Multi-Engine Maneuvers

Beech Model 95

NOTE: All maneuvers start with the aircraft trimmed straight and level above 3,000 feet AGL, power set at 22-23 inches and 2200-2300 rpm and airspeed indicating approximately 135 to 140 KIAS. All maneuvers should be entered at an altitude that will allow the maneuver to be completed no lower than 3,000 feet AGL.

SLOW FLIGHT- 58 KIAS

SET UP (all maneuvers should be preceded by a clearing turn, than pick an altitude and heading)

1. Cowl flaps	Open
2. Throttles-	Set to 14 inches (just above gear warning)
3. Yoke-	Back pressure to maintain altitude
4. Propellers-	High rpm (this will cause the manifold pressure to drop to 12 inches (zero thrust)
5. Gear-	Lower (at or below 130 KIAS, Vlo)
6. Flaps-	Lower (at or below 113 KIAS, Vfo) in three steps, first 10° then 20° then 32º
7. Throttles-	Forward to 18 inches (when airspeed approaches 60 KIAS)
8. Trim-	approximately 17 units nose up trim
9. Controls-	**Let go**, aircraft will be straight and level at 58-60 KIAS

RECOVERY

1. Throttles-	Full forward
2. Flaps-	Retract to 20º
3. Gear-	Retract
4. Flaps	Retract
5. Yoke-	Maintain altitude, as airspeed increases slowly re-trim aircraft to maintain altitude.
6. Throttles-	Decrease to 22-23 inches (when airspeed reaches 135 KIAS)
7. Propellers-	Decrease to 2200-2300 rpm
8. Trim-	As required to hold altitude, approx. 3 units nose up trim
9. Controls-	**Let go**, aircraft will be straight and level at 130 to 140 KIAS

STANDARDS

Altitude= +/ -50 feet, Heading= +/ -10°, Airspeed= + 5/ – 0 mph, Bank= +/ –5°

Notes:

A. Establishes and maintains an airspeed at which any further increase in angle of attack, increase in load factor, or reduction in power, would result in an immediate stall.
B. Accomplishes coordinated straight-and-level flight, turns, climbs, and descents with landing gear and flap configurations specified by the examiner.

STALL, IN LANDING CONFIGURATION-POWER OFF

SET UP (all maneuvers should be preceded by a clearing turn)

1. Throttles-	Set to 14 inches (just above gear warning)
2. Yoke-	Back pressure to maintain altitude
3. Propellers	High rpm (this will cause the manifold pressure to drop to 12 inches-zero thrust)
4. Gear-	Lower (at or below 130 KIAS, Vlo)
5. Flaps-	Lower (at or below 113 KIAS, Vfo) in three steps, first to 10° then 20° then 32º
6. Throttles-	Set to 10 inches (when airspeed reaches 80 KIAS)
7. Altitude-	Maintain, with constant increase of back pressure on the yoke until you feel the first indication of a stall; usually a strong buffet.

RECOVERY

1. Throttles-	Full Forward
2. Yoke-	Forward (lower nose to horizon, momentarily) once a positive rate of climb is established, accelerate to Vx or Vy
3. Flaps	Retract to 20º
4. Gear-	Retract
5. Flaps-	Retract
6. Yoke-	Pressure to maintain altitude, maintain Vx or Vy
7. Throttles-	Decrease to 22-23 inches (when airspeed reaches 135 KIAS)
8. Propellers-	Decrease to 2200-2300 rpm
9. Controls-	**Let go**; aircraft will be straight and level at 130 to 140 KIAS

STANDARDS

Heading= + / –10°, Maintains a specified angle of bank not to exceed 20º ,+ / –5°

Notes:

A. Establishes a stabilized descent in the approach or landing configuration, as specified by the examiner.

B. Transitions smoothly from the approach or landing attitude to a pitch attitude that will induce a stall.

C. Recognizes and recovers promptly as the stall occurs by simultaneously reducing the angle of attack, increasing power to maximum allowable, and leveling the wings to return to a straight and level flight attitude with a minimum loss of altitude appropriate for the airplane.

