FLYING LESSONS for July 15, 2010

suggested by this week's aircraft mishap reports

FLYING LESSONS uses the past week's 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 make and model airplane have little direct bearing on the possible causes of aircraft accidents, so apply these *FLYING LESSONS* to any airplane you fly. Verify all technical information before applying it to your aircraft or operation, with manufacturers' data and recommendations taking precedence.

If you wish to receive the free, expanded *FLYING LESSONS* report each week, email "subscribe" to mastery.flight.training@cox.net.

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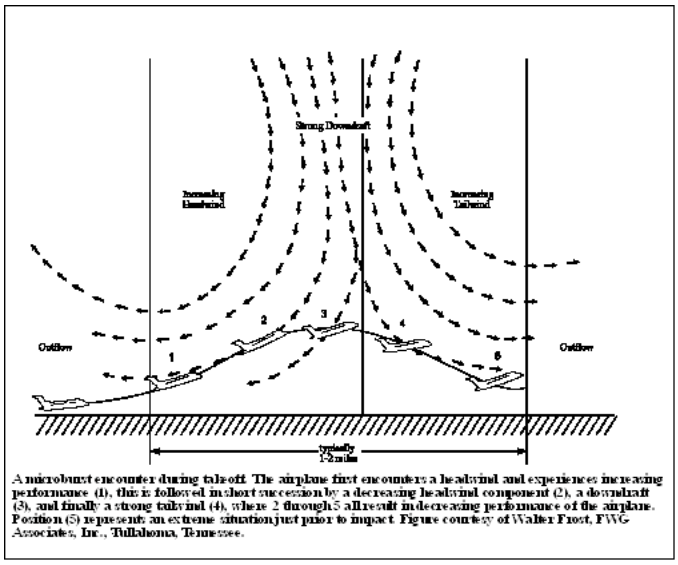
This week's lessons:

It's a race to the runway when you try to take off in the face of a storm. If you're rushed any number of things can go wrong—missed checklist steps, forgetting to set navigation equipment or prepare for an instrument launch, or even forgetting to start the second engine (all three have been factors in airline mishaps; are you more or less likely to do the same thing if you're flying single pilot?).

But even if you do everything right you're still in danger. Within 10 (or with severe storms, even 20) miles of a towering cumulus, downdrafts may pound the earth, then spread out in an oblong circle of rapidly changing wind speed and direction.



A microburst encounter during takeoff. The airplane first encounters a headwind and experiences increasing performance (1), this is followed in short succession by a decreasing headwind component (2), a downdraft (3), and finally a strong tailwind (4), where 2 through 5 all result in decreasing performance of the airplane. Position (5) represents an extreme situation just prior to impact. Figure courtesy of Walter Frost, FWG Associates, Inc., Tullahoma, Tennessee.

Encountering a rapidly increasing headwind causes an increase in lift and indicated airspeed—because "the needles go up" on the associated tapes or gauges, this is called a *performance-increasing event*. The effect is short-lived, however; once the airplane is established in the new air mass the performance will return to pre-penetration levels. The airplane is higher and further along that it would be otherwise, but otherwise performing normally.

Entering a rapidly increasing tailwind, conversely, is a *performance-decreasing event.* Lift and airspeed rapidly decrease; the airplane is low on glidepath or departure path slow and at a high, draggy angle of attack, and may be close to a stall.

Now here's the real hazard: You take off just as a microburst hits. One of four things happens:

- You encounter an increasing headwind. You accept the short increase in performance and, assuming you maintain control during the shear turbulence, you continue away from the storm.
- You encounter a rapid decrease in headwind component, or a shear to a tailwind. Airspeed drops and your angle of attack increases. You must lower the angle of attack

to keep flying; this may prevent you from clearing an obstacle. Or you see the sink rate build and instinctively pitch up to hold altitude. Drag increases further and you sink more rapidly, or you may stall—neither results in a good outcome.

- You enter the strong downdraft of the microburst, which may descend at thousands of feet per minute. Your airplane is pushed into the ground under a column of dense air.
- You hit a big change in the crosswind component. Your crosswind correction is wrong for conditions and you are diverted from your desired track; if the wind is strong enough you may lose directional control entirely.

The chances of each outcome aren't equal. But are you willing to bet on the one survivable outcome out of four likely events?

For more on microbursts see section 7-1-26 of the *Aeronautical Information Manual*.

See www.faa.gov/air_traffic/publications/ATpubs/AIM/Chap7/aim0701.html.

Comments? Questions? Tell us what you think at mastery.flight.training@cox.net.

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or by mailing a check to the address at www.mastery-flight-training.com. ***Thank you!***

Correction

There was an error in a formula for adjusting V_A for weights below maximum gross, that appeared in last week's *FLYING LESSONS*. Several readers pointed out that, as one wrote:

> In [the] note explaining the adjustment to Va for actual aircraft weight, Wg appears to be maximum gross (or the weight for which the published Va was calculated) and W1 the current, presumably lower weight. If that's the case, Wg / W1 and its square root will both be greater than 1. Should it actually have been Sqrt (W1 / Wg) x Va?

