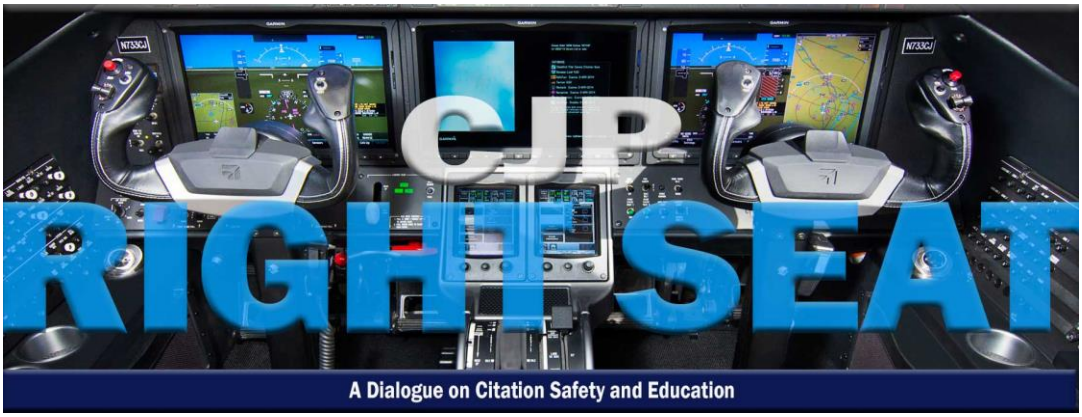
June 2021



— LATEST BRIEFING —

Santa Fe Brings Us Back Together to Focus on Safety

by Charlie Precourt, CJP Safety Committee Chairman

We celebrated our first regional event since the pandemic at Santa Fe from the 16th to 19th of June and saw a tremendous turnout, great venue, excellent hangar flying discussions and lots of excitement for being able to gather again in person! If this is any forecast for CJP's annual convention in Indian Wells, CA this October, it is bound to be an incredible event.

As you'd expect, safety was at the forefront of discussions in Santa Fe. David Miller provided a great presentation on cabin pressurization issues and how to be best prepared for this in your Citation. He shared some sobering ATC recordings of lost contact with aircraft that succumbed to loss of pressurization. It behooves all of us to fully understand our cabin pressurization systems, failure modes and the emergency memory items in the event of failure. To me, loss of cabin pressure at altitude is one of the most challenging emergencies we might face. Be sure to practice the mask donning regularly and ensure your copilot/passengers are informed on its use.

Knowing how to access the mask and get it on and operating in less than 5 seconds is really important. Our time of useful consciousness above 40,000 feet is limited. My personal technique is to use my left hand to remove my headset and any sunglasses in one swipe, while simultaneously crossing over with my right hand to grab the mask by its inflating levers and drop it over my head quickly. I just did that again in my recurrent sim training in Wichita last week... not something you want to try for the first time in an emergency. If you have any question about how much time you have in this situation, we've published the time of useful consciousness in the CJP InFlight Guides. You have 9-12 seconds at FL430, and only 5 seconds if it's a rapid decompression. Be prepared! If you don't have our InFlight Guide, you can download it at

www.citationjetpilots.com/safety/cockpitguides. We'll also be handing out version 2.0 of the Inflight Guides for attendees at our October convention. Thanks for the great presentation, David!

I followed David with a presentation on FOQA (Flight Operations Quality Assurance) or flight data monitoring. Connecting with some experiences from how we trained to land the Space Shuttle and the flight data recording that was available to us then, we discussed the benefits of seeing pertinent data immediately after flight to help us make every flight a training flight and improve our overall performance. As we have mentioned in previous Right Seat articles, CJP is pursuing a pilot program for FOQA to help us lower our incidence of accidents, particularly runway overruns, which comprise over 50% of all Citation accidents and negatively affecting our insurance premiums. The basic idea with FOQA is to collect parameters from our aircraft instrumentation in flight and then feed results back to the pilot on overall performance as compared against our Standard Operating Practices. We're making steady progress with a beta test involving ten of our members to prove the viability and affordability of the system. We will have an update on our progress at the annual convention.