D. Retracts the flaps to the recommended setting, retracts the landing gear, if retractable, after a positive rate of climb is established.

E. Accelerates to V_X or V_Y speed before the final flap retraction; returns to the altitude, heading, and airspeed specified by the examiner.

FULL STALLS POWER-OFF (Airplane Flying Handbook)

The practice of power-off stalls is usually performed with normal landing approach conditions in simulation of an accidental stall occurring during landing approaches. Airplanes equipped with flaps and/or retractable landing gear should be in the landing configuration. Airspeed in excess of the normal

approach speed should not be carried into a stall entry since it could result in an abnormally nose-high attitude. Before executing these practice stalls, the pilot must be sure the area is clear of other air traffic. After extending the landing gear, applying carburetor heat (if applicable), and retarding the throttle to idle (or normal approach power), the airplane should be held at a constant altitude in level flight until the airspeed decelerates to that of a normal approach. The airplane should then be smoothly nosed down into the normal approach attitude to maintain that airspeed. Wing flaps should be extended and pitch attitude adjusted to maintain the airspeed. When the approach attitude and airspeed have
stabilized, the airplane's nose should be smoothly raised to an attitude that will induce a stall. Directional control should be maintained with the rudder, the wings held level by use of the ailerons, and a constant pitch attitude maintained with the elevator until the stall occurs. The stall will be recognized by clues, such as full up-elevator, high descent rate, uncontrollable nosedown pitching, and possible buffeting. Recovering from the stall should be accomplished by reducing the angle of attack, releasing back-elevator pressure, and advancing the throttle to maximum allowable power. Right rudder pressure is necessary overcome the engine torque effects as power is advanced and the nose is being lowered. [Figure 4-5] The nose should be lowered as necessary to regain flying speed and returned to straight-and-level flight attitude. After establishing a positive rate of climb, the flaps and landing gear are retracted, as necessary, and when in level flight, the throttle should be returned to cruise power setting. After recovery is complete, a climb or go-around procedure should be initiated, as the situation
dictates, to assure a minimum loss of altitude. Recovery from power-off stalls should also be practiced from shallow banked turns to simulate an inadvertent stall during a turn from base leg to final approach. During the practice of these stalls, care should be taken that the turn continues at a uniform rate until the complete stall occurs. If the power-off turn is not properly coordinated while approaching the stall, wallowing may result when the stall occurs. If the airplane is in a slip, the outer wing may stall first and whip downward abruptly. This does not affect the recovery procedure in any way; the angle of attack must be reduced, the heading maintained, and the wings leveled by coordinated use of the controls. In the practice of turning stalls, no attempt should be made to stall the airplane on a predetermined heading. However, to simulate a turn from base to final approach, the stall normally should be made to occur within a heading change of approximately 90°. After the stall occurs, the recovery should be made straight ahead with minimum loss of altitude, and accomplished in accordance with the recovery procedure discussed earlier. Recoveries from power-off stalls should be accomplished both with, and without, the addition of power, and may be initiated either just after the stall occurs, or after the nose has pitched down through the level flight attitude.

STALL, IN TAKE-OFF CONFIGURATION-POWER ON

Note: Set power as to prevent a pitch greater than 30º nose up. Power should be set to no less than 65% of available power.

SET UP (All maneuvers should be preceded by a clearing turn)

1. Throttles-	Set throttles to 22 inches
2. Yoke-	Back pressure to decrease speed to T/O speed (87 KIAS)
3. Propellers-	High rpm
4. Yoke-	Back pressure to 20º
5. Altitude-	Maintain, with constant increase of back pressure on the yoke until you feel the first indication of a stall, usually a strong buffet.

