Pitot & Static Systems / Owner's Corner: Citation Mustang / Jet Shades Next-Gen

TWIN & TURBINE

FOR THE PILOTS OF OWNER-FLOWN, CABIN-CLASS AIRCRAFT

MARCH 2023 $3.95 US
VOLUME 27 NUMBER 3

AN OWNER'S VIEW OF THE CITATION MUSTANG


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Contents

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Photo Courtesy of Jessica Ambats

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New Horizons

Five years ago, I was offered an opportunity of a lifetime.

In February of 2018, longtime T&T editor Dianne White called and offered me – a young pilot and still relatively green aviation professional – the position of Editor-in-Chief of Twin & Turbine Magazine. While I was a contributing writer at the time, the offer still came as a complete surprise. But as the initial shock subsided, my heart immediately knew this was a life-changing opportunity, personally and professionally, and I readily accepted.

That phone call resulted in the absolute best job I never expected. I will forever be indebted to Dianne's confidence and trust in my ability. She has become one of my greatest mentors and inspirations.

In five years, we've doubled the contributing team (expanding expertise and perspectives), reinvigorated the magazine's design, founded multiple new editorial series, launched a modernized website, and more. But at the root of each accomplishment remains one firm, underlying mission since T&T's start: Deliver a valuable resource for owner-pilots with topics surrounding the safe, efficient and enjoyable operation and ownership of high-performance pistons, turboprops and jets.

The anniversary naturally has me reflective, but I am keen to bring it up as I prepare for yet another unexpected new chapter and major update. A couple of months ago, I decided to resign as T&T's Editor-in-Chief and pursue other opportunities. So, it is with mixed emotion that I announce this issue (March 2023) will officially be my final one at the helm.

However, I am thrilled to be handing the magazine over to more than capable hands. Beginning with the April issue, Lance Phillips will be assuming the role of editor.

Lance is a pilot and aviation professional who has held management and executive positions at FlightSafety, Hawker Beechcraft, Textron Aviation, Mooney and Lancair. He is now the executive director for the Pinnacle Air Network and an aviation business consultant. Also a writer and photographer, you may have seen Lance's name appear across T&T over the past year, specifically within the "Company Chronicles" series and the cover stories for August and February. He is type-rated in the Gulfstream G100 and flew the Beechjet as a corporate pilot but these days prefers to stay in the lower knots.

With great confidence, I now pass the baton to Lance, who will undoubtedly bring a fresh wave of knowledge and passion to the pages of this magazine. His piloting and professional background relate extensively to the very readership and writing team behind this publication. You can expect further introduction from Lance in his first Editor's Briefing next month.

It has been an honor to be entrusted with such a talented team and unique publication. Thank you all for your loyal readership and support over the past five years. Twin & Turbine will forever be a huge part of my life.

Blue skies,

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Technological Woes

Takeaways from the Southwest Airlines Meltdown

by **Stan Dunn**

PHOTOS BY AUTHOR

Plenty of media coverage was devoted to the Southwest Airlines meltdown that occurred in the second half of this past December. The beleaguered air carrier canceled 16,700 flights over the holiday season at an estimated cost of between $725 and $825 million (around half to cover refunds, the rest for reimbursements). This total equals the amount that Southwest earned in the first nine months of the year. The cancelations equaled the total for the preceding 10 months (which had already drawn White House ire due to poor, post-COVID performance). The opaque cost of bad press will certainly push the burden much higher. The exact number of affected passengers has not been disclosed, but a fair estimate has it at seven figures. As much as a half-a-percent of the total population of the United States was impacted.

The triggering incident was related to a "bomb cyclone" of freezing weather and wind. The severe conditions saturated large swaths of the United States, creating chaos for national air carriers. Yet for Southwest, the disruption extended well past the worst of the weather. There are a few reasons for this. First, Southwest utilizes a point-to-point network (as opposed to the more traditional hub-and-spoke of competitors). This model can be cumbersome when confronted with scheduling discontinuities. Air crews are spread randomly around the country, making recovery more difficult when cancellations occur en masse. Secondly – and more relevant to the ensuing meltdown – Southwest utilizes an antiquated network to reassign displaced flight crews. In a world increasingly reliant on automated solutions, aging technology has proven to be an Achilles heel.

The winter storm began on December 21. But the worst of the cancellations did not occur until the 26 when over 50 percent of Southwest flights were canceled. The technological meltdown drew a harsh response from the Department of Transportation. This rapidly evolved into an egg-on-face moment for the FAA. A week and a half after Southwest had unraveled the glitch, a nationwide ground stop was issued due to a failure in the government's Notice to Air Missions (NOTAM) network. The ground stop wreaked havoc on early morning departures. It resulted in just shy of 7,000 delays and 1,100 cancelations. A nationwide

ground stop is a rare event reserved for extraordinary circumstances. The last time it happened was in 2001.

Initially, the idea circulated that the NOTAM failure was the result of a cyberattack, but the final cause was much more benign. An IT contractor had unintentionally deleted files while "working to correct synchronization between [primary] and backup databases." Media experts soon postulated that antiquated IT systems had been the culprit. Some questioned the robustness of the NOTAM delivery mechanism. To be fair, the current system has decades of reliable operation under its belt. Still, the fiasco points to the obvious fact that a sole source failure was enough to paralyze domestic air travel – even if only for a handful of hours (most of which occurred in the middle of the night).

If you are into conspiracy theories, you might be inclined to think that the FAA did it on purpose. The 5-year budgetary process for the agency is up for reauthorization this year. Immediate talk by DOT representatives focused on the budget as a solution to the dilemma. The current NOTAM system is three decades old. Renewal is not slated to occur for another several years. On top of this, the current NOTAM system already has its detractors. Designed primarily to inform pilots of non-published restrictions in the national aerospace system, it often serves as a dumping house of operationally marginal data. Three full pages of obstacle locations (listed via long-form coordinates) is the sort of information that almost no pilot can meaningfully use.

The current FAA budget contains a myriad of objectives. Integration of Unmanned Air Systems (UAS) into the national aerospace system is one.

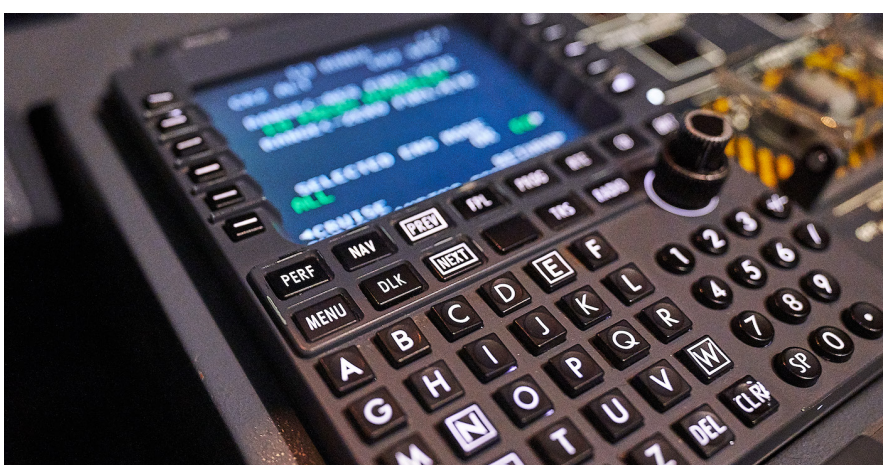
Advocacy of U.S.-based companies is another. Flight safety is in there somewhere as well. Across the pond, the European Union Aviation Safety Agency (EASA) has targeted 2027 as an entry point for single-pilot air carrier operations (initially, it will be limited to long-distance cruise flights, with two pilots still required in the terminal area). Boeing President Alexander Feldman commented on the issue in November. "The technology is there for single pilots; it's really about where the regulators and the general public feel comfortable." Recently, Boeing CEO Dave Calhoun echoed the sentiment, stating, "The future of autonomy is real." Airbus has long advocated for the removal of the second pilot. Tony Lucas, President of the Australian & International Pilots Association, counters, "The people going down this route aren't the people who fly jets every day. When things go awry [in an aircraft], they go awry fairly quickly."

Technology vs. Humanity

The days of pilots having direct control over their aircraft are rapidly diminishing. Computer nannies have been introduced into nearly every element of flight. In most modern jets, basic control inputs are "modified" by computers. It used to be that pilots pushed the stick, and that is where the aircraft went. It was reliable but not always safe (humans occasionally overreact). Limiting control surface deflection to maintain safe airframe loads (or to prevent stalls) has undoubtedly saved lives, but it has also produced an uncomfortable byproduct. In a fly-by-wire aircraft, pilots now issue maneuvering "requests" instead of commands. Automation has the final say over an increasing number of processes. This has produced a pretty good safety record, but it is not without danger. Look to Boeing's own 737 MAX as an example.

Technology has proven to be highly effective in reducing the accident rate in aviation, but up until now, it has always been in conjunction with a human operator. In the 1950s and 60s (the dawn of jet travel), there were half-a-dozen fatal crashes every year. Now they are exceedingly uncommon. And when they do occur, they rarely result in mass casualties (the last in the U.S. was the crash of Colgan Air 3407 in 2009). The proliferation of reliable turbine engines and a better understanding of adverse weather is a large part of the massive improvement in air safety over the past 60 years. Technological innovation has done the rest, yielding a 95 percent increase in airline safety since 1998.

General aviation is a slightly different story. Though the accident rate has decreased, it has not been as quick. There are a few obvious reasons for this. The first is that GA is comprised of a considerable proportion of piston aircraft. The reliability of piston powerplants has not changed much over the past half-century. The second is



that the GA fleet has the tendency to be older on average (GA aircraft log substantially fewer hours per year than airliners, giving them a longer lifespan). Also, GA does not benefit as much from risk analysis. Dedicated safety departments at airlines are staffed by full-time professionals who tap into data from thousands of flights per day. This data provides constructive feedback into training programs. Part 91 remains something of the "Wild West" in comparison. Still, there is hope on the horizon. ADS-B data provides more information for accident investigators who research small aircraft crashes. Better data will hopefully drive emerging training standards and lead to new technologies.