Finally, an update on our other major safety initiative of the year... our Go Around Decision Making study that kicked off with a questionnaire you should have received by e-mail in the past month. The study is being conducted by the Presage Group, who performed many similar studies with the airlines with great results. If you followed the Dale Earnhardt Jr. Latitude accident we briefed at last year's virtual convention, you'll realize that we are all susceptible to the risk of "pressing to land" when we are unstable on final. In this Latitude accident, the crew was unstable on 6 of 7 parameters, yet chose to continue, only to bounce three times due to excessive high energy and run off the departure end and catch fire.

What SOP parameters might that crew, and all of us, have benefitted from to recognize that we needed to take that one around? That's the goal of the Presage study. The Go Around Decision Making questionnaire is still available to you if you haven't completed it yet. Please help us out by sending in your answers today. Presage will begin compiling the results from all our participants by the end of June, so please complete it by then.

presage

The next phase of the study is to form a working group to look at the questionnaire results and brainstorm new SOPs that could help us all. Those potential SOPs will be evaluated in Flight Safety Textron Aviation Training simulators, and those that pass muster will be rolled out at our annual convention. If you would like to be a part of our working group, we'd greatly appreciate your help. We're gathering in Wichita the first weekend in August to work through this next phase of the project. If you can join us, please send an email to safety@citationjetpilots.com!

Thanks also to Neil Singer for his accompanying article on how to best use the new runway analysis programs that are available to us. We all should be taking advantage of these tools to understand what our max takeoff and landing weights are for any number of scenarios.... these are great tools, so have a look.

Fly Safe!

Charlie

CESNAV, iPreflight and ForeFlight - Oh My!

by Neil Singer, CJP Safety Consultant and Master Instructor

A recent CJP forum thread highlighted a significant difference in the maximum allowed takeoff weights obtained when the member ran a takeoff problem through both CESNAV and ForeFlight. The thread concluded with a request for some explanation on the similarities and differences between CESNAV, iPreflight and ForeFlight.

Before digging into the use and output of each program, a quick review of the potential limitations on takeoff weight in is order. Three conditions (considering only takeoff issues, and not enroute or landing performance) could limit a takeoff to below MTOW.

The first is most well understood – runway performance. For every takeoff we must be able to abort at V1 and stop within the runway surface designated as available for this purpose (the accelerate-stop distance available or ASDA, which can be different from the physical runway length for reasons we won't go into here.) We also must be able to continue the takeoff after an engine failure just before V1, accelerate to VR, and climb to 35' above the runway within the area designated for this calculation (the takeoff distance available – TODA – also not always the same as the runway length.) If the aircraft cannot both stop and go in the available area at MTOW, the takeoff weight will be *runway limited* to a weight that makes it possible to do so.

The next limit is a bit less intuitive – a potential climb limit. Note that this requirement has nothing to do with obstacles or terrain present around the airport. Even taking off from the flattest of flat-land airports, the airplane is required to make specified engine-out climb gradients. The two that are most often limiting to takeoff weight are second-segment gradient (the flaps are in the takeoff setting, gear is up, and engine making takeoff thrust) and enroute/ final gradient (flaps and gear up, engine at max continuous thrust). Again, if the aircraft cannot make all required gradients at MTOW, the takeoff will be *climb limited* to a weight where it can (just barely) do so.

The third limit can be the hardest to comply with – obstacle limits. The FAA tells us we must have a contingency procedure in place for the avoidance of terrain and obstacles following an engine failure during takeoff. For Part 135 and 121 operations the procedure itself is prescribed, but for Part 91 we are just told to have one. The tricky part is attempting, on our own, to determine if the airplane can avoid obstacles. Only looking at SID gradients does not assure all obstacles will be cleared and attempting to manually input obstacles is often impossible – at some airports, the list of obstacles runs over a full page of densely-spaced text. Further, this information is not kept up to date at every airport.

Given this, the only feasible way in which we can comply with this restriction is through the use of a *runway analysis* service. Runway analysis software is made up of two pieces – a detailed performance model of the aircraft supplied by the OEM and a comprehensive database of terrain and obstacles surrounding most every airport in the world. With these two pieces, the software can determine if takeoff at MTOW will result in an engine out flight

path that clears obstacles by a safe margin, and if not, reduce the allowed weight to an *obstacle limited* weight.