RECOVERY

1. Throttles-	Full forward

2. Yoke-	Forward, level the wings to return to straight and level flight with minimum loss of altitude, climb out at Vx or Vy once positive climb established (retract flaps and landing gear if extended)
3. Throttles-	Set to 22-23 inches (when airspeed reaches 110 KIAS)
4. Propellers-	Set to 2200-2300 rpm
5. Controls-	**Let go**, aircraft will be straight and level at 130 to 140 KIAS

STANDARDS

Altitude= minimum loss, Heading= +/ – 5°, Maintains a specified angle of bank not to exceed 20º, +/ – 5

EMERGENCY DECENT

1. Throttles-	Retard
2. Gear-	Extend (once airspeed below 130 KIAS)
3. Flaps-	Extend full (once airspeed below 113 KIAS)
4. Yoke-	Pitch to hold 100 KIAS

STANDARDS

Student recognizes depressurization, cockpit smoke, and or fire

STEEP TURNS

Note: Commercial multi-engine steep turns consist of two 360° turns in opposite directions one immediately after the other using a 50° angle of bank so as to trace a figure eight

SET UP- RECOVERY (all maneuvers should be preceded by a clearing turn)

1. Dir. Gyro-	Start steep turn at a cardinal heading
2. Throttles-	Set to 22-23 inches (should generate a speed of 125 KIAS)
3. Yoke-	Start turn, as bank passes 30° increase back pressure, maintain altitude, start the roll out 25° to 30° before original heading, upon reaching original heading immediately start turn in opposite direction
standards	altitude= + / – 100ft, airspeed= + / – 10kts, bank = +/ – 5º, headin/ - 10º

Vmc DEMONSTRATION

Note: The purpose of the Vmc Demonstration is to show our understanding and control of the aircraft with only one engine operative. These two main factors are 1.) the loss of rudder effectiveness and 2.) the adverse yaw created by one engine being inoperative while the other is still producing power. Recovery can be accomplished by a reduction of power on the operative engine, which will reduce the adverse yaw and the lowering of the nose which will increase airspeed, which in turn will increase rudder effectiveness.

SET UP (all maneuvers should be preceded by a clearing turn, choose heading)

1. Throttles-	Set 14 inches (just above gear warning horn)
2. Yoke-	Back pressure to maintain altitude
3. Propellers-	High RPM (this will cause the manifold pressure to drop to 12 inches; zero thrust)
4. Right Throttle-	Full forward (when airspeed approaches 87 KIAS) (note: as full power is added substantial right rudder will be necessary to maintain heading and it should be applied smoothly)
5. Right cowl flap-	Open
6. Left Throttle-	Fully retard (note: when left throttle is closed additional right rudder will be required to maintain heading)
7. Left cowl flap-	Close
8. Trim-	9 units nose up
9. Airspeed-	Stabilize at 87 KIAS (Vyse) momentarily
10. Yoke-	Slowly apply back pressure, so airspeed decreases 1 KIAS/second
11. Right Rudder-	Maintain directional control (note: as airspeed decreases the rudder becomes less effective; therefore more right rudder will be required to maintain directional control)
12. Yoke-	Continue to increase back pressure until loss of directional control occurs or first sign of a stall and or buffet

RECOVERY

1. Yoke-	Release back pressure so as to lower nose below horizon
2. Right Throttle-	Reduce power (good engine)
3. Airspeed-	Regain at minimum 78 KIAS (Vsse)
4. Right Throttle-	Full power
5. Yoke-	Resume 87 KIAS (Vyse)

STANDARDS

Maintain directional control within 20°, during the entry and recovery
Accelerate to Vxse/Vyse, + / – 5 mph, during the recovery

DRAG DEMONSTRATION

Note: The purpose of the Drag Demonstration is to show the effects of various airspeeds and configurations of gear, flaps, and propeller on the vertical performance of the aircraft. It should not only show that these factors can have a negative effect on the performance but should also give us a good idea of the relative value of each of them.

