Flight Maneuvers Guide

for

The Douglas DC-3 and Super 3 Aircraft Family

Flight Manuevers Guide Index

Flight Manuevers Guide Index ... Continued:

Operating and Limitation Airspeeds DC-3

All Speeds are in Knots

V-Speed	Description	Speed	Flap	Gear
Vne	Never Exceed Speed: Do not exceed this speed in any operation.	**190**		
Vno	Maximum Structural Cruising Speed: Do not exceed this speed except in smooth air, and then only with caution.	**156**		
Va	Maneuvering Speed: Do not make full or abrupt control movements above this speed.	**115**		
Vfe	Maximum Flap Extended Speed: Do Not exceed these speeds with given flap setting.	**135** **97** **96**	**1/4** **1/2** **3/4**	
Vlo	Maximum Landing Gear Operating Speed: Do not extend/retract gear above this speed.	**126**		
Vle	Maximum Landing Gear Extended Speed: Do not exceed this speed with gear extended.	**126**		**Down**
Vx	Best Angle of Climb Speed: Use this speed for obstacle clearance.	**84**		**Up**
Vxse	Best Single Engine Angle of Climb Speed: Use this speed for the greatest gain in altitude in the shortest distance with one engine inoperative.	**84**		**Up**
Vy	Best Rate of Climb Speed: Use this speed for the maximum climb in the least time.	**105**		**Up**
Vyse	Best Single Engine Rate of Climb Speed: Use this speed for the maximum climb in the least time with one engine inoperative.	**95**		**Up**
Vso	Stall Speed: Stalling speed in the Landing configuration.	**64**		**Down**

DC-3 Speeds Continued.

V-Speed	Description	Speed	Flap	Gear
Vs1	Stalling Speed: Stall speed with flaps up and landing gear retracted. (Clean)	**70**		**Up**
Vmc	Minimum Control Airspeed: This is the minimum flight speed at which the airplane is controllable with one engine inoperative.	**77**		**Up**
Vsse	Safe Single Engine Speed: Altitude can be maintanied more easily while retracting gear and feathering propeller at this speed.	**95**		
Max Glide	Most distance over the ground with the least altitude loss.	**N/A**		
Holding	Speed normally used for max endurance and ease of handling.	**110**		**Up**
No Flap Approach	Use this speed to make an approach to land with no flaps.	**85**		**Down**
ILS	Use this speed to make an ILS approach.	**90**	**1/4**	**Down**
Normal Landing	Downwind	**120**	**1/4**	**Down**
	Base	**90**	**1/2**	**Down**
	Final	**80**	**3/4**	**Down**
Cruise	This is normal cruise speed.	**140**		**Up**
Climb	Normal cruise climb speed.	**125**		**Up**
Red Line	Never Exceed	**190**		
Yellow Arc	Caution Range	**159 <---> 190**		
Green Arc	Normal Operating Range	**70 <---> 159**		
White Arc	Flap Operating Range	**64 <---> 97**		
Red Radial	Minimum Control Airspeed	**77**		
Blue Radial	Best Rate Single Engine	**95**		

Operating and Limitation Airspeeds Super DC-3

All Speeds are in Knots

V-Speed	Description	Speed	Flap	Gear
Vne	Never Exceed Speed: Do not exceed this speed in any operation.	**237**		
Vno	Maximum Structural Cruising Speed: Do not exceed this speed except in smooth air, and then only with caution.	**202**		
Va	Maneuvering Speed: Do not make full or abrupt control movements above this speed.	**125**		
Vfe	Maximum Flap Extended Speed: Do Not exceed these speeds with given flap setting.	**128** **115**	**1/4 (approach)** **> than 1/4**	
Vlo	Maximum Landing Gear Operating Speed: Do not extend/retract gear above this speed.	**144**		
Vle	Maximum Landing Gear Extended Speed: Do not exceed this speed with gear extended.	**126**		**Down**
Vx	Best Angle of Climb Speed: Use this speed for obstacle clearance.	**84**		**Up**
Vxse	Best Single Engine Angle of Climb Speed: Use this speed for the greatest gain in altitude in the shortest distance with one engine inoperative.	**84**		**Up**
Vy	Best Rate of Climb Speed: Use this speed for the maximum climb in the least time.	**113**		**Up**
Vyse	Best Single Engine Rate of Climb Speed: Use this speed for the maximum climb in the least time with one engine inoperative.	**113**		**Up**
Vso	Stall Speed: Stalling speed in the Landing configuration.	**68**		**Down**

Super DC-3 Speeds Continued.

V-Speed	Description	Speed	Flap	Gear
Vs1	Stalling Speed: Stall speed with flaps up and landing gear retracted. (Clean)	**76**		**Up**
Vmc	Minimum Control Airspeed: This is the minimum flight speed at which the airplane is controllable with one engine inoperative.	**78**		**Up**
Vsse	Safe Single Engine Speed: Altitude can be maintanied more easily while retracting gear and feathering propeller at this speed.	**94**		
Max Glide	Most distance over the ground with the least altitude loss.	**N/A**		
Holding	Speed normally used for max endurance and ease of handling.	**120**		**Up**
No Flap Approach	Use this speed to make an approach to land with no flaps.	**85**		**Down**
ILS	Use this speed to make an ILS approach.	**90**	**1/4**	**Down**
Normal Landing	Downwind	**120**	**1/4**	**Down**
	Base	**90**	**1/2**	**Down**
	Final	**80**	**3/4**	**Down**
Cruise	This is normal cruise speed.	**180**		**Up**
Climb	Normal cruise climb speed.	**130**		**Up**
Red Line	Never Exceed	**237**		
Yellow Arc	Caution Range	**202 <---> 237**		
Green Arc	Normal Operating Range	**76 <---> 202**		
White Arc	Flap Operating Range	**68 <---> 115**		
Red Radial	Minimum Control Airspeed	**78**		
Blue Radial	Best Rate Single Engine	**94**		

WARNING: ***The Wright 1820 engine should never be operated with Manifold settings less than Propeller RPM/100. (I.e. 18" & 1800 RPM) Operations with MP less than RPM/100 will result in SEVERLY LIMITED ENGINE LIFE. In instances where the Propeller is Driving the Engine inadequate oiling of the master rod bering occurs and engine failure may result. THEREFORE during traininig Engine Failure will be siumlated utilizing partial power settings consistant with safe engine operations.***

Taxiing

Objective: This procedure provides training for smooth, safe, and practical taxi operations.

Reference: Commercial PTS (AMEL) (III)(D), AC 61-21

Description: When ready to taxi, release the parking brake and as aircraft begins to move forward test brakes by depressing each brake pedal. Taxi at a moderate speed and avoid making fast turns that put abnormal side loads on the landing gear. Maximum speed for taxiing should be that which would allow the aircraft to be safely controlled in the event of a brake failure. Unless passing close to another aircraft or object, the nose of the aircraft should always follow the painted taxi lines. Directional control is accomplished first with rudder, then with differental power, and last with brakes. Unlock the tail wheel lock BEFORE beginning a turn.

Acceptable Performance Guidelines:

a. Exhibits commercial pilot knowledge by explaining all aspects of safe taxi procedures including the effect of wind on the airplane during taxiing.
b. Follows the prescribed taxi check list, if pertinent.
c. Performs a brake check immediately after the airplane begins movement, and thereafter uses proper braking technique.
d. Complies with markings, signals and clearances, and follows the proper taxi route.
e. Demonstrates proficiency in maintaining correct and positive control of the airplane's direction and speed considering existing conditions, and uses differential power, when necessary.
f. Positions flight controls properly considering wind.
g. Maintains awareness of the location and movement of all other aircraft and vehicles along the taxi path and in the traffic pattern.
h. Applies right-of-way rules and provides adequate spacing.
i. Avoids creating hazards to persons or property.

Pre Takeoff Briefing

Objective: This procedure defines crew responsibilities and coordinated procedures and techniques to be employed during a takeoff.

Reference: No PTS references available.

Description: Prior to takeoff the Captain will brief the First Officer with (at a minimum) the following information:

a. Who will fly the aircraft.
b. Procedures for emergency before V1.
c. Procedures for emergency after V1.
d. Expected destination in the event of an emergency after airborne.
e. Who will monitor engine gagues, operate flaps and gear, adjust power settings, preform communications tasks, turn on/off lights, transponder, radar and record times.

The following Phrases may be used and have understood meanings:

a. Line Items - The command "Preform Line Items" means that the non-flying pilot shall, upon lineup on the center line of the departure runway:
   1. Check Runway heading against Directional Gyro(s).
   2. Turn on Transponder.
   3. Turn on Lights as required.
   4. Turn on Radar (if installed) as required.
   5. Note and Record Times.

b. Standard Briefing - (Captain Flying) "I will fly the aircraft. As I taxi onto the runway you will preform Line Items. I will advance the throttles and you will tap my hand 2 inches below takeoff power and then trim power to Max T.O. power settings (NOTE: Use of more than Max Rated Takeoff Power is prohibited). You will continously monitor the engine gauges. You will call "airspeed alive" and V2 speed. Any abnormality below V2, advise me and we will abort. After V2, we will treat it as an airborne emergency. We will continue to 400 feet AGL; At that time we will identify, verify and agree and then you will feather the engine on my command. If VFR, we will climb to a safe altitude and come around and land. If IFR, you will advise ATC and we comply with instructions."

Acceptable Performance Guidelines:

a. This briefing will be performed prior to all takeoffs.

Normal Takeoff

Objective: This maneuver describes methods and techniques to be employed during a normal takeoff.

Reference: Commercial PTS (AMEL) (V)(A), AC 61-21

Description: The flying pilot shall brief the instructor pilot on takeoff procedures prior to clearance for takeoff. This briefing should consist of at least the following; Minimum Control Airspeed - Vmc , Vl-V2 speed , Rotation speed, Best Single Engine Rate of Climb speed - Vyse, Best All Engine Rate of Climb speed - Vy, and what procedures will be followed if an engine failure occurs prior to Vmc. The breifing should include the actual speeds to be used in nautical miles per hour for the aircraft being flown.

