



FLYING LESSONS for June 24, 2021

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 in your success as the 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:

This FAA preliminary report was posted last week:

Date:	16-JUN-21
Time:	19:50:00Z
Regis#:	N704AK
Aircraft Make:	LANCAIR
Aircraft Model:	EVOLUTION
Event Type:	ACCIDENT
Highest Injury:	FATAL
Aircraft Missing:	No
Damage:	DESTROYED
LOCATION	
City:	DENVER
State:	COLORADO
Country:	UNITED STATES
DESCRIPTION	
Description:	AIRCRAFT CRASHED UNDER UNKNOWN CIRCUMSTANCES AFTER STRIKING POWERLINES AND CAUGHT ON FIRE, DENVER, CO.
INJURY DATA	
Total Fatal:	2

The National Transportation Safety Board (NTSB) has reportedly traveled to the scene to do an in-person investigation, but there is no NTSB preliminary report posted as yet. Of course, any final investigative reports will not likely be published for a year or more.

Several media outlets have published additional, as-yet unofficial details, including [this from the Flight Safety Foundation’s Aviation Safety Network](#):

The pilot reported problems with the autopilot, the ATC tower observed the plane doing a 360. A following Cirrus reported seeing the aircraft impact power lines and “big fire ball” erupted.

We don’t know yet if this report is accurate—that’s what the NTSB investigation is for. But it prompts two FLYING LESSONS on considerations for autopilot failure. **One** we talk about often (although accident reports show the word doesn’t always get to the pilots who need it). **The other** is the main LESSON I want us to focus on this week.

The first LESSON is **how to disconnect the autopilot** in the event of malfunction. The possibilities vary based on airplane type, but will always include some if not all of these actions:

- Push the **autopilot disconnect** button. A prominent pushbutton, often mounted on the upright portion of the pilot’s control wheel, will shut off the autopilot when pushed. This same button may also interrupt the operation of electric trim associated with an autopilot for as long as you hold the button down, and is usually the first step of a Trim Runaway emergency checklist. But pushing such a button once (and releasing it) will turn off the autopilot.
- **Turn off the autopilot on the autopilot controller.** Self-explanatory.
- **Switch off the trim switch.** Many autopilot trim systems have a toggle or rocker switch on the panel. Turn off the switch and you turn off the autopilot’s ability to control the aircraft.

- **Pull the autopilot circuit breaker.** This removes power from the autopilot, rendering it inoperative.
- **Pull the trim circuit breaker.** This removed power from the electric trim system, which is the motive force of the autopilot.
- **Turn off the avionics master switch.** In a pinch this will remove power from the autopilot and trim system.
- **Turn off the battery and alternator switches.** Overkill, perhaps, and a worst-case, but if you have to this will remove electricity from the autopilot and the trim that serves it.

This is the *LESSON* we talk about fairly often. **If you fly an aircraft with an autopilot, you should be able to list every possible way to turn it off** in the event it's doing something other than you want or can control.

The second LESSON, however, is this: **what comes next?** What do you do after the autopilot malfunction, and you've successfully disengaged the autopilot? Here, unfortunately, is a classic example of [how not to respond](#)...with disastrous results. Excerpted from the report (you really should [read the entire narrative](#)):

The pilot was instructed by the ground controller to remain clear of Class B airspace. After an uneventful takeoff, while in Class B airspace, the pilot was instructed by the local controller to remain outside the Class B airspace, and the pilot advised the controller that the flight was descending. However, the airplane climbed briefly, followed by a series of descents and climbs with varying airspeeds that continued for about 5 minutes. **The pilot informed the controller that he could not disengage the autopilot** and requested radar vectors to return to the departure airport. While returning, the pilot informed the controller that **it took full forward and back control pressure to descend and climb, respectively, and he solicited and received assistance from another pilot on how to turn off the autopilot. The advice included pulling the autopilot circuit breaker, which the pilot said he did.**

The pilot apparently did not consult the emergency procedures for an autopilot pitch trim malfunction, which included a step to manually retrim the airplane. As the airplane turned to join final approach, witnesses saw the airplane enter a vertical descent and impact a lake. Postaccident examination found the **pitch trim in the full airplane-nose-up position.**

The National Transportation Safety Board determines the probable cause(s) of this accident to be the pilot's failure to maintain adequate airspeed while turning to join the final approach leg of the airport traffic pattern with full airplane-nose-up trim, which resulted in the airplane exceeding its critical angle of attack and experiencing an aerodynamic stall. Contributing to the accident were the pilot's mis- use of the forward elevator flight control input with the autopilot engaged, which resulted in the full airplane-nose-up trim; his failure to recognize and correct the mis-trimmed airplane per the emergency procedures; and the excessive control forces required to maintain control of the airplane in the mis-trimmed condition, which resulted in pilot fatigue.