SET UP (all maneuvers should be preceded by a clearing turn)

1. Throttles-	Set to 14 inches
2. Yoke-	Back pressure to maintain altitude
3. Propellers-	High rpm (this will cause the manifold pressure to drop to 12 inches, which is equal to zero thrust)
4. Right Throttle-	Full forward (when airspeed approaches 87 KIAS) (note: as full power is added substantial right rudder will be necessary to maintain heading and it should be applied smoothly)
5. Right cowl flap-	Open
6. Left Throttle-	Retard

7. Left cowl flap-	Close
8. Trim-	One revolution up **8 units @ 3000 agl**
9. Airspeed-	Stabilize at 87 KAIS (Vyse) and observe vertical speed
10. Yoke-	Increase back pressure until airspeed decreased to 78 KIAS (Vyse-10) and observe vertical speed **10 units nose up trim (-50 fpm @ 3k)**
11. Yoke-	Forward, decrease back pressure until airspeed increases to 97 KIAS (Vyse+10) and observe vertical speed **7 units nose up trim (0 fpm @ 3k)**
12. Airspeed-	Stabilize at 87 KIAS (Vyse)
13. Gear-	Lower and observe vertical speed **9 units nose up trim (-250 fpm @ 3k)**
14. Gear-	Retract
15. Flaps-	Lower to 20° and observe vertical speed **8 units nose up (-250 fpm @ 3k)**
16. Flaps-	Lower to 32° and observe vertical speed **12 units nose up trim (-500 fpm @ 3k)**
17. Gear-	Lower and observe vertical speed **9 units nose up trim (-600 fpm @ 3k)**
18. Left throttle-	Retard to idle and observe vertical speed

THE PERFORMANCE BELOW IS WITH ZERO (SIM. FEATHERED) THRUST ON THE DEAD ENGINE

15a. Flaps-	Lower to 20° and observe vertical speed **9 units of trim nose up (+200 fpm @ 3k)**
16a. Flaps-	Lower to 32° and observe vertical speed **11 units of trim nose up (-150 fpm @ 3k)**
17a. Gear-	Lower and observe vertical speed **9 units of trim nose up (-250 fpm @ 3k)**

*YOU CAN SEE THERE IS APPROX. **A + 350 FPM IMPROVED** PERFORMANCE WITH THE PROPELLER ON THE DEAD ENGINE FEATHERED.*

RECOVERY

1. Left Throttle-	Forward to 12 inches (zero thrust)
2. Gear-	Retract
3. Flaps-	Retract
4. Left Throttle-	Forward to 15 inches
5. Right Throttle-	Set to 22 inches
6. Left Throttle-	Forward to 18 inches
7. Right Throttle-	Set to 18 inches
8. Propellers-	Set to 2200-2300 rpm
9. Throttles-	Forward to 22-23 inches
10. Trim-	For level flight- approx. 3 unites nose up
11. Controls-	**Let go**, aircraft will be straight and level at 130 to 140 KIAS

LOSS OF ENGINE PROCEDURES

Engine out below Vmc:

1. Throttles-	Close both immediately

2. Brakes-	Apply as necessary to control aircraft
3. ATC-	Advise

Engine out after takeoff with insufficient runway to land:

1. Control Aircraft-	Rudder and aileron, Maintain airspeed (first Vmc then Vyse)
2. Mixture-	Full forward
3. Propeller-	Full forward
4. Throttle-	Full Forward
5. Control Aircraft-	FLY BLUE LINE
6. Gear-	Up
7. Flaps-	Up
8. Control Aircraft-	FLY BLUE LINE
9. Identify-	Dead foot, dead engine
10. Verify-	Close identified throttle SLOWLY
11. Fix or Feather-	Identified propeller retard, **immediately**

Note: switching tanks and attempting a restart at a low altitude should only be accomplished workload and altitude permitting. The safest course of action at low altitude may be to simply feather the dead engine and land

Also: in the real world, the cause of the engine failure would most likely be obvious, ie: high airframe vibration, oil on the engine cowl, fuel starvation-all which can be diagnosed by simply looking at the engine instruments and simple observation.

