Engine Failure on or Just After Takeoff

How to avoid making a bad situation worse

BY STEVE KROG

IT HAD BEEN a great Sunday so far. The sunrise was beautiful as you lifted off the runway en route to a pancake breakfast 40 minutes away. Your trusty bird purred like a satisfied kitten. The pancakes were good, coffee so-so, but conversations with fellow pilots were worth the trip. Time to head home to mow the yard before day's end.

A very quick once over while you visit with onlookers and your trusty airplane is ready to fire up and head for home. As you taxi out waving at friends and fellow pilots, your mind is already beginning to wander, distracted by all the things you need to get done before heading back to work in the morning. Power comes in, you begin your takeoff roll, and in a few seconds, you're airborne. Holding runway heading you pull the nose up just a bit to let the onlookers know you've got a great-performing airplane clawing toward 500 feet AGL.

After takeoff and until reaching at least 300–400 feet, the safe landing option is straight ahead or approximately 30 degrees left or right of straight ahead.

Research has proven, using a simulator, that it takes an alert pilot a minimum of four seconds to act after the engine quits. Without forethought, it takes twice that amount of time, or longer.

Seconds later everything is totally silent! What happened? The hot flash of panic has already overtaken your body. For several seconds, you sit in disbelief experiencing a serious case of brain freeze. Fuel gauges look normal. Five more seconds have passed. Your airspeed has dropped almost instantly from V_X to stall speed. Panic begins to subside. Oh yeah, push the nose over. Don't let it stall. Your mind is working in slow motion as you decide to initiate a left turn back to the airport. Then you realize it's going to take at least a 240-degree turn rather than a 180-degree turn to align with the runway. You hesitate, increasing your bank angle so, without realizing it, your left foot pushes hard against the left rudder creating a cross-controlled skidding turn. While executing the turn you allow the nose to come up a few degrees to "stretch" the glide hoping to make the runway.

Buzz, shudder, shudder, and bang! Then everything is truly silent. What happened?

Unfortunately, this scenario plays out from time to time among general aviation pleasure flying pilots. Some refer to the situation as lack of action or inaction taken after losing power on takeoff, or lack of situational awareness, while other aviators might refer to it as pilot "vapor lock" between the ears. The NTSB calls it pilot error.

Situations like this are rare, but they do occur. If prepared, pilot, passenger, and airplane return safely to the ground, or at the very least, the pilot and passengers are unharmed but the aircraft is damaged.

Based on my experience, observations, and reference book research, I've found the subject of loss of power on takeoff doesn't receive the attention it truly deserves. Consequently, most pilots are ill-prepared should the situation occur. Without practice, by the time one recognizes a serious problem is occurring, the best solution is no longer an option.

Research has proven, using a simulator, that it takes an alert pilot a minimum of four seconds to act after the engine quits. Without forethought, it takes twice that amount of time, or longer. Suspended in a silent airplane with the nose in the best angle of climb attitude dissipates both airspeed and altitude rapidly. Delay the correct inputs even longer and a critical situation now becomes dangerous, placing life and limb at risk.

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If turning back to the runway is attempted, the turn requires an approximate 240-degree turn. Without more than adequate altitude, the approach will generally come up short.

I employ several exercises when checking out pilots in an airplane in which they have little or no familiarity. Climb to a safe altitude of at least 2,000 feet AGL. Then align the aircraft with a road (simulating a runway) and initiate a takeoff/climb-out procedure and attitude. Reduce the power to idle but continue maintaining the climb-out attitude, and keep track of and record the time it takes for the airplane to slow to stall speed. Within eight to 10 seconds the stall warning begins to activate. With the engine remaining at idle, lower the nose and establish a stall recovery attitude until the indicated airspeed registers at least 15 mph above stall speed. Note the amount of altitude loss from the time the power was reduced until reaching this airspeed and return to level cruise flight.

Now repeat the exercise, but this time add a medium or 30-degree bank to the left simulating a pattern turnout and note times and altitude loss.

When I work with students, I like to challenge them but in a safe manner. On nearly every takeoff for the first two or three hours in the traffic pattern, I play the "what if" game: What if the engine quits now, where would you go, and what would you do? Then about every fourth time I reduce the power to idle simulating engine loss somewhere in the traffic pattern and have the student follow through on executing a forced landing based on the decision he or she made.

This practice quickly becomes a great eye-opener and a learning tool. Some of the choices made by the students are less than satisfactory, and by using this training procedure they see why a decision made wasn't a good decision.

Three of the general rules of thumb I teach and practice during pattern flight training include:

Once airborne on the takeoff, should the engine quit, the landing option is straight ahead on runway heading or no more than 30 degrees left or right of runway heading.

After reaching 300-400 feet AGL but still climbing to a desired 500 feet AGL on runway heading, landing options expand to include 90 degrees left or right of the runway heading should the engine fail.

Turning back to the runway is *not* an option.

Should a student attempt turning back to the runway, I'll let them proceed to a point while I monitor airspeed, altitude, coordination, and their actions. As a safety measure, I have all students lower the nose for a traffic check when reaching 500 feet AGL. As they do so, I will pull the power and observe as well as ask questions. The first two or three times I surprise them, it usually takes the predicted eight to 10 seconds before they take any action. By the time their brain has kicked in, the nose lowered, and the turn initiated, the altitude loss is approximately 200 feet. Students quickly realize the attempted return to the runway was not a good decision and that it is all but impossible to reach the runway.

After attempting this several times, I'll have students leave the pattern, climb to a safe altitude of 2,000 feet AGL, align the aircraft with a road to simulate a runway, and establish a full-power climb attitude. Noting the altitude, power is reduced to idle and a 180-degree turn attempted, which actually becomes about a 240-degree turn. Once realigned with the road, note the altitude. Seldom can this simulated return to the runway demonstration be completed without a loss of more than 500 feet. This exercise helps reinforce the idea that returning to the runway is neither a good nor safe idea, especially when there is less than 500 feet of altitude with which to work.

When I fly with students, they become accustomed to the idea that the engine can be quite "faulty" at most any point in the flight, and the "faults" often repeat themselves in an hour flight. I believe this helps drive home the point that even a good engine can fail, and it is wise to consciously be aware of the surroundings and the actions it would take to get back on the ground safely.

Dual cross-country flights are also a great learning experience, not only for navigating but also for practicing forced landings. Every few minutes I like to ask a student the question, "If the engine quit right now, where would you go?" This exercise helps instill in the student the need to always be aware of the topographical features over which they are flying.

It is very easy for pilots to become overly confident in their trusty pleasure flying airplane as they are very dependable if maintained properly. This overconfidence prevents pilots from playing the "what if" game leading to brain freeze and a potentially hazardous landing should a problem ever occur.

Practice keeps us all safe and sharp. EAA

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Author's Note: *Some may not agree with all of my statements and/practices. They are based on my flight-training experiences over four decades. There are also many makes and models of aircraft we fly, and not all fly alike. It may be necessary for you to determine your own numbers for safe operation should you experience a loss of power on takeoff.*

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