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FLYING LESSONS for March 27, 2025

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 most 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.**

This week's LESSONS:

A Cessna Caravan on a commercial flight crashed into the sea off Alaska. *AVWeb* reports:

> A Bering Air Cessna 208B that crashed on Feb. 6 in Nome, Alaska, killing all 10 people on board, was found to be more than 1,000 pounds overweight, according to a preliminary report from the National Transportation Safety Board (NTSB).
>
> The report stated that the plane's estimated gross weight at departure was approximately 9,865 pounds, which **exceeded the maximum allowed takeoff weight for flights in areas with forecasted icing conditions by about 1,058 pounds.** According to the pilot operating handbook, the maximum permissible takeoff weight for such conditions was the same as the basic airplane's weight, 8,807 pounds.

See:
https://www.avweb.com/aviation-news/bering-air-caravan-found-overweight-before-fatal-crash/
https://thomaspturner.com/wp-content/uploads/2025/03/2025.0206.C208-AK.pdf

AVWeb continues:

> NTSB Chairperson Jennifer Homendy said the aircraft was operating in an area where **moderate icing was possible** between 2,000 feet and 8,000 feet and where the weather posed potential hazards to light aircraft, according to an article from *AP.* [Associated Press].

Everything is a tradeoff—even more so in aviation. If the internet bulletin boards, the social media, and (in my experience) decades of hangar talk are indicative of the aviation culture, one of the most common areas for bargaining, tacit acceptance and normalized deviance by many pilots is an attitude of "fuzziness" about aircraft weight limits. "My airplane can handle it," you'll often read or hear. "With the [insert engine modification here] you can carry more," and climb through an icing layer or other hazard as if the horsepower changed the basic principles of aerodynamics.

See https://psychsafety.com/normalisation-of-deviance/

Another common comment you'll hear—that I've often heard—is that "being a little overweight doesn't matter as long as the center of gravity is good." I could debate that (and will, soon), but there is a certain logic to this false assurance. That's because the opposite is true: the weight of the airplane doesn't matter much if the CG is out of the envelope. Even within the approved range, fore and aft movement of the CG as the airplane is loaded has a definite impact

of aircraft performance. There's a very good explanation of the effects of CG location on performance on this web page by Pilot Institute.

See https://pilotinstitute.com/forward-vs-aft-cg-explained/

So the distribution of airplane weight is vital to performance, controllability and safety, even when the weight is below maximum. But when the CG is within limits, what about exceeding maximum weight?

Several maximum gross weight increases (GWIs) are approved under Supplemental Type Certificates (STCs) or their international equivalents. A commonly voiced opinion is that the paperwork itself does not affect aerodynamics; if an airframe is approved for a higher weight under some conditions it's obviously capable of flying at that higher weight safely without the STC paperwork. This is frequently cited in online discussions attempting to justify exceeding weight limits.

But these approvals carry with them noticeable decreases in airplane performance. For example, some hardware installation STCs for Beech A36 Bonanzas include an increase in maximum gross weight from the original 3600 pounds (1633 kilograms) to a new maximum of 4000 pounds (1814 kilograms)—an 11% increase. The *Pilot's Operating Handbook* (POH) STC Supplement for such modifications, however, warn that at the new maximum weight takeoff distance is increased by 30% and climb performance decreased by 30% compared to the same operations at the airplane's original maximum weight. ***The negative performance impact substantially exceeds the load-carrying increase.***

In some cases the additional weight approved by an STC has its own limitations, such as the "known icing" restriction noted in the Caravan preliminary report. ***Again,*** the point is this: aircraft weight limits, whether original or as approved as part of a modification, are set for a reason. Dismissing a weight limitation has potential consequences.

An extreme example of the performance impact of weight is single-engine rate of climb. For readers who don't fly piston twins, SE ROC is the maximum climb rate attainable with one engine inoperative and its propeller stopped, the other engine at maximum available power, and the pilot doing everything precisely right to minimize drag. Compared to an early, six seat Beech Model 58 Baron at maximum weight (5500 pounds/2495 kilograms), reducing weight by 400 pounds (180 kilograms) improves SE ROC by about 50% when the density altitude is about 4000 feet.

In piston twins and in all aircraft at high density altitudes, best practice is to carry the minimum fuel load to complete your planned flight with a sane fuel reserve, to have the best possible performance available in normal, abnormal and emergency conditions. Making shorter trip lengths and adding a fuel stop is a wise precaution if that's what it takes to keep weight down at high density altitudes.

The usual arguments against operating above the airplane's maximum weight limit are rules-based. Knowingly operating above maximum weight:

- is a violation of regulations, and
- will invalidate an aircraft insurance policy.

The *real* argument against loading the airplane above its maximum weight is that, although it might fly fine under normal circumstances (legality and insurance issues aside), weight is a performance reducer. ***If anything happens to reduce airplane performance,*** whether it be density altitude, airframe ice, partial or total loss of engine power or some other event, ***excess aircraft weight severely limits your chances of survival.***

There is a lot to unpack from the NTSB preliminary report of the Alaskan Cessna Caravan. A high weight, potentially unexpected icing conditions, and an unexpected need to hold in the freezing clouds over the sea.

