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BETTER PILOT / STICK & RUDDER



Gear-up Landings

And how to avoid them

IT WAS A SUNDAY in April 2009 when the private pilot of a retractable-gear (RG) Cessna 172 was practicing a power-off, 180-degree accuracy landing at Charleston, South Carolina, with one passenger aboard. The idea was to make a simulated engine-out approach and maneuver to a touchdown point on the runway. In a retractable-gear aircraft, the pilot often delays extending the landing gear until a landing on the runway is assured. In an actual emergency, the pilot would have to choose whether to extend the landing gear at all or to land gear-up.

No doubt, the pilot had every intention of extending the gear, but a distraction occurred. As he pulled back the power and started

down, another aircraft was approaching an intersecting runway. Thus distracted, the RG pilot soon found himself in an abnormal situation—on short final without the gear extended. Unfortunately, it was one that he failed to recognize and correct. According to the pilot's statement to the National Transportation Safety Board (NTSB), he never noticed the landing gear warning horn until the aircraft came to a stop gear-up on the tarmac.

They say there are only two kinds of retractable-gear pilots: those who have landed gear-up, and those who will. This tongue-in-cheek comment reminds us that unintended gear-up landings are easier to commit than we might realize. When situations occur that distract us from our normal routine, it's easy to end the flight with an unplanned "short-field landing."

ROUTINE PROCEDURES

Checklists are the first line of defense against gear-up landings, but routines can help as well. If we're in the routine of always putting the gear down at the same point in a flight, then we're less likely to miss or forget that step. If we use landing gear extension as a tool for controlling the aircraft, we're even less likely to forget.

For instrument pilots, the landing gear is often used as a tool to initiate descent on an approach. For example, many pilots will slow the plane down to an approach speed in level flight, and then extend the landing gear to initiate a descent. In most light aircraft, the landing gear adds just enough drag to depart level flight and start down a standard 3-degree glide slope without touching the throttle. Even on a non-precision approach, many instrument pilots will configure the airplane for level flight, and then extend the gear to initiate a descent.

For other pilots, the standard procedure is to extend the landing gear on the downwind leg as they complete their pre-landing checklist. Keep in mind that at busier airports (towered or non-towered), distractions can abound once we've entered the pattern, and the prospects of distraction are heightened. For that reason, we might consider completing the pre-landing check before entering the pattern.

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Regardless of the specific procedures we apply, we should give ourselves at least two or three chances to get the gear down. The pre-landing check is an obvious necessity, but a pre-landing, over-the-fence reminder could be the ticket to saving the day. If we make it a habit to always check fuel and gear on final, we increase the odds of a safe arrival.

MANAGING MURPHY

While distractions and incomplete pre-landing checklists are a common cause of gear-up landings, Murphy's Law often comes into play. Any number of events and conditions, including electrical problems, mechanical failures, and even environmental conditions such as frozen slush, can conspire against gear extension.

Consider the case of a Lancair 360 pilot who was attempting to land at Felts Field (SFF) in Spokane, Washington, one morning this past July. According to the NTSB report, the pilot had experienced an electrical problem and wasn't certain whether his gear was down and locked. On short final, the tower told him to "go around" because another aircraft was on the active runway.

Still uncertain about his gear as he came around the patch a second time, the Lancair pilot opted for a low approach "to feel if the gear would touch the runway." Not feeling it touch, he made a second go-around.

Murphy's Law was now in full force. The electrical system had now completely failed,

and without a radio, the pilot had no way to communicate with the tower or get further assistance. The mechanical situation was deteriorating as well. For some reason, the aircraft tended to bank left at high power, so the pilot was forced to fly the pattern with reduced power and could climb to only 500 feet above ground level. He approached the runway for a third time, now at low power and low airspeed. The aircraft stalled on short final and slammed into the ground about 100 feet short of the runway. Fortunately, the pilot suffered only minor injuries, but the aircraft sustained substantial damage. The cause of the accident is still under investigation.

DEALING WITH LANDING GEAR EMERGENCIES

So what do we do when the gear won't work right? The answer depends on the situation, so let's look at a few scenarios and see how they might play out.

Time, altitude, and fuel permitting, the first thing to do is troubleshoot the system, beginning with the circuit breakers for the gear motor. If that doesn't solve the problem, get out the checklist and follow the emergency landing gear extension procedure. If the aircraft is equipped with mirrors that allow you to see the gear, take a good, hard look. Finally, if you can't resolve the problem yourself, get on the radio and get some help. Try contacting a local fixed base operator or maintenance facility where a knowledgeable mechanic may be able to provide additional insight and input.