The reader who sent cited the formula in his Debrief comments apologized for having sent the formula with an error; I apologize for not checking before I included it in *FLYING LESSONS.* The correct formula is as stated above.

Debrief: Readers write about recent *FLYING LESSONS*

Reader Andy Buehler writes:

> During the 1200 hours of flying my own Musketeer I've never had any troubles. Now I read all these things that can go wrong. It makes me want to quit flying altogether and get an exotic car.

First, I hope you're kidding, Andy. The vast majority of personal flights are safe and enjoyable. A very few end in trouble or tragedy; the causes of airplane mishaps are depressingly repeated again and again. The hazard of reviewing accident causes is that it can color our vision of how safely most personal flights operate. There's a great hazard, however, from not applying the hard-won lessons learned for mishap history. *FLYING LESSONS* exists so you can recognize what can make a safe flight take a turn for the worse, and what to do when you see a common accident scenario begin to unfold. That lets you take active steps to avoid repeating mishap history.

Reader Mark Briggs, who owns, maintains and operates airplanes over the generally remote stretches of Canada, writes about the continuing discussion of flight plans, emergency locators and new technologies to trigger a search should your airplane go overdue:

> As always, I look forward to reading the MFT *Flying Lessons Weekly* when it magically appears in my in-box. Thank you for putting it together and sharing this information for the betterment of aviation.

In this week's edition I'm afraid I encountered a statement that really caused some virtual gnashing of teeth. You stated that SPOT [personal locator] is "the current ultimate in emergency location". I'm afraid that I have to disagree pretty vehemently with that statement. SPOT has some significant limitations, not the least of which is that you have to be alive and functioning pretty fully in order to push its 911 button, a level of capability often not to be found in crash survivors. I've read far too many web posts where the pilot says "if I have troubles I'll just hit the 911 button". Well, frankly, if we have enough time to push the 911 button then we likely have enough time to avoid the crash in the first place. Since that luxury isn't always available the automatic activation of an ELT is really our last chance for a magical box in our airplane to save our bacon.

With respect to the concept of SPOT providing a bread crumb trail for SAR to find, well, that trail is often a good thing and thus very useful. However it's also often of no use whatsoever. SPOT messages sometimes don't make it through the fairly complex network of radio signals, satellite reception, etc. Anybody who has used SPOT will have seen that sometimes, under certain conditions of topography etc, there will be missing updates along the path our flight has taken. In fast-moving airplanes even if every update is received on the ground there's more than enough time lapsed since the last update to make for a rather huge search area. This scenario is all-too-familiar to me when a friend went down this past winter. He was a technology-oriented guy and as soon as he was late for arrival the SPOT track was provided to Search & Rescue. As fate would have it, his airplane had travelled pretty far since its last SPOT position update and it took a long time to find the wreckage (unfortunately it was a completely unsurvivable crash).

With respect to ELT's, nobody wants to spend money on the new 406MHz units. But realistically speaking, most of that reticence is based on the performance record of decades-old equipment. There have been three major ELT classifications since they were first mandated. The original ones were made to meet TSO C91. Then we found C91 had some serious shortcomings and TSO C91a became the law of the land. Then came the new-fangdangled TSO C126 which governs 406MHz ELTs. Everybody wants to judge 406MHz ELTs based on the performance of the bad old TSO C91 units, many of which are still in service today since there was no mandate to remove them and replace with newer equipment. This historical bias is causing us to make poor decisions regarding this vital piece of equipment. Would you base your purchase decision for an IFR GPS today on the track record of a GPS from even 10 years ago? No, absolutely not, because you would know that GPS technology and performance has improved considerably in the last decade. If this is the case then why would you base your ELT equipment decision on the performance of an ELT which might be pushing 40 years of age? The times have changed, baby, and we need to pull our collective heads out of the sand and change with them.

Since there are no longer any satellites listening for 121.5MHz ELTs, a 406MHz unit is the only way to go. And they provide some very significant additional benefits in terms of encoding their transmission with a code unique to our individual aircraft (no more anonymous transmissions, so doing a communications search to find the ELT owner is fast and efficient and often avoids scrambling SAR resources), as well as the potential to provide accurate position data in the distress broadcast. The new ELTs are also tested to much more rigorous environmental standards than their predecessors, meaning they will be far more likely to survive a crash and send a meaningful distress signal to satellites orbiting overhead.

OK, I'll get off my soap box now. I just couldn't let a misleading statement about SPOT and ELTs go unanswered. If you wish more detailed information on this topic I would be happy to answer any questions you might have. Again, many thanks for your efforts to advance aviation safety.

Thank you very much, Mark. I'll run your in response to the letter about SPOT written by one of my other readers (which submitted in disagreement with something I'd written earlier). Me, I'm in favor of flight plans (either official or by letting someone know where and when you'll be, with instructions on who to contact and what to say if you're overdue), and accept the reality of needing some sort of automated system for crash activation, the 406 MHz ELT/GPS being the current solution. A SPOT could be a good adjunct to an automated position-reporting system.