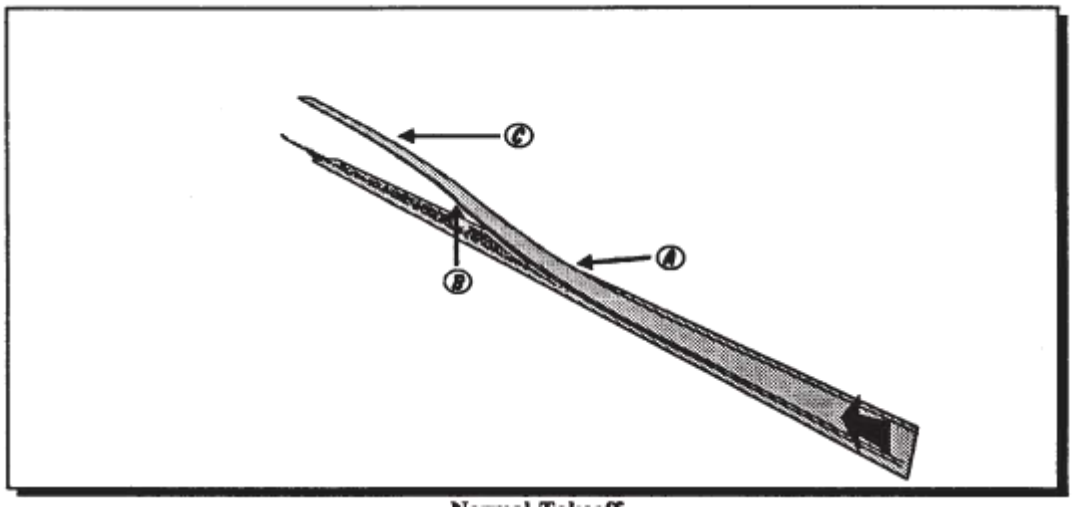
When the aircraft is taxied onto the runway the transponder will be turned on, the magnetic compass and the heading indicator will be checked to note runway alignment, and the heading bug will be set to the climbout heading. During takeoff roll, monitor engine instruments and use whatever control displacement is necessary to compensate for crosswind conditions. Rotation should be made at V2. At 50 feet, accelerate to 95 knots and METO power. At 300 feet AGL, accelerate to 105-115 knots and set climb power.

Acceptable Performance Guidelines:

a Exhibits knowledge by explaining the elements of normal and crosswind takeoffs and climbs including airspeeds, configurations, and emergency procedures.
b. Adjusts the mixture control as recommended for the existing conditions.
c. Notes any obstructions or other hazards in the takeoff path and reviews takeoff performance.
d. Verifies wind condition.
e. Aligns the airplane on the runway centerline.
f. Applies aileron deflection in the proper direction, as necessary.
g. Advances the throttles smoothly and positively to maximum allowable power.
h. Checks engine instruments.
i. Maintains positive directional control on the runway centerline.
j. Adjusts aileron deflection during acceleration, as necessary.
k Rotates at the airspeed to attain lift-off at V2 and establishes wind-drift correction, as necessary.
l. Accelerates to Vy+5.

Normal Takeoff ... Continued:

m. Retracts the wing flaps as recommended or at a safe altitude.
n. Retracts the landing gear after a positive rate of climb has been established and a safe landing
o. Climbs at Vy (+/- Knots) to a safe maneuvering altitude.
p. Maintains takeoff power to a safe maneuvering altitude and sets desired power.
q. Uses noise abatement procedures, as required.
r. Establishes and maintains a recommended climb airspeed. (+/- 5 Knots).
s. Maintains a straight track over the extended runway centerline until a turn is required.
t. Completes the after-takeoff checklist.



Normal Takeoff

A) Liftoff at manufacturer's recommended speed.

B) Positive Rate of Climb - Gear Up.

C) When reaching 400 ft AGL:
1. Accelerate to Cruise Climb
2. Set Climb Power
3. "After Takeoff" Checklist Completed.

Rejected Takeoff

Objective: This maneuver provides training in positive aircraft control for stopping the aircraft if a malfunction occurs during the initial takeoff phase.

Reference: Commercial PTS (AMEL) (VIII)(E), AC 61-21, Pilot's Handbook, FAA-Approved Airplane Flight Manual.

Description: Practice of rejected takeoffs will be initiated either by a simulated loss of engine power initiated by the instructor pilot or by the instructor pilot's oral identification of a simulated malfunction. The flying pilot will reduce both throttles to idle and employ normal stopping procedures. Rejected takeoffs in multiengine aircraft shall be practiced at speeds that are no more than 40 Knots. This may be accomplished by reducing power to idle with the throttle and applying brakes as necessary predicated upon runway condition and length.

Acceptable Performance Guidelines:

a. Exhibits commercial pilot knowledge by explaining the reasons for the procedures used for engine failure during takeoff before Vmc including related safety factors.
b. Aligns the airplane on the runway centerline.
c. Advances the throttles smoothly to maximum allowable power.
d. Checks engine instruments.
e. Maintains directional control on the runway centerline.
f. Closes throttles smoothly and promptly when engine failure occurs.
g. Maintains directional control within 15' of centerline and applies braking, as necessary.

Short and Soft Field Takeoffs

Objective: These maneuvers provide practice to develop proficiency in overcoming problems peculiar to marginal operations which may be encountered while taking off at short or soft fields.

Reference: Commercial PTS (AMEL) (V)(B), AC 61-21

Description:

It is impossible to specify an exact procedure to be used that would be correct in any given situation involving the need for a soft or short field takeoff. For the purpose of standardization, however, the short and soft field takeoff will be treated as two separate maneuvers as follows:

a. Soft Field Takeoff: Prime consideration should be given to becoming airborne as quickly as possible to overcome drag caused by tall grass, soft sand, etc., and may or may not require climbing over an obstacle.

b. Short Field Takeoff: Prime consideration is given to operating the aircraft in such a manner that will result in the greatest altitude gain in a given distance; i.e., over a 50 foot obstacle.

Execution of the soft field takeoff in a training environment should be as follows:

The aircraft should be taxied onto the runway at as fast a speed as possible consistent with safety. As the aircraft becomes aligned with the runway, power should be applied smoothly and as rapidly as the power plant will accept it, without faltering. In tailwheel type airplanes, the tail should be kept low to maintain the inherent positive angle of attack and to avoid any tendency of the airplane to nose over as a result of soft spots, tall grass, or deep snow.

Flaps should be set to up. Accelerate to V1 and rotate smoothly. Hold the aircraft in ground effect and accelerate to Vx

Retract the landing gear and resume the normal climb sequence.

Extreme care should be exercised during the time the aircraft is lifted off and as it accelerates to Vx. It should be noted that a premature attempt to climb too steeply may cause the aircraft to settle back to the surface due to loss of ground effect.

Short and Soft Field Takeoffs ... Continued:

Execution of the short field takeoff in the training environment should be as follows:

The short field takeoff will be made the same as a normal takeoff with the following exception. As the airspeed reaches the Best Angle of Climb speed (Vx) the nose is rotated to an angle of attack that will cause the aircraft to break ground and climb at that speed. At an altitude of approximately 50 feet and after passing over a simulated 50 foot obstacle, the nose is lowered to allow that airspeed to increase to Best all engine Rate of Climb speed (Vy). Upon reaching 400 feet AGL accelerate to Cruise Climb speed and reduce to climb power. The manufacturer's recommended flap setting, power settings, and speeds will be used.

Acceptable Perfonmance Guidelines:

a. Exhibits knowledge by explaining the elements of a maximum performance takeoff and climb, including airspeeds, configurations, and expected performance for specified operating conditions.
b. Selects the recommended wing flap setting.
c. Adjusts the condition levers as recommended for the existing conditions.
d. Positions the airplane for maximum runway availability and aligns it with the runway centerline.
e. Advances power levers smoothly and positively to maximum allowable power.
f. Checks engine instruments.
g. Adjusts the pitch attitude to attain maximum rate of acceleration.
h. Maintains positive directional control on the runway centerline.
i. Rotates to attain lift-off at 84 Knots.
j. Climbs at Vx, +5/-0 until obstacle is cleared, or to at least 50 feet above the surface, then accelerates to Vy +/-5 knots.
k. Retracts the wing flaps as recommended or at a safe altitude.
l. Retracts the landing gear after a positive rate of climb has been established and a safe landing cannot be made on the remaining runway or as recommended.
m. Climbs at Vy +/-5 knots, to a safe altitude.
n. Maintains takeoff power to a safe maneuvering altitude and sets desired power.
o. Uses noise abatement procedures as required.
p. Establishes and maintains a cruise climb airspeed +/-5 Knots.
q. Maintains a straight track over the extended runway centerline until a turn is required.
r. Complete the after-takeoff checklist.

Crosswind Takeoffs

Objective: This maneuver provides training in the more complex control techniques and limitations of the aircraft during takeoff with crosswind conditions.

Reference: Commercial PTS (AMEL) (V)(A), AC 61-21

Description:

Careful consideration should be given to the effects of a strong crosswind before even taxiing to the takeoff position. At the start of the takeoff, the controls are displaced as though the airplane were being slipped into the wind. Use rudder, aileron and differential power to maintain directional control. As the tailwheel comes off the ground, the rudder is used to prevent crabbing into the wind. While the aircraft is becoming airborne, the wheel into the wind leaves the ground last. If these corrections were not made, gusty winds could cause the plane to skip and if the plane were in a crab, landing gear failure or a ground loop could result. The aircraft should remain in slipping flight until well clear of the ground and then allowed to crab into the wind to continue the flight path straight out the extended runway centerline.

No maximum crosswind component has ever been established for the DC-3. Company policy is to limit crosswind takeoff training to no more than 13 knots of crosswind component. Though skillful pilots may successfully take off in much stronger winds, they should do so with a realization of the hazard involved.

Acceptable Performance Guidelines:

a. Exhibits commercial pilot knowledge by explaining the elements of normal and crosswind takeoffs and climbs including airspeeds, configurations, and emergency procedures.
b. Adjusts the mixture control as recommended for the existing conditions.
c. Notes any obstructions or other hazards in the takeoff path and reviews takeoff performance.
d. Verifies wind condition.
e. Aligns the airplane on the runway centerline.
f. Applies aileron deflection in the proper direction, as necessary.
g. Advances the throttles smoothly and positively to maximum allowable power.
h. Checks engine instruments.
i. Maintains positive directional control on the runway centerline.
j. Adjusts aileron deflection during acceleration, as necessary.
k. Rotates at the airspeed to attain lift-off at Vmc+5, Vsse, or the recommended lift-off airspeed and establishes wind- drift correction, as necessary.

Crosswind Takeoffs .... Continued:

l. Accelerates to Vy+5.
m. Retracts the wing flaps as recommended or at a safe altitude.
n. Retracts the landing gear after a positive rate of climb has been established and a safe landing cannot be accomplished on the remaining runway, or as recommended.
o. Climbs at Vy +/-5 Knots), to a safe maneuvering altitude.
p. Maintains takeoff power to a safe maneuvering altitude and sets desired power.
q. Uses noise abatement procedures, as required.
r. Establishes and maintains a recommended climb airspeed +/-5 Knots.
s. Maintains a straight track over the extended runway centerline until a turn is required.
t. Completes the after-takeoff checklist.

Lower Than Standard IFR Takeoffs

Objective: To enable the pilot to determine when a lower than standard takeoff can be made and provide the pilot training in reduced visibility takeoffs.

Description: The pilot will brief the non-flying pilot to insure mutual understanding of takeoff procedures to be used. The pilot will concentrate primarily on the aircraft instruments while the non-flying pilot monitors outside centerline indications. Special attention should be given to the thorough use of checklist procedures. Smooth positive throttle application and proper power settings will be emphasized. The takeoff run will be down the centerline with directional control maintained with rudder control, aileron and differential power if required. Differential braking should not be necessary except in emergencies.

