

**MANEUVERING WITH ONE ENGINE INOPERATIVE**

REFERENCE: AFH §12-23, PTS Commercial.

DESCRIPTION:

The aircraft is configured for single engine flight by either feathering the propeller on the inoperative engine or setting zero thrust. The aircraft is maneuvered to specified headings and altitudes as directed by the instructor/examiner.

OBJECTIVE:

To develop the student's ability to respond appropriately to engine failures occurring in flight and to maintain control of the airplane while maneuvering with one engine inoperative.

PROCEDURE:

1. Pre-maneuver check.
2. The instructor simulates engine failure on one engine only.
3. Maintain positive directional control and adjust the pitch attitude to maintain V_{YSE} (105 mph) as appropriate.
4. Establish proper control inputs for attitude and establish no more than 5° bank towards the operating engine.
5. Ensure that the mixtures, propellers and throttles are in the full fwd position.
6. Ensure that the flaps and gear are in the retracted position.
7. Verbally identify the affected engine (dead leg, dead engine).
8. Verify the suspect engine by retarding the appropriate throttle.
9. Re-evaluate single engine climb performance; if satisfactory, perform in-flight engine failure checklist and troubleshoot; if not feather the affected engine and time permitting, accomplish the engine secure checklist.
10. Determine the appropriate course of action and advise the appropriate ATC facility / instructor of your intentions.
11. Initiate a turn towards the nearest suitable airport.
12. Monitor the operating engine and adjust the engine controls as necessary.
13. Make turns, climbs and descents within the performance capabilities of the airplane as directed by the instructor.
14. Restart the inoperative engine, using appropriate procedures and return to cruise.

NOTE:

No simulated engine failures below 500' AGL. Between 500' and 3000' AGL the instructor will simulate the engine failure by reducing the throttle. Full feathering and securing of an engine must be accomplished above 3000' AGL and positions where safe landings on established airports can be readily accomplished. In the event that difficulty is encountered in restarting and/or un-feathering, it shall be treated as an emergency.



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LEARNING CONSIDERATIONS:

Planning and orientation

- Maintaining directional control.
- Using proper control input.
- Zero sideslip.
- Identify/Verify, fix or feather.
- Verification of inoperative engine.
- Feathering vs. zero thrust (simulated feather).
- Air-start procedure.
- Control vs. performance.
- Flows vs. checklist.

Faulty technique

- Allowing airspeed to reduce below V_{YSE} .
- Faulty zero sideslip procedure.
- Faulty identifying or verifying procedures.
- Faulty restart procedures.
- Inappropriate flow techniques.

Practical Test Standards	
PTS	Commercial Pilot
Airspeed	$V_{YSE} \pm 5$ KIAS
Altitude	$\pm 100'$ or minimum sink as appropriate
Heading	$\pm 10^\circ$
Note	Recognizes engine failure, sets engine controls, reduces drag, verifies inoperable engine and secures appropriately
Note	Establishes and maintains bank toward operating engine
Note	Maintain coordinated flight
Note	Restarts engine using appropriate restart procedure



VMC DEMONSTRATION

REFERENCE: AFH §12-27, PTS Commercial.

VMC is a demonstration of Control not Performance.

An altitude of at least 5000 'AGL is required before performing the maneuver. A VMC demonstration should not be performed with both engines at full power and then one engine suddenly made inoperative.

On airplanes with normally aspirated engines, power will be lost with a gain in altitude and thus, result in a VMC lower than stall. **To demonstrate actual loss of directional control the instructor should block one of the rudder pedals limiting its travel.** During the FAA flight test the examiner is not permitted do this. Should this condition occur recovery should be initiated at the stall warning horn or the aerodynamic buffet; (Whichever occurs first)

Power reduction on the operating engine should be smooth and only enough to regain control. The pitch adjustment to regain control should be brisk but the attitude should not be below the horizon.

DESCRIPTION:

The aircraft is configured with one engine at idle. The aircraft is then slowly pitched up until either loss of directional control occurs, stall warning, or stall buffet occurs. The aircraft is then recovered to normal single engine flight.

OBJECTIVE:

To develop the pilot's ability to recognize the indications of loss of directional control due to attempted flight below V_{MCA} with an engine inoperative and then to execute a proper recovery procedure.

