

BEST SINGLE-ENGINE RATE-OF-CLIMB SPEED

The best single-engine rate-of-climb speed becomes important when there are no obstacles ahead on takeoff, or when it is difficult to maintain or gain altitude in single-engine emergencies. The best single-engine rate-of-climb speed is 106 KIAS with wing flaps and landing gear up. This speed is indicated by a blue radial on the airspeed indicator.

The variations of wing flaps up best single-engine rate-of-climb speed with altitude are shown in Section 5. For best single-engine climb performance, the wings should be banked 5° toward the operative engine.

ENGINE INOPERATIVE PROCEDURES

ENGINE SECURING PROCEDURE

1. Throttle - CLOSE.
2. Mixture - IDLE CUT-OFF.
3. Propeller - FEATHER.
4. Fuel Selector - OFF (Feel For Detent).
5. Auxiliary Fuel Pump - OFF.
6. Magneto Switches - OFF.
7. Propeller Synchrophaser - OFF (Optional System).
8. Alternator - OFF.
9. Cowl Flap - CLOSE.

ENGINE FAILURE DURING TAKEOFF (Speed Below 92 KIAS)

1. Throttles - CLOSE IMMEDIATELY.
2. Brakes - AS REQUIRED.

NOTE

The distance required for the airplane to be accelerated from a standing start to 92 KIAS on the ground, and to decelerate to a stop with heavy braking, is presented in the Accelerate Stop Distance Chart in Section 5 for various combinations of conditions.

ENGINE FAILURE AFTER TAKEOFF (Speed Above 92 KIAS With Gear Up Or In Transit)

1. Mixtures - AS REQUIRED for flight altitude.
2. Propellers - FULL FORWARD.
3. Throttles - FULL FORWARD.
4. Landing Gear - CHECK UP.
5. Inoperative Engine:
 - a. Throttle - CLOSE.
 - b. Mixture - IDLE CUT-OFF.
 - c. Propeller - FEATHER.
6. Establish Bank - 5° toward operative engine.
7. Wing Flaps - UP, if extended, in small increments.
8. Climb to Clear 50-Foot Obstacle - 92 KIAS.

9. Climb at Best Single-Engine Rate-of-Climb Speed - 106 KIAS at sea level; 94 KIAS at 10,000 feet.
10. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
11. Cowl Flap - CLOSE (Inoperative Engine).
12. Inoperative Engine - SECURE as follows:
 - a. Fuel Selector - OFF (Feel For Detent).
 - b. Auxiliary Fuel Pump - OFF.
 - c. Magneto Switches - OFF.
 - d. Alternator Switch - OFF.
13. As Soon as Practical - LAND.

Upon engine failure after reaching 92 KIAS on takeoff, the multi-engine pilot has a significant advantage over a single-engine pilot, for he has a choice of stopping or continuing the takeoff. This would be similar to the choice facing a single-engine pilot who has suddenly lost slightly more than half of his takeoff power. In this situation, the single-engine pilot would be extremely reluctant to continue the takeoff if he had to climb over obstructions. However, if the failure occurred at an altitude as high or higher than surrounding obstructions, he would feel free to maneuver for a landing back at the airport.

Fortunately, the airplane accelerates through this "area of decision" in just a few seconds. However, to make an intelligent decision in this type of emergency, one must consider the field length, obstruction height, field elevation, air temperature, headwind, and takeoff weight. The flight paths illustrated in Figure 3-2 indicate that the "go no-go area of decision" is bounded by: (1) the point at which 92 KIAS is reached and (2) the point where the obstruction altitude is reached. An engine failure in this area requires an immediate decision. Beyond this area, the airplane, within the limitations of single-engine climb performance shown in Section 5, may be maneuvered to a landing back at the airport.

