FLYING LESSONS for September 5, 2019

FLYING LESSONS uses recent mishap reports to consider what *might* have contributed to accidents, so you can make better decisions if you face similar circumstances. In almost all cases design characteristics of a specific airplane have little direct bearing on the possible causes of aircraft accidents—but knowing how your airplane's systems respond can make the difference as a scenario unfolds. So apply these *FLYING LESSONS* to the specific airplane you fly. Verify all technical information before applying it to your aircraft or operation, with manufacturers' data and recommendations taking precedence. **You are pilot in command, and are ultimately responsible for the decisions you make.**

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This week's LESSONS:

It seems as if there has been an unusually high number of engine failures and off-airport landings over the last few months. Looking further back it's not been a terribly unusual year, especially since it's been the height of flying season in the U.S. where most flying—and therefore most accidents—takes place.

The pace at which information becomes shared in social media, and the fact that I personally know a few people who have been involved in off-airport landings (some successfully, others tragically not) have made me even more acutely aware of the possibility of engine failure than I at least *think* I am every time I fly.

Multiple sources agree that the vast majority of engine failures result from fuel mismanagement. Still, despite their extreme rarity mechanical engine failures do occur. The intent of this week's *LESSONS* is **not** to categorize the reason a single-engine airplane's engine fails in cruise flight. Nor is it to discuss the facts of any specific engine failure event. *Instead,* this week's focus is on the forced landing that follows an unrepairable cruise-flight engine failure regardless of that failure's cause.

Over the years I've asked past students who have subsequently survived an aircraft emergency what I did right, and what I could have done better, to help prepare them for the event. (I'm extremely fortunate that in over 30 years as an instructor I know of only one past student who has had a *fatal* mishap). Recently one past student responded: "**picking the right place to land.**" I agree. It's an opportunity for me to learn and to improve as a pilot and instructor.

Perhaps evidence of this, I had to go all the way back to June 2010 to find when I addressed off-airport field selection in *FLYING LESSONS Weekly.* Here is that discussion, with some updates.

See http://mastery-flight-training.com/20100610flying_lessons.pdf

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I was surprised to find that standard FAA pilot training texts (the *Aeronautical Information Manual* and the *Pilot's Handbook of Aeronautical Knowledge*) do not address the topic of emergency landing field selection. In the absence of advisory guidance, I jotted down a list of landing-zone qualities I'd try to consider in those heady moments after an engine quit. My list:

- Surface (rough, smooth, plowed, a road, etc.)
- Wind speed and direction
- Length
- Slope

- Ditches, paths or other irregularities crossing the landing surface
- Approaches (terrain and obstacles)
- Overhead wires on the approaches or across the landing surface
- Fences
- Obstacles or animals on the surface (hay bales, cattle, etc.)
- Nearby sources of rescue

That last one isn't a deal-breaker for a field selection, but it's also something that should be considered if you have more than one possible choice.

It took a little Google-sleuthing to find a really good reference on evaluating and choosing an off-airport landing zone. Leave it to the sailplane pilots to know what to look for. Kai Gersten's sailplane text *Off-Airport Landings* is an absolutely superb 24-page text not just for sailplane pilots, but for any of us who might have to pick out a field in a worst-case scenario. Sections include these gems about checking for wires around and over a landing zone:

There are likely to be wires:

- Between two poles.
- Between a pole and a group of trees, or a single tree. It is not uncommon to find a telephone pole hidden by one, or a cluster of trees.
- Between a road and a house.
- Above any road.
- Going to any kind of a building.

A narrow field with trees on one side and wires along a road on the other side, or a field with trees along both sides may have wires crossing anywhere along its length. Avoid such fields if at all possible. The advice of landing well into the field is not applicable in these situations. *The safest assumption is to pretend there are wires around the entire perimeter of every field.*

…and these observations about visual illusions related to unimproved fields, which would be even more important to remember under the stress of an unexpected arrival:

1. A narrow field will appear to be longer than it is.
2. A wide field will appear to be shorter than it is.
3. A long field will appear to be narrower than it is.
4. A short field will appear to be wider than it is.
5. If you have been [at] low [altitude] for a while, all fields will appear to be bigger than they are.

