SUDDENLY SINGLE

An engine failure procedure based on simplicity and airplane control

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When an engine quits and you sit there with only one running, what do you do?

Every pilot has probably seen statistics showing conventional twins are more dangerous in terms of casualties than single-engine airplanes after a powerplant packs up. A number of factors probably contribute to this—lack of planning for the eventuality of losing an engine is certainly a key one.

An engine failure under high density altitude and heavy weight conditions in most light twins is, at best, just a noisier glide and a higher energy encounter with terra firma than would have occurred with a single.

The first problem confronting the pilot is how to keep the airplane under control after an engine fails and clean up the mess. It's a safe bet nothing good is going to happen until stable flight in the best configuration for the situation has been established.

The only way to be assured that you master such a situation is to have a simple, general engine failure procedure firmly in mind ready for immediate use. Long checklist procedures are fine after things are under control, but they vary from airplane to airplane and are hard to commit to memory anyway. Right after an engine failure is the time to fly . . . not read.

To be effective, a general rule must work in almost any airplane so only one has to be learned; it must be easy to recall and execute so it can penetrate the moment of panic following an unexpected power loss. The very presence of a course of action in that kind of situation is one of the best panic-fighting weapons. All the manufacturer's recommendations in the world, painstakingly memorized from a handbook, won't help if your mind can't tear them loose from the butterflies in your stomach.

In line, then, here's one way to do it:

First, the procedure. Then some explanation. When an engine quits,

Center the ball
Climb
Clean it up
Close the throttle
Cage the engine

Then,

Raise the dead.

The simple terminology makes the procedure easy to recall. The rationale for the steps, and for their sequence, is follows:

Center the ball. This important first step is temporary. First, it identifies the dead engine by forcing your eyes to go immediately to the turn and slip indicator when the engine quits. With most turn needle instruments, unless the airplane happens to be in a hefty turn when the failure occurs, first indication of the engine that has failed is instantaneous—the needle is pointing toward it. Now, see where the ball is and step on it using as much boot as necessary to center it.

This will do two things. If the airplane was in level flight when the engine quit, rudder application will correct most of the initial heading deviation. And if you are in a turn, it will positively identify the dead engine. You may not believe it until you have done it, but it is quite easy when in a turn to stomp on the wrong rudder pedal and consequently misidentify the dead engine if you rely on the seat of your pants.

The best way to prove to yourself how well this technique works is to try it, preferably under the hood. Close a mixture or throttle back an engine suddenly (whichever is the recommended procedure for the airplane) and experiment with just this first step of the procedure before restoring power. You'll become a believer.

Climb. With the ball freshly centered, the airplane will be nearly wings-level or in a controlled turn, from which it is best to roll out as quickly as possible. Establish the proper attitude for best single-engine climb.

In most light twins, about 6 degrees nose up is a good place to start. If the nose is high, lower it. If low, raise it. *Do it.* Learn what this attitude is and how to recognize it on the attitude gyro as well as visually.

Above all, avoid snatching back on the yoke. This instinctive reaction, a sort of knee jerk to avoid the ground, is all wrong. If you have done it, deliberately checking the attitude and setting it where it should be will undo much of the damage. Simultaneously move the levers to full power. In training, do it in the proper order. In an actual failure, unless you have some special feature like a supercharger with no overpressure relief valve, don't worry about it. Just cram them up there. You may want to omit or modify this part of the procedure if the failure occurs in a noncritical flight regime.

In some airplanes, an advantage can also be had by exchanging the order of the Climb and Clean-it-up parts of the procedure. Notice that, up to this point, your eyes have been directed entirely to information required to control the airplane, first to the turn and slip indicator and then to the attitude indicator. This can prevent fixation on the engine and involuntarily pulling the nose up, both of which are deadly.

Clean it up. Go to the gear and flap switches and move them to the up position. *Always* do this step. If the gear and flaps are already up, fine. You have only lost a second or so, and this won't hurt you. *Deliberate, correct* execution of the procedure is far more important than lightning speed. If your best-single-engine-climb configuration is something other than flaps up, this position should be selected. In this case, you might want to change the nomenclature from "Clean-it-up" to "Configure." It's still easily recalled.

Close the throttle. One of your feet is busy keeping the ball centered. The other one is free. Pick the free one up and tap it. That will help make the mental connection to which side the failed engine is on. Then take that throttle and close it.

Cage the engine. If the previous steps were done correctly, nothing happened when the throttle was closed. (If it got quiet, of course, open that throttle and close the other one to make it noisy again.) Now, *deliberately* pull the prop control to feather and the mixture or fuel control to cutoff on the same side.