Automation is a big contributor to safety, but up until now, it has occurred mostly in bite-sized pieces. As a case example, GPWS was developed to address a specific threat (controlled flight into terrain). Later it was "enhanced" with several additional modes that improved pilot responses. Synthetic vision takes the EGPWS solution and presents it more intuitively. Similarly, TCAS originally alerted pilots to proximate aircraft. Now it provides unambiguous directions to avoid a collision. Some aircraft will automatically fly avoidance maneuvers through the autopilot. If you want to fly safer, technology has proven a highly efficient solution.

Single Pilot Operations

China Eastern Airlines recently partnered in an academic paper about Single Pilot Operations (SPO) in conjunction with Shanghai Jiao Tong University. Much attention throughout the paper is focused on the financial aspect of SPO. Likewise, a NASA Technological Interchange Meeting (TIM) focused on the issue in 2012. Again, most participants identified the primary driver of SPO to be the economic benefits to airlines. However, there was some disagreement as to the scale of savings (or whether it would be cheaper once the costs of new infrastructure were included).

The Union Bank of Switzerland (UBS) predicts that cost savings to the airlines of SPO would amount to $15B per year worldwide. This analysis most likely focuses on the direct costs of first officers (a role that would be modified by SPO). More difficult to analyze are the ancillary costs required to implement SPO on a broad scale. For example, a low latency, highly secure air-ground link would be required in the event a pilot became incapacitated or erratic. New air traffic control procedures would have to be incorporated as well. Multiply this on a global scale and the challenges to infrastructure are clear.

Then there is the question of equivalent safety. Accidents per 100,000 hours are 42 times higher in GA compared to the airlines. Corporate operators fare better, yet are still 10 times more likely to have an accident than their airline peers. SPO is undoubtedly a contributor to this comparative mismatch. Loss of Control In-flight (LOC-I) is a particularly deadly form of aviation

accidents. Statistics have demonstrated that single-pilot operations produce 6.7 times more fatal accidents than multi-crew operations due to loss of control.

The movement towards SPO will undoubtedly enhance flight safety for GA, regardless of what it does to the airlines. Yet the transformation may not be particularly quick. Optimism from manufacturers revolves around the generational pace of technological innovation. In 1950, for example, many aircraft required five crewmembers (a radio operator, navigator, flight engineer, and two pilots). The reduction from five to two took two decades. We have required that number for 40 years now. A mad scramble is underway to unravel this. At stake is supremacy in the manufacturing battle for the next generation of aircraft. The FAA, in part, is commissioned to facilitate the ability of U.S.-based aviation companies to compete with international conglomerates. The EASA does the same for European plane builders. The first manufacturer to produce an SPO-certificated aircraft (with an equivalent level of current safety) will possess a massive advantage.

The Displacement of Skilled Workers

The question falls into many parts. Is technology better for safety than a second pilot? If we can replace an airline pilot with automation, is GA on the brink of pilotless aircraft? What will SPO infrastructure cost to develop, deploy, maintain and operate? Are we rapidly approaching a new horizon in which automation kills the need for skilled workers? If technology can replace a pilot, how far behind is medicine, computer programming or law?

Just when concern begins to peak, another technological glitch saves the day. No matter how well our devices are engineered, there is always room for failure (or antagonistic exploitation). Automation solves very narrow problems and solves them very well. The complex stuff has traditionally been left to human operators. There is a good reason for this. Computers are great at quickly and reliably solving problems that exist within definite boundaries. Once the probabilistic haze of the real world is introduced, the potential for fatal errors becomes very real. The first generation of SPO airliners will undoubtedly come with hard lessons. It is easy to point to the fact that pilot error is the leading cause of accidents, but this glosses over a crucial element: the ratio between accidents caused and accidents prevented. A crash is obvious and comes with reporting requirements. A pilot saving the day is reminisced over a beer. Are humans worth the price? Will autonomous flight produce a new frontier, or will it drift along like the decades-old promise of a flying car? Either way, we are bound to discover the value of a pilot eventually. T&T

Stan Dunn *has 8,000-plus hours in turbine-powered aircraft, with three years of experience as an instructor and evaluator for airline pilots. Stan publishes detailed coverage of aviation accidents at bellmanmultimedia.com/flying. You can contact Stan at* **Stan@bellmanmultimedia.com**.

PHOTO COURTESY OF JESSICA AMBATS

AN OWNER'S VIEW OF THE

CITATION MUSTANG

(ALMOST) EVERYTHING YOU NEED TO KNOW

by **David Miller**

First, a little background about my Mustang experience is in order. I have owned three of them: one of the first (#008), one of the last (#445), and one in the middle (#284) – my current airplane. I have also owned a CJ1+ and leased an M2. After over 1,000 hours in the Mustang, I have probably experienced most of the good, bad and ugly that comes with ownership.

While the Mustang is not the fastest, roomiest or highest-flying single-pilot jet out there, it does all of those things extremely well and at one of the lowest costs per mile of any light jet. Let's look at the airplane in a little more depth.

Aircraft Performance

Pilots can plan on an honest 325 to 345 knots TAS at FL 410, depending on weight and temperature. Up there, you will see fuel flows of 500 lbs/hr total. Day in and day out, the airplane burns 100 gallons per hour. It's at home in the higher flight levels, at least in standard temperatures. Unlike its more powerful Citation competitors like the M2, the Mustang's Pratt & Whitney engines are sensitive to non-standard temperatures aloft.

Cruising in ISA+ 5 conditions or warmer will have a noticeable effect on performance. And the ability to climb to FL 390 and above in ISA+ conditions can be a struggle, especially after a gross weight takeoff. Plan on an initial 170-knot cruise climb after a pretty robust takeoff acceleration. Because the Mustang is not overpowered, it's important to carefully calculate performance in hot and high takeoff conditions, such as Gunnison, Colorado, where we have operated for many years.

PHOTOS BY AUTHOR

T&T contributing writer and Mustang owner David Miller.

Author's current and third Citation Mustang.

Complete "makeover" programs are available.

Regarding range, I like to be on the ground after 3:45, landing with a 600 to 700-pound VFR reserve. On a cool day, the tanks will hold 2,700 pounds of fuel, a nice increase from the 2,580 pounds per the flight manual. The normal useful load with the lower fuel weight is 700 to 750 pounds.

No surprise, the Mustang is not a fighter jet in handling, but it is honest, docile and stable in all situations. It is one of the easiest transition jets ever produced.

The airport performance is amazing. At normal landing weights, Vref is 88 knots, resulting in very short landing distances on dry runways. Coming from a King Air, your first thought in a Mustang landing is that you will surely die if you lose an engine at those low airspeeds. Fly the correct speeds, and you will be delighted with where you exit the runway. Soft landings are routine (at least, those are the ones I remember). And the Mustang's anti-skid brakes are very effective. It's simply a joy to operate on the ground and in the air.

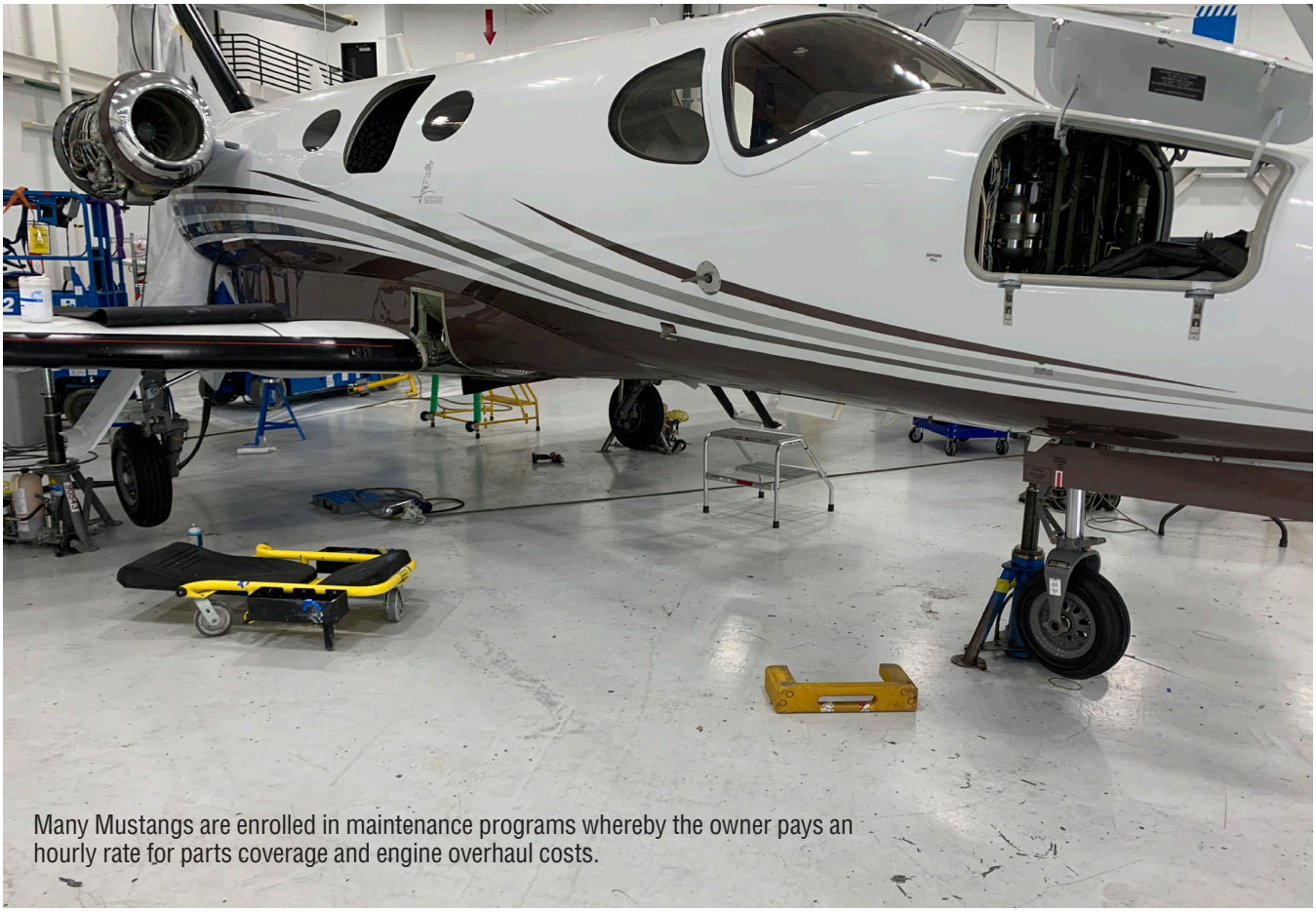
Avionics

Originally delivered with a Garmin G1000 suite, many airplanes have been upgraded with the NXi system. It's incredibly integrated, featuring a marvelous GFC 700 autopilot, the smoothest I have ever operated. The avionics were designed specifically for single-pilot operations. For instance, the landing field elevation is automatically loaded into the pressurization system as part of the flight plan entry. Vertical navigation and coupled visual approaches are simple. The engines are FADEC-controlled, making power management easy. Huge display screens and multiple display options reduce pilot workload significantly.

