

Mastering No-Power Approaches

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"What's that?" you wonder, as your back straightens and your ears come to attention. The engine coughs and continues to cough, spitting and hesitating before, suddenly, it dies and all goes eerily quiet. You pitch for best glide, run through your flows, read the checklists, but the engine refuses to restart. It has just become very real. What started as a simple powered flight has turned into an unplanned adventure in flying a really bad glider, a journey that no sane pilot wants to make.

With no power and no go-around opportunities available, you have only one attempt to make a successful landing. "Let's face it: The first time you have an engine failure, your heart is going to be in your throat," retired space shuttle commander Robert "Hoot" Gibson says. But the only way this flight will end happily is if you can stay calm. The only way you can stay calm is by saying to yourself: "I've got this." And you can only gain the confidence and the skills required to honestly say those words if you have practiced no-power approaches to proficiency.

Ultimate No-Power Approach

The ultimate no-power approaches were done by space shuttle pilots such as Gibson. The space shuttle would begin its long glide to the ground bursting into the atmosphere at about 400,000 feet. While the re-entry was completely smooth, Gibson says, the shuttle would be surrounded by fire until it slowed to 10,000 feet per second (more than 5,900 knots). A mistake had the potential to destroy a multimillion-dollar piece of equipment and end the lives of those inside it. No doubt, the stakes were high.

Because of the precision involved with this no-power approach, an incredible amount of training was required of the shuttle commander and copilot. Countless hours in a simulator were not enough. The commander would have to complete at least 1,000 no-power approaches in NASA's Gulfstream II, which had been modified by Grumman to simulate the response of a space shuttle, Gibson says.

Despite his extensive training with no-power approaches as an astronaut, Gibson has not stopped practicing. "I practice a dead-stick landing every time I fly my Cassutt," Gibson says. He has had his share of emergency approaches while racing at the Reno Air Races. With the rough terrain in the brushy Sierra Nevada foothills desert land, "your chances of survival are very slim if you don't put it on a runway," Gibson says.

Preparing for the Unthinkable

Even though we know engines sometimes quit, it is rare for us pilots to practice approaches at idle power. The optimism is not unreasonable because, if you take care of your engine and use your airplane only as a mode of transportation, the chance of having an engine failure is very small. "With 24,000 hours plus with the majority of it being in piston engine airplanes, I've never had an engine failure," says Kirby Ortega, a highly experienced instructor and designated pilot examiner who worked for Cessna for more than 30 years, most recently as the chief pilot for piston engine airplanes.

While emergency approaches are required for the Private Pilot certificate, it is not until you apply for the Commercial certificate that you need to demonstrate your ability to land without engine power with precision. The power-off, 180-degree accuracy approach and landing was added to the Commercial Pilot Practical Test Standards in 2002. It requires the applicant to fly from an altitude 1,000 feet agl or less on downwind to a preselected point on the runway or no more than 200 feet beyond that point at idle power. This is a good maneuver for any pilot to practice, and there is no question that it is a tough one to get right.

"I had a young guy the other day doing a commercial check ride and he missed it twice," Ortega says. "Part of it was because he wasn't factoring in the winds enough."

While challenging, the ability to consistently complete a successful no-power approach is definitely achievable. Glider pilots make one every time they fly.

While you may never experience a true emergency, the day you do you will thank yourself for practicing dead-stick landings in various conditions.

"I would rather have a skill that I don't need than need a skill that I don't have," says Bruce Bohannon, a flight instructor out of Angleton, Texas, who specializes in teaching upset recovery training and no-power approaches. Bohannon is likely one of the most experienced flight instructors in the world when it comes to real-life emergencies. He has lost count of the number of actual engine failures he has experienced through his years of crop-dusting, racing at the Reno Air Races and pushing airplanes to the max in attempts to break altitude records in the Exxon Flyin' Tiger.

During a record attempt at Sun 'n Fun one year, Bohannon blew up the engine in the stunt plane, based on a highly modified Van's RV-4. "Piston rings came out of the engine and landed on the baffling. It was trash," Bohannon says. "The airplane was absolutely covered in oil. But when I got to my key position I relaxed. I knew what to do. I had practiced it a gazillion times."

In case you were to lose your engine, you have likely been taught to fly at best glide speed, which will maximize your time aloft, target a point on the runway or an off-airport landing site, and circle to land at that spot. While this may result in a successful landing, there are other techniques that may have more predictable results.

You should absolutely target the best glide speed as soon as you lose power to give yourself the maximum amount of time to troubleshoot and get to the perfect spot for landing. It is once you get closer to the landing area that things can become more interesting.

Rather than target the runway itself, glider pilots are taught to target an initial point (IP), a visual reference point from which to begin the final approach. The IP may be over the glider port or at a location near or in the traffic pattern. "I emphasize always starting the pattern at exactly one position and height, since the pattern itself has to be improvised," says Dale Masters, an instructor at the Southern California Soaring Academy. The improvisation Masters refers to is the adjustment required for the current wind conditions. "The nationally approved method is TLAR for That Looks About Right," Masters jokes.

Keys to Success

There is a method to the madness. Rather than using the best glide speed once in the pattern, Masters teaches to use the best glide speed plus half the headwind on final. (You should, of course, always attempt to land into the wind.) Any excess speed or altitude can be bled off using spoilers, flaps, dive brakes or a forward slip.