It takes just a few seconds to execute these procedures with care and without undue haste. The result is a situation that is no worse than when the engine quit as far as altitude and speed are concerned.

Raise the dead. Engine, that is. Centering the ball has served its purpose, and it's time to abandon it. Generally speaking, a twin with an engine out requires more power to maintain altitude in straight flight with the wings level than it does in a slight bank, holding heading in a slip with the ball toward the low wing. A 5° bank was probably used during flight testing to determine the airplane's engine-out climb performance. Reading the fine print in the performance charts will usually verify this. Under marginal conditions, it can easily be the difference between climbing and not climbing.

At this point, everything that is necessary and possible has been done to keep the airplane under control and climbing. Relieve control pressures with trim, and the situation will now sort itself out. If the airplane is operated with due allowance in weight and density altitude for the possibility that an engine might decide to quit, the actual emergency will be quickly over. It is now possible to go to the checklist, shut off pumps, shed electrical loads, and do all the other general tidying up.

Once the basic procedure has been considered and thoroughly committed to memory, some modifications for special situations can be considered. The first one, taken in the order of the steps, is in the Climb procedure. If the failure has occurred in a normal cruise condition, there is no need for sudden power changes.

The Center-the-ball step will have identified the dead engine. If it has not obviously self-destructed, it may be possible to get it running again. If you have a good and handy checklist for this situation, use it. If not, here's another device; the FAIR check. An engine needs four things to run—Fuel, Air, Ignition and Rotation. If the fire is out, one element is missing or deficient. If the engine is not rotating after an in-flight failure, it is probably a basket case. If it is, one of the remaining three things is at fault. Under the heading of fuel, check pressure or flow indication, fuel selector positions and pump status. If you have a sump drain operable from inside the cockpit, you may want to try that. Also try carburetor heat or alternate air. Check and recycle ignition switches. Then, if nothing has worked, proceed with the shutdown.

"You can't search or fumble if an engine decides to go to lunch on takeoff or during a go-around"

In some airplanes, it may be desirable to do the Clean-it-up step before the Climb step. For example, if gear doors open and add drag during retraction, or if retraction is slow, or if the speed of gear or flap movement may depend on a hydraulic pump that will die when the engine is feathered, it may be best to start the reconfiguration right away. Analyze the airplane(s) you usually fly to determine which order the Clean-it-up and Climb procedures should be in, and learn them that way. *Don't try to learn them both ways.*

The Close-the-throttle step can be refined just a bit. If an engine should quit under a low-power condition, such as during an approach, closing the throttle may not positively confirm that this is indeed the dead engine. In this case, cycle the throttle forward and then back. If the situation is critical and the Climb procedure has already been completed, the throttle is already forward.

One remark about the Cage-the-engine procedure is in order. Most propellers on multi-engine airplanes are designed to go to the feather position if oil pressure is lost. The hubs contain latches that keep the blades from feathering on the ground when the engine is shut down. These latches withdraw due to centrifugal force as the rpm is increased from idle, allowing the feathering mechanism to operate. If an engine has failed with enough commotion to leave no doubt as to which one it is, and if it may be starting to seize, feather it immediately. Otherwise, if it slows down too much before the oil pressure goes away in the hub, the latches will engage and the prop will not feather.

So much for the refinements. The important thing, is to learn the procedure so thoroughly that you can recall it when you need it. Practice it at odd times. Take a second and run through it out loud when waiting for a traffic light, or watching a TV commercial, or whenever. Very importantly, practice it in the airplane you fly.

In that regard, here's the good news. About 95% of the benefit of the practice can be had absolutely free, sitting in the airplane on the ground. Have someone punch a rudder pedal down, or even punch one down yourself, and dry fly the procedure from there. Hold the pedal down, say "Center the ball" out loud, and look at the turn-and-slip indicator. Say "Climb," move your eyes to the attitude indicator and push the levers to the full power position in the correct order. Say "Clean it up" or "Configure," touch the gear handle and move the flap switch to the proper position. Say "Close the throttle," tap your free foot and do it. Say "Cage the engine," and move the levers. Say "Raise the dead," move your eyes back to the attitude indicator and your hand to the trim tabs.

Practice until your eyes and hands go smoothly and consistently to the right places. Put the levers in typical flight positions before you start and check them after each repetition of the exercise for correct position.

Speed is not overpoweringly important, but accuracy is. You can't search or fumble if one engine decides to go to lunch right after takeoff or at the beginning of a go-around with gear and flaps hanging.

May you never lose an engine on any airplane, but if you ever do in a twin, may you know what to do and do it. Wishing won't hack it. Forethought and practice will. □