Integrated systems like the G1000 and G3000 make recognizing abnormal situations like AHARS (attitude and heading reference system) and ADC (air data computer) failures quicker and easier. The cockpit checklist and flows are simple and well thought out. Significantly, the fine folks at Garmin have unofficially adopted the little Mustang as a platform for numerous avionics improvements, including the new GWX75 Doppler capable weather radar, the GR56 global Iridium datalink communications system and ADSB diversity transponders. I have those upgrades installed and they work as promised. It's especially nice to have an out-of-production airplane supported so well. Expect to see additional enhancements in the future.

Systems

The workload is also reduced with the electrically heated windshield. It's either on or off with no valves, switches or levers found on older Citation designs to manipulate. There is some visual distortion when the windshield is heated, but it's something you get used to. Pressurization is also normally a "set it and forget it" system and is very smooth. I can't remember the last time my ears popped in a descent. Some of my bigger airplane friends tease me about the old-fashioned wing de-ice boots on the Mustang, but they work



Many Mustangs are enrolled in maintenance programs whereby the owner pays an hourly rate for parts coverage and engine overhaul costs.

very well and have an "automatic" function with a two-minute cycle versus the manual switch on the King Airs I flew previously. Expect to replace the boots after about 10 years of operation.

The Mustang landing gear can be extended up to 250 KT IAS. And they do not require a very expensive, 10-year overhaul found on the Phenom series of aircraft. Mustang speed brakes are also very effective for the occasional rapid descent.

The air conditioning will blow you out of the cockpit if set to the highest setting. I've found it cools well in the Texas heat.

Cabin Comfort

Five passengers and no more, but the four in the back never complain. Sound levels are low. If the Mustang is your first jet, you will be pleasantly surprised at the lack of noise and vibration, which is especially nice on longer flights. Some owners have installed various internet options, which work well but add significant cost.

The baggage compartments are huge, with 320 pounds of capacity in the nose and 300 pounds in the rear. If it fits in a Chevy Suburban, it will fit in a Mustang. And the aft baggage compartment includes a ski extension, thanks to a request from the late Dave Goode, who owned the very first one.

Interestingly, the original Mustangs were not offered with an XM music option for the cockpit. The decision-makers at Cessna decided no pilot should be distracted when operating a jet. That train of thought lasted a very short time, and now you can listen to your favorite entertainment. I am one of a dying breed that chooses not to. But the folks in the back appreciate it.

The potty...well, think of a camping toilet at FL 410. But it works! More robust designs like those found on the Citation 525 series are prone to expensive corrosion. Ask any owner of a proper "flushing potty" if they ever use it, and the majority will say, "Only as a storage shelf." The simple Mustang design has saved the day on more than one occasion.

Cost & Support

Many Mustangs are enrolled in maintenance "programs" whereby the owner pays an hourly rate for parts coverage and engine overhaul costs. It's like a big bank account to prepare for future expenses. Currently, both of these programs run about $600/flight hour total. I recommend them, especially for the engines, for which a repair can easily exceed six figures.

Inspections on jets are frequent and rigid. It's more than just your average annual. And about every six years the airplane is taken apart into what looks like a thousand pieces and put back together. I have used Textron Aviation facilities exclusively for all my Mustangs. While not the cheapest, they have provided excellent service.

The airframe was manufactured from 2006 to 2017, with approximately 470 units still flying. Textron Aviation provides excellent support 24/7 through their "Team Mustang" group of experts. When I purchased #008, I was one of the first operators. I called their 800 number night and day with a host of stupid questions.

Safety & Insurance

After almost 1 million flight hours, the Mustang has an enviable record. As of January 2023, only two fatal accidents worldwide and none in the United States. The integrated avionics, slow approach speeds and excellent training platforms have made a real difference in the safety record.

Most underwriters like the "risk" associated with the Mustang. If you combine a thorough training program with FOQA (Flight Operational Quality Assurance) monitoring programs, and a well-written insurance application, reasonably priced coverage can be obtained. In addition, safety awards like the Citation Jet Pilots' "Gold Standard" program make a difference in the underwriting process.

Training

There are undoubtedly many new terms and procedures to learn if the Mustang is your first jet, but the airplane is the perfect transition platform. It is the easiest to fly of any airplane I have flown, from 172's to the Falcon 50.

I am a firm believer in full motion simulator training. Both SIMCOM and FlightSafety offer complete programs. I train at least twice per year for three days at FlightSafety in Wichita. There are also some fine in-airplane instructors for those who like to combine their training. However, for a first type rating, I recommend a full two-week simulator-based course.

Owner Organization

Citation Jet Pilot's Owner Pilot Association (CJP) has a wealth of information on the airplane, including costs of operation and immense safety resources. The organization is leading in the industry with its "Safe To Land" initiative, featuring the most extensive video library for single pilot jet owners. Of note is their "What Good Looks Like" series, with over 30 videos. You can watch amateurs like me struggle with the simplest procedures, then watch a real professional show you how it's done. CJP's website is the best "go-to" for everything Mustang (citationjetpilots.com).

Value

The Mustang experienced the post-COVID price craziness just like most aircraft. What were excellent sub $2 million-dollar airplanes quickly became hundreds of thousands more. That phenomenon is subsiding, and the market is becoming softer. The most sought-after models are those on "programs" with NXi avionics and factory maintenance.

Since many of the Mustangs are now over 10 years old, Textron and others have developed complete makeover programs, replacing the entire interior, repainting the airplane and upgrading the Garmin suite with the latest avionics mentioned above. The results are striking and hard to tell from brand new. It's a significant investment but timely with today's market values. Also, when you find the right airplane, hiring a "pre-buy" specialist is a must and has saved me money more than once.

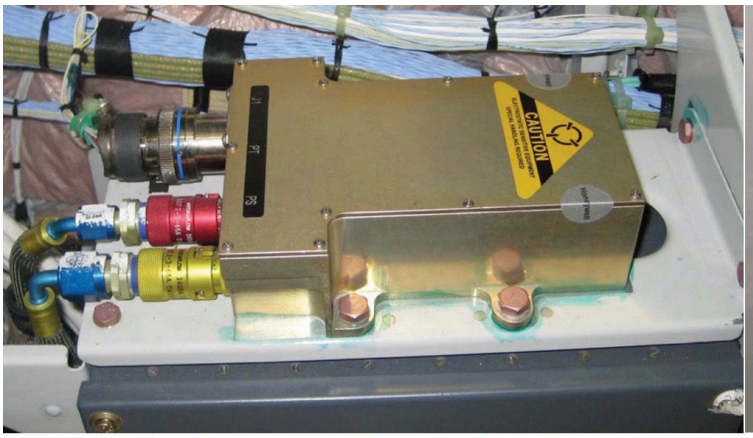
Pilots often love to go faster and further. For those Textron Aviation has numerous offerings. But for the best bang for the buck, the Mustang is really hard to beat. Its simple systems, avionics integration and cost of operation make it the first choice for many first jet owners. And many of them never look elsewhere. T&T

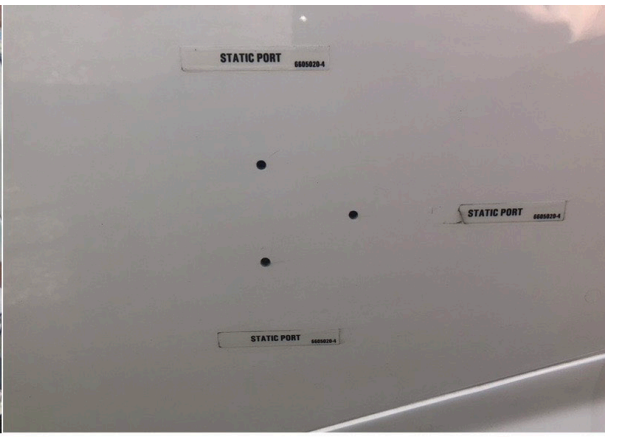
David Miller *has owned and flown a variety of aircraft from light twins to midsize jets for more than 50 years. With 6,000 plus hours in his logbook, David is the Director of Programs and Safety Education for the Citation Jet Pilot's Safety Foundation. You can contact David at* **davidmiller1@sbcglobal.net**.

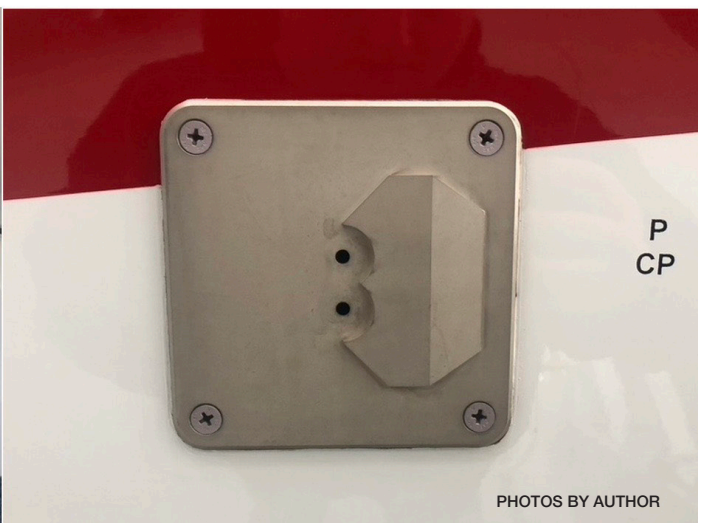
Under Pressure

Properly Maintaining Pitot and Static Systems

by **Elliott Cox**







PHOTOS BY AUTHOR

In the mid-18th century, French engineer Henri Pitot created a tube to measure the flow of water in the Seine River. German American inventor Paul Kollsman created the first accurate barometric altimeter in 1928. Pitot and Kollsman were separated by over 200 years, but the work of these two men has shaped the world of aviation.

