Dual-Qualified

Multiple ways to **get into trouble**

Staying proficient in multiple types can be harder than you might think.

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There are two competing thoughts about the wisdom of keeping qualified in two aircraft types. In one viewpoint, doing so makes you less proficient and capable in both. The opposing view is that it makes you a better stick and rudder pilot in both aircraft and less susceptible to becoming complacent in either.

Having maintained dual qualification a few times in my career, I endorse the former view since during those periods I had less confidence in piloting both aircraft.

But quite often we don't have a choice and the demands of the job dictate dual qualification. Some operations dictate more than one type, be it because of range, cabin size, operating cost or the aircraft's external dimensions. No matter the motivation, it will please the accountants to have dual-qualified crews because that appears to be cost effective. But at the same time, this arrangement will make the safety officer cringe. And while I sympathize with the bean counters, it is the body count that really concerns me.

The Size of It

If you've never been in the game of maintaining dual qualification, you might think the biggest problem lies with the sheer size of the airplanes. When I think of "big," I think of the Boeing 747. I was surprised to find it to be one of the easiest landing airplanes I've ever flown because of the cushioning effect of the massive wing and the airplane's inherent stability under virtually all landing conditions. Of course, I had my streak of bad landings, but I was unable to diagnose why or how I had managed to cure them. After a few years in the 747, it became advantageous for me to qualify in a turbocharged PA-32R Piper Lance. The surprise this time was that

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Two aircraft of the author's past that were almost identical but were actually worlds apart.

the Lance forced me to become more methodical about landings.

In the small aircraft the sequence is: "aim point/airspeed until the aimpoint disappears, eyes on the end of the runway, let the airplane sink to touchdown." In a jumbo it's: "aim point/airspeed until 50 ft., ensure autothrottles retard, eyes on the end of the runway at 30 ft., let the airplane sink to touchdown." It turns out my bad streaks were caused by skipping the "eyes on the end of the runway" bit. So, flying such different aircraft cured me of that oversight.

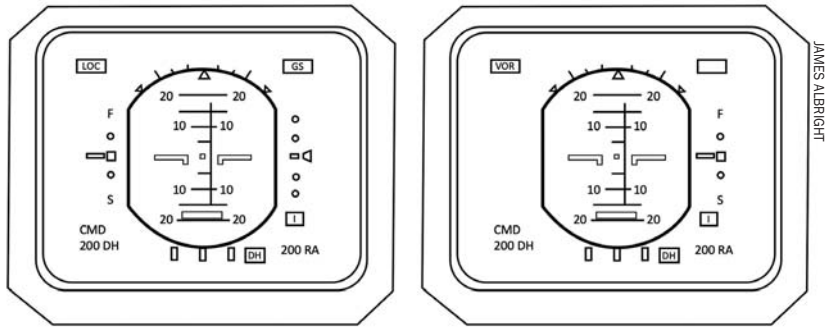
I've heard similar stories from many pilots about the stick and rudder aspect being a non-factor. Of course, there are exceptions. Mixing an airplane with ailerons and one without, for example, could be cause for extra caution. In my experience, the real challenges are located inside the cockpit and involve avionics and procedures.

Issue: Avionics

There is an old saying in the Gulfstream world that goes like this: "If you've flown one gee three, you've flown one gee three." There are just so many differences among the same model. You can have glass or non-glass cockpits. Some are electrically DC-powered, others are primarily AC-powered. The location of radios, navigation systems, and even basic avionics can differ even on aircraft with sequential serial numbers. Consequently, maintaining qualification on two different GIIIs can be a humbling experience.

While I was a pilot flying for the 89th Airlift Wing at Andrews AFB, Maryland, I primarily flew the C-20B, a Gulfstream III. We had seven "B models" at the time and a little more than half our squadron's pilots were qualified to fly it. It had what has become known as a "partial glass cockpit" and all seven were identical, inside and out. We racked up a lot of hours and after a while you could reach out and touch any switch without looking and your eyes reflexively knew the placement of every instrument and indicator.

At least that is the way it was for most of our pilots. I was not one of them. A small subset of pilots secretly kept qualification in three other aircraft, C-20Cs, which were also Gulfstream IIIs. While the B and C models were cosmetically similar, their cockpits were drastically different. Looking for the radio control head? Look again, that was where it was on the other airplane. Where is the VOR needle? No, not there — again, that was the other airplane. When flying the C model, everyone realized it would take a few hours to acclimatize to the new jet and seeming like an idiot was to be expected. But when we returned to the B model, our peers always had a good laugh at our expense: "What's with you? I thought you were good."



