertain that the airspace immediately surrounding the aircraft is clear of all other traffic by executing two 90-degree turns in the same or opposite directions.

OBJECTIVE: To teach the student to exercise conscientious and continuous surveillance of the airspace in which the airplane is being operated.

PROCEDURES:

1. Visually scan the area to the left and the right of the aircraft.
2. Enter a medium banked turn in either direction.
3. Continuously scan the area above, below, and ahead of the flight path.
4. After a 90 degree turn is completed, roll the aircraft level and reduce throttle to 15" MP.
5. Repeat steps 1 thru 3 in the same or opposite direction.
6. Perform either the **"Gear Down Before Landing Checklist"** or **"Configuration Flow"** as appropriate.
7. Turning maneuvers will be made in the direction of the last area cleared.

REFERENCES: FAA Instrument Rating Practical Test Standards, Instrument Flying Handbook FAA-H-8083-15, FAR and Aeronautical Information Manual

2-35 Com PTS
2-60 FOI PTS
2-35 Private
4-17 AFH

Airline Transport Professionals, Inc.

Vmc DEMONSTRATION
ENGINE INOPERATIVE LOSS OF DIRECTIONAL CONTROL DEMO

DESCRIPTION: The aircraft is maneuvered with the critical engine inoperative and wind milling to an airspeed at which directional control cannot be maintained. Recovery is initiated in a manner that allows control to be regained within 20 degrees of heading change and with minimum loss of altitude.

OBJECTIVE: To develop the students ability to recognize the indications of loss of directional control due to attempted flight below Vmc with an engine inoperative and then to execute a proper recovery procedure.

NOTE 1: RECOVERY FROM THIS MANEUVER MUST BE ACCOMPLISHED NO LOWER THAN 4000' AGL.

NOTE 2: CONDITIONS PREVAILING DURING THIS DEMONSTRATION MAY CAUSE THE AIRCRAFT TO REACH AN APPROACH TO A STALL BEFORE REACHING LOSS OF DIRECTIONAL CONTROL. RECOVERY IS THEREFORE INITIATED WHEN DIRECTIONAL CONTROL CANNOT BE MAINTAINED OR INDICATIONS OF A STALL ARE EXPERIENCED, WHICHEVER OCCURS FIRST.

PROCEDURES:

1. Perform clearing Turns
2. Reduce throttles to15" MP
3. Perform the **"Configuration flow"**.
4. Right Throttle - Full Open, Left Throttle - Closed
5. 3 to 5 Degrees Bank into Good Engine
6. Increase pitch so as to decrease airspeed by 1 knot/second
7. Limit rudder inputs at 20 knots above Vs. (77 knots).
8. Recover when you achieve either:
    - Loss of directional control
    - Full rudder travel
    - Stall horn
    - Aerodynamic buffeting
9. Reduce Power Partially and Lower Nose.
10. Regain control and airspeed increasing above Vmc.
11. Slowly apply full power on right engine.
12. Maintain 88 Knots (Blue Line)
13. Resumes cruise and perform **"Cruise checklist"** upon completion of maneuver.

REFERENCES: FAA Private and Commercial Practical Test Standards, PA-44 POH and Supplement

DRAG DEMONSTRATION (Vyse DEMO)

DESCRIPTION: With one engine feathered or set for simulated zero thrust and the other operating at full power, an attempt to find the speed that will produce the best rate of climb is made. Once this speed is determined it will be maintained while the effects of extension of landing gear, extension of flaps, extension of both gear and flaps, and windmilling propeller is observed. Minimum recovery altitude is 3000" AGL.

OBJECTIVE: To teach the student the effects of various airspeeds and configurations on single engine performance.