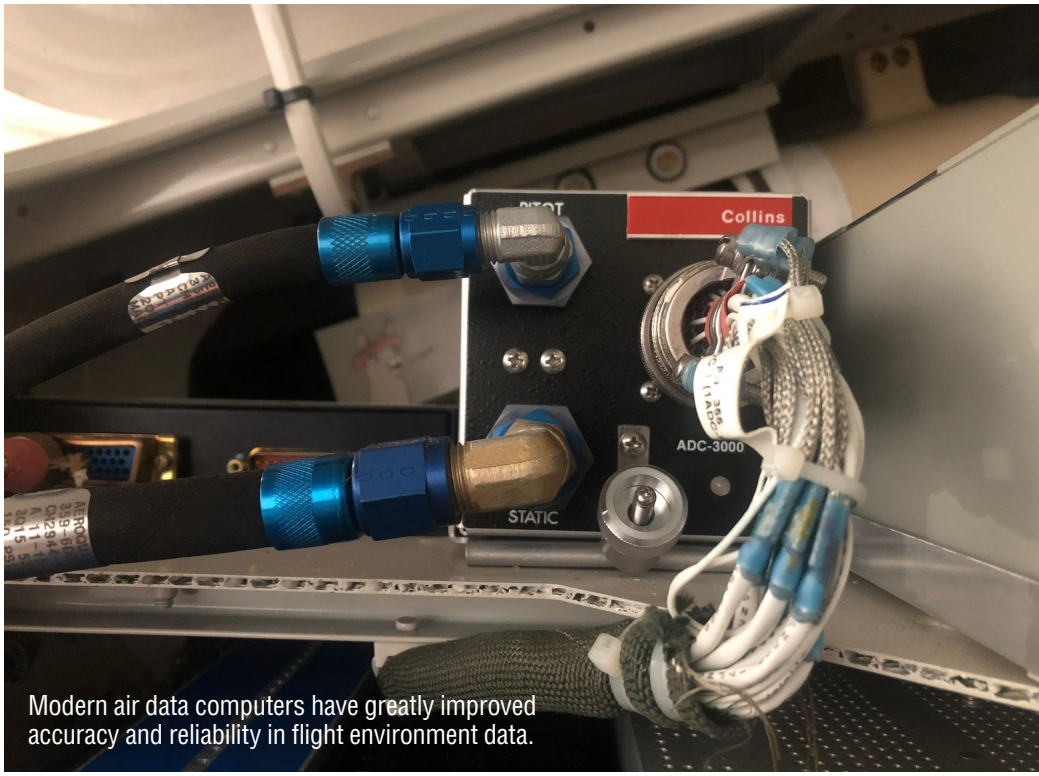
Static pressure (Ps) is the pressure of the ambient air immediately surrounding an airplane and is measured by ports installed on both sides of the fuselage. Static ports connect outside air to the flight environment instruments and are placed in locations along the fuselage where the ambient air is unaffected by the speed, attitude or angle of attack of the airplane.

Pitot pressure, also called total pressure (Pt), is simply ram air forced into the pitot tube when an airplane moves through the air. The tube that Henri Pitot created in the 18th century closely resembles what we use in airplanes today to measure airflow. But what that tube connects to has evolved and been refined to produce an extremely accurate measurement of how fast we're moving through the air.

In older pitot/static systems, there were tubes and hoses that provided static and pitot pressure directly to analog flight environment instruments. The only electrical connections were for backlighting and an internal vibrator for the altimeter so it wouldn't have to constantly be tapped

to "unstick" the needle. Analog instruments work a lot like bathroom scales in that changes in pressure mechanically move the needles, and dozens of feet of hoses, tubing and fittings were prone to chafing or cracking. Once a leak or an erroneous instrument got bad enough, it would usually manifest itself as an altimeter split between the pilot and copilot side with no way to know which side was the "bad" side.

Even with all the leaks and mechanical components of older air data systems, airplanes in the flight levels were vertically separated by 2,000 feet. So, even with the loose tolerances, the analog systems were enough to keep airplanes safely apart. Once the FAA declared that RVSM (Reduced Vertical Separation Minimums) would be mandated in January 2005 for U.S. airspace, there was a big push for owners and operators to upgrade to more accurate and reliable systems.

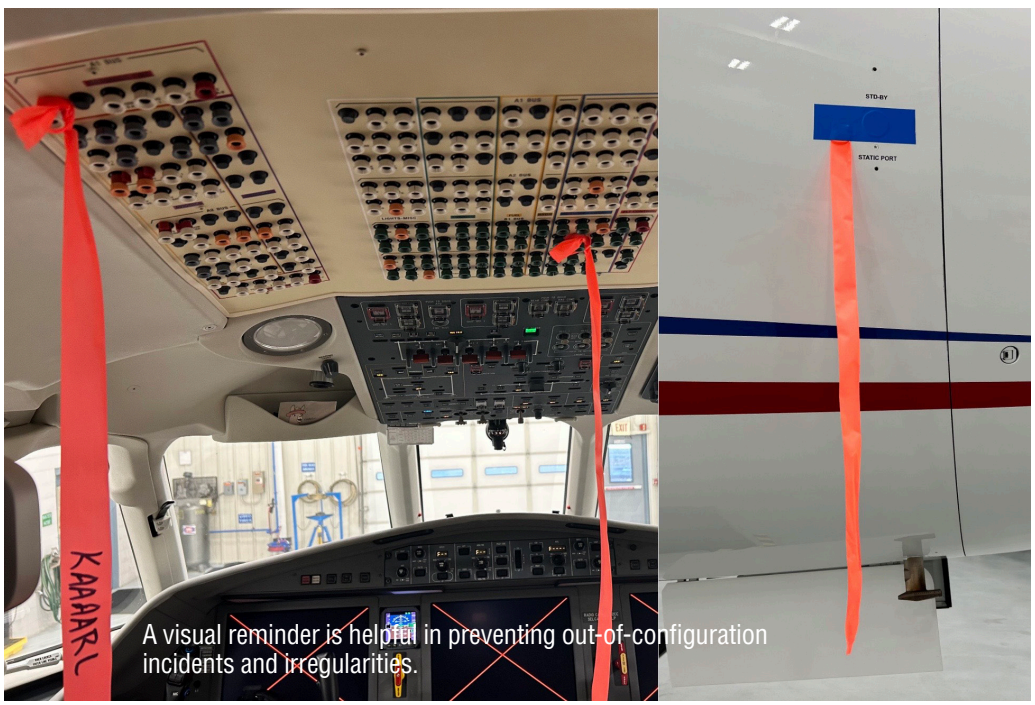


Modern air data computers have greatly improved accuracy and reliability in flight environment data.

RVSM changes aircraft vertical separation requirements between FL 290 and FL 410 from 2,000 feet to 1,000 feet. Anyone who has ever watched an airliner pass a thousand feet above their cockpit windows in the opposite direction surely has a great appreciation for just how little of a margin a thousand feet is when the closing rate is over a thousand knots.

RVSM-capable flight environment systems use pitot and static pressures plumbed directly to air data computers (ADCs), which eliminates the vast majority of tubes and hoses that used to snake behind the instrument panel. Outside air temperature, barometric correction, and angle of attack data are also sent to the ADCs, where they're analyzed, and a digital signal is then sent to the display via a digital data bus. A twisted, shielded pair of wires have replaced tens of feet of hoses and tubes, as well as dozens of leak-prone fittings.

In order to fly IFR in the U.S., an aircraft's transponder and air data system have to be tested per FARs 91.411 and 91.413 every 24 months by a certified repair station. The upside of all the flight environment data being consolidated in the air data computers is that we see a high level of reliability and accuracy. The downside is that when air data computers break, it's usually an expensive fix.



A visual reminder is helpful in preventing out-of-configuration incidents and irregularities.

To keep your system running smoothly, a good preflight goes a long way. I know I say that about everything, but it's especially true here. There were two fatal 757 crashes eight months apart in 1996 where a failure of the pitot/static system set into motion the events that caused both airplanes to crash.

Birgenair 301 sat outside in the Dominican Republic for 20 days. Two days before the accident flight,

