



# A Matter of Survival

Off-airport landings

**PERHAPS ONE OF THE** most challenging situations a pilot may face is the prospect of an off-field landing. Whether the cause is a fire, mechanical failure, fuel exhaustion, or extreme weather, the object of an off-field landing is simple: survival. As part of pilot training, we practice simulated engine-out landings, which usually conclude with a touchdown on an authorized airport runway. Sometimes we get lucky in an emergency and have a runway available when we need one. Other times, we're forced to put the aircraft down in much less desirable conditions. When that happens, it's important to understand what we're up against and what to do to survive the ordeal.

## THINKING AHEAD

One of the lessons taught to every new pilot is to always have an emergency-landing site picked out. In the event that something goes wrong—whether it's mechanical or weather—we need to have in our mind a clear choice of where to put down. Because aircraft are quite reliable and sophisticated these days, some pilots don't feel the need to be in such a state of preparedness. Regardless of whether we're flying over the mountains or flatlands, when the chips are down, knowing where to go can mean the difference between success and failure.

Keep in mind that an emergency-landing site is not necessarily a section of wide, open highway or a broad, flat field, but rather a place where we can come to a stop on the ground and survive the event. As instructor (now FAA designated examiner) Drew Chitica would put it, "In an emergency, the airplane has just one job, and that's to keep you alive. If you have to sacrifice the airplane to achieve that end, then do it!"

Not everything is as it seems, and that's especially true of off-field landing sites as viewed from aloft. What might appear like a good place to put down can in fact hold many challenges and surprises. If landing on a flat piece of paved runway can be tough, imagine doing it on a golf course. What appears to be flat, open grass is usually rolling terrain with myriad bunkers and other hazards that can make landing much more sporting than the tame tarmac of an airport. Likewise, what appears to be a dark brown cultivated field is most assuredly a soft one that will readily send the fuselage tripping over the nose gear. Even a large, empty expanse of parking lot can be crisscrossed with wires and studded with light poles.

## THE DESCENT

If you have a good amount of altitude to work with when things go wrong, it will give you an opportunity to configure the aircraft, make an emergency call to air traffic control, and maneuver to a reasonable landing position. Knowing your best glide speed and using it will help make the most of that altitude, but how you configure the plane is also critical. If you have a constant-speed prop, pulling the lever all the way back to low rpm (high pitch) can feel like taking the brakes off and can extend the glide considerably. Conversely, if you're trying to get down quickly, shove the prop control forward to increase the drag.

## CONFIGURING FOR SURVIVAL

Once you've committed to an off-field landing, configure the airplane for maximum survivability. Front seat passengers should slide their seat back,





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and then tighten their seat belt. As former National Transportation Safety Board (NTSB) investigator Greg Feith explained, this minimizes the potential of being slammed in the chest by the control yoke, which can be a fatal blow. Unfortunately, as pilot, you'll need to keep your seat forward to maintain control of the airplane until it comes to a complete stop. Turn off the magnetos and electrical system (potential fire hazard), and secure the fuel system to minimize the potential for spilled fuel at

### REPORTING AN ACCIDENT

Federal regulations require that the NTSB be notified immediately in the event of an aviation accident and certain incidents. It is also important that a NASA Aviation Safety Report (ASR) be filed within 10 days if you think you may have committed a violation to the FARs. An accident is defined as an occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage. An incident is an occurrence other than an accident that affects or could affect the safety of operations.

Effective March 8, 2010, the NTSB has modified certain reporting requirements. Be sure to familiarize yourself with the changes as soon as possible.

For information on how to file an NTSB and/or NASA report and links to the proper forms, visit [www.SportAviation.org](http://www.SportAviation.org).

the crash site. Besides, the last thing you need is a sudden engine restart when you're about to touch down. Whether to leave the doors secured or ajar is another hotly debated question. Closed doors help maintain the structural integrity of the airframe. Jammed doors can increase the challenge of exiting the aircraft in the aftermath of an off-field landing.

Many pilots get hung up on whether to put the gear up or down. There is no one right answer. Rather, it depends on the situation. Extended gear can help absorb the energy of an off-field landing, but it can also trip the airplane, causing it to flip over or tumble. In soft-field conditions, gear up might be the best choice for maintaining control until the aircraft stops. Look at the terrain ahead and give it your best shot.



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## THE "SLOW" STOP

Bringing an aircraft to a stop on the ground is a matter of expending the kinetic energy—the energy associated with its mass and velocity. For a normal landing, we rely primarily on brakes, and to a lesser extent on aerodynamic forces. For an off-field landing, the brakes may be ineffective because (a) the gear is not extended, (b) the wheels are not firmly on the ground, (c) braking action is nil due to the nature of the surface, or (d) some combination of the above. In a study of crash landings performed by FAA Safety Program Manager Mick Wilson decades ago, he found that when an airplane is decelerated by multiple smaller impacts, the landing is more survivable than when an abrupt stop occurs. To this end, we do better to collide with fences, haystacks, brush, and small trees that absorb energy while not completely stopping us. An impact that tears the wings from the structure will not only absorb considerable energy, but also separate the fuel from the people.

When trying to shoehorn a sick airplane into a tight spot, focus more on the approach end than the run-out. It is better to roll into the trees at the far end at 35 knots than it is to clip the tops of the trees on the approach at 70 knots and plummet into the earth. Remember, too, that seat restraints are designed to absorb the impact when moving forward and downward. They are much less effective when the aircraft is tumbling tail over nose wheel.

Sloping terrain always presents a challenge, and it can be extremely difficult to land downhill. The best advice from those who have been there is to land uphill, even if it means a tail wind. Landing uphill uses more energy, and shortens the stopping distance.