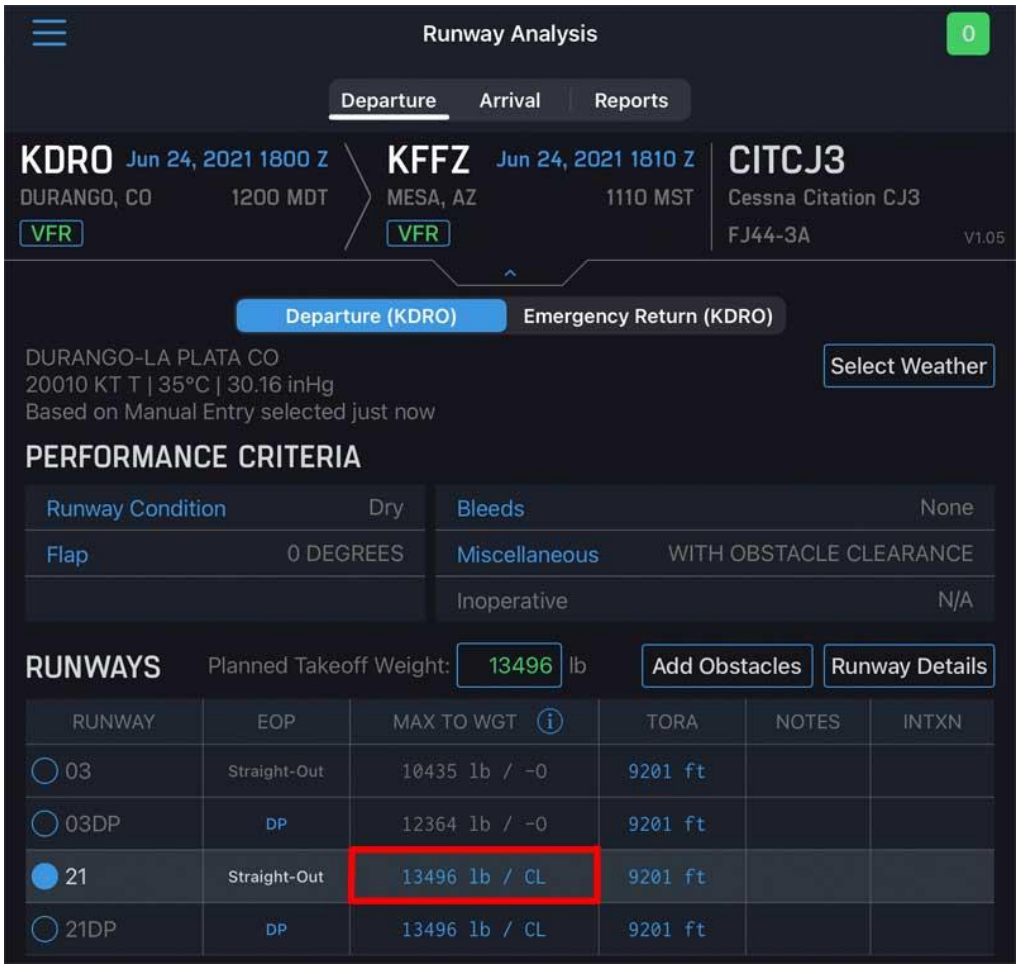
We see here the major limitation of CESNAV of which pilots need to be aware – there is no obstacle data loaded into the program, and thus no ability to provide an obstacle limited weight. CESNAV does allow for the manual input of obstacles or the specification of a minimum acceptable engine-out climb gradient, but as discussed above, these don't allow for certainty that all obstacles will be cleared.

With the academics established, let's look at a CJ3 performing a flaps-zero takeoff from runway 21 at Durango, CO (KDRO). Environmental conditions for all computations are set to: winds 200° at 10 knots (true), temperature 35° C, and altimeter 30.16.