See <https://aviation-safety.net/wikibase/264088>

After turning off a malfunctioning autopilot, you still need to fly the airplane and get it safely on the ground. This involves, if possible, eliminating (or at least minimizing) the effects of the out-of-trim condition the autopilot likely created in its failure. For most legacy airplanes, like the Beech Bonanza in the accident cited above, there is a manual backup to the electric trim system. But in many larger aircraft, and with increasing frequency in newer light airplane designs, the electric trim system is primary...and at times the *only*...way to trim the airplane.

This leaves us to consider just how we can overpower radically untrimmed flight controls in the aftermath of an autopilot malfunction. I wrote about this—among many other things—in an article for the Cirrus Owners and Pilots Association ([COPA](#)) that was [posted to its website](#) in September 2019. Here are the parts of this article pertinent to this week's *LESSONS*:

[A Bonanza Pilot Flies the Cirrus Sim](#)

I've been flying and teaching in Beech Bonanzas and Barons for 30 years. Early in my career I ran the Beech factory-authorized Bonanza training program, which centered on a type-specific Flight Training Device, colloquially called a "simulator." Teaching Bonanza and Baron pilots in "the sim" gave me a great

appreciation of the value of simulation not only for procedures and task training, but more importantly for presenting scenarios and decision-making exercises.

So when Michael Radomsky asked me to attend and critique his FEIST simulation program at North Las Vegas Airport in Nevada I jumped at the chance—not only would I experience the Cirrus simulator and Michael’s approach to type-specific teaching, I also hoped to be exposed to the decision-making and practical risk management taught in the Cirrus community and adapt these techniques to take back to Beechcraft pilots....

...I’ve always wondered how a Cirrus pilot would handle a pitch trim runaway. I’ve experienced this “for real” in an A36 Bonanza and the pitch forces were enormous. In the Bonanza there is a manual trim wheel you can use to restore the trim setting after a runaway, and as subsequent trim changes are needed for approach and landing. The Cirrus, of course, does not have a manual trim—after responding to a trim runaway there is no way to reset the trim. You’ll have to aggressively fight the trim to successfully land the airplane. Michael said he had not been presenting trim runaway in his syllabus, but agreed to try it with me to see if I was able to fly the airplane afterward....

...[After much practice and near the end of my session], without warning Michael also presented the trim runaway we’d discussed in the briefing. I caught it immediately (I’ve taught trim runaways for 30 years), but after pulling the appropriate circuit breaker the control pressures were almost impossible to overcome to fly an approach. I pulled the red handle [activated the Cirrus Airframe Parachute System]. Michael agreed that trim runaway probably requires engine shutdown and CAPS recovery because Cirrus does not include a manual trim control in the airplane.

See:

www.cirruspilots.org

<https://www.cirruspilots.org/Articles/a-bonanza-pilot-flies-the-cirrus-sim>

Circling back to the event that prompted this week’s *LESSONS*, I checked with aviation safety investigator and instructor Jeff Edwards, a *FLYING LESSONS* reader and one of the leading experts on the Lancair series of high performance amateur-built aircraft (and owner of an Evolution). Jeff confirmed, as I suspected, that like the Cirrus the “Evo” uses electrically driven trim and does not have a manual backup.

When I open a question/answer period in a Beechcraft instructional event, I often start by saying there are two questions I will *not* be able to answer about the airplanes:

- 1) Why did Beech do...(X)?, and
- 2) Why didn’t Beech do...(Y)?

Instead, I say, my job is to help pilots understand ***how to work with whatever the manufacturer chose to do with the design.***

In that spirit I’m not passing judgment on a designer’s decision to save weight and complexity by eliminating a manual means of trimming the controls when the autopilot and/or electric trim system is inoperative. I just want you to consider **what you are able to do** in the event of autopilot or trim failure. **How are you going to work with whatever designers chose to do with the design?**

Perhaps manipulating the power can help control pitch. Maybe use of flaps or speed brakes, if you have them, or extending and retracting landing gear if it is retractable. Maybe a slip would provide better control. Maybe nothing would help and you’ll have to “bail out,” that is, deploy the parachute...if you have one.

Now is the time to consider—and if possible, practice—how you will counter the effects of mis-set trim in the airplane you fly, and if you cannot manually trim off the pressures what you *can* do after an autopilot malfunction or trim runaway.

Questions? Comments? Relevant experience? Send them to mastery.flight.training@cox.net.

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Debrief:

Readers write about recent *FLYING LESSONS*:

Reader Henry Fiorientini writes about [last week's discussion](#) on changes to airplane empty weight over time:

Every so often after adding/removing/changing avionics, etc., I pay the (\$150?) for my A&P to just pull out the scales and do an ACTUAL weight and balance, with all the stuff I usually have in [the] plane. Years and decades of "plus this, minus that" can cascade into myriad errors. [An actual weighing] added to an annual [inspection] every 5-10 years seems a reasonable precaution.