All pilots requiring instrument privileges will be trained and tested for this procedure using a view limiting device from the time of initial runway alignment onward.

Acceptable Performance Guidelines:

a. Pilot must determine lower than standard takeoff can be accomplished at that airport and review the runway markings/lights for the departure runway.
b. Pilot should have an appropriate approach chart for the departure/takeoff alternate airports in place with proper radio frequencies set in the event of an emergency immediately after departure.
c. Maintain runway centerline during takeoff roll by reference to centerline markings and/or lights.
d. After normal rotation, pilot should establish normal climb utilizing localizer course for runway alignment until reaching a safe altitude (approximately 400 AGL).
e. Pilot should maintain heading +/-10 degrees and assigned climb speed +/-5 Knots during climb to assigned altitude.

Note: Refer to AIM- Pilot should review runway markings and lighting.

Engine Failure on Takeoff Below V1-V2

Objective: To enable the pilot to identify an engine failure durlng takeoff prior to reaching Vmc and accomplish steps necessary to abort the takeoff.

Reference: Commercial PTS (AMEL) (VIII)(E), AC 61-21, Pilot's Operating Handbook, FAA-Approved Airplane Flight Manual

Description: During a normal takeoff, the instructor will simulate an engine failure by retarding a throttle to idle (move mixture to cutoff) prior to reaching a speed of aproximately 50% Vmc (40 Knots maximum). The pilot will abort the takeoff.

It is important that the instructor review with the pilot, prior to the flight, how an engine failure will be simulated and insure that the pilot and instructor have agreed upon the procedures prior to the flight.

Acceptable Performance Guidelines:

a. Exhibits commercial pilot knowledge by explaining the reasons for the procedures used for engine failure during takeoff before Vmc including related safety factors.
b. Aligns the airplane on the runway centerline.
c. Advances the throttles smoothly to maximum allowable power.
d. Checks engine instruments.
e. Maintains directional control on the runway centerline.
f. Closes throttles smoothly and promptly when engine failure occurs
g. Maintains directional control and applies braking, as necessary.

Engine Failure on Takeoff Above Vl-V2

Objective: To enable the pilot to identify an engine failure after lift-off and accomplish the appropriate procedures to insure continued flight.

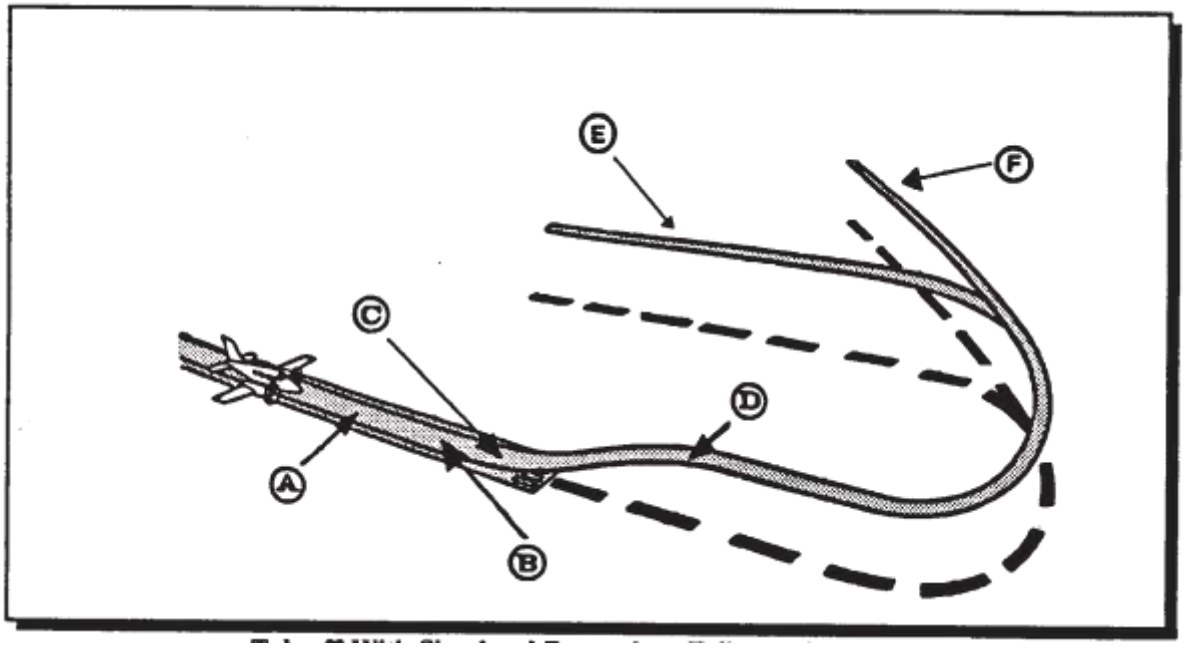
Reference: Commercial PTS (AMEL) (VIII)(F), AC 61-21, Pilot's Operating Handbook, FAA-Approved Airplane Flight Manual

Description: Upon reaching a safe altitude with gear and flaps retracted, the instructor will simulate an engine failure by reducing the throttle to idle. The pilot flys the aircraft maintaining directional control until reaching 400 feet AGL. No other action is taken during this period. At 400 feet AGL, the PIC and SIC identify, verify and agree. The SIC will feather the inoperative engine on the PIC's command. (note: If autofeather is installed and operational simply verfy that the engine is feathered and the Feather button is poped back out). The PIC will call for the "ENGINE OUT" checklist.

Note: During FAA checkrides this procedure may be tested prior to reaching 200 feet AGL. Gear and Flaps may or may not be retracted.
It is important that the instructor review with the pilot, prior to the flight, how an engine failure will be simulated and insure that the pilot and instructor have agreed upon the procedures prior to the flight.

Acceptable Preformance Guidelines:

a. Exhibits commercial pilot knowledge by explaining the reasons for the procedures used if engine failure occurs after lift-off including related safety factors.
b. Recognizes engine failure promptly.
c. Sets the engine controls, reduces drag, and identifies and verifies the inoperative engine after simulated engine failure.
d. Establishes Vyse if there are no obstructions; if obstructions are present, establishes Vxse or Vmc+5, whichever is greater, until obstructions are cleared, then Vyse and trims the airplane.
e. Maintains positive control of the airplane.
f. Follows the prescribed checklist to verify the accomplishment of procedures for securing the inoperative engine.
g. Establishes a bank toward the operating engine as required for best performance.
h. Recognizes the airplane's performance capability; climb or level flight is impossible, maintains Vyse and initiates an approach to the most suitable landing area.
i. Attempts to determine the reason for the engine malfunction.
j. Monitors the operating engine and makes necessary adjustments.
k. Maintains the specified heading, +/-10 degrees, and the specified airspeed, +/-5 Knots.
l. Divides attention between coordinated control, flightpath, and orientation.
m. Contacts the appropriate facility for assistance, if necessary.



Takeoff With Simulated Powerplant Failure After Liftoff

A) If engine failure occurs at or before liftoff, abort the takeoff

B) If engine failure occurs after liftoff:
1. Maintain directional control
2. Accelerate to Vyse

C) Positive rate of climb
1. Gear up
2. Identify-feather propeller of failed engine
3. Climb at Vyse

D) at 400 ft. AGL or obstruction clearance altitude:
1. Engine failure after takeoff checklist - completed
2. Circle and land .. or .. continue enroute climb.

E) Obstruction clearance altitude or above

F) Enroute Climb

Climbs and Climbing Turns

Objective: These maneuvers provide practice in controlling the aircraft during a climb with normal angles of bank while scanning the area for other aircraft.

Descrirtion: Climbs and climbing turns will be made in clean and takeoff configurations with climb power. Climbs will demonstrate the performance and may reveal heating problems at Vx, Vy, Vxse, Vyse, and in obstacle clearance configuration.

Climbing turns to predetermined headings up to 360 degrees will be practiced. In climbing turns, angles of bank to 45 deqrees can be used to demonstrate loss of performance with rise in “g” forces.

Acceptable Performance Guidelines:

a. Airspeed +/-5 Knots.
b. Recovery to assiqned heading within +/-5 degrees.

Steep Turns

Reference: Commercial PTS (AMEL) (VII)(A), AC 61-21

Description: The flying pilot will enter a steep bank attitude of at least 50 degrees to execute 360 degrees of turn. When entry airspeed is not recommended by the manufacturer, normal cruise airspeed or maneuvering speed--whichever is lower-will be used. Steep turns should be practiced, both left and right, and by rolling directly from one 360 degree turn into the other. In low powered airplanes, additional power should be added smoothly as the turn is established in order to maintain a stable airspeed. Entry and rollout rates should be smooth and executed with proper coordination.

Acceptable Perfonmance Guidelines:

a. Exhibits knowledge by explaining the performance factors associated with steep power turns, including load factor and angle-of-bank limitations, effect on stall speed, power required, and overbanking tendency.
b. Selects an altitude that will allow the maneuver to be performed no lower than 3,000 feet AGL.
c. Establishes the recommended entry speed.
d. Enters a 360 degree turn maintaining a bank angle of at least 50 degrees, +/-5 degrees, in smooth, stabilized, coordinated flight.
e. Recognizes the need to apply smooth, coordinated control to maintain the specified altitude, +/-100 feet, and the specified airspeed +/-5 Knots.
f. Divides attention between airplane control and orientation.
g. After completing a 360 degree turn, reverses direction of turn at the entry heading, +/-10 degrees, and performs a 360 degree turn, then rolls out at the entry heading, +/-10 degrees.
h. Avoids any indication of an approaching stall or tendency to exceed the structural limits of the airplane during the turns.

Approaches to Stall

Objective: These maneuvers afford familiarization with the airplane handling characteristics in the initial stall buffet region and provide training in stall recognition and proper recovery techniques.

Reference: Commercial PTS (AMEL) (VII)(A), AC 61-21

Description: Approaches to stall should be practiced at a minimum altitude of 4000 feet AGL. Stalls will be entered with at least 65% power; with power reduced on all engines; and in landing and in cruising configurations. Stalls should be entered by trimming the aircraft to either 1.5 Vso or 1.5 Vsl, whichever is appropriate, and smoothly increasing the angle of attack until the first physical indication of the stall occurs.

Recovery should be initiated at the first physical indication of a stall; such as uncontrollable pitching, buffeting, rapid decay of control effectiveness, or the application of full up elevator without producing further loss of altitude.

Note: No stalls will be practiced with any engine throttled or cut off and the other engine(s) developing effective power.