PROCEDURES:

1. Perform Clearing Turns
2. Set throttles to 15" MP
3. Perform the **"Configuration Flow"**.
4. Slow to 88 KIAS – "Blue line"
5. Extend landing gear
6. Add power to maintain 88 KIAS and altitude.
7. Extend flaps to 25 degrees.
8. Add power to maintain 88 KIAS and altitude.
9. Extend flaps to 40 degrees.
10. Add power to maintain 88 KIAS and altitude.
11. Left engine cowl flap closed.
12. Close left throttle (Windmilling prop)
13. Add max power on the right engine and maintain 88 KIAS and heading (Note VSI)
14. Flaps up maintain 88 KIAS (Note VSI)
15. Gear up maintain 88 KIAS (Note VSI)
16. Left throttle to 12" MP simulated feather power. Maintain 88 KIAS (Note VSI)
17. Pitch for 82 KIAS (Note VSI)
18. Pitch for 100 KIAS (Note VSI)
19. Bring throttles slowly together to 20" MP – maneuver complete
20. Recover with the **"Cruise Checklist"**

REFERENCES: FAA Private and Commercial Practical Test Standards, Piper Seminole training supplement.

ENGINE FAILURE DURING TAKEOFF (BEFORE Vmc)

DESCRIPTION: During takeoff roll the instructor will simulate an engine failure by reducing the power on one engine, forcing the student to immediately reduce power on the operating engine to maintain directional control. The takeoff will be aborted.

OBJECTIVE: To teach the student to recognize and react to an engine failure on ground roll, and to maintain good directional control through the aborted takeoff. The aircraft must remain within 15 feet of the runway centerline and the outcome must never be in serious doubt.

NOTE: Engine failure will not be simulated at a speed greater than 28 KIAS (50% of Vmc)

PROCEDURES:

1. During initial takeoff roll, the instructor will fail one engine by using throttle or mixture control.
2. The student will react to the differential thrust immediately by closing both throttles, maintaining directional control with rudder and smoothly applying the brakes as necessary.
3. The instructor will notify the student whether to stop or continue takeoff (depending on runway length).

NOTE: The checklist calls for shutting off master switch and fuel selectors in a real life situation, however in a simulated situation, verbally announce the appropriate action without actually performing the shutdown.

REFERENCES: FAA Private and Commercial Practical Test Standards, PA-44 POH, Airplane Flying Handbook FAA-H-8083-3.

FOF PTS 2-51
COM PTS 2-28
Private PTS 2-29

ENGINE FAILURE AFTER LIFTOFF

DESCRIPTION: During initial climb out the instructor will place the throttle on one of the engines to idle, forcing the student to decide to continue or abort. If the decision is to continue, upon reaching a safe altitude the airplane should be circled to land on the active runway.

OBJECTIVE: To teach the student to follow appropriate engine failure procedures for engine failures that occurs shortly after liftoff and to safely conclude the flight as he would in the event of an actual failure.

NOTE: NO ENGINE FAILURES WILL BE SIMULATED IN FLIGHT WHEN AIRSPEED IS BELOW Vsse.

PROCEDURES:

1. The instructor simulates an engine failure on one engine by placing the throttle in the idle position.
2. If adequate runway remains, land and stop on remaining runway.
3. If unable to land on remaining runway, maintain positive aircraft control and adjust to Vxse or Vyse as appropriate and establish control inputs for best single engine performance.
4. Perform in flight engine failure procedures (emergency checklist).
5. Re-evaluate performance, if satisfactory continue, if not land in most suitable area ahead.
6. If able to continue, maintain Vyse and climb straight ahead to an altitude to start turns.
7. Communicate with appropriate facility for assistance if necessary.
8. Perform the **"Engine secure checklist"** as time permits.

REFERENCES: FAA Private and Commercial Practical Test Standards, Airplane Flying Handbook FAA-H-8083-3.

FOI PTS 2-52
COM PTS 2-29
Private PTS 2-30

ENGINE FAILURE ENROUTE

DESCRIPTION: Response to the failure of an engine including, troubleshooting and propeller feathering will be conducted as appropriate. Coordinated control of the aircraft will be maintained and action taken to land at the nearest suitable airport. When directed, engine restart will be accomplished in accordance with prescribed procedures.

OBJECTIVE: To recognize promptly an engine failure, to complete the appropriate engine failure procedure, and to establish and maintain the desired flight attitudes required for best performance. Also, inform ATC of the situation and initiate the appropriate course of action necessary to ensure a safe landing.

