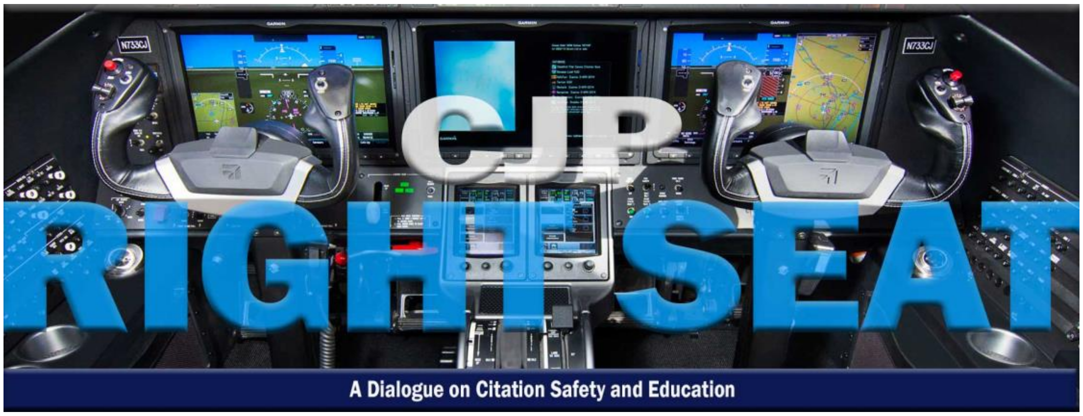
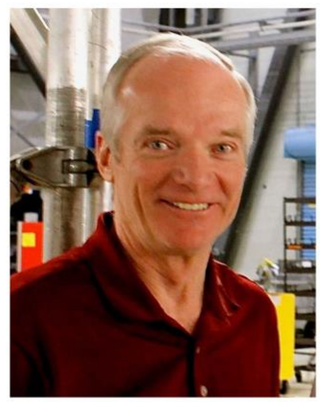
Citation Jet Pilots
OWNER PILOT ASSOCIATION

September 2020



— LATEST BRIEFING —

Virtually Unconventional



Rich Content in Store for Virtual Safety Standdown

by Charlie Precourt, CJP Safety Committee Chairman

We have made significant progress adapting to our 2020 pandemic challenges, and our Safety Standdown for the convention is shaping up to be a great event – including the regular member favorite Jeopardy challenge. You do not want to miss it!

We kick off the convention on October 22 at 8:30 a.m. Central Time and will move into the Safety Standdown starting at 1 p.m. We will begin with a fascinating review of the Dale Earnhardt Jr. Citation Latitude accident that resulted in a runway overrun and total loss of the aircraft. Fortunately, everyone got out OK, but the lessons learned regarding stabilized approaches and understanding of runway performance limitations are both compelling and riveting. David Miller will kick that session off with a fabulous video simulation/recreation of an unstable approach. Peter Basile of Textron Aviation will then give us a detailed play-by-play of the Latitude accident. I've seen the presentation and it is an eye-opener! What's most intriguing to me is how it hits right at the crux of our most common issue in Citation accidents and incidents. Runway excursions account for over 50 percent of all Citation accidents and incidents. In the analysis you'll see everything from the effects of an unstable approach, go around decision-making (or not), the importance of proper application of SOPs, and a number of other critical takeaways that apply to all Citation operations. This will certainly be a highlight of the day, so be sure to sign on at 1 p.m. on October 22.

Following the Latitude accident review, I will present a statistical summary of Citation accidents and incidents going back to the beginning of the CJP organization to show how trends since then can shape where we focus our training efforts to keep bringing accident rates down. We've been making steady progress as you'll see. I'll also cover a few of the more interesting incidents that have occurred since our last convention.

Just after 2 p.m., we'll dive into the Jeopardy challenge. We heard good feedback from you last year that you wanted more challenging, real-world scenario questions and less trivia, so

Neil Singer and I will set the game up around a flight planning and execution scenario that folds in our SOPs. We'll also have some clever ways to score by teams using polling technology online. This one should be a lot of fun and lead to good discussions as there will be some judgment calls that Neil has embedded into some of the questions that we can dissect together.

