

Maintain Airplane Control with One Engine Inoperative

Be prepared, know how to recover when one engine becomes inoperative during critical phases of flight

The problem

- An unexpected loss of power in one engine while flying a multiengine airplane during critical phases of flight such as during takeoff and landing has resulted in fatal accidents when the pilots did not maintain the airplane's minimum controllable airspeed (V_{mc}).
- Pilot experience in the accidents cited below has ranged from a private pilot with 765 hours total flight time and only a single-engine rating to a multiengine-rated pilot with 18,000 hours total flight time.
- These accidents demonstrate that having a multiengine rating alone may not be enough to avoid the risk of loss of aircraft control with one engine inoperative (OEI), especially if engine failure occurs during a critical phase of flight.

Related accidents

Sadly, the circumstances of each new accident are often remarkably like those of previous accidents, which suggests that some pilots are not taking advantage of lessons learned that could help them avoid making the same mistakes. The following accident descriptions illustrate some common—and preventable—scenarios related to a loss of aircraft control during OEI operation:

- Shortly after departure, the left engine of a Piper PA-31P airplane lost power. The airport tower air traffic controller reported to the commercial-rated pilot that smoke was coming from the airplane's left side and cleared the airplane to land on the nearest runway. The pilot initiated a left turn and the airplane's bank angle increased as it approached the runway; the airplane eventually impacted terrain in a nose-down, near-vertical attitude. The pilot and passenger were fatally injured. **The pilot's improper response to the OEI, including allowing airspeed to decrease and turning into the inoperative engine, led to a loss of aircraft control.** ([CEN18FA116](#))

- The multiengine-rated private pilot of a Smith Aerostar 601 airplane declared an emergency shortly after takeoff. The tower controller cleared the pilot to land on any runway before clearing him to land on runway 9R. Ground witnesses reported that the airplane was in a left bank at 400 to 800 ft agl when the left bank increased, and the nose suddenly dropped. A pilot witness described the maneuver as a stall/spin, Vmc roll, and/or snap roll. The pilot was fatally injured when the airplane collided with terrain. **The pilot's multiengine rating highlights the fact that a multiengine rating alone doesn't guarantee avoiding loss of aircraft control during OEI.** ([CEN18FA050](#))
- The single engine-rated private pilot of a Beech BE58 airplane requested to return to the airport shortly after departure because the engines were "not running right." The pilot was cleared to land, but the airplane impacted terrain about 500 ft from the runway's threshold; the pilot and four passengers were fatally injured. The distribution of the wreckage suggested a steep descent and impact attitude with little horizontal motion, consistent with a loss of control. Examination of the left engine found a catastrophic failure of the engine. **The single engine-rated pilot didn't possess a multiengine rating and likely lacked any formal training in how to recover from OEI.** ([ERA18FA046](#))
- The airline transport pilot and passenger of a Piper PA-31T were fatally injured when the airplane impacted terrain shortly after takeoff. The tower controller reported that the airplane appeared to be in a shallower-than-normal climb before it banked left and descended into terrain. Postaccident examination of the engines found that the right engine was not producing power at the time of impact. **The pilot had about 18,000 total hours of flight time at the time of the accident but was relatively new to this particular airplane, highlighting the importance of training and proficiency specific to the aircraft being flown.** ([CEN17FA266](#))
- Witnesses reported observing a portion of the multiengine-rated pilot's takeoff roll in a Cessna 421C, which they described as slower than normal; the airplane was subsequently blocked from their view. Examination of the runway environment found evidence suggesting that, during the takeoff roll, the left engine was producing partial power. About 1/2 mile from the airport, the airplane impacted trees in a left-wing, nose-low attitude, consistent with the airplane being operated below the minimum controllable airspeed. Maintenance personnel reported that, in the weeks before the accident, the airplane's left engine had been experiencing a problem that prevented it from initially producing 100 percent power. Despite attempts to correct this discrepancy, it wasn't corrected before the accident flight. **The pilot's improper decision to continue takeoff with degraded engine performance and improper response to the OEI allowed the airspeed to decrease, which led to a loss of aircraft control.** ([CEN13FA509](#))

What can pilots and mechanics do?

- **Be honest about your knowledge of OEI operations and your ability to recognize and handle an OEI situation in your airplane, especially during takeoff and other critical phases of flight.**
- **Be thoroughly familiar with the recommended procedures and checklists for OEI operations—particularly the memory checklist items—in the airplane flight manual and pilot operating handbook.**
- **Ensure that you have a multiengine rating and establish multiengine proficiency.**
- **Seek training in any new multiengine airplane model you fly to ensure that you fully understand the relationship between OEI and V_{mc} for each phase of flight and the proper recovery techniques for that airplane.**
- **Do not allow perceived operational pressures (for example, from air traffic controllers, passengers, etc.), continuation bias, or last-minute runway changes to influence your decisions to safely fly and land the airplane.**
- **Avoid distractions (for example, conversations with passengers or setting radio frequencies) and stay mentally focused when maneuvering at low altitude.**
- **Remember that a loss of one engine is a 50% loss of power, which can reduce climb performance by at least 80% to 90% and creates asymmetrical thrust. Attention and proper response to these factors are crucial to maintaining airplane control during OEI.**

Interested in more information?

- [FAA Airplane Flying Handbook FAA-H-8083-3B chapter 12](#) discusses transitioning to multiengine airplanes with an emphasis on OEI operations.
- [FAA booklet *Flying Light Twins Safely*](#) contains extensive discussion of the numerous aspects involved with OEI operations.
- [FAA Advisory Circular 90-109A](#), Transition to Unfamiliar Aircraft, discusses the importance of learning the performance and control characteristics of a new aircraft.
- The National Business Aviation Association developed a paper titled [One Engine Inoperative Takeoff Planning and Climb Performance](#) that examines the operator knowledge, application, and training issues underlying OEI takeoff planning.

The reports for the accidents referenced in this safety alert are accessible by NTSB accident number from the [Aviation Accident Database](#) link, and each accident's public docket is accessible from the [Accident Dockets](#) link for the Docket Management System.

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