PROCEDURE:

1. Pre-maneuver check.
2. Select a visual reference point on the horizon and cross check with Heading Indicator.
3. Reduce power to 12" MP.
4. Maintain altitude as airspeed decreases.
5. Maintain heading with visual references point.
6. Below 110 mph, props full forward. Trim as required.
7. At blue line (105 mph) increase the power to full on designated engine and reduce power on other engine to idle.
8. Apply enough rudder and bank into operating engine to maintain directional control and zero side slip.



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9. Slowly apply back pressure to maintain a climb attitude and enough aileron and rudder to maintain directional control. Allow the airspeed to deteriorate at approximately 1 mph per second. (1° per second)
10. Rudder input should continue to increase until either stall warning horn is heard, the aerodynamic buffet is felt or there is a loss of directional control.

RECOVERY:

1. Simultaneously reduce the throttle on the operating engine and reduce the nose attitude to accelerate toward blue line.
2. Release rudder deflection.
3. Once directional control has been regained the power on the operating engine should be smoothly applied, rudder re-applied and the airplane accelerated to maintain V_{YSE} .
4. At the completion of the maneuver meet the throttles in the middle and return to normal cruise settings.

LEARNING CONSIDERATIONS:

Planning and orientation

- Performance vs. control.
- Factors affecting VMC.
- Effects of flaps on VMC.
- Certification of VMC
- Required altitude to perform VMC demo. (POH)

Faulty technique

- Failure to maintain directional control.
- Failure to identify loss of directional control.
- Inadequate rudder input.
- Inability to attain and hold zero sideslip.



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Practical Test Standards	
PTS	Commercial Pilot
Airspeed	+ 10 KIAS above V_{SSE} or V_{YSE}
Altitude	Above 4,000'
Heading	Maintains as appropriate
Note	Increases pitch attitude 1 mph per second
Note	Recognizes loss of control, stall warning or buffet
Note	Recovers promptly by simultaneously reducing power and angle of attack
Note	Recovers within 20° of entry heading
Note	Advances power smoothly and accelerates to $V_{XSE}/V_{YSE} \pm 5$ KIAS as appropriate

SENECA I PROCEDURES

Vmc DEMO

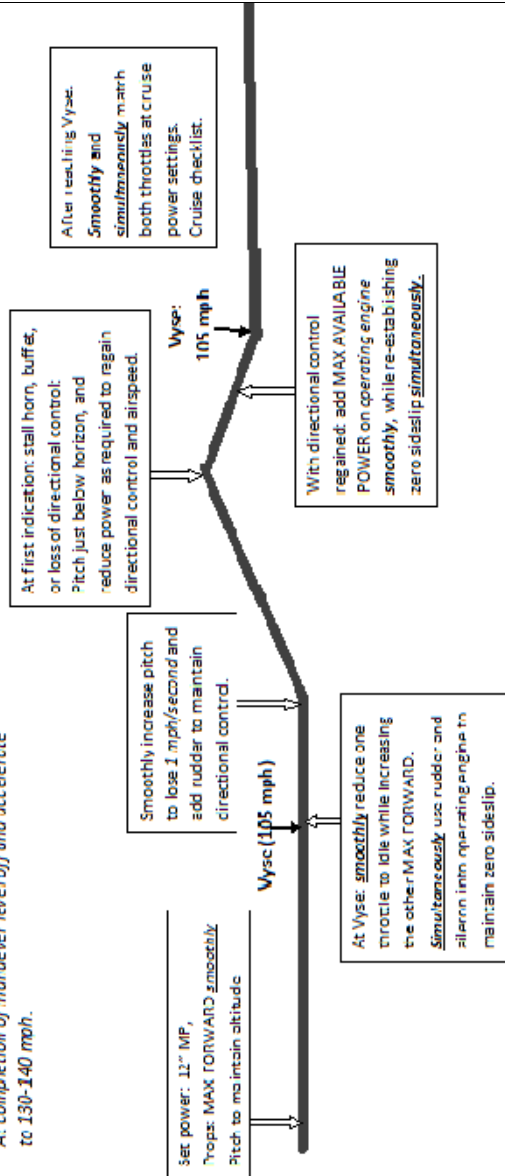
Note 1:

Begin maneuver in level flight 4000' AGL

Maintain heading with a visual reference.