PROCEDURES:

1. The instructor simulates an engine failure by placing the appropriate mixture control in idle cut-off, shutting off the appropriate fuel selector, or with the throttle when above 3000' AGL.

NOTE: WHEN OPERATING BELOW 3000' AGL, THE ENGINE FAILURE WILL BE SIMULATED ONLY WITH ADJUSTMENTS TO THE THROTTLE CONTROLS.

2. Establish control imputes for best performance.
3. Complete the appropriate engine failure procedures while flying towards the nearest available airport.
4. Determine the appropriate course of action and advise ATC/Instructor of the situation with your request.
5. Monitor the operating engine and adjust engine controls as necessary.
6. Make turns, climbs, and descents within the performance capabilities of the aircraft.
7. Restart the inoperative engine and return to cruise.

NOTE: NO ENGINE FAILURES WILL BE SIMULATED IN FLIGHT WHEN THE AIRSPEED IS BELOW Vsse.

REFERENCES: FAA Practical Test Standards, PA-44 POH and Seminole Emergency Checklist.

APPROACH AND LANDING WITH AN INOPERATIVE ENGINE

DESCRIPTION: An engine failure simulated and appropriate single engine procedures are followed. The simulated failed engine throttle to simulate a feathered propeller. The traffic pattern is continued to a normal landing.

OBJECTIVE: To teach the student to execute a safe approach and landing in the event of an engine failure.

PROCEDURES:

1. At some point prior to or during the traffic pattern the instructor will simulate an engine failure.
2. Follow appropriate engine failure procedures and establish control inputs for the best performance.
3. Fly the pattern as described in the traffic pattern operations procedures if within the capabilities of the airplanes single engine performance.
4. When ready to start descent for landing (or increase rate of descent if level flight is not possible) extend the landing gear.
5. Adjust pitch and power so as to maintain desired approach angle and as a minimum Vyse.
6. When landing is assured extend flaps in small increments and adjust pitch and power to maintain desired approach angle and speed. Max recommended flap setting; 25°.
7. Execute appropriate landing procedures.

REFERENCES: FAA Private and Commercial Practical Test Standards, Airplane Flying Handbook FAA-H-8083-3.

AFH 12-#3

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INSTRUMENT APPROACH - ONE ENGINE INOPERATIVE

DESCRIPTION: An instrument approach is flown with one engine inoperative.

OBJECTIVE: To help the student gain skill and proficiency in performing correct procedures when an engine fails before or during an instrument approach.

NOTE: NO PRACTICE SINGLE ENGINE MISSED APPROACHES ARE PERMITTED IN ATP AIRCRAFT.

NOTE: ATP REQUIRES 88 TO 100 KIAS APPROACH SPEED AND FLAPS TO 0 DEGREES FOR CIRCLE TO LAND APPROACHES.

PROCEDURES:

1. After determining an engine has failed, perform the appropriate single engine emergency procedures and establish control inputs for best performance.
2. LANDING GEAR:
    - ILS- The gear should be extended at the normal point (glideslope intercept) since satisfactory performance can usually be achieved.
    - NON-PRECISION (STRAIGHT-IN) - Extend gear at the FAF.
    - CIRCLING -ATP requires that you put the landing gear down when leaving the MDA and in the position for landing (see note).

NOTE: THE PROCEDURES LISTED ABOVE FOR GEAR OPERATIONS MAY NEED TO BE MODIFIED FOR VARIED AIRCRAFT PERFORMANCE. THE GEAR BEING EXTENDED DURING SINGLE ENGINE OPERATIONS MAY PRODUCE SUCH A DECREASE IN PERFORMANCE THAT THE AIRCRAFT MAY NOT BE ABLE TO MAINTAIN THE GLIDE SLOPE ON A PRECISION APPROACH, OR THE MDA ON A NON-PRECISION APPROACH. THE PA-44 MAY NOT HAVE ENOUGH PERFORMANCE TO MAINTAIN MDA ON ONE ENGINE WITH GEAR DOWN, PARTICULARLY DURING CIRCLING. THE FINAL AUTHORITY AS TO WHEN THE GEAR WILL BE EXTENDED DURING APPROACH PROCEDURES IS THE PILOT IN COMMAND.