Acceptable Perfonmance Guidelines:

a. Exhibits knowledge by explaining the aerodynamic factors associated with stalls, and recoveries.
b. Selects an entry altitude that will allow recoveries to be completed no lower than 4,000 feet AGL.
c. Stabilizes the aircraft at Vyse in level flight with gear and flap configuation as specified by the instructor or check pilot.
d. Establishes straight-and-level flight or level 20 degree bank turns, +/-5 degrees, as specified by the instructor or check pilot.
e. Adjusts pitch and power as necessary to induce a stall while maintaining altitude, +/-50 feet.
f. Recognizes a stall and recovers at the first indication through proper power and control application --
    1. Straight-ahead standards.
        i. Maintain heading, +/-10 degrees, and altitude +/-50 feet during the entry.
        ii. Maintains heading +/-10 degrees, and altitude +/-100 feet during recovery.
    2. Turning standards.
        i. Maintains 20 degrees of bank, +/-5 degrees, and altitude, +/-50 feet during entry.
        ii. Levels the wings and maintains heading +/-10 degrees, and altitude, +/-100 feet during the recovery.

    Note: Altitude loss of 200 feet is acceptable in the DC-3 with power off.
g. Avoids excessive pitch change or a secondary stall during any recovery.
h. Returns to airspeed and configuration as specified by the instructor or check pilot.

Slow Flight

OBJECTIVE: These maneuvers demonstrate the degree of controllability available while in Slow Flight conditions. They provide the opportunity to practice control techniques which are most beneficial in the low speed regimes encountered during takeoffs, landings, and powerplant failure emergency situations.

2. **DESCRIPTION**: Maneuvering during slow flight is practiced in both cruise and landing configuration, and will consist of straight flight, turns, climbs, and descents. This type of slow flight will be practiced at 1.2 Vs1.

3. **ACCEPTABLE PERFORMANCE GUIDELINES**:

A. Airspeed 1.2 Vs1 +-5 knots

B. Altitude +/- 50 feet of assigned.

C. Specified Heading +- 10 degrees

D. Rolls out on a specified heading +- 5 degrees

Propeller Feathering and Unfeathering

Objective: To develop in the trainee the proper procedures and proficiency for feathering and unfeathering an inoperative enqine .

Description:

a. Feathering:

At a safe altitude (minimum 3000' above terrain) and within landing distance of an adequate airport, an engine will be cut with mixture or fuel selector. The following procedures will then be followed:

1. Maintain aircraft control.
2. Mixtures as required; both throttles positioned for maximum power.
3. Gear, and Flaps as required.
4. Determine which engine failed, and verify by closing throttle on dead engine.
5 If unable to remedy cause of failure, feather.
6. Turn towards airport and contact tower.
7. Clean up dead engine in accordance with manufacturer's approved procedures and check for fire.
8. Monitor engine instruments on operating engine, and adjust power, cowl flaps, and speed as necessary.
9. Maintain altitude with airspeed at least Vyse or above if possible.

b. Unfeathering:

Unfeathering will be accomplished in accordance with the engine restart in-flight checklist.

Acceptable Performance Guidelines:

Proficiency will be evaluated on the basis of maintaining desired heading, airspeed and altitude; prompt identification of a failed engine; and the accuracy of shutdown and restart procedures.

NOTE: Company aircraft should not be feathered during training when outside air tempertures are below 60 F. due to the potiential for damage to the engines.

Maneuvering with Powerplant Inoperative

Objective: This maneuver provides practice in properly maintaining aircraft control during one of the more critical inflight emergencies. It develops a knowledge of aircraft characteristics under adverse conditions, together with control applications necessary to achieve a maximum margin of safety.

Reference: Commercial PTS (AMEL) (VIII)(B), AC 61-21, Pilot's Operating Handbook, FAA-Approved Airplane Flight Manual

Description: See WARNING on Page 8 for power settings. The trainee will make turns into and away from inoperative engine using up to 30 degrees of bank. Power will be used as required to maintain altitude and/or airspeed.

Acceptable Perfonmance Guidelines:

a. Exhibits commercial pilot knowledge by explaining the flight characteristics and controllability associated with maneuvering with one engine inoperative.
b. Sets the engine controls, reduces drag, identifies and verifies the inoperative engine after simulated engine failure.
c. Attains the best engine inoperative airspeed and trims the airplane.
d. Maintains control of the airplane.
e. Attempts to determine the reason for the engine malfunction.
f. Follows the prescribed checklist to verify procedures for securing the inoperative engine.
g. Establishes a bank toward the operating engine, as necessary, for best performance.
h. Turns toward the nearest suitable airport.
i. Monitors the operating engine and makes necessary adjustments.
j. Demonstrates coordinated flight with one engine inoperative (propeller feathered, if possible) including --
    1. straight-and-level flight.
    2. turns in both directions.
    3. descents to assigned altitudes.
    4. climb to assigned altitudes, if airplane is capable of climbs under existing conditions.
k. Maintains the specified altitude, +/-100 feet, when a constant altitude is specified, and levels off from climbs and descents, at specified altitudes, +/-100 feet.
l. Maintains the specified heading during straight flight, +/-10 degrees.
m. Maintains the specified bank angle, +/-10 degrees, during turns.
n. Divides attention between coordinated control, flightpath, and orientation.
o. Demonstrates engine restart in accordance with prescribed procedures.

Unusual Attitude Recovery

Objective: To be able to control the aircraft should it inadvertently be placed in an unusual attitude such as from wind shear or wake turbulance.

Reference: IFR PTS (III)(G), FAR Part 61, AC 61-27

Description: These are not normally practiced. The key to recovery is not how you got there but where you go from here. As soon as an unusual attitude is detected, the recovery should be initiated primarily by reference to the airspeed indicator, altimeter, vertical-speed indicator, and turn-and-slip indicator. First bank attitude for wings level then pitch to nose level is generally the best technique. As the rate of movement of altimeter and airspeed indicator needles decreases, the attitude is approaching level flight. When the needles stop and reverse direction, the aircraft is passing through level flight. A practiced cross-check is the best insurance policy.

Acceptable Performance Standards:

a. Exhibits adequate knowledge of the factors relating to attitude instrument flying during recovery from unusual flight attitudes (both nose-high and nose low).
b. Uses proper instrument cross-check and interpretation, and applies the appropriate pitch, bank, and power corrections in the correct sequence to return the aircraft to a stabilized level flight attitude.

Instrument Holding Procedures

Objective: This maneuver provides practice in applying instrument holding procedures.

Reference: IFR PTS ((II)(C), FAR Parts 61 and 91, AC 61-27, AIM

Description:

Decelerate to holding airspeed before reaching the holding fix. Unless specified by the aircraft manufacturer, holding speed should be the minimum consistent with good aircraft control, but never in the area of reverse command. This lower speed will require less power and allow prolonged holding and fuel economy. Procedures for holding patterns and recommended entry procedures outlined in Part I of the Airman's Information Manual will be used.

Acceptable Perfonmance Guidelines:

a. Exhibits adequate knowledge of holding procedures.
b. Changes to the holding airspeed appropriate for the altitude or aircraft when 3 minutes or less from, but prior to arriving at, the holding fix.
c. Uses an FAA recommended entry procedure and holding pattern for a standard, nonstandard, published, or nonpublished holding pattern.
d. Recognizes arrival at the holding fix and initiates prompt entry into the holding pattern.
e. Complies with ATC reporting requirements.
f. Uses the proper timing criteria, where applicable, as required by altitude or ATC instructions.
g. Complies with pattern leg lengths when a DME distance is specified.
h. Uses proper wind correction procedures to maintain the desired pattern and to arrive over the fix as close as possible to a specified time.
i. Maintains the airspeed within 10 knots, altitude within 100 feet, headings within 10 degrees, and radials and bearing in a manner where the outcome is never seriously in doubt.

Instrument Approach Briefing

Objective: To assure consistant, safe procedures for conduting an instrument approach.

Description: The briefing informs the non-flying pilot of the type of approach, minimums, missed approach procedure, and expected required calls (altitudes, times, airport in sight or not in sight, minimums and deviations). Both pilots should review the approach plates prior to iniating the approach.

Acceptable Performance Guidelines:

The approach briefing shall be presented as required.

ILS Approaches

Objective: This maneuver affords practice in terminal area arrivals utilizing the ILS for the final approach portion.

Reference: IFR PTS (V)(C), FAR Parts 61 and 91, AC 61-27, Standard Instrument Approach Procedure Chart; AIM

Description: Normal ATC procedures will be followed using the appropriate ATC and navigational facilities. The instructor pilot or ATC will clear the trainee for a front course approach. The PIC will command the SIC to to set the NAV/COMs as appropriate for the approach. The localizer frequency will be set and identified on the appropriate NAV receiver with front course heading set on the OBS. The marker beacon should be turned on, the ADF turned on and tuned to proper frequency, and identified and functioning. The second VHF NAV receiver, if available, should be tuned and identified as necessary to provide fix points along the approach course, if applicable, or also be tuned to the localizer being used, or for missed approach maneuvering. The in-range checklist should be completed during the intermediate approach segment, but no later than before passing the outer marker outbound.

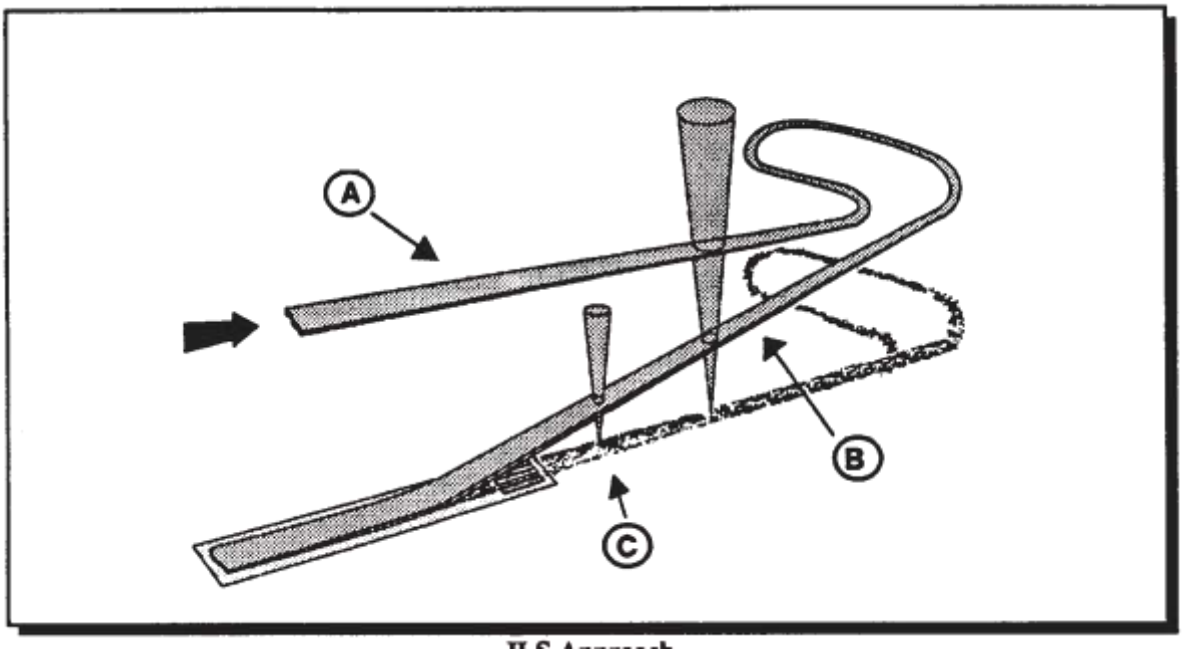
Prior to reaching the final approach fix inbound, the trainee shall verbally verify the field elevation, decision height, and missed approach procedures. As the glide slope is intercepted, the before landing checklist will be completed with the exception of landing flaps, which may be delayed until the landing is assured. After passing the final fix, the approach airspeed should be maintained. At decision height, the trainee will continue the approach and land with hood removed or execute a missed approach as directed by the instructor pilot.