Once we've come to the realization that the gear isn't going to work, we have to make some tough choices. Let's say for example that we can get only one of the main gear down, plus the nose wheel. Do we attempt a landing with the two gear down and locked,

SEVEN Steps to Avoid Gear-Up Landings

1. Make a thorough preflight inspection of the aircraft's landing gear system. Look for leaking actuators, improperly rigged mechanisms, bent doors and rods, rub marks, and other signs that point to potential problems.
2. When operating in cold temperatures with wet, snowy, or slushy runway conditions, delay bringing up the gear or cycle the gear up, down, and then up again. This can help remove moisture, snow, and slush accumulations that can freeze the gear in the up position.
3. Tap on the brakes before bringing the gear up to stop the wheels from rotating before they enter the gear wells. For tight-fitting gear wells, this can sometimes prevent the gear from jamming.
4. A mirror installed on the strut of a high-wing aircraft can help us get a look at the gear when its status is in question.
5. Back up the before-landing checklist with a quick over-the-fence gear check. A memory jogger such as "Mixture, prop, gear locked!" can be a handy reminder.
6. If a gear problem develops, go to the checklist and follow the emergency landing gear extension procedures. Get help from a passenger or use the autopilot or wing-leveler to help with the workload.
7. If the emergency landing gear extension procedures don't resolve the problem, get on the radio and ask for help from a mechanic or knowledgeable builder/owner.

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and the third up or dangling? Remember that the objective is to maintain control of the aircraft until it comes to a stop, so we need to determine which configuration will provide the most control. If the gear-down configuration causes us to veer off the runway, catch a wingtip, or plow the nose in and flip over, then we should carefully consider the gear-up option. In many cases, we may be better off making a landing in the clean configuration, even if one gear leg is hanging down. The weight of the aircraft will likely collapse the dangling gear, and we're more likely to maintain control on the belly than on one wheel and a skidding wingtip.

More choices come when we consider the airport and runway to use. In general, we should opt for an airport where emergency services are available. In some cases, we might also have a choice between grass and pavement. Some pilots might think that the chances of a fire are less when landing on the grass, but there are other factors as well. If the grass is rough, bumpy, or water-soaked, the aircraft might be likely to dig in and take a tumble. In that case, the pavement might be a safer option.

Another tack that some pilots take is trying to free stuck landing gear by performing high-g maneuvers or bouncing on the runway on the good (down and locked) gear. Sometimes a rapid pull-up will release a stuck gear, so if conditions permit, we might give that option a try. Bouncing on the runway might work, too, but the inherent risk makes it a poor choice. A minor misstep or misjudgment can result in a much more serious accident than making a smooth and controlled gear-up landing.

One final consideration some pilots might be tempted to explore is whether or not to shut down the engine(s) before landing. After all, an engine is pricey, and if we can avoid damaging it, we might save ourselves a considerable sum of money. While this option might sound good in theory, it can be difficult (not impossible, though) to execute. Timing is everything. We must shut the engine(s) down early enough, and then slow the aircraft down enough to allow the propeller to stop windmilling, but not too soon or too slow to end up short of the runway. Then we might need to cycle the starter to position the prop horizontally—not easy to do while you're trying to land.

The problem with this dead-stick approach is it seriously limits our options. Once the engine is shut down, a go-around is out of the question. Unless we have a lot of runway to work with, and maybe a "second in command" to help, we should probably keep the engine running.

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PREPARING FOR TOUCHDOWN

Regardless of where and how we plan to make our emergency gear-up landing, a few steps can help minimize the damage. First, let someone on the ground know what the plan is so that help is readily available. Stow any loose items that might become projectiles in a rapid deceleration. Tighten seat belts (all the passengers', too). A front-seat passenger should, if possible, move the seat back to stay clear of the yoke to avoid being struck by it in the chest.

Oftentimes, the heat generated from aluminum scraping on pavement is enough to ignite a fire. To minimize this risk, we must turn off the fuel and the electrical system. When we do this depends on the situation. If we're planning to dead-stick it in, we should shut off the fuel and electrical master as soon as the engine is shut down and the flaps are extended. Otherwise, secure the fuel and battery master once the aircraft comes to a complete stop.

Landing gear problems are more common than we might think, and forgetting to put the gear down is easier than we might imagine. By sorting through the scenarios and following some simple procedures, we can avoid ending up on the skids, or at least keep the damage to a minimum. *EAA*

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