3. FLAPS: Flap extension will adversely affect aircraft single engine performance and should be reduced unless the landing is assured.
4. TROUBLESHOOT: If outside the final approach fix, troubleshoot. If inside the final approach fix, troubleshoot if time permits.

REFERENCES: FAA Instrument Pilot Practical Test Standards.

Private PTS Z-36

COLLISION AVOIDANCE PRECAUTIONS

DESCRIPTION: Considerations and methods found effective for both spotting and avoiding other aircraft in flight and during ground operations.

OBJECTIVE: To develop the student's ability to effectively scan and clear the area, and recognize and avoid collision hazards both on the ground and in the air.

PROCEDURE:

1. Effectively scan for collision hazards. (You can't avoid it if you don't see it!)
    - Keep your attention outside the aircraft as much as possible.
    - Be alert for distractions that may draw your attention away from the outside.
    - Use a complete scan from as far behind you as reasonable, sweeping in 20° increments, around the front of the aircraft to as far behind you as reasonable on the other side.
    - Be aware of potential blind spots inherent in the type of aircraft you are flying.
    - Make no turns without first scanning the area that may be blocked out by either wings.
    - Make gentle turns left and right as necessary when climbing or descending to help see past the aircraft nose cowl.
2. Be prepared to react appropriately to avoid a collision hazard by remaining in a normal flying position with hands and feet on proper controls.
3. Always consider the other aircraft as not having you in sight and expect the unexpected.
4. Be especially alert for any aircraft in flight that appears on the horizon, growing in size, and remains at the same relative position on the windshield. This aircraft is on a collision course with you.
5. Take prompt action to avoid any possible traffic conflicts.

REFERENCES: FAA Private and Commercial Practical Test Standards, Aeronautical Information Manual.

LOST PROCEDURES

DESCRIPTION: The airplane will be positioned in an unexpected location. The student will then determine this new location and make corrections to get back on course.

OBJECTIVE: To gain proficiency in relocating yourself after being lost and then getting established back on course.

PROCEDURE:

1. Maintain positive aircraft control at all times.
2. Use topographical features and/or navaids to determine your position.
    a. Topographical features
        - Reset the heading indicator.
        - Turn the sectional chart to match your heading.
        - Look outside to find any prominent landmarks.
3. Match the landmarks to the chart.
    b. Navaids
        - Reset the heading indicator.
        - Tune and identify available stations (VOR and NDB).
        - Decide whether a new course or simply an intercept should be used to continue on to your destination.
        - If you are still unable to locate your position, contact the nearest FSS for RADAR assistance or DF STEER.

NOTE: THE STUDENT IS EXPECTED TO BE AWARE OF THE TYPES OF ASSISTANCE AVAILABLE AS WELL AS HOW AND WHEN TO REQUEST IT. SATISFACTORY COMPLETION OF THE PHASE CHECK, HOWEVER, WILL REQUIRE THAT THE STUDENT BE ABLE TO DETERMINE POSITION AND REESTABLISH HIS/HER COURSE WITHOUT OUTSIDE ASSISTANCE.

REFERENCES: Airplane Flying Handbook FAA-H-8083-3, Aeronautical Information Manual.

DIVERSIONS

DESCRIPTION: When it becomes necessary to change course while enroute, a new course will be plotted and flown and the ETA revised.

OBJECTIVE: To develop skills necessary for plotting a new course and determining a new ETA while enroute.

PROCEDURE:

1. Determine present position and the location of the new destination.
2. Turn to an estimated heading that will avoid any restricted airspace or obstructions or adverse weather.
3. Draw the new course on your chart and note the starting position and time.
4. Determine distance and magnetic heading.
5. Compute ETE, ETA and fuel required and compass heading.
6. Fly your new route as planned.
7. Revise your flight plan as necessary with the nearest FSS, and if appropriate receive a weather update for the new route and destination.