Acceptable Performance Guidelines: The trainee will comply with ATC or instructor's instructions, and fly the airplane in a precise coordinated manner. The following standards are considered acceptable:

a. Exhibits adequate knowledge of the elements of an ILS/MLS instrument approach procedure.
b. Selects and complies with the appropriate ILS/MLS instrument approach procedure to be performed.
c. Establishes two-way communication with ATC, as appropriate to the phase of flight or approach segment, and uses proper radio communications phraseology and technique.
d. Selects, tunes, identifies, and confirms the operational status of ground and aircraft navigation equipment to be used for the approach procedure.
e. Complies with all clearances issued by ATC or the instructor pilot.
f. Advises ATC or the instructor pilot anytime the aircraft is unable to comply with a clearance.
g. Establishes the appropriate aircraft configuration and airspeed, considering turbulence and wind shear, and completes the aircraft checklist items appropriate to the phase of flight.

ILS Approaches ... Continued:

h. Maintains, prior to beginning the final approach segment, desired altitude within 100 feet, heading or course within 10 degrees, and airspeed within 10 knots.
i. Applies the necessary adjustments to the published DH and visibility criteria for the aircraft approach category when required, such as
    1. FDC and Class II NOTAMs.
    2. inoperative aircraft and ground navigation equipment.
    3. inoperative visual aids associated with the landing environment.
    4. National Weather Service (NWS) reporting factors and criteria.
j. Establishes an initial rate of descent at the point where the electronic glide slope is intercepted, which approximates that required for the aircraft to follow the glide slope.
k. Allows, while on the final approach segment, no more than three-quarter-scale deflection of either the localizer or glide slope indications, and maintains the desired airspeed within 10 knots.
l. Avoids descent below the DH before initiating a missed approach procedure or transitioning to a normal landing approach.
m. Initiates immediately the missed approach procedure when, at the DH, if the required visual references for the intended runway are not distinctly visible and identifiable.
n. Transitions to a normal landing approach when the descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers.



ILS Approach

A) Prior to I.A.F. (or Intermediate segment if Radar vectored):
1. Complete "In Range" checklist and "Before Landing" checklist up to gear down.
2. Approach Flaps.
3. Approach Airspeed.

B) At Glideslope interception:
1. Gear Down.
2. Approach Airspeed.
3. "Before Landing" checklist compelete except landing flaps.

C) At decision height, if landing can not be completed, execute missed approach.
1. Power - maximum.
2. Flaps - takeoff position.
3. Positive rate of climb - gear up.
4. Follow takeoff airspeed schedule.

Localizer (LOC), Back Course/DME

Objective:

This maneuver affords practice in terminal area arrivals utilizing the localizer in both front course, as well as back course approaches, in conjunction with the use of a DME for distances inbound in lieu of marker beacons or compass locators.

Reference: IFR PTS (V)(A), FAR Parts 61 and 91, AC 61-27, Standard Instrument Approach Procedure Chart, AIM

Description: The instructor and trainee will first assure that an approved approach chart is available for this maneuver. ATC or the instructor pilot will clear the trainee for a specific LOC or LOC Back Course approach. The primary localizer approach frequency will be tuned in to assure proper localizer needle function. Since each DME approac] is different, close reference will be made to the approac] chart for proper frequencies and distances. Generally, a VOR is also identified whereas a radial from that VOR can also be utilized to verify the readings from the DME. Therefore, it is advisable to tune the secondary receiver to the frequency and turn the OBS to the radial indicated especially where the pilots decision areas are located. Remember, the approach charts where the use of DME are involved show a DME distance and an actual distance. This is caused by the off centerline locations of the VOR/LOC being used. The before landing checklist, up to the landing gear down and landing flaps, will be accomplished prior to crossing the DME position or VOR intersection indicated on the chart. This is called the position fix.

The standard procedure is to descend from the position fi to the Minimum Descent Altitude (MDA), level off and continue at the MDA until the missed approach point (MAP) is reached. If the approach lights or runway lights are not in sight at this point, a missed approach will be made. ***NOTE:*** On a back course approach, the localizer needle is reversed unless the radio equipment being used has a back course needle reversing mode. Regardless, you must disregard all glide slope indications on a back course approach. Full deflection of the localizer needle in either case requires an immediate call to the tower and a missed approach.

The position fix can be identified by the VOR radial indicated on the approach chart and/or the DME distance indicated on the approach chart.

Prior to crossing the position fix inbound, the trainee will verify field elevations, decision heights, missed approach procedures, and time from outer marker to missed approach. Time over the position will be noted while holding the localizer centered.

The before landing checklist will be completed prior to the final approach fix inbound and the landing gear down and flaps set in landing configuration passing the FAF.

Localizer (LOC), Back Course/DME ... Continued:

Acceptable Perfonmance Guidelines:

The trainee will comply with the recommended procedures and maneuvers in a smooth, coordinated manner. The following are considered acceptable:

a. Exhibits adequate knowledge of the elements of a Localizer (LOC), Back Course/DME instrument approach procedure.
b. Selects and complies with the appropriate Localizer (LOC), Back Course/DME instrument approach procedure to be performed.
c. Establishes two-way communications with ATC, as appropriate, to the phase of flight or approach segment, and uses proper radio communications phraseology and technique.
d. Selects, tunes, identifies, and confirms the operational status of ground and aircraft navigational equipment to be used for the approach procedure.
e. Complies with all clearances issued by ATC or the instructor pilot.
f. Recognizes if heading indicator and/or attitude indicator is inaccurate or inoperative, advises controller, and takes appropriate action.
g. Advises ATC or the instructor pilot anytime the aircraft is unable to comply with a clearance.
h. Establishes the appropriate aircraft configuration and airspeed considering turbulence and wind shear, and completes the aircraft checklist items appropriate to the pha~e of the flight.
i. Maintains, prior to beginning the final approach segment, altitude within 100 feet, heading within 10 degrees and allows less than full-scale deflection of the CDI, and maintains airspeed within 10 knots.
j. Applies the necessary adjustments to the published MDA and visibility criteria for the aircraft approach category when required, such as:
    1. FDC and Class Il NOTAMs.
    2. Inoperative aircraft and ground navigation equipment.
    3. Inoperative visual aids associated with the landing environment.
    4. National Weather Service (NWS) reporting factors and criteria.
k. Establishes a rate of descent and track that will ensure arrival at the MDA prior to reaching the MAP with the aircraft continuously in a position from which descent to a landing on the intended runway can be made at a normal rate using normal maneuvers.
l. Allows, while on the final approach segment, no more than a three-quarter-scale deflection of the CDI, and maintains airspeed within 10 knots.
m. Maintains the MDA, when reached, within +100 feet, -0 feet to the MAP.
n. Executes the missed approach procedure when the required visual references for the intended runway are not distinctly visible and identifiable at the MAP.
o. Executes a normal landing from a straight-in or circling approach when instructed by the instructor pilot.

VOR Approaches

Objective: This maneuver affords practice in terminal area arrivals utilizing the VOR for the final approach portion.

Reference: IFR PTS (V)(A), FAR Parts 61 and 91, AC 61-27, Standard Instrument Approach Procedure Chart, AIM

Description: ATC or the instructor pilot will clear the trainee for a specific VOR approach. The primary VHF navigational receiver to be used will be properly tuned, identified, and course selector set for the approach. The number two navigational receiver is to be used to identify intersections, missed approach point, or as a backup for the number one receiver, it also will be properly tuned.

The in-range checklist should be accomplished immediately prior to commencing the approach to reduce pilot workload and allow concentration on maneuvering the aircraft for the approach. The landing checklist may be accomplished at any time during the approach with the exception of landing gear and flaps. Prior to the final approach fix, the trainee will verify field elevation, MDA, time to missed approach, and missed approach procedures.

Upon passing the final approach fix, begin descent to MDA or step down fix, if applicable. Landing gear should be extended at the final approach fix inbound. Landing flaps may be delayed until landing is assured.

At MDA and appropriate time, the trainee will advise that the airport should be in sight. The instructor will advise that a landing or missed approach be executed.

Two variations of the VOR approach now exist. They are the DME arc to final approach course and the Area Navigation approach. The DME arc to final approach is accomplished by flying an arc around the VORTAC at a specified distance until intercepting the final approach course.

The RNAV approach is accomplished in the same manner as the normal VOR approach, but utilizes waypoints in lieu of the actual VORTAC station. This approach requires the use of special on-board RNAV equipment and special RNAV approaches are published. Unless the RNAV equipment is approved, there will be no RNAV approaches conducted during actual instrument conditions.

Acceptable Perfonmance Guidelines: The trainee will comply with ATC and published procedures. The aircraft will be operated in a smooth coordinated manner. Proper tuning and setting of the radios should be accomplished and no full scale deflections of the CDI during final approach are acceptable. Standards are as follows:

VOR Approaches ... Continued:

a. Exhibits adequate knowledge of the elements of a VOR/VORTAC instrument approach procedure.
b. Selects and complies with the appropriate VOR/VORTAC instrument approach procedure to be performed.
c. Establishes two-way communications with ATC, as appropriate, to the phase of flight or approach segment, and uses proper radio communications phraseology and technique.
d. Selects, tunes, identifies, and confirms the operational status of ground and aircraft navigational equipment to be used for the approach procedure.
e. Complies with all clearances issued by ATC or the instructor pilot.
f. Recognizes if heading indicator and/or attitude indicator is inaccurate or inoperative, advises controller, and takes appropriate action.
g. Advises ATC or the instructor pilot anytime the aircraft is unable to comply with a clearance.
h. Establishes the appropriate aircraft configuration and airspeed considering turbulence and wind shear, and completes the aircraft checklist items appropriate to the phase of the flight.
i. Maintains, prior to beginning the final approach segment, altitude within 100 feet, heading within 10 degrees and allows less than full-scale deflection of the CDI or 10 degrees in the case of RMI, and maintains airspeed within 10 knots.
j. Applies the necessary adjustments to the published MDA and visibility criteria for the aircraft approach category when required, such as:
    1. FDC and Class II NOTAMs.
    2. Inoperative aircraft and ground navigation equipment.
    3. Inoperative visual aids associated with the landing environment.
    4. National Weather Service (NWS) reporting factors and criteria.
k. Establishes a rate of descent and track that will ensure arrival at the MDA prior to reaching the MAP with the aircraft continuously in a position from which descent to a landing on the intended runway can be made at a normal rate using normal maneuvers.
l. Allows, while on the final approach segment, no more than a three-quarter-scale deflection of the CDI or within 10 degrees in case of an RMI, and maintains airspeed within 10 knots.
m. Maintains the MDA, when reached, within +100 feet, -0 feet to the MAP.
n. Executes the missed approach procedure when the required visual references for the intended runway are not distinctly visible and identifiable at the MAP.
o. Executes a normal landing from a straight-in or circling approach when instructed by the instructor pilot.