After a mid-afternoon break, we'll finish up the Jeopardy challenge then discuss Flight Operations Quality Assurance (FOQA, or Flight Data monitoring). Many of our members have been participating in a beta test of our own FOQA system that could be a big benefit to us for both insurance and training.

Finally, we'll have a fantastic interview with Tom Abood and David Miller to dive into the details of Tom's flight control emergency and the ambiguous cockpit indications he experienced when his AOA probe failed on takeoff. We will also have a few more of our popular "What Good looks Like" videos to round out the afternoon before transitioning to our Gold Standard Safety Awards.

Despite the pandemic, we are still well above 60 recipients of the Gold Standard, and at least half are earning the award for the first time – very exciting to see that. Congratulations to all who have committed to continuous learning and training. That's a big deal for our community!

Side note: David Miller has a message for all of us at the convention. Make sure you're seated.

Our guest authors for this edition of Right Seat come from AVIAA, LOFT and Neil Singer, who discuss upset issues, upset training and landing performance. AVIAA has a partnership with many providers of UPRT that can provide discounts for CJP members. Jim "Huck" Harris, a LOFT instructor at the Carlsbad training facility, follows up with some inside baseball on angle of attack. And Neil Singer shares a recent AOPA article on landing performance. Thanks to all for contributing.

Fly safe!

Charlie

How About the Best Ground School Ever?

by David Miller, Director of Programs and Safety Education

From the comfort of your office or couch, attend the virtual convention and get all the up-to-date information to safely operate your Citation.

- · Review of 2019-2020 Citation accidents
- · In-depth analysis of Earnhardt accident with Peter Basile of Textron
- · New "What Good Looks Like" videos, including actual CJP member experiences
- · Safety Standdown with Charlie Precourt and Neil Singer
- · Interaction and Q&A

Registration is open on our website now! All content will be available to those registered on demand shortly after the live event.
David

Why Consider Upset Prevention and Recovery Training?

by AVIAA

Upset Prevention and Recovery Training (UPRT) is the change from controlled flight into upset scenarios like spins or dives and learning the methods to properly and safely recover from these conditions.

There are varying opinions on the effectiveness of upset prevention and recovery training. Regardless of your view, the facts cannot be ignored: loss of control inflight (LOC-I) remains the most significant contributor to fatal aircraft accidents. The NTSB has shown that single pilot operations accounted for six times more fatal loss of control accidents than crewed flight from 2008 to 2018. In an in-depth loss of control accident analysis report prepared by the International Air Transport Association, they concluded that "…human performance deficiencies, including improper, inadequate or absent training, automation and flight mode confusion, distraction the 'startle' factor and loss of situational awareness frequently compounded the initial upset and precluded an effective recovery until it was too late."

UPRT Awareness

Since the European Union Aviation Safety Agency made upset recovery a mandatory pilot requirement the training has gained more attention. Ahead of any progressive enforcement from the FAA on the subject, insurance companies are looking at advancing their interests in the industry by imposing similar conditions in their pilot warranties to reduce an unacceptably high number of fatalities tied to loss of control accidents.

UPRT vs. Other Training

In absence of upset recovery training, could a pilot benefit from more training in their aircraft or in a simulator? Certainly, as would following safe operational protocols and procedures limit your exposure to unwanted circumstances. But regardless of how much training you have, an unexpected event can turn an expert pilot into a novice one without the *right type* of training. We have all witnessed weather change dramatically during a flight so to suggest a sudden wind shear could not stall the aircraft is incorrect. The Roman philosopher, Pliny the Elder once said, "There is only one thing certain and that is that nothing is certain." So, why not be prepared for the worst if, heaven forbid, something were to happen in your aircraft.