But notably, the Caravan was operating an approved weight…approved *if* icing conditions did not exist. Shouldn't it be safe to fly at that same weight even if the paperwork does not allow? That's consistent with the usual internet chatter and hangar talk. Regardless of what ultimately caused the deaths of all aboard, the crew likely realized, too late, that there is indeed a good reason to keep airplane weight within limits for the operation begin flown.

See https://thomaspturner.com/wp-content/uploads/2025/03/2025.0206.C208-AK.pdf

Questions? Comments? Supportable opinions? Let us know at mastery.flight.training@cox.net.

Debrief

Readers write about previous *LESSONS*

Last week I discussed an instructional "secret" that included, as one part, a *LESSON* on crosswind landings. Reader Ed Stack adds to the *LESSON*:

> As a USAF flight instructor, I use to take other pilots to airports with 20+ knots of XW [crosswind] when possible to get a good workout. Any certified pilot can make landings into a headwind, but what happens when you show up and the winds are near max[imum] crosswind? ***Are you confident in your skills?***
>
> As an airline pilot, the last event I request at annual sim[ulator] training is a 90 degree crosswind at 33 gusting [to] 40 knots. I have it done at KSNA [John Wayne/Orange County Airport in southern California] which is one of the shortest runways in our [airline] route structure. My airline's airplane maximum demonstrated XW limit is 33 [knots]. Going over the max in the sim forces me to work hard and leave with confidence.

Every airplane will have some ultimate maximum crosswind component, one at which full crosswind control deflection is insufficient to maintain directional control. Anything less than that ultimate limit is at least theoretically possible. In that case it's the pilot's current skill that sets the limit. Finding and developing a pilot's personal crosswind skills is a continuous process. Part of that process is stretching the pilot's capabilities in a safe, controlled way…as the reader says, Thank you, Ed.

See https://thomaspturner.com/flying-lessons-weekly/flying-lessons-for-march-20-2025/

Reader Jim Piper addresses one of the specifics of last week's report, the serious-injuries crash of a turbine-conversion Beech Bonanza after it's forward cabin door opened shortly after takeoff:

> I'm curious why, with the power the turbine modification delivers the crash aircraft was **slow**. I can appreciate how the pilot may have only been at 250 feet [above field elecation], but not slow, unless he panicked and **pulled power off**. Having experienced about 6 door openings in the 26 years I've owned my A36 [Bonanza] I understand the distracting affect it can have, but I'm still here!

I have the same question. I think you're right: the pilot felt that attempting to close the door outweighed the need to climb to a safe altitude, and in order to close the door he throttled way back (potentially) to reduce air load against the door to make closing it more easily. Word is that

initial investigation of this crash revealed patterns of injury consistent with a pilot reaching over to try to close the door consistent with the time of the crash. Thank you, Jim.

Reader John Watts raises one of the ironies, and the hazards, of flight instruction:

> Thank you for another thoughtful and useful *FLYING LESSONS*. The *LESSON* of **making an abnormal situation as normal as possible** is spot on, but it highlighted something that has always bothered me a little about some flight instruction techniques.
>
> In your example, ***the last instruction you provided*** to the student was to make one more crosswind takeoff and landing. In proceeding to the same runway while dealing with an abnormal situation, isn't it possible they were ***simply trying to do what you told them to do***, just with an added wrinkle? If I were the student, I'd probably do the same thing, because I would be trying to comply with the last direction I received. I would have assumed you simply were trying to make it more challenging. I would like to think, and I honestly believe based on experience, that if I were solo I would choose the runway best aligned with the wind.
>
> I've encountered similar situations in instruction before, both in the military and in civilian life. It usually goes something like, **"Why did you do that?" "Because I was trying to do what you told me to do!**"
>
> I've learned to deal with this by **briefing my actions out loud to the instructor as I take them, so he / she understands not just what I'm doing, but *why*.** Another way to mitigate this could be for the instructor to tell the student before the flight that, in the event of a simulated or actual emergency, **the resolution of the emergency takes precedence over previous direction** (or something to that effect). In the end this is a communication issue between the instructor and student as well as a decision-making and flying issue.

That is indeed possible, John. I do address your comments in my preflight briefing before an instructional flight. I tell the Pilot Receiving Instruction (PRI) that he or she should fly as if alone in the airplane. If they see something or detect an issue they shouldn't wait to ask me what to do, but make a decision and follow through with it. "As time permits tell me what you're doing and why; we might talk about it after the flight but **you won't be wrong**." It might not totally eliminate the "you told me to" response, but it might. Thank you, John.

More to say? Let us learn from you, at **mastery.flight.training@cox.net**

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– Andrew Urban, Sun River, Wisconsin

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