VOR/DME Approach

Objective: This maneuver affords practice in terminal area arrivals utilizing the VOR for the final approach portion in conjunction with the use of the DME for assistance in identifying the position fix. The position fix is generally identified by a radial of a nearby VOR. The trainee will assure that the correct approach chart is being used and the correct frequencies are tuned in.

Reference: IFR PTS (V)(A), FAR Parts 61 and 91, AC 61-27, Standard Instrument Approach Procedure Chart, AIM

Description: ATC or the instructor pilot will clear the trainee for the specific VOR approach. The primary VHF navigational receiver to be used will be properly tuned, identified, and course selector set for the approach. If the number two navigational receiver is to be used to identify intersections or position fixes, missed approach points or a backup for the number one receiver, it also will be properly tuned. The DME will also be tuned to the proper frequency and the trainee will assure that he has noted the DME distances. The trainee will be aware that DME distance rarely are the same as the actual distances.

The in-range checklist should be accomplished immediately prior to commencing the approach to reduce pilot workload and allow concentration of maneuvering the aircraft for the approach. The landing checklist may be accomplished at any time during the approach with the exception of landing gear and flaps. Prior to the final approach position fix, the trainee will verify field elevation, MDA, time to missed approach, missed approach procedures, and the DME distances.

Upon passing the final approach position fix, begin descent to MDA or step down fix, if applicable. Landing gear should be extended at the final approach position fix inbound. Landing flaps may be delayed until landing is assured. The DME will be used to verify position fix on inbound leg.

At MDA, appropriate time and DME distance, the trainee will advise the airport should be in sight. The instructor will advise that a landing or missed approach be executed.

For DME arc instructions, see VOR approach.

For RNAV approach instructions, see VOR approach.

VOR/DME Approaches ... Continued:

Acceptable Performance Guidelines: The trainee will comply with ATC and published procedures. The aircraft will be operated in a smooth, coordinated manner. Proper training and setting of the radios should be accomplished and no full scale deflections of the CDI during final approach are acceptable. Acceptable standards are as follows:

a. Exhibits adequate knowledge of the elements of a VOR/DME instrument approach procedure.
b. Selects and complies with the appropriate VOR/DME instrument approach procedure to be performed.
c. Establishes two-way communications with ATC, as appropriate, to the phase of flight or approach segment, and uses proper radio communications phraseology and technique.
d. Selects, tunes, identifies, and confirms the operational status of ground and aircraft navigational equipment to be used for the approach procedure.
e. Complies with all clearances issued by ATC or the instructor pilot.
f. Recognizes if heading indicator and/or attitude indicator is inaccurate or inoperative, advises controller, and takes appropriate action.
g. Advises ATC or the instructor pilot anytime the aircraft is unable to comply with a clearance.
h. Establishes the appropriate aircraft configuration and airspeed considering turbulence and wind shear, and completes the aircraft checklist items appropriate to the phase of the flight.
i. Maintains, prior to beginning the final approach segment, altitude within 100 feet, heading within 10 degrees and allows less than full-scale deflection of the CDI, and maintains airspeed within 10 knots.
j. Applies the necessary adjustments to the published MDA and visibility criteria for the aircraft approach category when required, such as:
    1. FDC and Class Il NOTAMs.
    2. Inoperative aircraft and ground navigation equipment.
    3. Inoperative visual aids associated with the landing environment.
    4. National Weather Service (NWS) reporting factors and criteria.
k. Establishes a rate of descent and track that will ensure arrival at the MDA prior to reaching the MAP with the aircraft continuously in a position from which descent to a landing on the intended runway can be made at a normal rate using normal maneuvers.
l. Allows, while on the final approach segment, no more than a three-quarter-scale deflection of the CDI, and maintains airspeed within 10 knots.
m. Maintains the MDA, when reached, within +100 feet, -0 feet to the MAP.
n. Executes the missed approach procedure when the required visual references for the intended runway are not distinctly visible and identifiable at the MAP.
o. Executes a normal landing from a straight-in or circling approach when instructed by the instructor pilot.

NDB Approach

Objective: This maneuver affords practice in terminal area arrivals utilizing the ADF for the final approach portion.

Reference: IFR PTS (V)(B), FAR Parts 61 and 91, AC 61-27, Standard Instrument Approach Procedure Chart, AIM

Description: The instructor pilot shall clear the trainee for an NDB approach from any specific position, or following a descent in a holding pattern. Emphasis will be placed on the proper technique in tracking a magnetic bearing. The before landing checklist, up to landing gear down and landing flaps, will be ac-complished inbound to the NDB.

Station passage is confirmed when the ADF needle has made more than a 90 degree swing. As station passage is recognized, the before landing checklist will be completed with the exception of landing flaps which may be delayed until landing is assured.

Prior to crossing the station inbound, the trainee will verify field elevation, MDA, missed approach procedure, time from the station to missed approach.

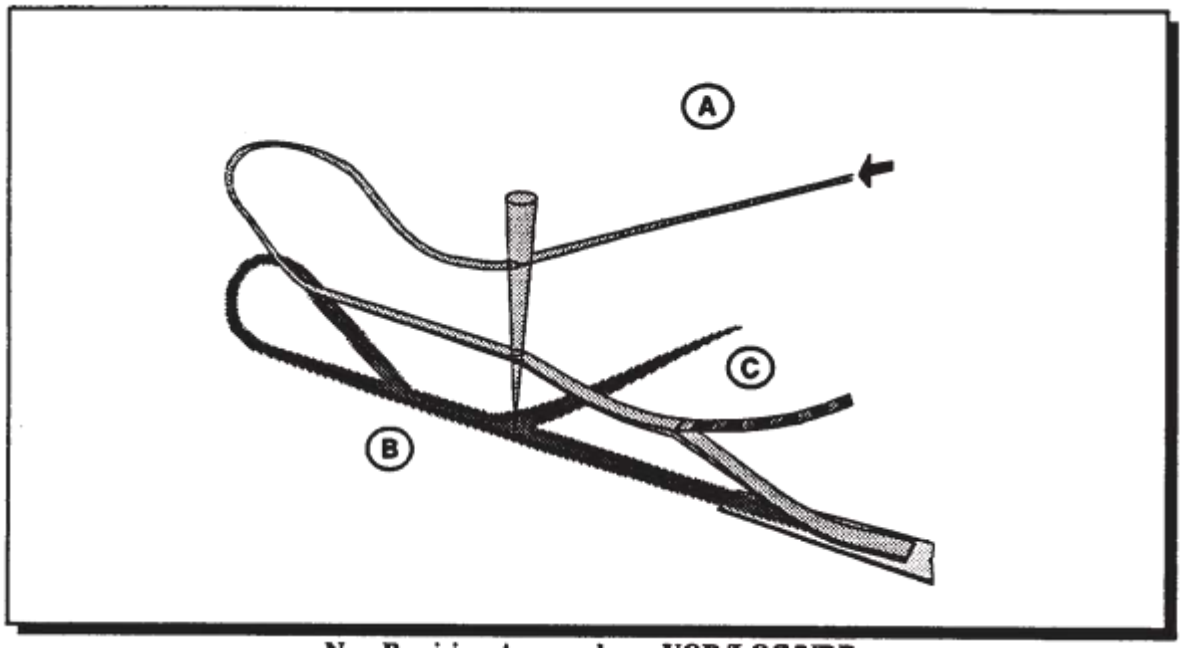
Time over the station will be noted and the descent normally made at 500 FPM. At MDA and appropriate time, the trainee will advise that the airport should be in sight and the instructor pilot will advise if a landing or missed approach is to be executed.

Acceptable Perfonmance Guidelines: The trainee will comply with recommended procedures and maneuver the aircraft in a smooth coordinated manner. The following standards are considered acceptable:

a. Exhibits adequate knowledge of the elements of an NDB instrument approach procedure.
b. Selects and complies with the appropriate NDB instrument approach procedure to be performed.
c. Establishes two-way communications with ATC, as appropriate to the phase of flight or approach segment, and uses proper radio communications phraseology.
d. Selects, tunes, identifies, confirms, and monitors the operational status of ground and aircraft navigation equipment to be used for the approach procedure.
e. Complies with all clearances issued by ATC or the Instructor pilot.
f. Recognizes when heading indicator and/or attitude indicator is inaccurate or inoperative, advises controller and takes appropriate action.
g. Advises ATC or the instructor pilot anytime the aircraft is unable to comply with a clearance.
h. Establishes the appropriate aircraft configuration and airspeed considering turbulence and wind shear, and completes the aircraft checklist items appropriate to the phase of flight.

NDB Approaches ... Continued:

i. Maintains, prior to beginning the final approach segment, the altitude within 100 feet, heading and bearing within 10 degrees, and airspeed within 10 knots.
j. Applies the necessary adjustments to the published MDA and visibility criteria for the aircraft approach category when required, such as -
   1. FDC and Class II NOTAMs.
   2. inoperative aircraft and ground navigation equipment.
   3. inoperative visual aids associated with the landing environment.
   4. National Weather Service (NWS) reporting factors and criteria.
k. Establishes a rate of descent and track that will ensure arrival at the MDA prior to reaching the MAP with the aircraft continuously in a position from which descent to a landing on the intended runway can be made at a normal rate using normal maneuvers.
l. Maintains, while on the final approach segment, a deviation of not more than 10 degrees from the desired bearing, and maintains airspeed within 10 knots.
m. Maintains the MDA, when reached, within +100 feet, -0 feet to the MAP.
n. Executes the missed approach procedure when the required visual references for the intended runway are not distinctly visible and identifiable at the MAP.
o. Executes a normal landing from a straight-in or circling approach when instructed by ATC or the instructor pilot.



Non Precision Approaches - VOR/LOC/NDB

A) Prior to I.A.F.:
1. Complete "In Range" checklist.
2. "Landing" checklist complete up to gear.
3. Approach flaps set.
4. Approach airspeed.

B) Final Fix:
1. Gear Down (except when planning a circle to land).
2. Approach airspeed.
3. "Before Landing" checklist complete except for landing flaps.
4. Degin descent to MDA.

C) If airport is not in sight at the expiration of time limits - execute a standard missed approach for the facility or as directed by ATC. Descent below MDA is not authorized untill - visual contact with the airport is made. If visual contact is lost at any time after initial sighting, execute a missed approach immediately.

Circling Approach

Objective: This maneuver is used to provide training in maneuvering the aircraft at low altitudes under weather conditions at the published circling minimum descent altitude and landing on a runway other than the instrument approach runway.