**An impact that tears the wings from the structure will not only absorb considerable energy, but also separate the fuel from the people.**

If there just isn't any open space and you are forced to land in the trees, fly into the treetops under control rather than stalling into them. A stall means a nose dive between the trees, and little damage to signal your location to rescuers. It is much better to take off a few treetops and create a visible sign of where you ended up. This will also consume energy in a more survivable manner than nosing straight down into rock and dirt.

## NIGHT MOVES

Darkness increases the challenge of an off-field landing by a significant margin since it can be nearly impossible to see what's below you. A long line of lights can indicate a stretch of highway that might be used, but it can be extremely difficult to see hazards like transmission lines, highway signs, and other obstacles. Some experts recommend picking out the darkest spot you can find, since it probably is devoid of man-made buildings and other structures. They say to turn your landing





## HOW to CRASH an AIRPLANE (and Survive)

An excellent reference by retired FAA Aircraft Accident Investigator and Aviation Safety Program Manager Mick Wilson, the book describes how to minimize the risk of crash-related injuries and fatalities. Available from Aviation Forum Company for \$19.95, and shipping charges may apply.

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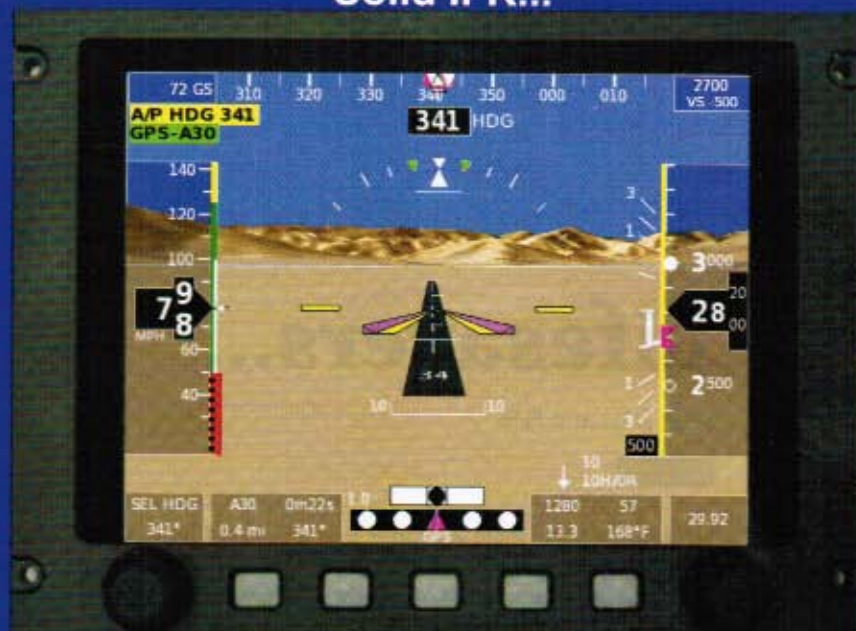
light on for the approach, and if you don't like what you see, turn it off again. It's no joke. The last thing you want to do is make erratic evasive maneuvers that could put you into a stall or spin at low altitude.

An alternative approach taught to me in my early days of flying might be a lifesaver in a situation where the terrain or hazards are shrouded in darkness. The technique is for a Cessna 172, but it might be adapted to other light aircraft as well. The procedure is to extend full flaps, trim the nose all the way up, and then slide your seat back and keep your hands and feet off the controls. Sounds crazy, but the aircraft assumes a stable, nose-up attitude, slow airspeed (but above stall), and a survivable sink rate of about 600 feet per minute. This configuration can result in a survivable crash landing under a broad range of conditions and terrain types, and it could be applied in total darkness or when making a Hail Mary descent in instrument conditions.

Off-field landings hold many challenges, but the more we know and understand about the process, the better chance we have of surviving the odds. **EAA**

**Robert N. Rossier**, EAA 472091, has been flying for more than 30 years and has worked as a flight instructor, commercial pilot, chief pilot, and FAA flight check airman.

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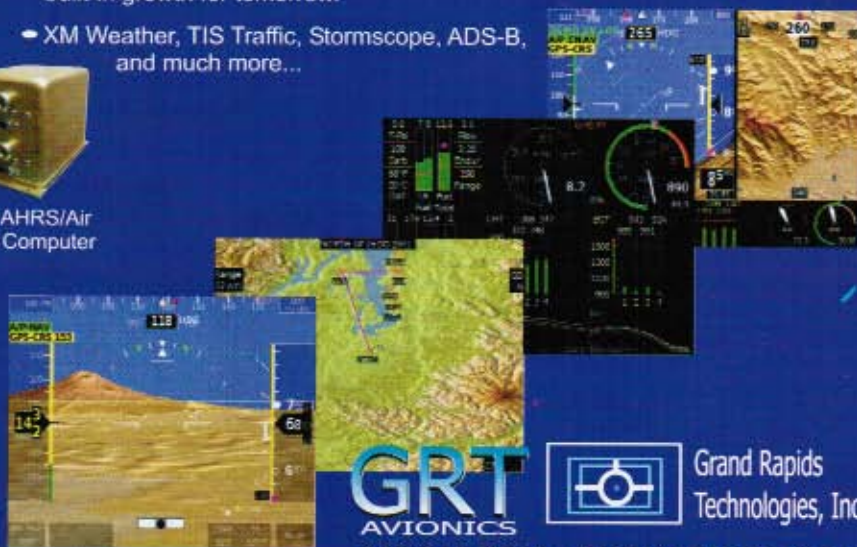
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