First the output from CESNAV:

We are clearly told that the takeoff weight has been limited below MTOW due to our second concern: the *climb limit*. The required runway of 6679' is 2522' shorter than the available runway, so no issue with a runway limit. By taking off at 13,496 pounds (slightly less than MTOW for a CJ3) our engine-out climb performance will *just barely* meet the requirements. These requirements, it is important to note, are not very conservative – as little as 150 FPM climb rate achieved by a test pilot with perfect engine-out technique.

APG's iPreflight app uses the same performance formulas that drive CESNAV but adds the comparison of the engine-out flight path to terrain and obstacles. Good news here:



TOW: 13489 lb	Departure	Reduced Thrust
V1	114	N/A
VR	118	N/A
V2	122	N/A
VFTO	130	N/A
Power	96.0	N/A
Takeoff Distance	6685 ft	N/A
L/O Altitude	8416	N/A
Assumed Temp C	N/A	N/A

We have exactly the same limit – 13,496 pounds due to climb limits (CL). Further, our calculated V speeds are precisely the same, and the required field length is within 6 feet of that CESNAV returned. We also have the added confidence that our flight path will not result in terrain or obstacle impact, as we are not given an obstacle-limited weight below the climb limit.

Finally, the relatively new offering from ForeFlight:

Runway Analysis KDRO — in N700GD (525B CJ3 - FJ44-3A) Created Jun 21 2021 13:24 GMT-0400 - FFM 13.4.1

TAKEOFF SUMMARY

Wind	200°T / 10 kts ↓ 10 kts | → 3 kts
Temperature	35°C
Altimeter	30.16 inHg / 1021 hPa
Takeoff Flaps	Up
Anti-Ice	Off
Type II/III/IV Deice Fluid	Not Applied
Obstacle Criteria	FAA 120-91A
Runway / EOP	21 / Straight Out
TORA / TODA / ASDA	9,201 / 9,201 / 9,201 ft
Surface Condition	Dry
Takeoff Weight	13,489 lbs
Takeoff Thrust N1	96.1%
V1 / VR / V2 / VENR	113 / 118 / 121 / 130 KIAS
TOFL	6,761 ft
Level Off Altitude	8,453 ft

LANDING SUMMARY

No landing runway requested

TAKEOFF ENGINE OUT PROCEDURE

Continue straight on extended runway centerline.

Takeoff Analysis - KDRO - Durango-La Plata County - Elevation 6,689 ft

Runway		**03**		**21**
TORA/TODA/ASDA		9,201 / 9,201 / 9,201 ft		9,201 / 9,201 ft / 9,201 ft
Slope		0.8%		-0.75%
Winds		↑ 10 kts | ← 3 kts		↓ 10 kts | → 3 kts
	OAT	**EOP (Jeppesen)**	**Straight Out**	**Straight Out**
MTOW (lbs) LIMIT	**33°C**	12,484 Obstacle	12,355 Obstacle	13,703 Climb
	35°C	12,307 Obstacle	12,073 Obstacle	13,489 Climb
	37°C	12,124 Obstacle	11,793 Obstacle	13,109 Climb

Here we see a slight difference in the climb limit – 7 pounds less than returned by CESNAV or iPreflight, and two V-speeds that differ by one knot. These negligible differences are due to the method used by ForeFlight in calculating performance and can be ignored for practical purposes. Similarly to iPreflight, ForeFlight is considering *all* limits in that obstacle limits are being evaluated.

So, if making a true apples-to-apples comparison, all three software products should deliver very similar, if not identical, results. On the forum post it was determined that inputting an unnecessary minimum climb gradient in CESNAV resulted in the most divergent output from the rest of the field.

It's important to conclude with the caveat that while runway 21 at KDRO does not have obstacles in the departure corridor that limit takeoff weight, this is actually a fairly unusual situation. Many airports outside mountainous areas have hills, buildings, road embankments, etc. close to the departure end, which while not very high in absolute terms, require a high *angle* to clear due to their proximity.

On Final: What Good Looks Like, Part II

by David Miller, Director of Programs and Safety Education

Last issue, we met Neil Singer, part of our CJP safety team. This month, we'll have a chance to pick the brain of astronaut Charlie Precourt, chairman of the CJP Safety Committee.