He adds:

Luck plays a surprisingly small role in successful field landings. Ninety-nine percent is know-how, preparation and skill. Warning: There will be a test sometime after this course. The time and place will be at your first field landing and failing is not an option.

Gersten's short book is definitely worth a read to better prepare you for an off-airport landing. Consider it your *FLYING LESSONS* homework for the week.

See:
https://www.faa.gov/air_traffic/publications/atpubs/aim_html/index.html
https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/
https://www.norcalsoaring.org/uploads/1/0/0/6/100675970/landing_off_field_-_kai_gertsen.pdf

The following week's Debrief included these reader responses:

Reader John Townsley adds this recommendation:

How to CRASH an Airplane (and Survive!) by Mick Wilson is a great resource for anyone flying small aircraft. The book, as well as a DVD and a CD of his seminar on this topic are available from www.crashandsurvive.com. It has several suggestions for selecting either an emergency landing site (for when you MUST come down) or a 'precautionary' landing site (when you're coming down, but you have a
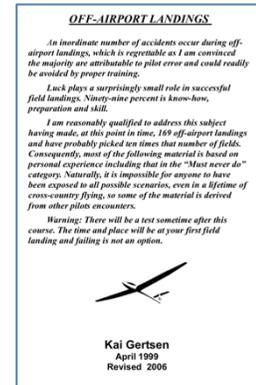
little time to pick your meeting place with terra firma). Mick had lots of experience flying in mountainous conditions, then later as an FAA accident investigator. ***Surviving an off-airport landing really begins well before the emergency*** or abnormal indications dictate an immediate return to earth. There are skill factors, but also significant psychological factors that have a lot of influence on whether the pilot and passengers survive or join the data set of aircraft related fatalities. It's a good read.

See http://crashandsurvive.com/crash_frame.htm

Thanks, John! Instructor Tony Johnstone adds his expertise on off-airport field selection:

Good commentary on emergency landings. I believe it is an area that does not get enough attention from some CFIs. I certainly notice on Flight Reviews that many pilots don't have a good plan for dealing with an engine failure. You shouldn't be trying to work it out on the fly. My priorities:

1. **Best glide speed IMMEDIATELY** to maximize time in the air and options. (Rolling the elevator trim all the way back will do this for you in most high-wing Cessnas, for instance.)

2. **Look for a place to land and head right at it.** Be realistic about how far you can get, know what your rate of descent is power-off, how high you are, so you know how long you have in the air. If you are gliding at 60 knots at 3000 feet AGL, descending at 700 FPM, you've realistically got just over three minutes to get to your landing site with enough altitude to maneuver to land. So count on about three miles gliding distance with no wind, you will not get to that airport that is five miles away unless you have a significant tailwind.

Best choices, in descending order:

1. **Airfield** (always be aware of the closest one as you go cross-country, and remember it may be behind you).

2. **Paved road.** Four-lanes will not have wires [across them] most of the time. Land *with* the traffic flow which should be moving at about the same speed as you.

3. **Unpaved road.** Look for wires, even if there are wires they are often far enough back to allow you to get down, but *if there are buildings on the opposite side there are probably overhead wires crossing the road*.

4. **Fields** are my last choice unless you can be sure they are dry and hard. *Wet or muddy surfaces will almost always result in you winding up on your back*.

If you are heading to a landing site and you see something better, my rule is you can **change your mind one time only!** Don't take time dithering between two sites and winding up between them. And I agree with your last point, if I'm going to roll an airplane up into a ball in an off-airport landing, I'd like it to be close to someone who can help to get me out of the airplane!

If you can't get the engine to restart and you are committed, make the radio call. If you are already in contact with a facility tell them first, then go to 121.5 if instructed. Hopefully they will have the sheriff and the EMS guys waiting or at least enroute when you get down. And follow Bob Hoover's advice, fly it all the way into the crash. Even if you have to land in a less-than optimal spot, if you touch down at minimum speed with the wings level you are probably going to walk away from it!

Thanks, Tony. As I often say, **W**ings level, **U**nder control, at the **S**lowest **S**afe airspeed, and also, at the onset of engine failure, **Fly the airplane**, then **Aim Somewhere**, and attempt a restart if altitude and time permit.