The Worldwide General Aviatio

owner/operators and chief pilots of these air

100%

TOTAL MARKET COVERAGE

JETS - 21,487

CHIEF PILOTS & OWNERS

COUNT	AIRCRAFT
66	AIRBUS A300S
8	ASTRA 1125
39	ASTRA 1125SP
48	ASTRA 1125SPX
23	BEECHJET 400
239	BEECHJET 400A
228	BOEING BBJ
18	BOMBARDIER CRJ
745	CHALLENGER 300
286	CHALLENGER 600
68	CHALLENGER 601-1A
94	CHALLENGER 601-3A
325	CHALLENGER 604
62	CHALLENGER 650
3	CHALLENGER 800
58	CHALLENGER 850
6	CHALLENGER 870
354	CIRRUS VISION SF50
118	CITATION 500
339	CITATION 525
303	CITATION BRAVO
182	CITATION CJ1
96	CITATION CJ1+
231	CITATION CJ2
225	CITATION CJ2+
458	CITATION CJ3
216	CITATION CJ3+
383	CITATION CJ4
178	CITATION ENCORE
75	CITATION ENCORE+
370	CITATION EXCEL
10	CITATION I
241	CITATION I/SP
408	CITATION II
46	CITATION II/SP
140	CITATION III
145	CITATION LATITUDE
43	CITATION LONGITUDE
312	CITATION M2
489	CITATION MUSTANG
124	CITATION S/II
313	CITATION SOVEREIGN
108	CITATION SOVEREIGN+
268	CITATION ULTRA
260	CITATION V
25	CITATION VI
108	CITATION VII
297	CITATION X
37	CITATION X+
256	CITATION XLS
310	CITATION XLS+
1	DIAMOND I
23	DIAMOND IA
17	DORNIER ENVOY 3
310	ECLIPSE EA500
17	EMBRAER LEGACY
20	EMBRAER LEGACY 450
78	EMBRAER LEGACY 500
102	EMBRAER LEGACY 600
64	EMBRAER LEGACY 650
15	EMBRAER LINEAGE
332	EMBRAER PHENOM 100
475	EMBRAER PHENOM 300
86	EMBRAER PRAETOR
55	FALCON 10
23	FALCON 100
13	FALCON 200
248	FALCON 2000
5	FALCON 2000DX
25	FALCON 2000EX
135	FALCON 2000LX
126	FALCON 2000LXS
24	FALCON 20C
16	FALCON 20C-5
15	FALCON 20D
1	FALCON 20D-5
16	FALCON 20E
45	FALCON 20F
71	FALCON 20F-5
171	FALCON 50
5	FALCON 50-4
8	FALCON 50-40
99	FALCON 50EX
262	FALCON 7X
53	FALCON 8X
161	FALCON 900
26	FALCON 900C
17	FALCON 900DX
322	FALCON 900EX
85	FALCON 900LX
152	GLOBAL 5000
6	GLOBAL 5500
202	GLOBAL 6000
22	GLOBAL 6500
55	GLOBAL 7500
244	GLOBAL EXPRESS
25	GULFSTREAM G-100
110	GULFSTREAM G150
203	GULFSTREAM G-200
252	GULFSTREAM G-280
10	GULFSTREAM G-300
9	GULFSTREAM G-350
21	GULFSTREAM G-400
294	GULFSTREAM G-450
95	GULFSTREAM G-500
596	GULFSTREAM G-550
68	GULFSTREAM G-600
383	GULFSTREAM G-650
15	GULFSTREAM G-I
13	GULFSTREAM G-II
10	GULFSTREAM G-IIB
81	GULFSTREAM G-III
152	GULFSTREAM G-IV
290	GULFSTREAM G-IVSP
174	GULFSTREAM G-V
27	HAWKER 1000A
5	HAWKER 1000B
1	HAWKER 125-1AS
1	HAWKER 125-600A
9	HAWKER 125-600AS
36	HAWKER 125-700A
5	HAWKER 125-700B
65	HAWKER 4000
203	HAWKER 400XP
43	HAWKER 750
105	HAWKER 800A
14	HAWKER 800B
346	HAWKER 800XP
43	HAWKER 800XPI
82	HAWKER 850XP
167	HAWKER 900XP
2	HAWKER-3B
168	HONDA JET
2	JET COMMANDER 1121
1	JET COMMANDER 1121B
2	JETSTAR 731
6	JETSTAR II
4	LEARJET 23
4	LEARJET 24
1	LEARJET 24A
1	LEARJET 24B
13	LEARJET 24D
6	LEARJET 24E
6	LEARJET 24F
1	LEARJET 25
15	LEARJET 25B
1	LEARJET 25C
22	LEARJET 25D
1	LEARJET 28
23	LEARJET 31
152	LEARJET 31A
19	LEARJET 35
380	LEARJET 35A
20	LEARJET 36
34	LEARJET 36A
118	LEARJET 40
214	LEARJET 45
200	LEARJET 45XR
89	LEARJET 55
8	LEARJET 55B
6	LEARJET 55C
244	LEARJET 60
114	LEARJET 60XR
13	LEARJET 70
109	LEARJET 75
17	LEARJET 7T
119	PILATUS PC-24/45
272	PREMIER I
6	SABRELINER 40A
1	SABRELINER 40EL
2	SABRELINER 40R
4	SABRELINER 60
8	SABRELINER 60ELXM
38	SABRELINER 65
4	SABRELINER 80
1	SABRELINER 80SC
1	SUKHOI SBJ
3	SYBER JET SJ30
49	WESTWIND 1
1	WESTWIND 1123
12	WESTWIND 1124
38	WESTWIND 2

TURBOPROPS - 13,856

CHIEF PILOTS & OWNERS

COUNT	AIRCRAFT
174	AVANTI
2	AVRO RJ70
5	BRITISH AEROSPACE 146
486	CARAVAN 208
2109	CARAVAN 208B
137	CHEYENNE I
13	CHEYENNE IA
202	CHEYENNE II
45	CHEYENNE III
35	CHEYENNE IIIA
61	CHEYENNE IIXL
37	CHEYENNE IV
214	CONQUEST I
264	CONQUEST II
74	DAHER TBM-700A
86	DAHER TBM-700B

PHOTO BY JESSICA AMBATS

n & Business Aviation Markets

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352	DAHER TBM-850
116	DAHER TBM-900
69	DAHER TBM-910
96	DAHER TBM-930
124	DAHER TBM-940
4	DAHER TBM-960
163	DE HAVILLAND DHC
25	EPIC E1000
1	FOKKER 100
1	FOKKER 70
20	JETSTREAM 31
68	JETSTREAM 32
66	JETSTREAM 41
29	KING AIR 100
442	KING AIR 200
20	KING AIR 200C
13	KING AIR 200T
238	KING AIR 250
23	KING AIR 260
175	KING AIR 300
14	KING AIR 300LW
629	KING AIR 350
91	KING AIR 350C
34	KING AIR 350ER
375	KING AIR 350I
6	KING AIR 350IER
41	KING AIR 360
7	KING AIR 90
195	KING AIR A90-1
6	KING AIR A/B90
69	KING AIR A100
162	KING AIR A200
28	KING AIR A90
95	KING AIR B100
1030	KING AIR B200
117	KING AIR B200C
105	KING AIR B200GT
6	KING AIR B200SE
8	KING AIR B200T
40	KING AIR B90
281	KING AIR C90
35	KING AIR C90-1
181	KING AIR C90A
358	KING AIR C90B
68	KING AIR C90GT
96	KING AIR C90GTI
137	KING AIR C90GTX
13	KING AIR C90SE
234	KING AIR E90
147	KING AIR F90
29	KING AIR F90-1
4	MERLIN 300
14	MERLIN IIB
4	MERLIN III
23	MERLIN IIIA
42	MERLIN IIIB
17	MERLIN IIIC
2	MERLIN IV
12	MERLIN IV-A
32	MERLIN IV-C
78	MITSUBISHI MARQUISE
13	MITSUBISHI MU-2F
1	MITSUBISHI MU-2G
11	MITSUBISHI MU-2J
30	MITSUBISHI MU-2K
11	MITSUBISHI MU-2L
20	MITSUBISHI MU-2M
21	MITSUBISHI MU-2N
23	MITSUBISHI MU-2P
45	MITSUBISHI SOLITAIRE
68	NEXTANT 400XT
1	NEXTANT G90XT
939	PILATUS PC-12 NG
604	PILATUS PC-12/45
202	PILATUS PC-12/47
278	PIPER JETPROP
82	PIPER M500
193	PIPER M600
1	PIPER MALIBU
578	PIPER MERIDIAN
255	QUEST KODIAK 100
1	ROCKWELL 680T TURBO
5	ROCKWELL 680V TURBO II
5	ROCKWELL 680W TURBO II
4	ROCKWELL 681 HAWK
5	STARSHIP 2000A
45	TURBO COMMANDER 1000
22	TURBO COMMANDER 690
126	TURBO COMMANDER 690A
130	TURBO COMMANDER 690B
61	TURBO COMMANDER 840
22	TURBO COMMANDER 900
21	TURBO COMMANDER 980

TWIN PISTON - 8,807 OWNERS

COUNT	AIRCRAFT
38	BARON 56 TC
1446	BARON 58
1	BARON 58 PA
363	BARON 58P
102	BARON 58TC
3	BARON A56TC
320	BARON G58
181	BEECH DUKE B60
292	CESSNA 414
388	CESSNA 414A
34	CESSNA 421
28	CESSNA 421A
272	CESSNA 421B
615	CESSNA 421C
109	CESSNA 310
165	CESSNA 340
553	CESSNA 340A
53	CESSNA 402B BUSINESS LINER
125	CESSNA 402C
28	CESSNA 404 TITAN
292	CESSNA 414
388	CESSNA 414A
34	CESSNA 421
28	CESSNA 421A
272	CESSNA 421B
615	CESSNA 421C
57	CESSNA T303
111	DIAMOND D42
120	DIAMOND DA
84	PIPER 600 AEROSTAR
3	PIPER 600A AEROSTAR
45	PIPER 601 AEROSTAR
4	PIPER 601B AEROSTAR
203	PIPER 601P AEROSTAR
24	PIPER 602P AEROSTAR
581	PIPER CHIEFTAIN
26	PIPER MOJAVE
304	PIPER NAVAJO
257	PIPER SENECA
12	ROCKWELL 500 SHRIKE
23	ROCKWELL 500A SHRIKE
83	ROCKWELL 500B SHRIKE
47	ROCKWELL 500S SHRIKE
4	ROCKWELL 500U SHRIKE
12	ROCKWELL 520 COMMANDER
3	ROCKWELL 560 COMMANDER
9	ROCKWELL 560A COMMANDER
5	ROCKWELL 560E COMMANDER
6	ROCKWELL 560F COMMANDER
11	ROCKWELL 680 SUPER
3	ROCKWELL 680E
10	ROCKWELL 680F COMMANDER
11	ROCKWELL 680FL GRAND COMMANDER
4	ROCKWELL 680FLP GRAND LINER

HIGH PERFORMANCE MOVE-UP SINGLES - 6,873 OWNERS

COUNT	AIRCRAFT
446	CESSNA 182
55	CESSNA 206
426	CESSNA P210N
22	CESSNA P210R
57	CESSNA T182
1106	CIRRUS SR20
3594	CIRRUS SR22
21	MOONEY ACCLAIM ULTRA
12	MOONEY OVATION ULTRA
235	PIPER MALIBU
183	PIPER MATRIX
472	PIPER MIRAGE

TWIN & TURBINE

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a maintenance crew removed all the protective covers to perform engine runs and neglected to reinstall the covers. On the takeoff roll, the captain's airspeed indicator showed zero knots and only started "working" when they were airborne and climbing. What the captain thought was airspeed was actually the sea-level air trapped in the pitot line expanding against the now-decreasing static air and giving the false indication of positive pressure coming into the pitot tube. Several wrong assumptions later, the airplane crashed into the Atlantic. The pitot tubes were never recovered, but the most likely cause is that a mud dauber wasp built a nest inside the perfectly cylindrical tube.

In the case of Aeroperú 603, the crew neglected to find tape that covered some or all of the airplane's static ports. The aircraft was washed before the flight and the ground crew didn't remove the tape. The aircraft took off after midnight from Lima, Peru. The combination of erroneous airspeed and altitude indications and a lack of ground references on a dark night over water caused the aircraft to crash into the ocean.