NOTE: WHEN RELATIVELY SHORT DISTANCES ARE INVOLVED AND FUEL IS NOT CRITICAL, THE STUDENT WILL BE EXPECTED TO MAKE ESTIMATES WITH A REASONABLE DEGREE OF ACCURACY RATHER THAN ACTUAL COMPUTATIONS.

REFERENCES: Airplane Flying Handbook, FAA Private and Commercial Practical Test Standards.

EMERGENCY DESCENTS

DESCRIPTION: The procedure consists of simulation of a condition that requires a descent to a lower altitude and/or airport as quickly as possible.

OBJECTIVE: To prepare the student to recognize a condition that requires an immediate descent and how to perform this descent in a timely manner without exceeding the limitations of the aircraft.

PROCEDURE:

1. Reduce power to idle.
2. Clear the area to the right or left and then commence a descending turn in either direction. Lower landing gear (at or below Vlo dn).
3. In smooth air, increase speed up to Vne. In turbulent air, do not exceed Va.
4. Upon reaching a prescribed altitude (as assigned by instructor/examiner), level off smoothly without exceeding any limitations.
5. Retract Gear below 109 KIAS.
6. Resume normal cruise and perform cruise checklist.

NOTES: CONDITIONS THAT REQUIRE EMERGENCY DESCENTS ARE; DECOMPRESSION, COCKPIT SMOKE AND/OR FIRE. OUR SINGLE ENGINE AIRCRAFT ARE NOT PRESSURIZED AND CANNOT DECOMPRESS, HOWEVER, WE WILL TRAIN THE STUDENT TO REACT TO SUCH A CONDITION AS PART OF OUR COMPLETE PILOT TRAINING. MOST SINGLE ENGINE AIRCRAFT DOES NOT HAVE AN EMERGENCY DESCENT CHECKLIST, AND IN ITS ABSENCE, DESCEND THE AIRCRAFT AS TIMELY AS POSSIBLE WITHOUT EXCEEDING ANY LIMITATIONS.

REFERENCES: FAA Private and Commercial Practical Test Standards, PA-44 POH, and Supplement

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FOF PTS 2-55
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FOI PTS 2-25
Comm PTS 2-15 Private PTS 2-8, 13

SHORT-FIELD TAKEOFF AND CLIMB

DESCRIPTION: The short field takeoff and climb is used when the takeoff distances are at a marginal length for executing a normal takeoff and where obstacle avoidance may also be a factor.

OBJECTIVE: Compute aircraft performance and runway lengths and conditions to ensure a safe takeoff and climb from a short runway.

ELEMENTS:

NOTE: PIPER SEMINOLE PA 44-180 SHORT-FIELD TECHNIQUES - IF THE SITUATION PRESENTS A WIDE MARGIN ON OBSTACLE CLEARANCE, THE SAFEST SHORT-FIELD TECHNIQUE TO USE IS WITH THE FLAPS UP (0°). THE AIRCRAFT SHOULD BE TAXIED AND POSITIONED SO AS TO MAXIMIZE THE TAKEOFF AREA. TAKEOFF POWER SHOULD BE APPLIED SMOOTHLY AND CONTINUOUSLY, SO AS TO ACCELERATE THE AIRPLANE AS RAPIDLY AS POSSIBLE.

1) Flaps	UP
2) Stabilator Trim	Takeoff Range
3) Brakes	Set
4) Full Power	Set
5) Brakes	Release
6) Accelerate to	70 KIAS
7) Rotate firmly	75 KIAS through 50' AGL
8) Accelerate to Vx (82 KIAS) for obstacle clearance or Vy (88 KIAS), no obstacle.	
9) Gear	Up

PROCEDURE:

1. Best angle (82 KIAS) should be maintained only if obstacles are a factor.
2. Best rate (88 KIAS) should be maintained with full power until adequate terrain clearance is obtained.
3. Flaps and landing gear should remain in the takeoff position until well clear of obstacles and the best rate of climb is established. Retract the flaps in increments to avoid a sudden loss of lift and settling of the airplane.
4. **"After Takeoff Checklist"**: At a safe maneuvering altitude, 1000 AGL reduce engine power to 75% (24" HG + 2500 RPM) for cruise climb (≥100 KIAS); combination of reduced power and increased climb speed provides better engine cooling, less engine wear, reduced fuel consumption, lower cabin noise, and better forward visibility.
5. Throttles should be retarded first, followed by the propeller controls. Cowl flaps can be adjusted as necessary to maintain CHT's and oil temperatures within normal operating ranges. (PA 44 AFM; FAA-H-8083-3, FAR 91-91).