Reference: IFR PTS (V)(E), FAR Parts 61 and 91, AC 61-27, Standard Instrument Approach Procedures Chart, AIM

Description: The approach to the airport from final fix is accomplished with gear down and approach flaps. Maneuver the aircraft onto the downwind leg at a position not more than published minimum visibility distance from the landing runway. Visual reference with the runway must be maintained throughout the maneuver. When landing is assured, complete the "Before Landing" checklist. Maintain MDA until the aircraft is in a position from which a normal approach to landing can be made. The turn and rate of descent should be adjusted so as to bring the aircraft smoothly in alignment with the runway utilizing a normal glide slope approaching the runway. From this point a normal approach and landing shall be executed. It should be emphasized that excessively banked turns close to the ground are undesirable and should be avoided.

Acceptable Performance Guidelines:

a. Exhibits adequate knowledge of the elements of a circling approach procedure.
b. Selects and complies with the appropriate circling approach procedure considering turbulence and wind shear and considering the maneuvering capabilities of the aircraft.
c. Confirms the direction of traffic and adheres to all restrictions and instructions issued by ATC and the examiner.
d. Does not exceed the visibility criteria or descend below the appropriate circling altitude until in a position from which a descent to a normal landing can be made.

Contact and Visual Approach Procedures

Description: The contact approach is the equivalent of a special VFR approach while on an IFR flight plan. Practice of the contact approach requires that the flying pilot demonstrate his ability to fly the intended path to the airport in VFR conditions identifying prominent landmarks and the possible hazards to navigation along the path and explaining what he would do if he was unable to continue the approach. The last is important since there is, by definition, no missed approach procedure for a contact approach.

Practice of the visual approach procedure is accomplished during the normal landing practice as this
configuration; therefore, exact go-around procedures must be used to assure that a successful missed approach can be accomplished.

Acceptable Performance Guidelines:

a. Exhibits adequate knowledge of missed approach procedures associated with standard instrument approaches.
b. Initiates the missed approach promptly by applying power, establishing a climb attitude, and reducing drag in accordance with the manufacturer's recommendations.
c. Reports to ATC beginning the missed approach procedure.
d. Complies with the published or alternate missed approach procedure.
e. Advises ATC or examiner anytime the aircraft is unable to comply with a clearance, restriction, or climb gradient.
f. Follows the recommended checklist items appropriate to the go-around procedure.
g. Requests. if appropriate, ATC clearance to the alternate airport, clearance limit, or as directed by the examiner.
h. Maintains the recommended airspeed within 10 knots, heading, course, or bearing within 10 degrees and altitude(s) within 100 feet during the missed approach procedure.

Emergency Descent

Objective: This maneuver affords training in recommended procedures for establishing the highest practical rate of descent available during emergency conditions arising from an uncontrollable fire, structural failure, or from any other situation demanding an immediate and rapid descent.

Description: The primary purpose of this maneuver is to descend the aircraft as soon as practicable to a safe altitude. In order to maintain positive "G" forces and for the purpose of clearing altitudes below, a 30 to 45 degree bank should be established in the initial descent for at least a 90 degree heading change. This maneuver should be performed with the aircraft configured as recommended by the manufacturer. Performance of this maneuver should strictly adhere to the procedures outlined in the aircraft flight manual. Unless an actual emergency exists, the emergency descent should always be done in daylight, VFR conditions, and never through any cloud layers.

High Speed Method:

This is a minimum drag descent used in situations such as uncontrolable fire. In the case of an engine fire, landing gear and flap extension should be avoided as long as possible to prevent fire damage to the components. Further, if the fire is in zone #1 (which has no C02 protection), the higher air speed provides better airflow for engine cooling, and may even blow the fire out.

1. Landing gear and flaps . . . . . UP
2. Throttles . . . . . Closed
3. Props . . . . . Full Aft (Low RPM)
4. Airspeed . . . . . VNE MAX.

Low Speed Method:

This method is recommended in cases where it would be safer to descend at a lower airspeed, such as in turbulent air, failure to govern prop speed of if structural damage has been sustained.

1. Throttles . . .. Closed
2. Props . . . . . Full Forward (High RPM)
3. Landing gear . . . . . Down at 130 Knots
4. Flaps . . . . . Down as airspeed permits
5. Descend at maximum airspeed of VFe, rate approx. 1500 FPM.

Acceptable Performance Guidelines:

a. Maintain positive aircraft control.
b. Do not exceed designated maximum speeds.
c. Maintain positive "G" forces.

Note: As soon as all prescribed procedures are completed and the descent is established and stabilized, this maneuver will normally be terminated. In piston driven engines a prolonged emergency descent may cause engine damage due to rapid cooling of the cylinders.

Normal Landing

Objective: This maneuver provides training through the entire landing traffic pattern, including touchdown and rollout. It is used to develop proper techniques in power and control usage at relatively low airspeeds during the critical phases of final approach and touchdown.

Reference: Commercial PTS (AMEL) (XI)(A), AC 61-21, Pilot's Operating Handbook, FAA-Approved Airplane Flight Manual

Description: The "In-range" checklist will be completed before entering the traffic pattern. Unless otherwise directed by ATC, entry to the downwind leg should be midfield at traffic pattern altitude and a 45 degree angle. Speed should be reduced to that compatible with other aircraft in the pattern as practicable. Set Approach Flaps.

When downwind opposite the point of touchdown, extend landing gear and complete "Landing" Checklist except for landing flaps. Angle of bank should not exceed 30 degrees while in the traffic pattern.

Under normal conditions, landing flaps should not be extended until established on final and the landing is assured. When established on final approach, and after landing flaps are extended, stabilize airspeed to that recommended by the manufacturer . If a recommended airspeed is not furnished by the manufacturer, a speed equal to 1.3 Vso should be used. The approach should be planned so the landing will be made in the center of the first one-third of the runway with a smooth transition from approach to landing attitude. Always use a smooth coordinated power reduction in aircraft using power during the approach.

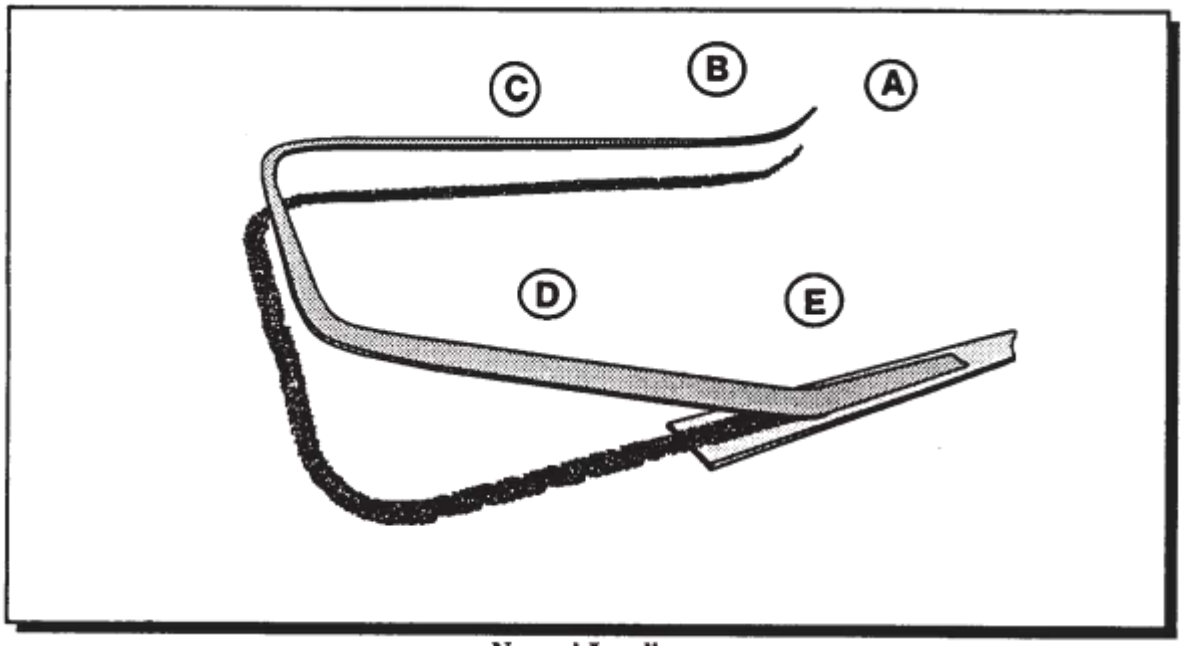
The "After Landing" Checklist will not be accomplished until clear of the runway.

Acceptable Performance Guidelines:

a. Exhibits commercial pilot knowledge by explaining the elements of normal and crosswind approaches and landings including airspeeds, configurations, performance, and related safety factors.
b. Establishes the approach and landing configuration and adjusts the power controls, as required.
c. Maintains a stabilized descent angle and the recommended approach airspeed, with gust factor applied, +/-5 Knots.
d. Notes any obstructions or other hazards in the approach path and landing area, and considers landing performance capability.
e. Verifies wind condition and makes positive correction for crosswind.

Normal Landing ... Continued:

f. Maintains a precise ground track on final approach.
g. Recognizes and promptly corrects deviations during approach and landing.
h. Makes smooth, timely, and precise control application during the transition from approach to landing roundout (flare).
i. Touches down smoothly at approximate stalling speed, beyond and within 200 feet of a specified point, with no drift and the airplane's longitudinal axis aligned with the runway centerline.
j. Maintains positive directional control and crosswind correction during the after-landing roll.
k. Completes the after-landing checklist in a timely manner.



Normal Landing

A) Approaching traffic pattern at 45 degrees to downwind leg, reduce to traffic pattern altitude and airspeed.

B) Downwind:
1. Traffic pattern airspeed.
2. Flaps - approach.

C) Opposite touchdown - "Before Landing" checklist complete.

D) Final - Flaps Landing position.

E) Threshold - airspeed 1.3 Vso or manufacturer's recommended (1.2 Vso minimum).

Simulated Forced Landings

Description: A simulated forced landing can be practiced with the aircraft in any configuration. The instructor will announce "forced landing" and check that the throttles are closed. In order to obtain the best glide ratio, the cleanest configuration and best glide speed are normally established as soon as possible. If the airspeed is above the glide speed the flying pilot should maintain altitude, place the aircraft in its cleanest configuration and allow airspeed to dissipate to best glide speed. Altitude permitting, the flying pilot should determine the best landing area available. Many variables including altitude, obstructions, wind direction, landing direction, landing surface, gradient, and landing distance requirements of the aircraft will determine the pattern and approach techniques used to complete the maneuver. The flying pilot should consider landing on a long field crosswind or uphill or downwind, if such a landing would be safer than directly into the wind.

Note: During the glide and approach, the instructor pilot will assure that measures are taken to keep the engines operating normally.

Utilizing any combination of normal gliding maneuvers, from wings level to spirals, the flying pilot is expected to eventually arrive at the normal "key" position at normal traffic pattern altitude for the selected landing area. From this point on the approach is the same as a normal power-off approach allowing the flying pilot to use his previous experience in judging his landing point.