When performing your preflight inspection, look inside the pitot tube for obstructions, preferably with a flashlight, and also look at the vent hole(s) on the outside of the tube to make sure there aren't any clogs. If you see something inside the tube, unless it's right on the edge of the opening and you're sure it'll come right out, call a maintenance tech. People have tried to dig things out of pitot tubes only to end up packing them like a Civil War musket. If you accidentally shove something into the pitot tube, tools, testing and invoices will likely be involved before you can go flying. It may look like a simple thing but remember that anytime even one fitting is loosened on the pitot/static system, leak checks and functional tests must be accomplished.

I know I don't need to say this but humor me. Pitot tubes are not grab handles to use to get a good look inside the nose gear well. My knees hurt too, but please find a different way to brace yourself. Another pro tip from the "been there, got the scars" file: It only takes once to grab a hot pitot tube before you'll forever lightly hit the tube with the back of your fingers before touching another one. I've done the "that might be hot" smack to a pitot tube that was lying on my toolbox before picking it up.

All the same advice applies to static ports. You typically can't see very much in there, but it's good practice to take a look anyway. On RVSM-certified aircraft, it's important to keep the "RVSM critical" area around the static ports and pitot tubes clean because contamination or deformation in these areas can cause erroneous indications. Your aircraft's AFM or POH should have a diagram of where the RVSM critical area is. Otherwise, contact the

manufacturer or your favorite maintenance technician and they should be able to help.

Covers for your pitot tubes and static ports are as important as performing a good pre-flight inspection. Covers are an inexpensive way to add a lot of protection from bugs nesting in those perfectly round, perfectly bug-sized openings. You may feel the urge to roll those long red streamers up to make them look a little neater and to keep them from scuffing up the paint. Don't do that. The sole purpose of those streamers is to be as obtrusive as possible to minimize the risk that they'll accidentally be left on the airplane. There's also very little chance that they'll scuff the paint.

If you wet wash your airplane, take proper precautions when covering pitot/static probes and sensors. There is typically a procedure in Chapter 20 of your aircraft's maintenance manual that will tell you how to properly wash your aircraft. If you don't have access to your maintenance manuals, call your favorite shop or the manufacturer and ask if they'd provide you with the procedure. These precautions are important not only to protect the pitot/static system but to protect the airplane from ingesting water into places that can't shed moisture, creating a higher-than-normal chance for corrosion.

If you use tape to cover your static ports for any reason, my recommendation is to include a couple of feet of fluorescent orange or pink surveyor flagging tape so it's flapping in the wind and extremely hard to miss on even the most blurry-eyed pre-flight inspection. I use flagging tape any time I change the configuration of the airplane – pulling an inspection panel, disengaging a circuit breaker, or anything that needs to be reset before a flight. Because I work alone most of the time, it's really easy to get sidetracked and forget about that engine cowling that is only secured with one fastener. Flagging tape is available at any hardware store and is an inexpensive visual reminder that something is outside its normal configuration.

A properly maintained pitot/static system is mind-bogglingly accurate. It will keep you safely away from all that other aluminum zooming around in the flight levels, but these systems are as delicate as they are robust. Something as benign as a piece of tape or an unfortunately placed wasp can cause chaos, but with proper maintenance and thorough pre-flight inspections, we can eliminate most of the "gotchas" that can foul up our most critical instruments. T&T

Elliott Cox *is a pilot and the Director of Maintenance for a Part 91 Corporate Flight Department in the Southeast. You can reach him at his website TheWritingFlyer.com or by email at* **elliott@thewritingflyer.com**.

Jet Shades: Next-Generation

by **Rich Pickett**

PHOTOS BY AUTHOR

While I have loved flying in sunny skies for 45 years, sometimes (as all pilots know), the sun can be a bit too bright and hot. This includes operations on the ground since even air-conditioned aircraft have challenges in hot and humid environments.

We first reviewed Jet Shades in the March 2019 issue of Twin & Turbine. I met Kevin Duggan, the founder of Jet Shades when I obtained the first set of their product for my Eclipse Jet. Once I started using them, there was no turning back. I've since wanted them in all of the airplanes I fly, from pistons to jets and now gyrocopters as well.

Subsequently, I've installed them in a Cirrus SR22, Cessna T206H, Beechcraft Premier, Cessna CJ3, and Cessna CJ. My son, Tigre, and I even worked with the Jet Shade's team on the design for some of these aircraft. The process was iterative, with multiple test flights, to ensure the products met our goals. They were some of the most enjoyable test flights I've done.

While Jet Shades' original composition works well, Kevin, an engineer, searched for the next generation of the material, and they have developed a new product with exceptional capabilities. The new product line is called Ultra-Thins for lighter aircraft and Gen 2 for heavier aircraft. The new product is thinner, more lightweight, and can withstand much higher temperatures. Tigre and I also found the material extremely useful in curved applications, especially when designing templates for side windows that wrap around the fuselage.

Since there are many variations of interior trims on aircraft even within the same model year, and especially after years of exposure to environmental heat and UV, installation flexibility becomes a key component of the design. Jet Shades' original products can be custom-made or adjusted in the field. However, the new offering is substantially easier to trim – even with conventional scissors if necessary. The choice of materials gives the aircraft owner options, and the team at Jet Shades can offer suggestions on the best choice.

CJ3 windshield with "Cruising Shades."

Flying at FL 450 with Gen 2 shades.

The newest product material is thinner, more lightweight, and can withstand higher temperatures (Cessna T206).

All Jet Shades products offer excellent optical clarity and ease of installation, and new versions are no exception. Jet Shades will offer the new product in two variations: High-Visibility and Premium, both of which block 99.9 percent of UV-A and UV-B and exceptionally reduce heat transmission. The Premium upgrade will substantially increase the filtering of infrared and visible light.

Jet Shades also offers a Professional Series of their product, starting with the Cessna Citation models. In addition to a unique mounting system, the set includes Cruising Shade, which are movable panels usable when flying at high altitudes.

An interesting option is the laser engraving on the shade itself to personalize your set. I've installed Gen 2 sets on the Citations we fly for our personal and business flights, and we are very pleased with the results. Whenever Tigre and I fly a plane without them, we always comment on how we miss them in the cockpit.

Now in the fourth year of production, Jet Shades has sold thousands of its products in a variety of aircraft. Knowing Kevin and his team, they will continue to expand and innovate their product line in the future. T&T

With 12,000+ hours of piloting more than 100 aircraft models, **Rich Pickett** *still has a passion for flying. Rich holds an ATP, CFII SME, SES, glider licenses, and type ratings in the L29, L39, Citation 500/510s/525s, Eclipse 500S, Beechcraft Premier and DA10. His company, Personal Wings, provides training, mentoring and aircraft services. You can contact Rich at* **rich@personalwings.com**.

by **Kevin R. Dingman**

React: Pilot Reflexes

PHOTOS BY AUTHOR

"Minutes of sheer terror, followed by hours of sheer boredom, followed by minutes of sheer terror."

Months of boredom followed by minutes of sheer terror was reportedly first used in The Great War (WWI) to describe the waiting and then terror of trench warfare. The adage has since been modified and adapted to activities like aviation, racing, baseball and space flight. The above version was used to describe flying an early model and sometimes cantankerous business jet. It's now used to illustrate the extreme mental or physical contrasts of an activity. Such can be the contrast between a routine cruise, followed by a frenzied descent and a demanding approach.

The last thing most pilots want is to feel rushed. While flying a high-performance aircraft on a short, slippery runway or landing with an aircraft system failure, or flying at night, in icing, in low visibility (the list could go on and on), feeling hurried can be a recipe for disaster – or at least a recipe for mistakes. There's a handful of reasons ATC may give us a slam-dunk descent. Most commonly,

it's because of conflicting traffic below us, an airspace constraint, letters of agreement between sectors, or the controller waiting for a "hand-off" from the next sector. Of course, in the cockpit, we joke that the reason for a late descent clearance is that they had to finish a donut, a sneeze, take a potty break, or simply forgot about us. In any case, it's up to us to manage the resulting faster-than-normal descent.

WKF

WKF: White Knuckle Factor. Used in the measurement and evaluation of stress in the cockpit.

In modern GA, we can perhaps replace the minutes of sheer terror description above with excitement or, more accurately, intensity. If you fly enough, there will be events that elevate the intensity level, which in turn, increases the WKF. You may not have heard of WKF, but a moderate level of it is both real and desirable. It shows a person is paying attention. Too much, however, can result in panic and the disappearance of the laminate on the yoke.

Transitioning through the V-speeds and climb segments during a heavyweight takeoff or from a short runway can be much like a rocket launch, with several critical decision points along the path. And if the departure or arrival requires precision due to terrain, weather or procedural constraints, the WKF can be elevated. Running low on fuel, an engine failure on takeoff, slippery runways, and hoping the visibility comes up another quarter-mile at the alternate are examples that could elevate the WKF to a new-yoke-needed level.

Relaxed

If the last hour (or five) in the flight levels have gone smoothly, we often find ourselves quite relaxed at the top of descent – with zero WKF. This pre-descent mental condition can resemble being sleepy, lethargic or having hypoxia. Because of this, the transition from cruise to descent can often come quickly and catch us by surprise. Like waking to an alarm set later than we meant, then trying to catch up. I'm sure that you have experienced it. You think you have prepared for the descent, but once it begins, you feel like you're behind the airplane. The phenomenon occurs because our body and mind have been at a reduced level of tasking, and the new demand for physical and mental concentration is a relatively large and sudden change. What we needed was a warm-up period.

Just as during takeoff, it's important to devote the requisite level of respect and attention to planning, preparing and accomplishing the descent and approach. This is particularly important when the upcoming procedures are complex, dicey due to weather and terrain or ATC issues you a slam-dunk. There are several things we can do to prepare both physically and mentally for the descent and approach in order to get ourselves warmed up. These techniques include physical activity, mental aerobics and drugs.