SHORT-FIELD TAKEOFF AND CLIMB (Cont.)

COMPLETION STANDARDS:

- Exhibits knowledge of the elements related to short-field takeoff and climb.
- Positions the flight controls and flaps for the existing conditions.
- Clears the area, taxies onto position for maximum utilization of available takeoff area.
- Rotates at the recommended airspeed.
- Climbs at the manufacturer's recommended airspeed and configuration until the obstacle is cleared, or until the airplane is at least 50 feet above the surface.
- After clearing the obstacle accelerates to and maintains Vy, ±5 knots.
- Retracts landing gear and flaps after a positive rate of climb is established, or as specified by the manufacturer.
- Maintains takeoff power to a safe maneuvering altitude, then sets climb power.
- Maintains directional control and proper wind-drift correction throughout the takeoff roll and climb.
- Completes appropriate checklists.

REFERENCES: Airplane Flying Handbook, FAA-H-8083-3, FAA Private and Commercial Pilot Practical Test Standards.

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FOI PTS 2-30
Flying hand 7-14
Private PTS 2-14
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SHORT FIELD APPROACH AND LANDING

DESCRIPTION: This maneuver allows for the plane to land and stop on a short runway or when a landing must be made over an obstacle, which shortens the available runway.

OBJECTIVE: The student will be able to properly configure the plane for the approach, using proper power setting and flap setting for each segment of the approach. The pilot will be able to establish a steady descent, which allows for minimum floating during the round out and the plane to be stopped in the shortest distance. After touchdown the flaps will be retracted, brakes fully applied and the yoke brought fully back. Throughout the entire approach the pilot will maintain proper ground track to compensate for the wind.

ELEMENTS:
Piper Seminole PA-44 Short Field Techniques – See below

1. Approach with full 40° Flaps at 75 KIAS, immediately after touchdown, raise the flaps, apply backpressure to the wheel and apply brakes.
2. If a crosswind or high wind landing is necessary, approach with a higher than normal speed and with zero or 25° flaps, immediately after touchdown, raise the flaps, apply back pressure to the wheel and apply brakes, maintain the appropriate crosswind correction.
3. The maximum demonstrated crosswind component for landing the PA 44 is 17 KTS.

NOTE: REFER TO THE PERFORMANCE CHARTS.

COMPLETION STANDARDS:

- Exhibits knowledge of the elements related to short-field approach and landing.
- Considers the wind conditions, landing surface, and obstructions.
- Selects the most suitable touchdown point.
- Establishes the recommended approach and landing configuration and adjusts power and pitch attitude as required.
- Maintains a stabilized approach, controlled rate of descent, and recommended airspeed, or in its absence, not more than 1.3 Vso, with gust factor applied, ±5 knots.
- Use power to control the rate of descent while maintaining the appropriate airspeed – additional power decreases the rate of descent while less power increases (**Short-Field is a practical application of SLOW FLIGHT**).
- Make small corrections in a timely manner.
- In gust conditions add ½ the gust factor to your approach speed.
- The approach speed in the PA 44 is 75 KIAS with 40° Flaps (AFM).
- Makes smooth, timely, and correct control applications during the round out and touchdown.
- Maintain the appropriate crosswind correction through touchdown to prevent drifting.

SHORT FIELD APROACH AND LANDING (Cont.)