UPRT In-Aircraft vs. Simulator

Is upset recovery training better in aircraft or in a simulator? Arguments can be made for both sides. Simulators have their limitations just like training in an aerobatic propeller aircraft in lieu of the business jet you typically fly. Each method also has its own unique benefits and most industry experts will agree either training is better than none, so long as it doesn't create a negative experience. The Navy Seal motto is a pleasant reminder: "Under pressure, you don't rise to the occasion, you sink to the level of your training."

If you are interested in lifesaving upset prevention, recognition and recovery training, AVIAA has partnered with industry leading UPRT providers to offer discounted pricing to CJP members. Reach out to info@aviaa.com *to learn more.*

A Greek Named Alpha

by Jim "Huck" Harris, LOFT Instructor

I am a big fan of flying Angle of Attack and knowing the entire maneuvering envelope of my aircraft. I feel particularly suited to write this article because in one of my former aviation lives, I spent 18 years flying fighter aircraft with a major focus on Air Combat Maneuvering – *Dog Fighting*. I flew almost 4,000 hours in highly maneuverable aircraft, continually encountering high Angle of Attack situations including stalls, departure to stalls, spins and airspeed down to zero with pitch attitudes up to 90 degrees nose up; backing down, canopy-to-canopy with an adversary trying to get at my six. This occurred on the majority of those training flights as I practiced and instructed advanced fighter tactics. That focus was necessary to develop proficiency for when faced with the need for extreme defensive or offensive maneuvers. Each of those thrilling flights had a happy ending because I understood Angle of Attack.

Now, before you conclude the author is crazy and far from one whom should address an audience of general aviation pilots, I'll add that my next aviation career included more than 31 years and 25,000 hours flying 737, 727, DC-10 and 777 aircraft for a major airline; half of that spent in Flight Standards and Training including developing recovery procedures for what the airlines refer to as *Advanced Maneuvers*.

As pilots first study aerodynamics they learn that it is more correct to state that Angle of Attack produces lift on aircraft, not airspeed. The formal definition of Angle of Attack (AOA) is the angle between the mean aerodynamic chord line and the relative wind. At zero AOA, no lift is being produced. On takeoff roll, as the pilot increases pitch, AOA increases and lift begins to generate. As the amount of lift increases and exceeds the force of gravity acting on the gross weight, the aircraft begins to climb. There is a specific AOA that will represent best angle of climb, best rate of climb, max range cruise, max endurance as well as other important parameters that are optimized by operating the aircraft at the AOA for that flight regime. In fact, the AOA of stall is actually defined as the AOA of maximum lift.

Historically, the Academics of Aerodynamics have assigned the letter of the Greek alphabet, "Alpha" to represent AOA. Hence the title of this article.

Because Alpha produces lift and causes an aircraft to fly, it is also Alpha that may cause an aircraft to cease to develop sufficient lift to continue flying. With safety being our foremost priority as pilots, we always want to operate our aircraft well within the aerodynamic envelope. In other words, in total control of *A Greek Named Alpha*. That notwithstanding, our training must include an understanding of control of AOA during simulator training scenarios that involve recovery from nose high and nose low situations. Granted, it would have to be a very bad day, but these could occur during line operations.

There are a number of factors that could cause unusual attitudes or excessive AOA situations. Some of these could be:

- Wake turbulence following a larger aircraft.
- Encountering turbulence caused by weather phenomena.
- Distraction during level-off from descent causing pilot to not add sufficient power.

Whatever the cause, immediate recognition, analysis of the required action, and rapid application of correct recovery MUST HAPPEN NOW! Controlling Alpha throughout the recovery is mandatory to prevent the situation from getting much worse.

The following breaks down the general sequence of required recovery actions.

Assess the Situation

You may be IMC or VMC when faced with an unusual attitude, therefore your best reference is your PFD and airspeed while cross-checking with secondary instruments. Are you nose high or nose low? Are you in an excessive angle of bank or close to wings level? What's your airspeed? Any discrepancies should be confirmed on the other pilot's instruments or standby indicators.

Disconnect the Autopilot

Most of the cruise portion of our flights and approach is with the autopilot engaged. This may be the source of the unusual attitude and even if it is not, it must be disengaged immediately.