Drugs

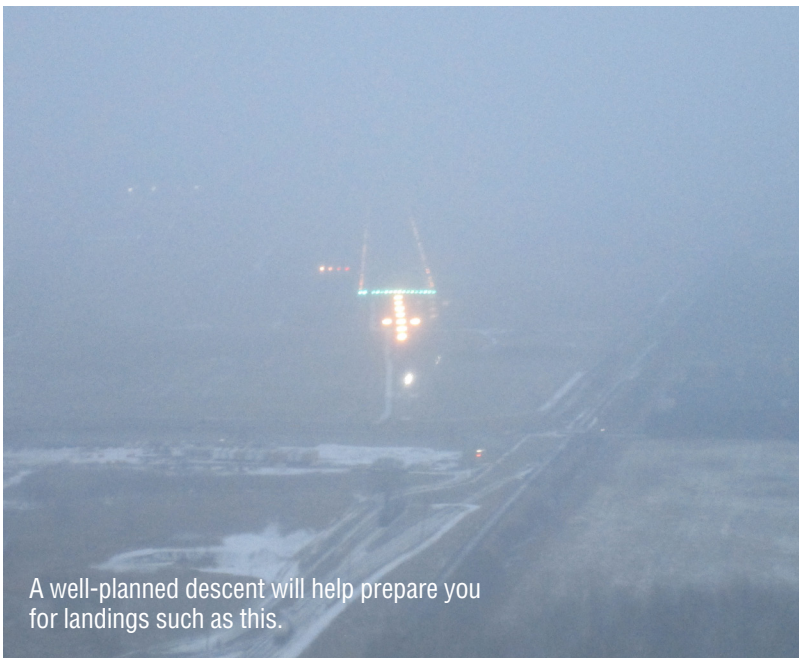
> I always keep a supply of stimulant handy in case I see a snake, which I also keep handy. – W.C Fields

Since the suggestion of using drugs to enhance alertness raised your eyebrows, let's cover stimulants first. In the military, pilots of single-seat aircraft flying long missions are issued prescription-strength amphetamines to be taken 30 minutes or so before landing. When strong stimulants wear off, the resulting mental crash can be significant and unpredictable, hence the reason military pilots go through a testing phase with the drugs first and why we don't want to use them in GA.

Since prescription stimulants are not an option, more civil and predictable alertness-enhancing drugs can be found in common drinks. Caffeine in coffee, tea, or soft drinks is the most prevalent and is effective in most people. Energy drinks are another source. They use a combination of sugar, caffeine, ephedrine, taurine and ginseng for the desired effect; an intense and potentially unhealthy cocktail – also inducing a follow-on mental crash. For some, however, none of these drinks are effective for long. In any case, you must manage the timing of the mental crash. And unless you have an onboard potty, the timing of all this drinking will be critical. You don't want the distraction of a full bladder using up your 15 minutes of new-found alertness and concentration.

Let's Get Physical
(Olivia Newton-John, 1981)

If cockpit or cabin space allows, standing up and doing a few "squat" type exercises or simply moving around can warm up the muscles. When flying the Citation, I like to



A well-planned descent will help prepare you for landings such as this.

go to the cabin and socialize with the passengers for a few minutes mid-cruise. This presents the opportunity for some mild exercise and is good PR – as long as I don't do push-ups or squats in their view. Isometrics is a type of exercise in which the joint angle and muscle length do not change during contraction. For flight decks with limited space, or a cabin full of curious but anxious pax, this type of exercise can be accomplished while remaining seated by pushing arm, leg, stomach and neck muscles against themselves or an immovable object.

Muscle contraction will stimulate blood flow, increase heart rate and improve alertness. An additional benefit of standing and performing isometrics is the prevention of deep vein or arterial thrombosis (DVT). This potentially serious medical condition is the clotting of blood sometimes associated with extended periods of sitting. These clots can embolize (lodge in or obstruct) and cause arteries to the brain to occlude (close off), resulting in an ischemic (clot) stroke or transient ischemic attack (TIA). Bottom line: Get off your butt or do some isometrics.

Old-Fashioned Ciphering

The final warm-up is in our thinking process. It's prudent to use the last 15 minutes or so before beginning the descent to review the arrival, approach and missed approach. In previous issues of T&T, we addressed the math commonly used in computing an efficient point at which to begin the descent: multiply the altitude to lose by three then add or subtract a smidgen for the tailwind/headwind, and that will be the distance consumed, in miles, for the descent. We also conceded that modern avionics usually make such old-fashioned exercises obsolete – unless you need/want to warm up that brain. Anyway, it's also a good way to confirm electronic calculations. Reviewing the altitude and speed restrictions on the arrival procedure is also prudent because often the printed restrictions are not easy to find without searching the outlying narrative and fine print. And the exercise will also confirm that the FMS database agrees with the pubs in your tablet.

Some RNAV arrivals can be quite a handful, even when using the VNAV mode of your flight management system. The FRDMM FIVE into DCA is a prime example. It's a two-page (which is now common) RNAV, descend-via-arrival. You pretty much can't look away from the instruments as you monitor the step-down fixes, course changes and speed restrictions. It's hard to imagine that the airspace around DC is so complex as to warrant such precision. One of my FOs once speculated that the arrival procedure is nothing more than a filter making it easier for ATC to recognize a non-pilot with nefarious intentions. Drinking some coffee, doing some squats and waking up the brain may help you to comply with a DCA-type procedure and prevent the launching of surface-to-air munitions in your direction.

Slam-Dunk

We've all had ATC issue a descent clearance that came later than we would prefer. Pilots have labeled this a slam-dunk: throttles to flight idle, set the speed command to the fastest number ATC will allow, throw out the speed brakes and dive-dive-dive. This type of maneuver, however, is suggested as a possible contributing factor in the 2013 crash of Asiana flight 214 in SFO. When necessary, a response of "unable" to ATC can solve a multitude of problems. If you attempt compliance, the slam-dunk will assuredly increase the feeling of being behind the airplane and possibly contribute to a serious error in judgment.

And finally, even if you fly the same approach often, a good review will help to catch changes to the approach or missed approach procedures. A commonly skipped check is a RAIM prediction if planning a GPS approach. If the number of GPS satellites available is 23 or fewer, RAIM availability must be checked using ground-based prediction software. Otherwise, you are reliant on your onboard system to discover insufficient RAIM at the last minute during the approach. Don't forget to take note of inoperative components, such as the glide slope (making it a localizer approach) or part of the approach lighting, like runway centerline lights or the VASI or PAPI. Often the transition from landing to a high-speed taxiway is very busy as ground control issues a catalog of rapid-fire instructions. So, take note in advance of any closed taxiways, particularly ones you intend to use for exiting the runway.

Terror, Thrombosis, and Snakes

The view out our window is compelling. It's easy to divert your attention from the cockpit to the world outside – the view is, after all, one of the reasons we fly. And it's normal to be distracted by onboard events as well. Let's not neglect preparation for the descent and approach, though. For a variety of reasons, this phase of the flight has become increasingly demanding with opportunities to commit errors of omission and commission at every turn (pun intended). Prepare for the descent and approach by increasing your alertness, circulating some blood and warming up your brain. Be careful out there. None of us want our boredom in cruise to be followed by minutes of terror or arterial thrombosis. Unless that is, you carry some stimulants and a snake in your kitbag. If so, never mind everything I said. T&T

Kevin Dingman *has been flying for more than 40 years. He's an ATP typed in the B737, DC9 and CE-650 with 25,000 hours in his logbook. A retired Air Force major, he flew the F-16 and later performed as an USAF Civil Air Patrol Liaison Officer. He flies volunteer missions for the Christian organization Wings of Mercy, is retired from a major airline, flies the Cessna Citation for RAI Jets, and owns and operates a Beechcraft Duke.Contact Kevin at* **dinger10d@gmail.com**.

Jump in and Jet

"Five years ago, I bought a really nice Cessna Citation Mustang out of the Bay Area and have been flying it around ever since," said Brad Lund, a real estate investor and jet owner from Southern California. "It costs a little bit more to operate per hour than a turboprop, but it's been quite affordable all things considered. I've grown into it very nicely, and because I fly single pilot, I can just get up and go."

Lund's first introduction to aviation came as a child and was a prologue to his real estate career.

"My dad was not a pilot but dabbled in aviation a little bit. He took lessons on and off and would take me to flying events like the Reno Air Races. I decided I wanted to get my license and got it in 1994 when I was 24 years old. I was just out of college and newly married. I didn't have a lot of money, but I got serious about it and decided I would bang it out fast and get it done. I remember laying down $3,000 in cash to get my pilot's license, which was a lot of money for me."

Learning to fly opened a whole new world for Lund, especially within his home state. Times were good at the beginning of his flying career.

"I started my career as a real estate broker and eventually bought several apartment buildings. There was a deal that I was working on where I sold an

apartment building, and the guy didn't have enough money to pay me. So, he said, 'Hey, would you be interested in taking an airplane on trade for some of the seller financing?' I agreed and picked up a nice 1969 Cessna Turbo 210 and flew that around for several years. I really had a good time with that plane and would fly my family back and forth between Northern and Southern California all the time."

Lund was enjoying the freedom that aviation afforded him and his family, as well as its benefit to his growing real estate portfolio. But several factors soon sidelined him from the cockpit.

PHOTO COURTESY OF JESSICA AMBATS

"I had a couple of scary experiences with turbulence. I remember a time I was flying out of Santa Barbara and the turbulence was severe. My wife was crying as my two kids were in the backseat screaming. I imagined we'd all end up dead, so I considered giving up flying entirely," said Lund.

"Then in 2008, during the big real estate bust, I basically lost everything and had to start over. I sold the plane to pay some debts, moved to Southern California, and ended up divorced. I was basically starting all over again from scratch. I rebuilt by buying self-storage facilities and created a chain of properties called 'Purely Storage.' After having a few properties under my belt, there came a need and an opportunity to lease a plane from a guy at the John Wayne Airport (KSNA). It was a 2004 Lancair Columbia 400, which I flew for several years."

Initially, while Lund was growing this new business, he didn't have the luxury of leaning on the time savings of private aircraft.

"When I first started out buying these self-storage facilities, I used to drive to all of them. At one point, I was driving a Prius all over California. In time, I thought I should be driving a better car and bought a beautiful BMW 7 Series. I got so busy that I hired a driver and was sitting in the back seat working the whole time. I was usually gone two, three, or four days at a time, staying in hotels and paying all the expenses for my driver and me."

Brad and Becky Lund.

"The Columbia 400 then helped me get around to see properties with ease, and I flew it for several years. It was a great plane. The business kept growing and I would use the airplane to fly around to more and more self-storage facilities often in different directions."

Lund really liked the aircraft, but one aspect made him consider making the move to another bird.

"The Columbia 400 was a little costly to maintain. Every year something would go out and need to be fixed, whether it was a turbocharger, a cylinder head, or something else. My annuals were crazy money and I thought, 'For this much maintenance, I could be flying something nicer.'"

