# ON THE NUMBERS

## 500 FEET, 3 DEGREES, AND OTHER SECRETS TO A STABLE APPROACH

*Flighttraining*

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**A** few years ago, I got a call from one of my foreign students who was training for his commercial certificate in the United States. His English was slightly broken, but we mostly understood each other. He wanted to tell me about his latest flying adventure—one that got a little more exciting than he had planned. He said that he had rented my airplane (I owned a Cessna 172 and leased it back to the school) to get in some night landings.

“I have bad news. Your nosewheel is gone,” he said matter-of-factly.

“You mean that it’s flat?”

“No, it’s missing.” His voice grew more urgent. “I cannot find it.”

At this point, I was getting a little worried, but hoping I had misunderstood him.

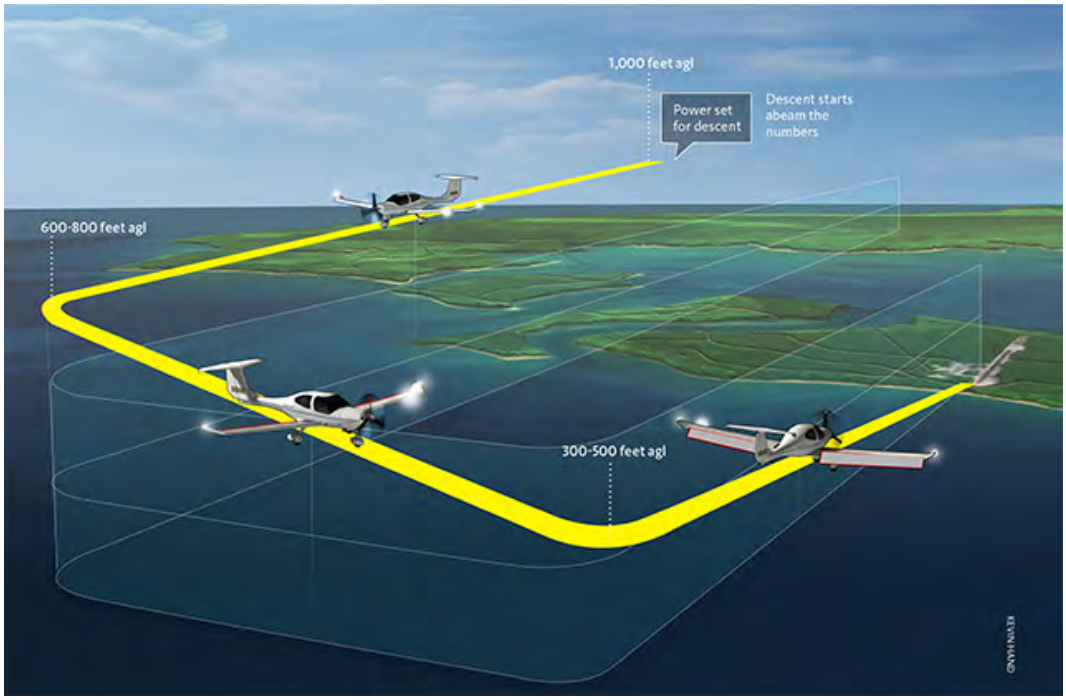
When he was coming in for his first landing, he said, the four white lights of the precision approach path indicator (PAPI) signaled that he was too high. He attempted to salvage the approach by setting up a high rate of descent. However, the ground came up faster than he had anticipated. The pilot ended up landing hard, nose first, before bouncing and finally settling down on the runway again.

But something did not feel right on the deceleration. It was not until the propeller struck the runway and the airplane came to rest nose low that he realized the nosewheel had been torn

off in the botched landing. Thankfully, he walked away from the accident with nothing but a bruised ego and a renewed respect for the stabilized approach. My airplane was not so lucky. It ended up with a damaged prop and bent firewall, and was a total loss.

This pilot was not the first to try to salvage a botched approach. We all have done it using varying techniques: pulling the power to idle, extending all of the flaps earlier than normal, and maybe a forward slip for good measure. These are commonly accepted techniques for losing excess altitude without increasing airspeed on final. Most of the time, we're able to pull it off with nothing more than an increased heart rate and maybe a firm touchdown. But when does a high approach become an unstable approach? An unsafe approach?