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Left illustration: A standard EADI showing on glideslope. Right illustration: A non-standard EADI without a valid glideslope signal showing an on-speed indication.

Feeling like an idiot seems to be a common thread among dual-qualified pilots. It isn't a problem, so long as we take the time to reacquaint ourselves from airplane to airplane. But we often revert to our comfort zones when under stress. In those conditions, even what some would consider a minor cockpit difference can become deadly.

To realize just how critical it is to have everything where we expect it, consider the instrument landing aystem (ILS); there is no more comfortable instrument approach. No matter where in the world you are, having a flight director guide you down to minimums as the raw data remains centered can give any pilot a huge shot of confidence. Even without the flight director, we practice regularly to keep the localizer centered and the airplane on course, as well as the glideslope deviation indicator in the middle and us on a beautifully stable glidepath. Right? Now, without looking, where do you expect to see the glidepath indicator? Will it be on the left or right of the attitude indicator?

The standard layout, as described by Advisory Circular 25-11, is to have the glideslope deviation indicator on the right, provided a valid frequency is tuned and the avionics have a valid signal to display. Otherwise the indicators should disappear. That has been the standard for a while, but there are legacy systems out there. The pilots of Gulfstream III N85VT knew all too well about the non-standard layout of a portion of their fleet of airplanes. Of the six aircraft they routinely flew, five had the glideslope indicator on the left, non-standard side. Of those, four had an airspeed fast/slow indicator on the right side and the remaining airplane had nothing at all. These highly experienced pilots flew the non-standard layout mostly, but not exclusively.

On Nov. 22, 2004, a crew flying N85VT was prepositioning to William P. Hobby Airport, Houston (KHOU) on an IFR day that would demand their best instrument flying skills. The runway visibility was one-eighth statute miles in fog with runway visual range between 1,600 and 2,400 ft. The first officer dialed in the correct ILS frequency in the standby window of the radio's control panel but forgot to throw the switch that turned it active. Neither pilot followed up with the "identify" step of what every basic instrument pilot has drilled into their heads: Tune, identify, monitor.

The captain turned the airplane to intercept what he thought was the localizer but turned out to be the VOR. He voiced concern that his flight director would not go into the approach mode but proceeded to fly the course line and start a descent along what he seemed to think was the glideslope. Passing about 1,000 ft., the first officer realized the wrong frequency was active and made the switch. He said, "you're all squared away now." The captain turned and intercepted the localizer at an altitude of about 900 ft., which was 800 ft. below the glideslope. He continued to descend to his decision altitude of 244 ft., only to impact a light pole at 198 ft. more than 3 mi. short of the runway. All three people on the aircraft were killed.

The NTSB speculates that the pilots believed they were on glideslope because the indicator on the right side of the electronic attitude director indicators (EADIs) was centered. Without the localizer tuned, the glideslope indicator

on the left would have been absent. They flew the fast/slow indicator believing they were on glideslope. Once the localizer was tuned, it is likely the glideslope indicator would have appeared on the left of their EADI, but by that time they were focused on the fast/slow indicator.

The Ground Proximity Warning System was supposedly operational (no problems documented) but none of the lifesaving calls were made. It is easy to find fault with the pilots, who besides making the tune/identify/monitor errors, failed to make all but one of their required callouts. But who among us hasn't gone into "I'm going to make this work" mode when falling behind the airplane? Today's standardized avionics have made it easier for us, but flying aircraft of two different configurations still complicates matters for dual-qualified pilots.

Issue: Procedures

Consider the mundane task of turning an aircraft's oxygen system on prior to flight. You might have a single switch or two with one switch for the airplane system and the other for the cabin. It is a useful arrangement for the aircraft's initial flights after initial build, but little more than a nuisance once the cabin is outfitted. That is the case in "traditional" Gulfstreams like the G550, as well as the "hybrids" such as the G150. Generations of Gulfstream pilots know that the price of getting the order wrong can be the proverbial "rubber jungle" of oxygen masks deployed by mistake, 10 or 15 min. of stuffing those masks back into their containers, and a case of beer to the mechanic left with that task. For years Gulfstream pilots knew that the aircraft switch is turned on first, followed by the cabin. But that is not true for the hybrids, where the order is reversed.