- Touchdown should occur at the minimum controllable airspeed that results in a power off stall when the throttles are closed.
- Remains aware of the possibility of wind shear and/or wake turbulence.
- Touches down at a specified point at or within 100 feet beyond a specified point, with little or no float, with no drift, and with the airplane's longitudinal axis aligned with and over the center of the landing surface.
- Maintains crosswind correction and directional control throughout the approach and landing.
- Maintain a sideslip all the way to the runway.
- The upwind main wheel should make first contact.
- Deflect the ailerons into the wind to prevent the upwind wing from rising.
- Applies brakes, as necessary, to stop in the shortest distance consistent with safety.
- After touchdown, lower the nose and begin braking firmly and evenly.
- For maximum braking, apply elevator pressure.
- Retract the flaps and continue braking until the airplane comes to a complete stop.
- Completes appropriate checklists.

REFERENCES: FAA Private and Commercial Pilot Practical Test Standards, Airplane Flying Handbook FAA-H-8083-3.

TURNS AROUND A POINT

DESCRIPTION: A maneuver consisting of circles with a constant radius around a reference point (i.e. an intersection, a tree, a tower)

OBJECTIVE: The student will recognize and compensate for changes in wind direction by applying different amounts of bank. The student will also divide attention between aircraft control and completing the maneuver.

PROCEDURES:

1. Choose an appropriate reference point within gliding distance to emergency field.
2. Enter maneuver on the downwind at assigned airspeed and altitude, with the first turn to the left.
3. Complete two turns and exit at point of entry, reversing course as directed.

REFERENCES: FAA Private Pilot Practical Test Standards, Airplane Flying Handbook FAA-H-8083-3.

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INSTRUMENT FLIGHT
ENGINE FAILURE DURING STRAIGHT AND LEVEL FLIGHT

DESCRIPTION: This procedure demonstrates engine-out recovery techniques for aircraft under instrument conditions during straight and level flight.

OBJECTIVE: The student should demonstrate smooth, proper technique and decision making for recovering the aircraft or feathering the propeller. The action will be performed with minimal course deviation (i.e. altitude and heading). The student should inform the controlling agency and supply necessary information.

PROCEDURES:

1. Prompt recognition of engine failure.
2. Setting of engine controls, reduction of drag, identification and verification of the inoperative engine.
3. Establishment of the best engine inoperative airspeed and trim.
4. Use of the prescribed checklist to verify the accomplishment of procedures for securing the inoperative engine.
5. Establishment and maintenance of the recommended flight attitude, as required, for best performance.
6. Technique for maintaining positive aircraft control by reference to instruments.
7. Appropriate methods to be used for determining the reason for the malfunction.
8. Importance of determining aircraft's performance capabilities with regard to action that assures a safe landing.
9. Maintenance of altitude or minimum sink rate, considering existing conditions.
10. Importance of monitoring and properly adjusting the operative engine.
11. Avoidance of flight contrary to the single engine operations of the aircraft.

REFERENCES: FAA Instrument Instructor Practical Test Standards.

SYSTEMS AND EQUIPMENT FAILURE

DESCRIPTION: These tasks will enable the pilot to recognize and react to the various failures of aircraft systems and equipment during flight.

OBJECTIVE: The student will be able to explain the causes of, indications of, and recommended pilot actions for various systems and equipment malfunctions.

PROCEDURES:

1. Importance of availability and use of an emergency checklist.
2. Smoke, fire, or both, during ground or flight operations.
3. Rough running engine or partial power loss.
4. Fuel starvation.
5. Engine overheats.
6. Hydraulic system malfunction.
7. Electrical system malfunction.
8. Carburetor or induction icing.
9. Door or window opening in flight.
10. Inoperative or 'runaway' trim.
11. Landing gear or flap malfunction.
12. Pressurization malfunction.
13. Failure of pitot-static system, vacuum/pressure system and associated flight instruments.
14. Any other system or equipment malfunction.

REFERENCES: FAA Commercial Pilot and Multi-Engine Instructor Practical Test Standards, PA-44 POH.

COM PTS 2-31
FOI PTS 2-50
AFH 12-1
Private 2-32

PRINCIPLES OF FLIGHT – ENGINE INOPERATIVE

DESCRIPTION: An overview of the aerodynamics of multiengine aircraft during the times when an engine becomes inoperative.