A stabilized approach may not be exciting, but it's safe. In Advisory Circular 91-79A, the FAA says a stable approach has four main characteristics. By 1,000 feet above field elevation for an instrument approach or 500 feet agl for a visual approach, the aircraft must be:




**1. IN LANDING CONFIGURATION.** This means that flaps and gear (if they're retractable) must be extended and the before-landing checklist has been completed. In other words, you are finished flipping switches and free to focus more attention outside the aircraft.

**2. ON GLIDESLOPE.** A typical approach follows a 3-degree descent angle. If you're flying an instrument approach, this means that the glideslope needle is not deflected more than one dot on the CDI. For a visual approach, that would mean a red over white visual approach slope indicator or two red and two white lights on the PAPI. With no visual approach aids, keep the runway in the same relative position in the windscreen. It should not move up or down, but only grow larger.

**3. MAINTAINING A NORMAL DESCENT RATE.** This one is a little less clear. Most industry leaders agree that a 500- to 700-feet-per-minute rate of descent would be considered normal, depending on your groundspeed. Any descent in excess of 1,000 fpm is unstable, although it may be called for in special cases such as a cockpit fire, loss of cabin pressurization at high altitudes, or other emergencies.

**4. ON APPROACH SPEED.** This means that you are flying at or within five knots of the manufacturer-recommended approach speed (or, if none is given, 1.3 VSO). Certain situations, such as gusty winds, call for higher approach speeds. Just make sure you have extra runway distance available to account for the longer landing roll.

While these stable approach criteria may sound simple, they're not always easy to accomplish. I teach my students to get in the habit of flying the traffic pattern the same way every time. During cruise, spend some time calculating when to begin your descent in order to arrive at traffic pattern altitude in plenty of time to slow down during the level-off. Also, whenever possible, try to enter the pattern on the downwind leg. While it may be tempting to enter on base at nontowered fields, you may be setting yourself up for an unstable approach.

As for airspeed, in most light general aviation aircraft, I teach to fly the downwind leg no more than 20 knots over your final approach speed. Then, as power is reduced and flaps or landing gear extended, the airspeed will naturally decrease about 10 knots per leg.

You should also find your rhythm for gear and flap extension. Extend these at the same point in the pattern every time. Many instructors teach configuration changes abeam the touchdown point on downwind, on base leg, and once established on final approach. A good rule of thumb for instrument approaches is to extend the landing gear (if retractable) and 10 degrees of flaps just prior to the final approach fix on an instrument approach.

As your approaches start to look consistent, your landings will as well. Remember, you should only need minor pitch or power changes to keep the descent rate constant. If you are making large corrections, that could be a sign that you are flying an unstable approach.

What will happen if you do not meet all of these requirements and yet still continue the approach and landing? To be honest, probably nothing—at least for a while. The vast majority of unstable approaches turn into uneventful landings. Therein lies the problem. If you continue getting away with it, you gain confidence in your ability to push the limits, and the line begins to blur between what is safe and what is unsafe.

If you fly long enough, you eventually will find yourself with a set of circumstances that will render a far more exciting landing than you had planned. In the case of the pilot who rented my airplane, the nighttime darkness affected his perception of height above the runway, leading to the hard landing. Maybe for you, the circumstances will be high winds, low visibility, or a wet runway. Whatever the situation, you could be facing a hard landing, tail strike, runway overrun, or even an incident or accident.

The solution to avoiding any of these undesirable circumstances is deceptively simple: Go around. We all know it's the proper thing to do when faced with an unstable approach, but not

many of us actually do it. The Flight Safety Foundation determined that 97 percent of commercial aircrews will continue an unstable approach and land rather than go around. The same holds true for general aviation. Most of us will resort to drastic flying measures rather than abort the approach. We, the flying community, need to change our way of thinking.

Instead of adding undue excitement by attempting to rescue an unstable approach or stick a rough landing, why not challenge ourselves to make a stable approach every time? Better yet, let’s learn to take pride in the decision to go around if conditions aren’t right for a stable approach. It is no easy feat to be in the landing configuration and on target airspeed and descent rate for every approach, but it is a goal worth working toward. It will require planning and a commitment to safety. It will mean caution and conservative flying. It may not be thrilling, but it's safe.