ENGINE OUT AT ALTITUDE

1. Control Aircraft-	Rudder and aileron, Maintain airspeed (first Vmc then Vyse)
2. Mixture-	Full forward
3. Propeller-	Full forward
4. Throttle-	Full Forward
5. Control Aircraft-	FLY BLUE LINE
6. Gear-	Up
7. Flaps-	Up
8. Control Aircraft-	FLY BLUE LINE
9. Switches	Check mags on
10. Fuel selector-	Crossfeed
11. Boost pumps-	On
12. Control Aircraft-	FLY BLUE LINE
13. Identify-	Dead foot, dead engine
14. Verify-	Close identified throttle SLOWLY
15. Fix or Feather-	Identified propeller full back, **immediately**

note: at altitude it may not be necessary to immediately fly blue line in order to hold altitude, speed may be determined by performance. *SE CEILING (50 fpm)…6,900*

SHORT FIELD TAKEOFF

1. Flaps-	Position 20º
2. Brakes-	Hold
3. Throttles-	Full power (observe engine instruments)
4. Brakes-	Release
5. Yoke-	Rotate at 73 KIAS, Vmc; climb out at 78 KIAS, Vsse

6. Flaps- Once obstacle cleared by 50ft, accelerate to 87 KIAS and retract flaps

SHORT FIELD LANDING

Note: fly a normal approach to be stabilized no later than 500 agl; ie: full flaps, gear down, and airspeed stable at 78 KIAS + half the gust.

1. Flaps- Set 32º-full (on final)
2. Throttles- Set 16 inches (on final)
3. Trim- Set 13º units nose up (on final)
4. Flaps- Retract upon landing (**take great care not to retract gear**)
5. Yoke- Upon landing apply full bake pressure
6. Brakes- Apply maximum without locking

SHORT-FIELD APPROACH AND LANDING ADDITIONAL NOTES:

The primary elements of a short-field approach and landing do not differ significantly from a normal approach and landing. Many manufacturers do not publish short-field landing techniques or performance charts in the AFM/POH. In the absence of specific short-field approach and landing procedures, the airplane should be operated as recommended in the AFM/POH. No operations should be conducted contrary to the AFM/POH recommendations. The emphasis in a short-field approach is on configuration (full flaps), a stabilized approach with a constant angle of descent, and precise airspeed control. As part of a short-field approach and landing procedure, some AFM/POHs recommend a slightly slower than normal approach airspeed. If no such slower speed is published, use the AFM/POH-recommended normal approach speed. Full flaps are used to provide the steepest approach angle. If obstacles are present, the approach should be planned so that no drastic power reductions are
required after they are cleared. The power should be smoothly reduced to idle in the roundout prior to touchdown. Pilots should keep in mind that the propeller blast blows over the wings, providing some lift in addition to thrust. Significantly reducing power just after obstacle clearance usually results in a sudden, high sink rate that may lead to a hard landing. After the short-field touchdown, maximum stopping effort is achieved by retracting the wing flaps, adding back pressure to the elevator/stabilator, and applying heavy braking. However, if the runway length permits, the wing flaps should be left in the extended position until the airplane has been stopped clear of the runway. There is always a significant risk of retracting the landing gear instead of the wing flaps when flap retraction is attempted on the landing rollout. Landing conditions that involve either a short-field, high-winds or strong crosswinds are just about the only situations where flap retraction on the landing rollout should be considered. When there is an operational need to retract the flaps just after touchdown, it must be done deliberately, with the flap handle positively identified before it is moved.

PLEASE REFERENCE CURRENT PTS FOR ALL MANEUVER STANDARDS