Cockpit check lists are a part of this maneuver. Items appropriate to the aircraft being used will be covered. The flying pilot will perform the memory items and then call for and perform the appropriate check list to insure that all items have been attended to.

Note: It is mandatory that the instructor and flying pilot know before hand who is going to initiate the go-around and who will be flying the aircraft at that time. No simulated forced landing is to be carried below 200' AGL unless a safe landing iB assured. Proximity of person~ and structures must be considered when descending under 400 feet AGL.

Acceptable Perfonmance Guidelines:

a. Airspeed +10 kts. -0 Kts.
b. Altitude at key position +200' from normal pattern altitude.
c. Go-around initiated at 200' altitude from a position where it is obvious that a safe landing could be made, or a landing completed on an approved landing area.

Landing with Simulated Powerplant Failure

Objective: This maneuver provides training in accomplishing approach to land (and landing) with a failure of one powerplant.

Reference: Commercial PTS (AMEL) (VIII)(H), AC 61-21, Pilot's Operating Handbook, FAA-Approved Airplane Flight Manual

Description:
a. Conditions of flight:

1. **See Engine WARNING on Page 8.**

2. All simulated engine failures will be accomplished with throttle, and feathering will be simulated with zero thrust when less than 2000' above terrain.

b. The maneuver:

1. Due to variations in performance, limitations, etc., no specific flight path or procedure can be proposed that would be adequate in all engine emergencies.

2. A single engine approach and landing can be accomplished with the flight path and procedures almost identical to a normal approach and landing, with three noteworthy exceptions:

   i. Speed on final should not be less than Vyse until the landing is assured; thereafter, at the approach speed commensurate with the flap posit until the landing flare.

   ii. Under normal conditions, the landing will be made with full flaps; however, full flaps should not be lowered until the landing is assured. In this configuration, approach speed should be 1.3 VSo.

   iii. If unusual circumstances dictate landing with other than full flaps, the approach speed will be 1.3 V1.

Note: Long flat approaches with high power output on the operating engine and/or excessive threshold speed that results in floating and unnecessary runway use should be avoided.

Landings with Simulated Powerplant Failures ... Continued:

Acceptable Performance Guidelines:

a. Exhibits commercial pilot knowledge by explaining the procedure used during an approach and landing with an inoperative engine.
b. Sets the engine controls, reduces drag, and identifies and verifies inoperative engine after simulated engine failure.
c. Establishes the recommended airspeed and trims the airplane.
d. Follows the prescribed checklist to verify procedures for securing the inoperative engine and completes pre-landing checklist.
e. Establishes a bank toward the operating engine as required for best performance.
f. Maintains proper track on final approach.
g. Establishes the approach and landing configuration and power.
h. Maintains a stabilized descent angle and the recommended final approach airspeed until landing is assured. Not less than Vyse.
i. Touches down smoothly beyond and within 500 feet of a specified point, with no drift and the longitudinal axis aligned with the runway centerline.
j. Maintains positive directional control during after-landing roll.

Short and/or Soft Field Landings

Objective: These maneuvers are practiced to develop proficiency in overcoming problems peculiar to marginal operations which my be encountered while landing at short and/or soft fields.

Description:

a. Short Field Landings:
Short field landings should be made from a stabilized final approach in landing configuration. Manufacturer's recommended airspeed should be used, with moderately low power and a constant rate of descent. The landing should be accomplished with little or no floating. Upon touchdown, the throttles should be closed immediately accompanied by proper application of brakes to minimize the after-landing roll.

b. Soft Field Landings:
In tailwheel-type airplanes, the tailwheel should touch down simultaneously with or just before the main wheels, and then should be held down by maintaining firm back elevator pressure throughout the landing roll. This will minimize any tendency for the airplane to nose over and will provide aerodynamic braking.

Note: Extreme caution should be exercised when practicing short and soft field landings at minimum speeds. At these speeds, high sink rates may occur in some aircraft requiring excessive altitude and/or power for recovery.

Acceptable Performance Guidelines:

a Exhibits commercial pilot knowledge by explaining the elements of a short-field approach and landing, including airspeeds, configurations, and related safety factors.
b. Considers obstructions, landing surface, and wind conditions.
c. Selects a suitable touchdown point.
d. Establishes the recommended short-field approach and landing configuration and adjusts power and pitch, as required.
e. Maintains a stabilized descent angle, precise control of the descent rate, and recommended airspeed.
f. Maintains a precise ground track on final approach.
g. Recognizes and promptly corrects deviations during approach or landing.
h. Makes smooth, timely, and precise control application during the transition from approach to landing roundout (flare).
i. Touches down smoothly beyond and within 100 feet of a specified point, no drift, and with the airplane longitudinal axis aligned with the runway centerline.
j. Maintains positive directional control during the after-landing roll.
k. Applies smooth braking, as necessary, to stop in the shortest distance consistent with safety.
l. Completes the after-landing checklist in a timely manner.

Crosswind Landings

Objective: This maneuver provides training in the more complex control techniques and limitations of the aircraft during landing with crosswind conditions.

Reference: Commercial PTS (AMEL) (XI)(A), AC 61-21, Pilot's Operating Handbook, FAA-Approved Airplane Flight Manual

Description: On short final approach, the crab into the wind is changed to a slip into the wind. The force held on the controls is proportionate to the crosswind. The slip must keep the flight path and the fuselage of the aircraft aligned with the runway centerline. As ground contact is made on the wheel into the wind, the controls are gradually moved farther in the same direction to compensate for loss of control effectiveness as speed decreases.

Certification rules require that there be no uncontrollable ground looping tendencies in 90 degree crosswinds which do not exceed 0.2 Vso. Though skillful pilots may successfully land in much stronger winds, they should do so with a realization of the hazard involved.

Acceptahle Performance Guidelines:

a. Exhibits commercial pilot knowledge by explaining the elements of normal and crosswind approaches and landings including airspeeds, configurations, performance, and related safety factors.
b. Establishes the approach and landing configuration and adjusts the power controls, as required.
c. Maintains a stabilized descent angle and the recommended approach airspeed, with gust factor applied, +/-5 Knots.
d. Notes any obstructions or other hazards in the approach path and landing area, and considers landing performance capability.
e. Verifies wind condition and makes positive correction for crosswind.
f. Maintains a precise ground track on final approach.
g. Recognizes and promptly corrects deviations during approach and landing.
h. Makes smooth, timely, and precise control application during the transition from approach to landing roundout (flare).
i. Touches down smoothly at approximate stalling speed, beyond and within 200 feet of a specified point, with no drift and the airplane's longitudinal axis aligned with the runway centerline.
j. Maintains positive directional control and crosswind correction during the after-landing roll.
k. Completes the after-landing checklist in a timely manner.

No Flap Approach and Landing

Objective: This maneuver provides training in making approaches and landings with simulated failure of components of the landing flap system.

Reference: ATP PTS (VI)(F), Part 61 (Appendix A), Operating Handbook or Flight Manual, AC 61-21

Description: No flap landings will be conducted as a normal landing except without flaps and from a speed equal to 1.3 times the power off stall speed with flaps retracted (1.3 Vsl = 91 Knots). The trainee should be aware that in most aircraft the touchdown will be in a higher than normal nose up attitude, and that the landing roll will be longer due to the loss of drag caused by the no flap condition and higher touchdown speed. The use of brakes may be required as dictated by runway length and surface.

Acceptable Performance Guidelines:

a. Exhibits adequate knowledge of the factors which affect the flight characteristics of an airplane when full or partial flaps, and other similar devices become inoperable.
b. Uses the correct airspeeds/V-speeds for the approach and landing.
c. Maintains the proper airplane pitch attitude and flight path for the configuration, gross weight, surface winds, and other applicable operational considerations.
d. Uses a runway of sufficient length for the zero-flap condition.
e. Uses wheel brakes in a manner which ensures bringing the airplane to a safe landing considering the point of touchdown and the runway remaining.
f. Maneuvers the airplane to a point where, in the opinion of the examiner, a landing to a full stop on the appropriate runway could be made.

Go Around

Objective: This maneuver develops an understanding of airplane climb capabilities in the landing configuration.

Reference: Commercial PTS (AMEL) (XI)(B), AC 61-21, Pilot's Operating Handbook, FAA-Approved Airplane Flight Manual

Description: This maneuver involves a go-around with both engines operating normally while in the final stages of a landing approach. All phases of the "Before Landing Checklist will have been completed.

At any time on final approach prior to actual touchdown, the instructor will command "Go-around." This will simulate a landing obstacle such as fire equipment, another aircraft, large animal, etc., moving onto the runway directly into the landing path, or a sudden and violent shift in surface wind. The trainee will immediately apply maximum power and stop the descent. When descent has stopped, the flaps will be aircraft pitch adjusted to to Vyse for initial climb.

After positive rate of climb is established, the gear will be retracted and the aircraft will be allowed to accelerate to Vy, and if necessary, final flap retraction will be accomplished.

From this point the maneuver will be conducted in the same manner as a normal takeoff.

Acceptable Perfonmance Guidelines:

a. Exhibits commercial pilot knowledge by explaining the elements of a go-around procedure, including the recognition of the need to go around, the importance of making a timely decision, the use of recommended airspeeds, the drag effect of wing flaps and landing gear, and the importance of properly coping with undesirable pitch and yaw tendencies.
b. Makes a timely decision to go around from a rejected landing.
c. Applies takeoff power and establishes the precise pitch attitude required to attain the recommended airspeed.
d. Retracts the wing flaps, as recommended, or at a safe altitude, and establishes Vy.
e. Retracts the landing gear, after a positive rate of climb has been established.
f. Trims the airplane and climbs at Vy, +/-5 Knots, and maintains the proper ground track in the traffic pattern.

WINDSHEAR/MICROBURST

The pilot will apply "Maximum Power" and set the flaps to 10° while assuming an initial attitude of 7 1/2° nose up. Maintain this attitude even if the descent continues. An increase in the pitch attitude will aggravate the situation. When the descent has been arrested, the pilot establishes and maintains 85 Knots. After a positive rate of climb has been established and all obstacles cleared, retract the flaps to 0° and complete the after takeoff checklist.

Note: At the pilots descression in an actual emergency Manifold/Temperature limits may be exceeded to the extent necessary to handle the emergency. Advise maintenance of the approximate time that specific limits were exceeded..

ACCEPTABLE PERFORMANCE GUIDELINES

A. Exhibit adequate knowledge of a rejected landing procedure, including the conditions that dictate a rejected landing, the importance of a timely decision, the recommended airspeed/V-speeds, and also the applicable "clean-up" procedure.

B. Timely decision to reject the landing for actual or simulated circumstances.

C. Apply the appropriate power setting for the flight condition and establish the correct pitch attitude necessary to obtain the desired takeoff-from-altitude performance.

D. Retract the wing flaps at a safe altitude and establish a positive rate of climb at 95 knots $\pm$ 10 knots.