Makes sense. I'd do it without all my extra equipment on board, so the new data is an accurate aircraft empty condition. Thank you, Henry.

Frequent Debriefer John Townsley adds:

A few years ago I flew for a well-known volunteer organization that boasts a large fleet of aircraft. The paint on the aircraft I customarily flew was getting a bit rough so the plane was scheduled with a non-local paint shop at a rock-bottom price. I never saw the paint shop specs. After a few months the aircraft returned with new colors. However, **the logs contained no mention of whether it was stripped before new paint** was applied.

I read accident reports and find a lot of takeaways in most of them. One stand-out takeaway is that **weight changes accompany painting**. Because the aircraft hadn't been weighed for several years **I suggested it should be re-weighed**. If nothing more the new W&B would **incorporate all those unknown "negligible" changes** in a current useful load calculation. But, it didn't happen. The local upline manager supported the inexperienced maintenance manager who, based on a vote of half dozen pilots, decided against confirming (or updating) the aircraft weight, moment, and useful load. The aircraft flew ok, however a new maintenance facility three years, about 300 hours, and perhaps 700 landings later advised it be reweighed. Meanwhile **the aircraft had acquired 110 pounds** since it's previous trip to the scales.

A little W&B forensics followed. About 10 pounds were due to a long-ago **math error**. Perhaps some of the remaining 100 pounds could be attributed to **"negligible" additions that weren't balanced by "negligible" subtractions**. Who knows? The upshot was a lot of takeoffs over gross, and a lot more landings were over the allowable landing weight.

Here are some additions to your eight-item list of "A few things ...":

Ninth: Never make maintenance decisions by asking for pilots to "vote." **Follow the rules, or adhere to best practices where rules are fuzzy.**

Tenth: Realize that **non-pilot owners/managers may make poor decisions based on ignorance, a false sense of economy, or when they abdicate their responsibility to exercise due diligence** where when faced with conflicting advice.

Eleventh: **A&Ps are not immune to errors of optimism** or a misplaced desire to shave a few pennies.

And, by the way, several of the "things" you listed were *absolutely* involved in both creating and perpetuating the overweight situation with this aircraft.

Great additions, John. Thank you.

Reader Rick B. adds one more:

Twelfth: Don't rely on the new weight and balance calculation provided to you after maintenance.

After my aircraft had dual [Garmin] G5s installed and the vacuum and backup vacuum systems removed, a revised weight and balance sheet was added into my POH by the shop owner. However, **I calculated my own new weight and balance data** and found his to be incorrect. When I brought this to his attention, he admitted his error and revised the document.

Yes, we should be able to expect accurate log entries when we pick up the airplane at the shop. But yes, we're all human, too. Each one of us is capable of error. And as much as mechanics may try to please airplane owners by keeping the costs down, pilots need to let their mechanics know that all reasonable expenses are acceptable with prior approval.

Returning an airplane to service is a team effort between the maintainers and pilots. We have to trust each other, and doublecheck each other as well, to ensure the job—including the paperwork—is complete. Thank you, Rick.

Questions? Comments? Send them to mastery.flight.training@cox.net.

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"I...look at **safety as the primary practice of managing risk to an acceptable level**. I think sometimes maybe people just blindly accept the risk, and I think it's important to assess those risk areas and manage the risk. If we could get people thinking of managing safety, if we could get them thinking in terms of it's really a risk-management situation, that would be an evolution.

When people think of risk management, their eyes glaze over. But a good definition comes from the FAA. They say that **we manage risk whenever we modify the way that we do something to increase the chances of success and decrease the chances of injury, failure, or loss**. I think we do that in day-to-day life.

- Retiring NTSB Chairman Robert Sumwalt, as quoted in [AINOnline](#)

See https://www.ainonline.com/aviation-news/business-aviation/2021-06-18/sumwalt-reflects-time-ntsb-highlights-risk-management?utm_hsid=28756093&utm_campaign=AIN%20Alerts&utm_medium=email&_hsmi=134713235&_hsenc=p2ANgtz-qZvocLwthCwTVh2i64NV4_MoKYGkg_7LdEWxWMH50_EiCNGKG-i7xoVFzW2g_hkVQBLiS8VznzUO1BH35wd-RnV_0Q&utm_content=2&utm_source=hs_email

"The point I want to emphasize is that flying can be made safe. That is, ordinary flying for pleasure and business. But the public is forever confused by accidents from careless flying, pioneer flights, or military maneuvers in the air."

- Commander Richard E. Byrd in *Skyward*, published in 1928—nearly 100 years ago

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