We have at several additional resources now we didn't have back in 2010, including:

- Nate Jaros' *Engine Failure Survival Tactics* is one of the most recent books to address, among other things, site selection for an engine-out off-airport landing.

- Whole-airplane parachutes in thousands of general aviation airplanes.

- Electronic flight bag software like ForeFlight Mobile and others now include a **Glide Ring** showing the airplane's possible glide radius, taking into account the airplane's altitude, its glide ratio, winds aloft and height of terrain.

The Glide Ring is not without considerations, including:

1. The glide ratio is added to the software's aircraft profile and can be adjusted (perhaps overly optimistically) by the use.

2. The glide ratio from the Pilot's Operating Handbook or Airplane Flight Manual, which is most commonly where the user gets the value to input, assumes maximum glide configuration (including flaps and landing gear up, cowl flaps closed, propeller to low RPM—all as applicable to the airplane type, of course) and consistent, straight-ahead flight at Best Glide speed. Any delay, any turns that increase rate of descent, and anything less than perfect execution of the glide means the airplane cannot glide as far as the Glide Ring suggests.

3. The Glide Ring takes winds into account, but as winds change in descent the Glide Ring will change as well.

See https://www.amazon.com/Engine-Out-Survival-Tactics-Emergencies-ebook/dp/B01HTWFPQU

Don't wait until the engine quits before evaluating what the Glide Ring is telling you. I scan it frequently to see what is in possible glide range, especially if that includes an airport. I use the Glide Ring to **know where to aim *before* the engine failure**, so I can "aim somewhere" even as I troubleshoot the problem and attempt an engine restart.

I am constantly looking for possible landing sites in cruise flight—with heightened awareness recently with the perceived increase in engine-out, off airport landings. Looking at the references and reading the experiences above, I have a lot better idea of what to look for in an off-airport landing site, and how to manage that landing for the best chance of survival.

Next week we'll look at preparing the cabin and your passengers for touchdown; making the transition from Best Glide to Landing Without Power speed; considerations I've learned from the experts about when and when not to activate a whole-airplane parachute; and for pilots of retractable gear airplanes, when—and when not—to extend the landing gear.

Comments? Questions? First-hand experience you want to relate? Let us all learn from you, at mastery.flight.training@cox.net

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Thank you, generous supporters.

"Danger is relative…inexperience is a magnifying glass." – Charles Lindbergh, in *The Spirit of St. Louis*

Time Out for Safety

A good and thoughtful article by AINOnline*'s Matt Thurber:*

A spate of business aviation accidents has discussion boards and Facebook pilot groups asking the question: why have there been so many in recent months, a notable turnabout from last year's far better record? It's not uncommon in the military for organizations to take a break when safety issues rise to a high level, called a "safety standdown"…. During my career, there have been a few instances where, in retrospect, I should have applied more consideration toward the safety of what I was doing. In thinking about that, I came up with a concept…. (more)

See https://www.ainonline.com/aviation-news/blogs/ainsight-time-out-safety?utm_campaign=AIN%20Alerts&utm_source=hs_email&utm_medium=email&utm_content=76285458&_hsenc=p2ANqtz-9yizb_pcDflvwJc8T6MltzcuXimLNzt5qNaihWo7doG28lTeRurQvEfWtheBbj24Ldo-SjWjj6N8BURe5S5QPQhSWduQ&_hsmi=76285458

Single-Pilot Safety Standdown
Pursuing *Mastery* in Single-Pilot Business Aviation Operations

Aviation is a key resource for your success. It allows you freedom and opportunities not available by other means. The demands of piloting a sophisticated aircraft while running a successful business presents significant operational challenges that requires a continuous journey of learning that goes beyond bare-minimum qualification and currency. Just as you need keen insight to make informed decisions to succeed in business, so too you need emphasis on Aeronautical Decision Making (ADM) and airmanship to safely and efficiently employ your airplane as a business asset. Attend the NBAA Single-Pilot Safety Standdown October 21 in Las Vegas, NV, to learn key methods, techniques and resources to go beyond mere proficiency and take you on the path to mastery of your business aircraft.

See https://nbaa.org/events/2019-single-pilot-safety-standdown/

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Thomas P. Turner, M.S. Aviation Safety
Flight Instructor Hall of Fame 2015 Inductee
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