Control the Angle of Attack

Whether nose high or nose low, you must avoid high AOA during recovery. This is usually accomplished by releasing any back pressure on the control column but may require you to unload the AOA. The necessary forward yoke will at most cause you to experience Zero G but never Negative G. Remember, angle of bank increases stall speed.

If nose high, apply maximum power; If nose low, reduce throttles to idle and use speed brake as necessary.

If nose high fly the nose to the horizon or slightly below the horizon.

This may require overbanking up to a max of 45 degrees to assist in reducing pitch; approaching the horizon level the wings.

If nose low, level the wings THEN pull the nose up.

Avoid rolling or unsymmetrical G that might overstress the aircraft in your pull out.

In simulator sessions, I often see clients reduce power when presented with a nose high unusual attitude. **If you are nose high, you must add power**. Adding thrust with high mounted engines will also help in generating a nose-down moment. Alternatively, if nose low, you **must reduce power** to idle and extend speed brakes as required.

Everything just described could be summarized with the jingle: "**UNLOAD**, **POWER** (as required), **ROLL**, and **PULL** (to the horizon)"

An aircraft upset is one emergency where you cannot sit back and "wind the clock" as you discuss options. Your action must be immediate while always respecting, *A Greek Named Alpha*.

Happy landings to all.

Jim Harris, known to friends and associates as "Huck" graduated in 1969 from the United States Naval Academy. He spent the next 18 months in Navy Pilot training in Pensacola, FL, Meridian, MS and Kingsville, TX. Upon earning his Navy Wings he reported to NAS Miramar to train in the F-4J Phantom and subsequently to Fighter Squadron 143 onboard USS Enterprise in 1972. Huck flew 100 combat missions over North Vietnam, South Vietnam and Laos. He was selected to attend the TOP GUN school upon return to San Diego, followed by deployment for eight months to the Mediterranean, flying the F-4J from USS America. His next assignment was as a TOP GUN Instructor for 2.5 years flying the F-5E, A-4E and T-38 as simulated Migs. He transferred to the Naval Reserve in 1977, again flying the F-4 and was hired by a major airline where he spent the next 31 years. In the Reserve, Huck also flew the F-14 Tomcat and was Commanding Officer of Fighter Squadron 301, retiring as a Navy Captain. He accumulated 417 carrier arrested landings on seven different Aircraft Carriers. He has been on the Staff at LOFT since January 2018.

Some Landings are Not Meant to Be

Turbojet landing performance calculations.

by Neil Singer

Reprinted from the August 2020 issue of AOPA Pilot magazine by permission of Aircraft Owners and Pilots Association.

There's an old saying in aviation that while landings are mandatory, takeoffs are always optional. The implication being that once a pilot is in the air, they find themselves committed to the flight, and the best time to make a safety decision is often before the takeoff has commenced.

When it comes to performance planning in jets, however, the saying can be flipped on its head: takeoffs are more or less mandatory, but every particular landing should be thought of as optional. By this, I mean that once an airplane finds itself at a given airport, at some point it is going to have to depart that airport, short of taking the wings off and trucking it out. Given this, performance planning for takeoff becomes an exercise in reverse engineering: given the unalterable conditions of runway, altitude and terrain, and the expectations of temperature, wind and precipitation and/or icing, what kind of loading can we permit and successfully depart the airport with an out during every stage of the takeoff and departure?

For landing, however, the pilot finds themselves in a different situation: approaching an airport to land they can no longer alter their weight, or change the airport or environmental conditions. Thus, the performance calculations are executed to a binary outcome: landing can be safely affected with adequate margins, or it cannot be and a diversion to an airport with more salutary variables must be performed.

Whereas takeoff performance planning is largely driven by mitigation strategies for a theoretical engine failure during each phase of departure, landing performance planning is mostly a question of energy, kinetic energy to be specific: given the energy present in a landing airplane due to its mass and velocity, how much runway will be needed for the brake system of the aircraft to absorb that energy and stop the airplane? An increase in mass (landing weight) or velocity (ground speed at touchdown), or a decrease in braking effectiveness (runway surface friction decreasing due to moisture) will necessitate more runway be used.