130-140 mph (Cruise Power)

At completion of maneuver level off and accelerate to 130-140 mph.



**ENGINE FAILURE IN FLIGHT**

REFERENCE: AFH 12-21 AND 12-22, PTS Commercial.

An engine failure in flight should be simulated by the throttle if below 3000 feet AGL (this should be done smoothly). If above 3000 feet, engine failure in flight should be simulated by either the fuel shut off valve or the reduction of the mixture levers.

OBJECTIVE:

Develop the knowledge of elements related to the procedure used for engine failure during flight. Develop the skills necessary to recognize engine failure, maintain airplane control and safely recover the airplane.

PROCEDURE:

AS SOON AS THE ENGINE FAILS THE FOLLOWING STEPS ARE IMMEDIATE

CONTROL: Apply rudder and bank to counteract the yawing and rolling moment, pitch the airplanes nose to the horizon (this will give you blue line).

PERFORMANCE: Once control has been established performance is now a priority.

MixturesFull forward

Propellers.....Full Forward

ThrottlesFull Forward

Flaps.....Up

Gear.....Up

Fuel pumps.....On

Maintain zero side slip.

IDENTIFY: Which engine has failed? Remember inoperative leg = inoperative engine

VERIFY: whichever engine the pilot identifies has failed, retard the throttle smoothly halfway. If there is no change in engine noise or performance the failed engine has been verified. Once it has been determined which engine has failed the throttle should be brought back to the idle position then open 1”.



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DETERMINE FIX OR FEATHER: If not on an approach, or in the airport environment an attempt should be made to re-start the engine or at least determine why it failed. If not in the airport environment a turn to the nearest most suitable airport should be made. If below 3000' or on approach you must feather and secure. (Simulated)

FIX—Above 3000' AGL

1. fuel selector crossfeed
2. cowl flap open
3. alternate air on
4. mixture rich
5. propeller forward
6. throttle open 1"
7. fuel pump on
8. magnetos R / L, off / on

**If engine fails to start;
Feather**

FEATHER—Below 3000' AGL/APH

1. propeller feather
2. fuel selector off
3. cowl flap closed
4. alternate air off
5. mixture idle cutoff
6. fuel pump off
7. magnetos off
8. alternator off

Land as soon as possible:

The engine shut down and securing checklist should now be performed. An emergency declared and a briefing made to ATC and your passengers.

LEARNING CONSIDERATIONS:

Planning and orientation

- Maintaining directional control.
- Using proper control input.
- Zero sideslip.
- Identify/Verify, fix or feather.
- Verification of inoperative engine.
- Air-start procedure.
- Control vs. performance.
- Flows vs. checklist.

Faulty technique

- Airspeed reduced below V_{YSE} .
- Faulty zero sideslip procedure.
- Faulty identifying or verifying.
- Faulty restart procedures.
- Inappropriate flow techniques.
- Failure to maintain heading.



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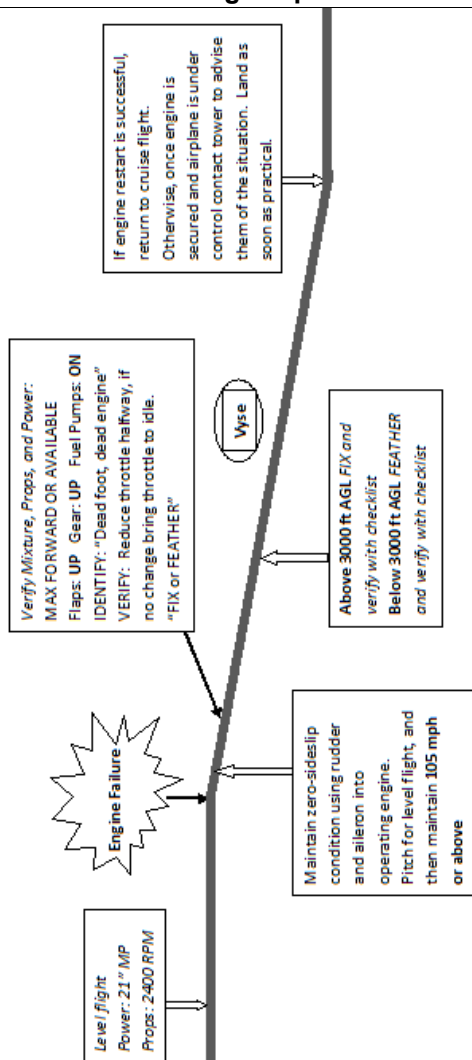
Practical Test Standards	
PTS	Commercial Pilot
Airspeed	$V_{YSE} \pm 5$ KIAS
Altitude	$\pm 100'$ or minimum sink rate as appropriate
Heading	$\pm 10^\circ$
Bank	$\pm 5^\circ$
Note	Recognizes engine failure, sets engine controls, reduces drag, verifies inoperable engine and simulates feathering appropriately
Note	Establishes and maintains bank toward operating engine
Note	Follows prescribed checklist /monitors operating engine with necessary adjustments