In a procedure similar to the IP concept, the military uses key positions. "You have a high key position, right over the approach end of the runway, where you're going to be making a constant 360-degree turn," Gibson says. "The 180-degree position is called low key, and that is probably going to be 1,200 to 1,500 feet. You need to know what your high key altitude is

and what your low key altitude is for your particular airplane because, if you're headed to a runway and you get yourself down to an altitude that is below high key, you know you can't make a whole 360-degree turn. In that case you have to drive to your low key position."

The only way you can know the numbers to target for high and low key is through practice or by flying with an instructor who is familiar with no-power landings in your airplane type. Bohannon recommends that you find out the minimum altitude you can lose during a 180-degree turn with no power and then double that altitude for a comfortable altitude to start from abeam the runway on downwind. While in many airplanes that number may be 1,000 or 1,200 feet, in the Pitts, Bohannon says, it is 2,000 because its wing produces so little lift.

Bohannon jokes that a good glideslope indicator in a Pitts during an engine failure is a brick. "We all carry them," he says. "If the engine quits you throw it out and follow it, because that's about your best glide angle."

There are many factors that affect your glide ratio. If you fly an airplane with a constant-speed propeller, you may be surprised at the amount of drag produced by the high-pitch angle of the propeller with the power at idle and how bringing the prop control back will affect your glide range.

You should also know how much drag the landing gear and flaps will add. In many cases, the first notch or two of flaps adds more lift than drag. Bohannon recommends playing around with the best configuration at the key position — likely one or two notches of flaps and landing gear down — so that your main focus can remain on getting the airplane to the targeted landing spot. Whatever the configuration you choose, you should always use it consistently during practice so that you have predictable results.

Another factor to consider with higher-powered airplanes, particularly if you lose the engine during the climb, is that you may need to lower the nose quickly to get to the best glide speed and away from the stall. You lose airspeed quickly once all that power is gone.

While you should target the best glide speed initially, it may not be the optimal once you get closer to the ground. "I would not ever use my best glide speed as the approach speed because you have no options if you're short," Bohannon says. "If I use 15 to 20 mph over my best glide speed in the circle to land, it keeps me a lot closer to the runway because I'm diving down and turning in a smaller radius than if I slowed the airplane to best glide and tried to do a circle to land based on that." With a strong wind, Bohannon contends, you may not make it to the runway.

Also, seeing that you may end up short, you may be tempted to raise the nose. "It makes you feel good for one second and then you start sinking faster," Bohannon says. It is an evil start of a cycle that has resulted in many pilots landing short of the runway and even stalling the airplane with devastating outcomes.

With a few extra knots in the bank, you can trade speed for altitude if you get low. And if you need to bleed off speed or altitude, there are many options. You can add flaps, bring the prop forward, add speedbrakes (if available) or slip or skid the airplane.

In the Cub Bohannon uses for teaching, the approach speed is 60 mph. "On a no-wind day, we're doing 60 over the ground," he says, "but that same day with 15 miles of wind I'm only going 45 miles per hour. That's 25 percent longer to descend, which means I'm going to hit the ground way sooner in that wind. The time doesn't change. It's how far you go during that time."

If there is a lot of wind, you need to give yourself even more of a margin. You may want to increase your approach speed a few more knots, but you should also either make a shorter radius turn to the runway or set yourself up at a higher key position on a high-wind day.

Crosswind components are also important to take into consideration because they have the potential to create very dangerous situations during the base-to-final turn that has ended the lives of far too many pilots.

With a tailwind on base, the tendency is to fly past the centerline, steepen the bank, add rudder into the turn and, if you're low, pull back on the stick. It is the perfect setup for a snap roll, which is impossible to recover from at such a low altitude. Instead, turn early! The wind will drift you to the runway centerline. Slip by pushing rudder opposite to the turn to slow down.

However, with a headwind component on base you don't want to slip. As you turn you have the wing into the wind up. Since you need to transition that wing to down once aligned with centerline, you may fly through the centerline in this situation. If you need to dissipate speed, skid the turn.

Since conditions are always changing, you have to use the TLAR method Masters mentioned. Unless there is a mountain at the end of the runway, it is better to land a little long than a little short. "Very few people get killed overshooting the runway," Bohannon says.

Another mistake pilots make is trying to save their airplanes instead of minimizing the impact to save their own lives. You shouldn't worry too much about damaging the airplane. If you need to skid the airplane sideways or put the gear up to prevent going off the end of the runway, do it.



Since the most critical phase of the no-power approach is the segment from the low key position to the runway, it is worth practicing these procedures in the pattern as often as you can. "You can practice this any time you've got a pattern with nobody in front of you," Bohannon says. "It's absolutely free! And it's fun." And since you are already in the pattern, shock cooling should not be a concern, which is one excuse pilots give for not practicing no-power approaches, Ortega says.

Learning to execute precision landings without power is no mystery. Glider pilots do it every time they fly using a number of tried-and-true techniques.

You may never have the displeasure of experiencing a real engine failure, but if you do, you will be happy you practiced no-power approaches. Bohannon claims that, at the end of his course, he shuts down his Cub's engine completely and lets his students dead-stick the airplane all the way to the ground. "And after they've done two or three of those they leave here going, 'This is really easy.' And that's the key to this; you practice it until it's easy," he says.