Unfortunately, any increase in landing weight is compounded by a necessary increase in landing speed, due the calculation of our first landing speed, VREF. Calculated for every landing, and based on the landing flap position (when options exist), icing conditions, and landing weight, VREF is the approach speed, at which aircraft should cross the runway threshold. It represents 130 percent of stall speed for the landing weight, so as landing weight increases, so does stall speed and VREF.

Before we can begin the complex calculations that examine if our weight and VREF will allow for a safe landing on the runway to be used, a more basic restriction on landing weight must be complied with; one that relates to the other two landing speeds typically calculated- approach climb speed and final takeoff speed (used similarly in this case for landing).

Approach climb speed, called VAPP or VAC by two large manufactures of light jets, is selected to give the best possible climb performance during a go-around with one engine inoperative. With maximum takeoff power (time limited) on the operating engine, the landing gear retracted, and the flaps in the go-around position, the aircraft must be capable of achieving a 2.1 percent climb gradient: climb up 2.1 feet for every 100 feet of forward flight. While the OEM has latitude in selecting this approach climb speed, it cannot be less than 1.5 times stall speed in the go-around flap configuration, and the flap setting selected for go-around cannot raise stall speed more than 10 percent from stall speed with the flaps in the landing position. So, while retracting flaps fully for the go-around would result in a much better climb gradient, it is not allowed as the stall speed increase would be too large. Rather, a partial flap retraction is performed, and this partial flap setting maintained for the initial part of the go around.

At conditions of high altitude and temperature, the ability of the aircraft to achieve the mandated 2.1 percent gradient can be in question. Particularly an issue for the smallest light jets that have a lower thrust/weight ratio than their larger and higher-performing siblings, this inability to meet the gradient at high weight can cause an *approach climb limit* on landing weight. Some OEMs are able to mitigate this limit to landing weight by allowing for a reduced flap landing setting- trading off a higher VREF and landing distance for the less restrictive approach climb limit present with the lower flap extension present during the go-around.

Consider a Phenom 100 landing during summer at Colorado Springs (KCOS), with an outside temperature of 30 degrees C. If the landing is performed with full flaps (36 degrees of extension), the go-around must be performed with a 26-degree setting. This setting carries enough drag that the aircraft would be approach climb limited to a 7,600-pound landing weight, a more or less impractically low limit if any passengers are to be carried.

With a landing conducted with the lower 2-degree setting, however, the go-around is conducted with only 10 degrees of flaps. This creates significantly less drag during the climb-out, and so the weight limit jumps to over 9,500 pounds, nearly the structural landing limit. For this reduced flap setting an extra 5 knots of approach speed is needed, translating to an extra 300 feet of runway requirement, a fair tradeoff for the increased landing weight.

After go-around, once the aircraft has reached a safe altitude above the ground, the aircraft is accelerated to the final climb out speed (VFTO), flaps are retracted, and thrust reduced to the maximum continuous setting. This “en route” climb must be capable of maintaining a 1.2 percent gradient with one engine failed, but is less commonly a restriction on landing weight than the approach climb. During combinations of landing at low altitude and high temperature, however, it can be restricting, and must be observed just as the approach climb limit. Manufactures typically combine the approach and en route climb limit information onto one chart that displays the more restrictive limit for a given altitude and temperature.

Of interest is the absence of a requirement to demonstrate that an engine-out missed approach can clear terrain. Even for-hire operations are not required to perform an obstacle clearance analysis for one-engine-inoperative missed approaches or rejected landings. Rather the FAA recommends that “it is appropriate to provide information to the flight crews on the safest way to perform such a maneuver should it be required.”

As a missed approach is started both farther and higher from the runway end than a takeoff, the use of *takeoff* engine-out climb-out data (runway analysis) is considered a safe option for ensuring engine out go-around performance is adequate. Fortunately, engine failures are rare in jet aircraft, as are missed approaches; the confluence of both is a very remote occurrence.