OBJECTIVE: To introduce the student to engine inoperative aerodynamics and the drag effects of certain components and configurations of the aircraft:

- Extension of landing gear
- Extension of flaps
- Extension of both gear and flaps
- Windmilling propeller in the inoperative engine

PROCEDURES:

1. Importance of reducing drag and banking properly into the good engine(s) for best performance:
    - Landing gear position – Extension of the landing gear adds drag and diminishes any additional power that may be required for climb performance.
    - Position of flaps – Extended flaps reduces the engine-out yaw forces; however, flaps increase drag and reduce airplane performance.
    - Propeller (wind milling or feathered) – A wind milling propeller produces significant drag that contributes to engine-out yawing forces and higher Vmc. Full-feathering propellers align with the relative wind and thus minimize yawing tendencies, Vmc, and drag. Feather the propeller.
    - Sideslip condition – The large rudder deflection required to counteract the engine-out yaw results in a lateral lift force on the vertical stabilizer. With wings level and the inclinometer ball centered the lateral lift places the aircraft in a moderate sideslip toward the operative engine. Sideslips are disadvantages because the relative wind blowing on the operative engine side of the vertical fin increases the asymmetric moment, stall characteristics severely degrade, climb and acceleration capabilities are significantly reduced, and Vmc will be higher. **A zero sideslip (3-5° bank toward the operating engine and the inclinometer ball split toward the good engine) minimizes drag and maximizes performance and controllability.**

2. Importance of establishing and maintaining proper airspeed:
    - In the event of an engine failure, whether after lift-off, en route, or approaching a landing, Vyse (±5 knots) should be attained and maintained.
    - If altitude cannot be maintained, this airspeed will provide the slowest rate of descent and the most time for an emergency landing.
    - Never sacrifice airspeed for altitude, if airspeed bleeds off excessively Vmc may occur.

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PRINCIPLES OF FLIGHT – ENGINE INOPERATIVE (Cont.)

- Vmc is the minimum airspeed at which directional control of the aircraft can be maintained with an engine inoperative and the operating engine producing maximum takeoff power.

- At any airspeed less than Vmc, maximum rudder/aileron deflection is not sufficient to counteract the asymmetrical yawing forces caused by takeoff power on the operating engine and a powerless windmilling propeller on the other. Rudder effectiveness is completely dependent upon the velocity of airflow across it; too little airflow and directional control is lost.

3. Importance of maintaining proper pitch and bank attitudes, and proper coordination of controls:
   - It is very important that the pilot remain calm and collected in the event of an engine failure. Pilot technique and checklist completion are the keys to maximizing the performance and handling characteristics of the aircraft. Maintenance of proper pitch and bank attitude, control coordination will increase the likelihood of a safe outcome from an engine-out emergency.
   - The more a pilot deviates from the proper pitch and bank attitudes, and proper coordination of controls drag maximizes performance and performance and controllability more severely degrade, thus the more likely Vmc or a stall/spin is to occur.

4. Performance available based on the following drag configurations –
   When an engine fails on a light twin, performance is reduced by 80% or more. Performance is not halved because climb performance is a function of thrust horsepower, which is in excess of that required for level flight. Power is lost and drag increases considerably due to the asymmetrical thrust produced by the operating engine, which now carries the full burden. The operating engine must now produce 75% or more of its rated power to overcome the increase in drag, leaving little excess power for climb performance. In an engine-out emergency thrust must be maximized (full power) and drag minimized (flaps up, gear up, prop feathered) to achieve maximum climb performance.
   a) Extension of landing gear – results in 150 FPM rate of descent in the PA- 44
   b) Extension of flaps – results in 400 FPM rate of descent in the PA-44
   c) Extension of both gear and flaps – results in 550 FPM rate of descent in the PA-44
   d) Wind milling propeller on the inoperative engine – results in 400 FPM rate of descent in the PA-44

REFERENCES: Airplane Flying Handbook FAA-H-8083-3, FAA Private and Commercial Pilot Practical Test Standards.