Dropping oxygen masks in the cabin can be embarrassing to a pilot, but type-specific confusion in some airplanes can cause more serious damage, injury, or even loss of life. The G550 flight management system (FMS), for example, automatically makes many performance entries and even reads the fuel gauges. In the G150 these require manual entries. Pilots who fly both types can forget and end up taking off with invalid data. The larger aircraft requires its outflow valve be closed overnight, but that isn't the case for the smaller Gulfstream. This mistake cost a pilot his life on Jan. 4, 2018, when attempting to open his G150's main entrance door.

The aircraft, OE-GKA, had arrived at Kittilä Airport, Finland (EFKT) two days prior and was planned to fly on a positioning leg to Yekaterinburg, Russia (USSS) without passengers. The captain opened the door and helped the flight attendant with interior duties while the first officer remained outside to brush snow off the aircraft. The captain eventually went into the cockpit to start the auxiliary power unit (APU) and went outside to help the first officer with snow removal. After exiting the airplane, he closed the door, leaving the flight attendant (F/A) alone inside.

A little later the F/A felt a strange pressure in her ears and chest. She went into the cockpit to get the attention of the pilots working outside by knocking on the window. The pilots noticed the knocking and the captain went to open the door. According to the copilot's observations, the captain had an unusually difficult time getting the door to open. Then, he pulled even harder on the door handle at which point the door blew open forcefully, hitting the captain who was standing underneath the door and knocking him to the ground. The copilot, who had been standing approximately 1 meter from the left side of the door, was also knocked down by the pressure wave.

On the face of it, the accident was caused by the pilots failing to check the position of the outflow valve as required by the checklist prior to starting the APU, which automatically introduced pressurized air to the cabin. When he closed the main entrance door, leaving only the cabin attendant inside, the aircraft pressurized. There was no way to shut the APU down from the outside of the airplane and the cabin attendant had not been trained in this procedure. The captain's errors may have technically caused the accident, but the design of the system set him up for the failure. All G150 pilots should be aware of the criticality of ensuring the outflow valve is open prior to starting the APU. Any G150 pilot who also flies other Gulfstream models should realize that the standard procedure of closing the outflow valve after shutdown may not be optimal in all aircraft. There is also a lesson for all other pilots, too. Pilots flying aircraft with even these kinds of minor procedural differences need to pay closer attention to checklists because proper procedures in one airplane can set them up for catastrophe in others.