Mark replied:

Thanks for your response. It's funny - we seem to share a similar viewpoint on this topic. I favor the belt and suspenders approach, and then throw in an additional belt just for good measure. In Canada we have a lot of sparsely settled land - lots of rocks and trees and not much else. As a result I always file a VFR flight plan (I'm not instrument rated, otherwise that would be my first choice) and use flight following whenever/wherever it's available. I virtually always either leave a written itinerary or tell somebody where I'm going and when I expect to be back or to arrive at destination (cell phones are a terrific tool for those safe arrival calls, but again in Canada coverage outside of the more densely populated areas is sketchy to non-

existent), and I carry a 406MHz ELT as the last chance option. At Oshkosh one of my purchases will be a 406MHz PLB [personal locator beacon] as a backup to those three primary SAR alerting techniques.

In July 2009 *Kitplanes* magazine published a good article on testing done on SPOT by Langley Muir. I was involved in getting the article into print. If you have access to this magazine it makes a good read - and shows that SPOT, like any techno-marvel, has its flaws as well as its strengths.

Reader Stan Stewart addresses carburetor heat

Just read your latest weekly *FLYING LESSONS* and regarding your blub about the most common cause of reversible engine failure in carbureted engines being carburetor heat: Since the muffler that provides the source of carburetor heat does not have much mass, carb heat needs to be applied in a timely manner while the engine is still producing power as the muffler will cool off rapidly if the engine quits altogether, and no heat will be available to melt the ice. Full throttle will lessen the venturi effect and may help melt the ice. Carb heat should be applied immediately and simultaneously with any other corrective action such as lowering the nose to establish a glide, not after any other action. (In my opinion)

I enjoy your weekly *FLYING LESSONS* and the weekly Beech accident reports. Thanks!

Thank *you*, readers.

It's almost time…

…to finalize plans for your flight to Oshkosh. There's still time, however, to prepare to ensure your safe arrival. This week let's wrap up the annual *FLYING LESSONS* seven-part series on Arriving at AirVenture with Part 7: AirVenture Arrival Wrap-Up.

See www.aero-news.net/news/featurestories.cfm?ContentBlockID=A435616D-9450-45AB-9234-70D5FFF01A1E&Dynamic=1

Recapping the earlier articles:

Part 1: Know the NOTAM (note: the correct link for this year's EAA NOTAM is here.)
Part 2: Have a Back-up; Fill 'er Up
Part 3: Airspeed Control
Part 4: Spot Landings
Part 5: Don't Go It Alone
Part 6: Crosswinds and Tailwinds

See also:
www.aero-news.net/news/featurestories.cfm?ContentBlockID=E1FEE301-00FA-4BC9-9B2A-A114EDAA14D6&Dynamic=1
www.airventure.org/flying/2010_NOTAM.pdf
www.aero-news.net/news/featurestories.cfm?ContentBlockID=11B5B140-1161-457B-BE89-3AA633B059B8&Dynamic=1
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www.aero-news.net/news/featurestories.cfm?ContentBlockID=439EFF1E-2A8F-4F12-A1FD-13EF01B27318&Dynamic=1

Arrive safely; I hope to see you there!

Come see my presentation, "The Lost Art of Directional Control" at 10:00 am Saturday July 31 AirVenture, in the FAA Aviation Safety Center. And I invite you to the General Aviation Safety Awards Wednesday, July 28 at 7 pm in the Theater in the Woods—because you, *FLIYNG LESSONS* readers, are the main reason I'll be there.

Question of the Week

This week's question:

Have you ever encountered a suspected microburst? What happened? What did you do? Tell us at mftsurvey@cox.net

Last week we continued with a question from the week before:

Do you routinely file flight plans, even for VFR trips, or at least let someone on the ground know your plans and how to start a search if you're overdue? What value do you see in filing a VFR flight plan?.

Here are your responses:

Rarely do we [a public-use agency] not file a flight plan, either VFR or IFR. It is just another level of safety that is absolutely free and certainly worth my time. The missions we perform require that we have as much information disseminated to those responsible as possible. Basically, I feel the more folks that know where I am going and what I am doing, the more folks will be looking for me if I do not turn up. Thanks for your great articles!

I don't file VFR flight plans because pretty well all of my cross-country flights are flown IFR. Regardless of the weather, in the crowded and complicated airspace of the mid-Atlantic states, it's more comfortable to have ATC sort out the airspace issues and help me watch for traffic.

I file IFR only when necessary. I rarely file VFR flight plans. I always use flight following. I always tell family where I am flying, the route I am taking, and when I expect to return. Keep up the good work.

And a reader addressed a previous question of the week on how he chose an instructor to check him out in his newly purchased airplane:

Before completing the purchase of my current plane (an A36 Bonanza) I contacted the type club (ABS) and got a list of its instructors, experts in the type, near where the plane was located, on the other side of the country from me. The one I chose was not only familiar with the type, unbeknownst to me he was familiar with that specific plane, having instructed the previous owner. After getting checked out in the plane with that instructor, my usual instructor from back home flew out commercial and accompanied me back home.

Fly safe, and have fun!

Thomas P. Turner, M.S. Aviation Safety, MCFI
2010 National FAA Safety Team Representative of the Year
2008 FAA Central Region CFI of the Year