SENECA I PROCEDURES

ENGINE FAILURE IN FLIGHT

Note 1. If not on an approach or in the airport environment above **3000 ft AGL** attempt to fix the engine first. Fly a heading toward the nearest airport after attempting to perform the Fix or Feather checklists. No engine failures below 500' AGL by instructors.

Note 2. Maintain at or above 105 mph and maintain altitude as much as possible. **20° of bank or more** may be used when turning into good engine. **20° of bank or less** should be used when turning into INOP engine.



**APPROACH AND LANDING - ONE ENGINE INOPERATIVE**

REFERENCE: AFH 12-22 AND 12-23, PTS Commercial.

DESCRIPTION:

The landing involves the transition from cruise with accuracy, smoothness and positive control to the landing roll.

OBJECTIVE:

Develop the pilot proficiency on a single engine approach and landing.

PROCEDURE:

1. This procedure assumes that the engine shut down and simulated feathering checklists have already been accomplished.
2. Upon entering the downwind, establish airspeed of 115 mph.
3. Prior to midfield downwind, a before landing flow/checklist should be completed.
4. Abeam the desired touchdown point, reduce power to 12"-15" MP and extend flaps to 10°; establish a 500' descent at 115 mph.
5. Turn base leg approximately 45° from touchdown point, extend the flaps to 25° and maintain 115 mph descent. Trim as required.
6. Turn final approach, props full forward, airspeed approximately 105-115 mph.
7. Use ailerons to keep the aircraft flying down centerline. Use the rudder to align the nose of the aircraft on the centerline.
8. On short final, (landing assured) extend flaps to 40° and reduce your speed to 105 mph by retarding the throttle while increasing your pitch to maintain your rate of descent.
9. Upon arrival in ground effect the throttle should be smoothly reduced to idle and back pressure applied, allowing the aircraft to settle onto the runway at the minimum controllable airspeed.
10. After touchdown, apply full crosswind correction if necessary.
11. Avoid heavy use of the brakes on the landing roll out.
12. Taxi off of the runway and complete the after landing checklist.



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LEARNING CONSIDERATIONS:

Planning and orientation

- Runway length, width and surface condition.
- Effect of high density altitude and landing distance required.
- Consideration of obstructions or hazards.
- Landing performance data and limitations.
- Effect of flaps on approach and landing.
- Anticipate the effect of wind drift, yaw and necessary control inputs.
- Wind shear and wake turbulence considerations.
- Timely execution of go-around if necessary.

Faulty technique

- Inappropriate removal of hand on throttle.
- Improper pitch and attitude control during round out and touchdown.
- Excessive airspeed that results in floating before touchdown.
- Airspeed less than V_{YSE} before short final.
- Failure to compensate for wind drift throughout landing.

Practical Test Standards	
PTS	Commercial Pilot
Airspeed	Approach airspeed +/- 5 KIAS
Note	Recognizes engine failure, takes appropriate action, maintains control
Note	Banks toward operating engine
Note	Follows prescribed checklist /monitors operating engine with necessary adjustments
Note	Smooth and timely control applications during round out and touchdown
Note	Touches down on first 1/3 of available runway aligned with centerline
Note	Maintains crosswind correction and directional control throughout approach