Charlie is a four-time space shuttle guy, commanding two missions. Currently flying a CJ1+, he is a board member of EAA and NBAA and in his spare time runs a company that builds rockets for the stuff you see blasting into space on a regular basis.

Needless to say, Charlie is a "pilot's pilot." On his first flight in a Citation Mustang, he made the landing from the right seat and literally touched down without any sensation whatsoever. The kind of landing I make about every 10 years. Unfortunately, I was in the left seat... and *so* pissed off. I put my hand on his shoulder as we taxied off the runway and said, "Don't worry, Charlie, it will get a little better each time you try."

I thought you might like to hear from someone who has pretty much done it all.

What military aircraft have you flown?

In order of highest hours to least: T-38 Talon, A/T-37 Dragonfly, F-15 Eagle, F-4 Phantom, L-39 Albatross, A-7 Corsair, Shorts Tucano, Mig-21 Fishbed, L-29 Delfin, KC-135 Tanker, C-550 Radar testbed, T-33 T-Bird (Shooting Star), Mirage III, C-130 Hercules, H-58 Helo, C-141 Starlifter, Lockheed U-2 Dragonlady, F-111 Aardvark, Mirage 2000, T-43 (Boeing 737), AV-8A/B Harrier, H-1 Huey, H-206B Helo, Lockheed S-3A Viking, F-104 Starfighter, F-1 Mirage, MB-339, OV-1 Mohawk, F-16 Falcon, F-18 Hornet, French Jaguar, T-28 Trojan... and an additional 30 or so GA aircraft.

You were involved with the Columbia space shuttle [investigation.] Can you talk about how that accident changed you?

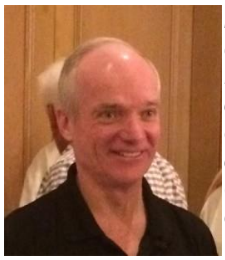
The biggest impact was losing close friends. It is sobering to see those close to you lost in an activity you love. As NASA's chief astronaut at the time, I had personally selected and certified them for that flight. What we learned in the aftermath was had we acted earlier on information in front of us, we may have had a chance to prevent this.

The real underlying cause was what we have come to call "normalization of deviance" – accepting problems as OK when we shouldn't have. In the loss of Columbia, it was pieces of foam coming off the external tank, which had happened without consequence on every flight – until the one time it had a big consequence. What the experience made me realize is accidents are preventable if we have the right mindset about risks and take measures to mitigate risks. Things like lots of training, ensuring proper maintenance and joining a type club for mutual support and learning.

Compare flying a military fighter jet to a Citation.

One word: maneuverability. Fighter jets are extremely aerobatic and extremely powerful. Initial climb rates in excess of 20,000 feet per minute are not unheard of. High G turns up to 9 G are also common. On the other hand, the Citation challenges you in different ways – precision instrument flying, smooth maneuvering, handling complex air traffic and weather situations, and managing passengers and crew. Although the two are very different from a handling and maneuvering standpoint, they are equally challenging to the pilot's mental capacity!

You are spearheading CJP's FOQA effort. Can you talk about what that is and why we need it?



FOQA stands for Flight Operations Quality Assurance, which describes a data-driven technique for catching safety trends before accidents happen. The airlines have had huge success with it and have seen accident rates drop to amazingly low levels. Performance data is collected from the aircraft each flight and allows flight crews to spot areas in need of improvement, and to share lessons learned with everyone in their FOQA group. An example would be catching a tendency of pilots to arrive high at the threshold and land beyond the desired touchdown point. Seeing this happen among a number of pilots in the group could lead to changes in SOPs, or it might lead to changes with air traffic control in the event they contributed to the trend with their own handling procedures.

Charlie practices what he preaches. During a recent Citation Mustang recurrent at FlightSafety Textron Aviation Training in Wichita, I saw him spread out three system diagrams and a memory items checklist on the classroom table. All of them personally designed by him. He made a 100 on the class test... I didn't.

Fly safe.

(The preceding article was featured in the February 2021 issue of Twin & Turbine *magazine and is reprinted with permission.)*