FINLAND SAFETY INVESTIGATION AUTHORITY

Post-accident view of the aircraft's main entrance door

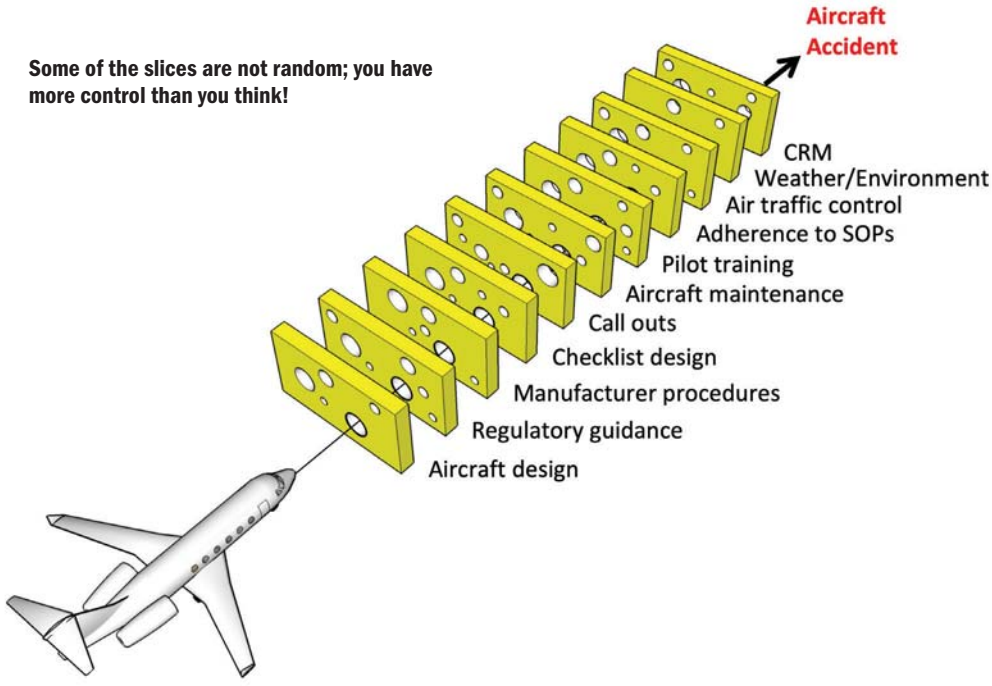
Dual Qualification: Management's Role

When endorsing dual-qualified among their pilots, managers play a key role in the success or failure of that position. The decision to dual-qualify pilots is primarily an economic one but can also be driven by a desire to keep pilots proficient when the number of hours flown in each type is low. No matter the reasoning, mitigation strategies do not necessarily have to be costly. The most successful techniques that I've seen include the following:

(1) Select aircraft from the same manufacturer to minimize the biggest differences. Checklists, procedural flows and system designs can be radically different when one aircraft comes from a different airframer.

(2) Choose aircraft that are "sympathetic" in that they share design philosophies. For example, requiring a pilot to be well-versed in Honeywell and in Collins FMS designs is only asking for procedural mistakes. The fact that not all airplanes use landing gear safety pins is another example, since mixing pinned and pin-less types can lead to a takeoff with the pins still inserted.

(3) Assign each pilot a primary and a secondary airplane; it may be advisable to allow the pilot to act as captain only on the primary.



Some of the slices are not random; you have more control than you think!

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(4) Alternate training events between aircraft and provide for training at least every six months. The least confident dual-qualified pilots I've interviewed alternated training with 12 months between recurrents — another recipe for failure.

(5) Require a minimum level of experience in one type before branching out to a second. I recommend pilots have at least 500 hr. and a year in type to learn best practices and solidify the lessons from initial training, and at least one recurrent.

(6) Once dual-qualified, insist on type-specific training at least once a year.

(7) Track type-specific currency in terms of hours per month, trips per month and recency of training to ensure at least one pilot of every assigned crew is truly proficient.

(8) Establish a minimum level of currency in terms of hours and trips per month below which a pilot is no longer considered qualified and must attend recurrent training.

Dual Qualification: A Pilot's Survival Guide

(1) Encourage cross-platform standardization. You will have varying levels of flexibility when it comes to modifying checklists, callouts and other procedures. To the extent possible, these should be standardized between types. Some aircraft, for example, mark as complete those checklist items the system senses have been addressed. Others require pilots to challenge and respond to each item on the checklist. If you are flying both types, it would be wise to apply the challenge-and-response procedure to all items for both aircraft.

(2) "Chair fly." The day before flying the type you haven't operated in a while, it may be wise to sit in the cockpit and practice every step of every normal checklist. You should also visualize the procedures required to start engines, taxi, takeoff, descend, land and shut down.

(3) Keep an honest written log, critiquing yourself. We pilots realize that what we do for a living can be complicated. As egocentric human beings, we also have a tendency to excuse ourselves when things don't go as well as possible. Keeping a post-flight critique log can help you target your problem areas prior to your next recurrent training session.

(4) Spring-load yourself to the "knock it off" position. Fighter pilots in training reserve the "knock it off" call for when the situation accelerates beyond their mental faculties. If you aren't as proficient as you want to be, don't be afraid to set the parking brake prior to launching to reassess. If the airplane gets to the final approach fix before you do, a holding pattern might be in order.

Picking Your Swiss Cheese Slices

Accident investigators are fond of saying that few accidents are caused by a single factor; that most mishaps occur because of a chain of factors. They will tell you that breaking just one link of that chain can prevent the accident. Flight safety officers will add another metaphor to this and talk about Swiss cheese. Imagine a ray of light trying to shine through a stack of several layers of Swiss cheese. Because the holes are random, the chances of the light getting all the way through is minimized. The light is circumstance, each slice of cheese is a different factor and if the light emerges, you have an accident.

It seems that pilots flying multiple types have a more complicated stack of Swiss cheese facing them than their single-type peers, but that doesn't have to be true. You shouldn't think of the holes in each layer of cheese as random. You can determine the positions of those holes. Let's say one layer is the design of the airplane itself, the next is your checklist procedures, the next is your mandatory callouts, and so on. It could be that the callout layer that works for one airplane will fail to catch mistakes in design and checklists in the other. If you can adjust the callouts to work for both aircraft, you can prevent that ray of light from reaching the scene of the accident. **BCA**