ENGINE FAILURE DURING TAKEOFF GO NO-GO DECISION

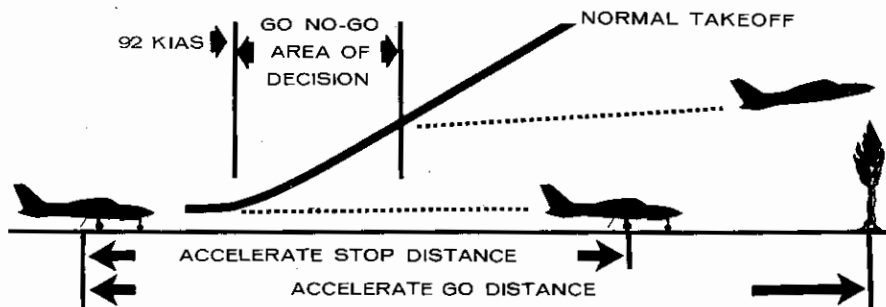


Figure 3-2

At sea level standard day, with zero wind and 5500 pounds weight, the distance to accelerate to 92 KIAS and stop is 3645 feet, while the total unobstructed distance required to takeoff and climb over a 50-foot obstacle after an engine failure at 92 KIAS is 3645 feet. This total distance over an obstacle can be reduced slightly under more favorable conditions of weight, headwind, or obstruction height. However, it is recommended that in most cases it would be better to discontinue the takeoff, since any slight mismanagement of single-engine procedure would more than offset the small distance advantage offered by continuing the takeoff. Still higher field elevations will cause the engine failure takeoff distance to lengthen disproportionately until the altitude is reached where a successful takeoff is improbable unless the airspeed and height above the runway at engine failure are great enough to allow a slight deceleration and altitude loss while the airplane is being prepared for a single-engine climb.

During single-engine takeoff procedures over an obstacle, only one condition presents any appreciable advantage; this is headwind. A decrease of approximately 6% in ground distance required to clear a 50-foot obstacle can be gained for each 10 knots of headwind. Excessive speed above best single-engine rate-of-climb speed at engine failure is not nearly as advantageous as one might expect since deceleration is rapid and ground distance is used up quickly at higher speeds while the airplane is being cleaned up for climb. However, the extra speed is important for controllability.

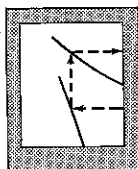
The following facts should be used as a guide at the time of engine failure: (1) discontinuing a takeoff upon engine failure is advisable under most circumstances; (2) altitude is more valuable to safety after takeoff than is airspeed in excess of the best single-engine rate-of-climb speed since excess airspeed is lost much more rapidly than is altitude; (3) climb or continued level flight at moderate altitude is improbable with the landing gear extended and the propeller windmilling; (4) in no case should the airspeed be allowed to fall below the best single-engine angle-of-climb speed, even though altitude is lost, since this speed will always provide a better chance of climb, or a smaller altitude loss, than any lesser speed. The single-engine best rate-of-climb speed will provide the best chance for climb or the least altitude loss, and is preferable unless there are obstructions which make a steep climb necessary.

WARNING

The propeller on the inoperative engine must be feathered, landing gear retracted and wing flaps up or continued flight may be impossible.

Single-engine procedures should be practiced in anticipation of an emergency. This practice should be conducted at a safe altitude, with full power operation on both engines, and should be started at a safe speed of at least 105 KIAS. As recovery ability is gained with practice, the starting speed may be lowered in small increments until the feel of the airplane in emergency conditions is well known. It should be noted that as the speed is reduced, directional control becomes more difficult. Emphasis should be placed on stopping the initial large yaw angles by the IMMEDIATE application of rudder supplemented by banking slightly away from the yaw. Practice should be continued until: (1) an instinctive corrective reaction is developed and the corrective procedure is automatic and, (2) airspeed, altitude, and heading can be maintained easily while the airplane is being

RPM TO SIMULATE CRITICAL (LEFT) ENGINE INOPERATIVE AND FEATHERED



- CONDITIONS:
1. Propellers in Low Pitch (Full Forward Position).
 2. Manifold Pressure Adjusted to Obtain Proper RPM.