Back to the more likely situation that a go-around is not performed, and landing is attempted. Pilots must understand that the *unfactored landing distance* requirements they calculate from manufacture supplied data are predicated on the aircraft crossing the threshold at exactly VREF. Any speed over VREF will increase landing distance above the book value: an aircraft with a VREF of 100 knots crossing the threshold at 110 knots has 10 percent more speed, but 21 percent more kinetic energy, as energy increases with the square of velocity. Given this, an aircraft expecting a 2,000-foot ground roll from book values would need an extra 420 feet if VREF is exceeded by 10 knots.

Unfortunately, the accident history shows that when one landing parameter is exceeded, many other often are as well, and all contribute to a longer landing roll. The unfactored landing distance is validated by a test pilot crossing the threshold at exactly 50 feet, bringing the power to idle, descending up to 480 feet per minute to touchdown, and initiating full braking one second after the main wheels touch down. Any variation from this aggressive profile will increase the landing distance. An extra 10 feet high above the expected 50 feet will add 200 feet to the landing distance, while any floating or delay in braking will add 170 feet per second when the aircraft has a typical touchdown speed of 100 knots.

Adding together the possible variations from ideal technique, we see that an expected 3,000-foot-long landing can easily use 4,000 feet or more if the pilot isn't on top of all the variables affecting the actual distance needed. Because of this, the unfactored landing distance should never be thought to be an adequate amount of runway to actually land on. The FAA flat out states that "The unfactored landing distances in the manufacturer-supplied AFM reflect performance in a flight test environment that is not representative of normal flight operations."

For-hire operations are required to apply a safety factor to their landing performance planning, so as to have an extra two-thirds of the calculated runway required present as a safety margin. Thus, if the calculated performance says a landing in 3,000 feet is possible, the actual landing distance available (LDA) could not be less than 5,000 feet. While this *factored landing distance* calculation is not required for private operations, it is a widely accepted best practice to calculate and observe it.

Utilization of a safety margin becomes especially important when landings are conducted on non-dry runways. History has shown that jets depart non-dry runways at a rate 1,300 percent higher than on dry surfaces. Whether the runway is *wet* (defined in wonderfully simple terms by the FAA as when it is "not dry") or *contaminated* (when more than 3 millimeters of standing water, slush, or snow exists), performance planning becomes rapidly less precise and scientific.

Recent safety alerts issued by the FAA attest to the fact that "Several recent runway-landing incidents/accidents have raised concerns with wet runway stopping performance assumptions. Analysis of the stopping data from these incidents/accidents indicates the braking coefficient of friction in each case was significantly lower than expected." A review of these accidents found that when landing on a runway without grooving–lateral channels that carry water off the runway surface–rainfall intensity more than light should signal that the runway has transitioned from wet to contaminated, while on a grooved runway heavy precipitation should do the same.

For one common light jet landing at a typical weight, the unfactored landing distance increases from 2,600 feet on a dry runway to 3,500 feet when wet, and further to 4,600 feet if the water crosses the 3-mm threshold to contaminated. This jet that can land with an adequate safety factor on a 4,500-foot dry runway now needs nearly 8,000 feet of pavement to have the same safety margin in the presence of moderate rainfall if the surface is not grooved. Not many runways at smaller general aviation airports are this long, so it is unsurprising to see runway overruns on wet and contaminated runway continue to plague light jets.

Pilots are encouraged to calculate before landing if they will have enough runway should conditions change from wet to contaminated. In some cases, the LDA will be sufficient for landing in any condition, while on shorter runways a landing may have an adequate safety margin only if the runway is dry or wet, but not if contaminated. In this case the pilot must be alert during the approach to any indication, whether from a runway condition code update, a pilot braking action report, or a change in observed precipitation rate, that the threshold to contaminated conditions has been crossed, and be prepared to divert to a preidentified alternate with a longer surface and/or better conditions.