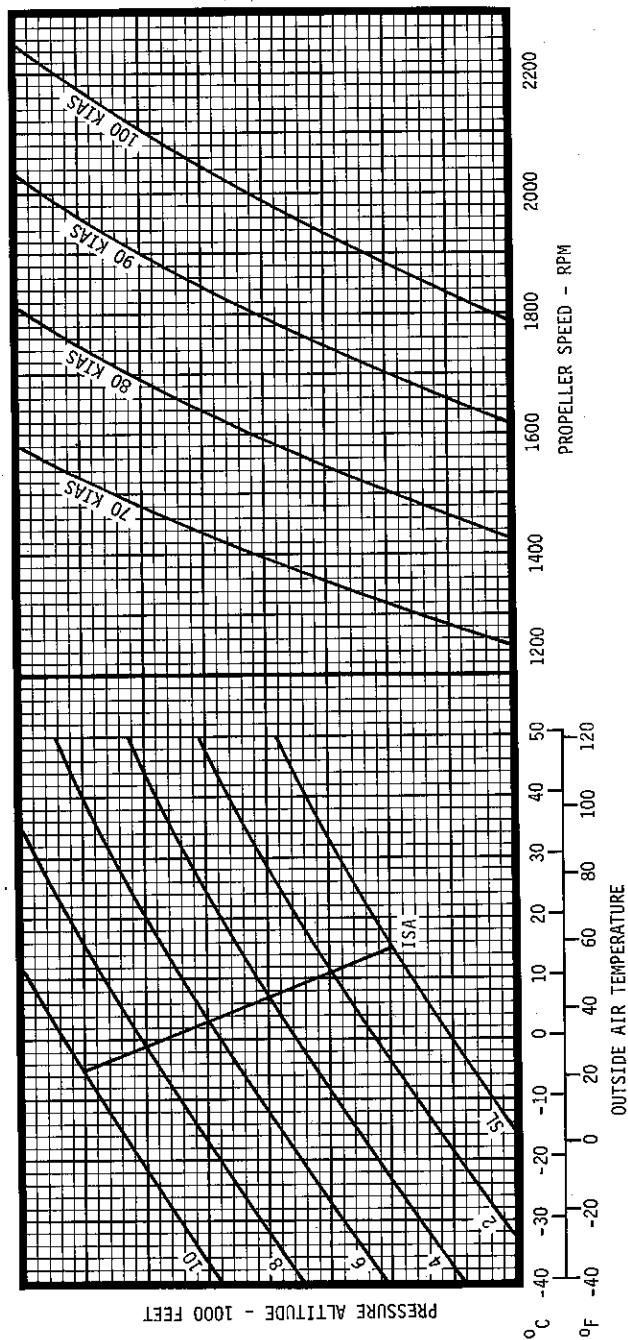


Figure 3-3

prepared for a climb. In order to simulate an engine failure, set both engines at full power operation; then at a chosen speed, pull the throttle control of one engine to idle, and proceed with single-engine emergency procedures. Simulated single-engine flight characteristics can be practiced by setting propeller RPM to simulate a critical engine inoperative condition as shown in Figure 3-3.

ENGINE OVERSPEED

Should an overspeed condition occur, the pilot should reduce airspeed as quickly as possible by closing both throttles. On reaching an airspeed below 120 KIAS and above the single-engine rate-of-climb speed (blue radial), set the RPM control on the overspeeding engine for feather. If propeller will not feather, the power on the normally operating engine should be advanced to maximum and the power on the overspeeding engine should be advanced to 50 RPM below the maximum allowable RPM (red line). Maintain the best single-engine rate-of-climb speed (blue radial) and land as soon as practical. This will provide more than zero thrust at altitudes up to approximately 10,000 feet. During landing, the application of partial throttle on the malfunctioning engine (within limits of the tachometer red line) will minimize asymmetrical thrust.

ENGINE FAILURE DURING FLIGHT

1. Inoperative Engine - DETERMINE. Idle engine same side as idle foot.
2. Operative Engine - ADJUST as required.

Before Securing Inoperative Engine:

3. Fuel Flow - CHECK. If deficient, position auxiliary fuel pump switch to ON.
4. Fuel Selectors - MAIN TANKS (Feel For Detent).
5. Fuel Quantity - CHECK. Switch to opposite MAIN TANK if necessary.
6. Oil Pressure and Oil Temperature - CHECK. Shutdown engine if oil pressure is low.
7. Magneto Switches - CHECK.
8. Mixture - ADJUST until evidence of engine firing. Continue to adjust for smooth operation.

If Engine Does Not Start, Secure as Follows:

9. Inoperative Engine - SECURE.
 - a. Throttle - CLOSE.
 - b. Mixture - IDLE CUT-OFF.
 - c. Propeller - FEATHER.
 - d. Fuel Selector - OFF (Feel For Detent).
 - e. Auxiliary Fuel Pump - OFF.
 - f. Magneto Switches - OFF.
 - g. Propeller Synchrophaser - OFF (Optional System).
 - h. Alternator Switch - OFF.
 - i. Cowl Flap - CLOSE.
10. Operative Engine - ADJUST.
 - a. Power - AS REQUIRED.
 - b. Mixture - AS REQUIRED for flight altitude.
 - c. Fuel Selector - AS REQUIRED (Feel For Detent).

NOTE

Auxiliary fuel on the side of the failed engine is unusable.