With all of the great options to ascend to in his aviation journey, which aircraft was the then 1,000-hour pilot leaning towards?

"I was originally looking to upgrade to a Piper Mirage. But then I thought, 'Well, why don't I just skip that and go straight into a Piper Meridian?' But when I went to finance a Meridian, the lender said they didn't like financing the plane because their values were all over the place. The lender asked whether I had considered a TBM or not, but I looked to discover they were crazy money. Then they asked if I had considered just skipping into a jet and suggested the Citation Mustang as an option," Lund recalled.

"When I purchased my aircraft, Mustangs were about $700,000 less than available TBMs. Of course, jets cost more to operate, but $700,000 buys a lot of jet fuel! When I first sat in the Mustang, I thought it was way more plane than I needed. But I pulled the trigger on a 2009 model anyway."

The aircraft has been a crucial aspect of the company's growing operations.

"Today, we have 33 locations in several western states: California, Nevada, Arizona, Washington, and Texas. With the Mustang, I can leisurely depart by nine in the morning, fly up to Sacramento to see a couple of properties, stop in Fresno and Bakersfield on the way home to see a couple more, and still be home before dinner. Time is money."

Lund remarked how the transition into the Citation 510 went remarkably

well, and he enjoys the annual training to stay sharp in the cockpit.

"I did my jet transition and type rating training in my aircraft at a place in Long Beach called Aero City Flyers. I highly recommend them. They deal with a lot of Mustang owners and maintain many of them as well. My initial type rating training took about a week. Now every year I go back for my recurrent training, which is basically a day of classroom and sim training and then the check ride. It's not too hard, and it's good for me. And they're right here in my backyard, so it's convenient."

These dedicated times in the plane have allowed Lund to become better acquainted with its operations and more appreciative of its capabilities.

"I have been pleasantly surprised by many things in the Mustang. It's a slightly slower jet that some people have even referred to me as 'The Fisher Price of Jets.' But it does 340 knots true all day long – double the speed of the Columbia 400 – and almost always exceeds the POH. Sometimes as I'm flying home and on arrival into Southern California, there will be other commercial jets on my tail and the controllers will move me a few degrees off course to allow them to pass me. But for my mission, the Mustang is phenomenal," Lund proudly noted.

"My missions are usually a thousand miles or less, so a typical flight for me is an hour to two and a half hours long. It burns around a hundred gallons an hour until you get to altitude. Then once you get to altitude, where I typically fly in the mid-30s, it burns about 80 gallons an hour. Turboprops

would be more affordable if you were only flying an hour or less, but the Mustang affords me so many other luxuries over a turboprop: the look, ride, comfort, cabin size, performance, deicing capabilities, getting over the weather, having two jet engines, and so many other things."

Even with how much he's enjoyed flying his Mustang, Lund came to miss low and slow flying.

"The negative of the Mustang is that you're flying from Point A to Point B and it's IFR flying everywhere you go. I had to buy another plane to get the sensation of flying back to do the low and slow thing again! I bought a CubCrafters Carbon Cub FX3 a couple of years back and absolutely love it too! It's nice to have two planes. I have one that flies quickly from A to B and another for playing around on weekends." T&T

You can follow all of Brad's flying adventures on Instagram at **@raddadbrad.**

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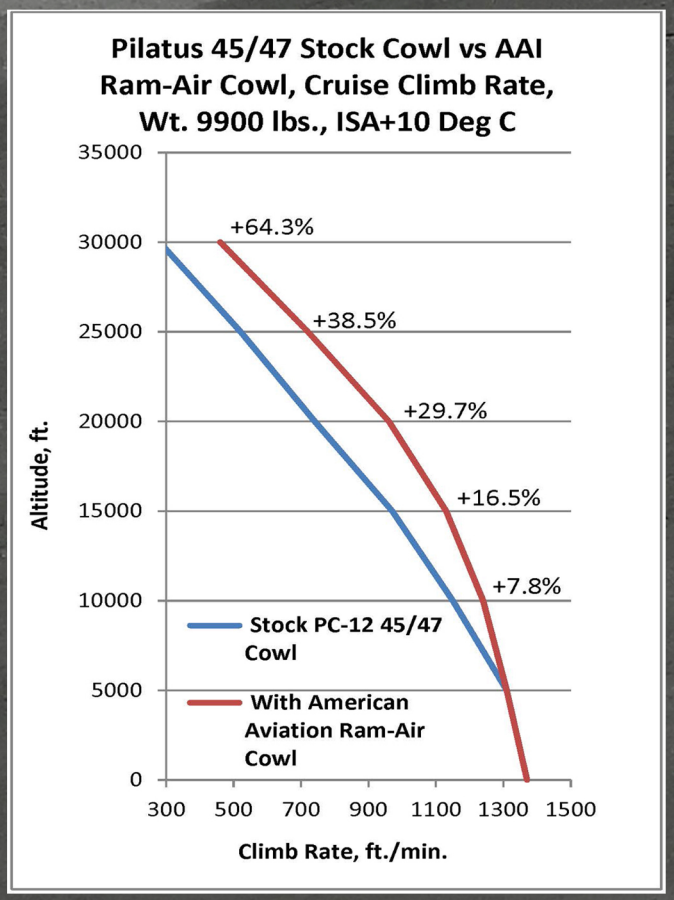
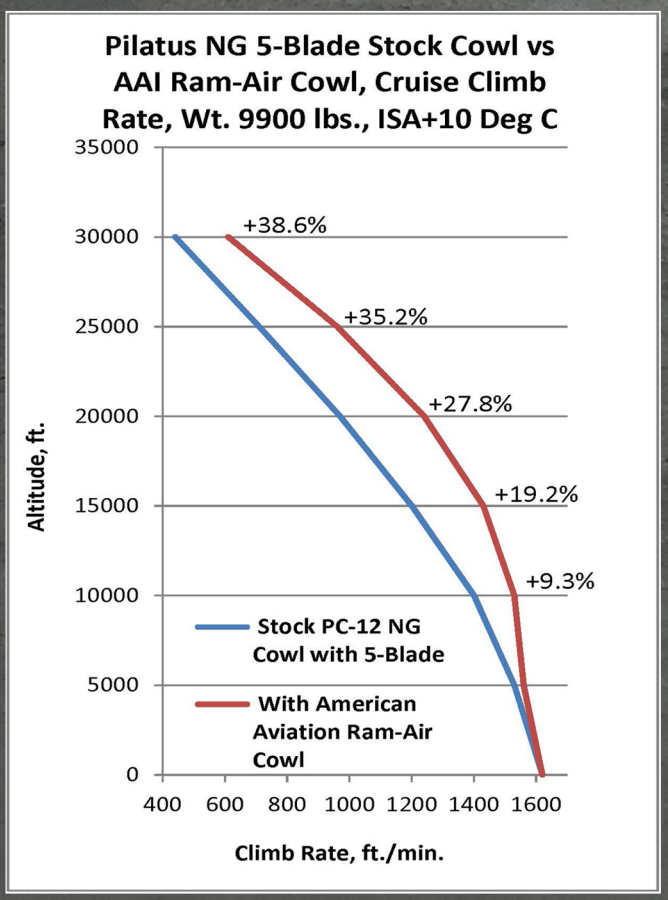
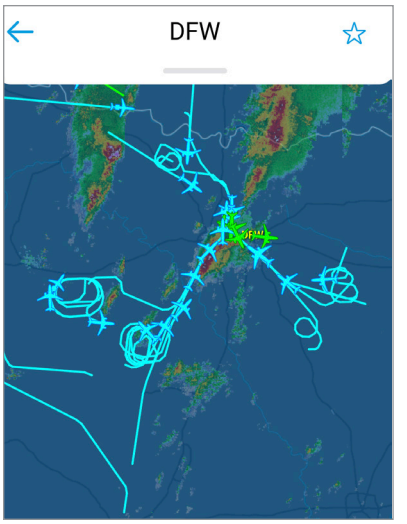




Minutes to Spare

What's your standard operating procedure for flying to your home airport with thunderstorms approaching? One method is to wait at the departure airport until all is clear, then proceed. Another is to fly as close as possible to the action and land short to let things settle down before the final leg.



I've tried both. On this particular day, it was a hybrid solution. I was headed home from a CJP Safety Committee meeting in Scottsdale, Arizona (KSDL), and I had some helpful experience in the right seat – CEO of FlightSafety Textron Aviation Training, Brian Moore.

The season's first major cold front had raced through Arizona the day before. As my buddies departed in their various Citations, Brian and I were left behind to study the angry weather approaching the Dallas area.

My plan was to wait at the Jet Aviation FBO until the line of thunderstorms moving into DFW was close enough to permit a departure from Scottsdale. At DFW, the airlines were holding or diverting all day, but I had the option to hold in the comfortable pilot's lounge.

Finally, after 3 hours, the forecast and my risk tolerance looked acceptable. As we taxied out to Runway 21, the Addison (KADS) weather was not so great.

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BKN023 OVC040 21/18 A2965

We were delayed for 15 minutes getting a takeoff clearance in bright, sunny Arizona skies. A delay that proved very fortunate.

En route in light to moderate turbulence at FL 390, it was obvious the weather was unsteady. Initially, we faced a 25-knot headwind, then an increasing tailwind. Temperatures ranged from ISA -1 to +10. Midway through the 2.5-hour flight the winds were 213 at 145 knots.

Our plan was to make an approach into the Dallas area and if unable to land at home base, divert to Denton (KDTO), where the front had passed.

As seen in the picture, taken on the climb out of SDL, it was going to be close. Each update of the NEXRAD depiction indicated a very slow eastward movement of the nasty weather, which later caused 19 tornadoes in three states. Then, an attention-getting note on the KDAL special weather observation as we began the descent:

"Note, hail less than one-quarter inch."

The winds shifted from 180 at 26 knots to 310 at 32 knots as the front crossed the airport. Addison is located just a few miles north of DAL. Would the passing front clear the thunderstorms out before we landed?

On arrival, we monitored the tower and ATIS for changes. On the frequency, we heard, "Regional approach, November 1234, with you declaring minimum fuel." A lot of airplanes were finally released from holding.

Under the overcast, in clear twilight skies, it looked like the taxi hold at Scottsdale was just long enough to allow the heavy rain to clear. On a visual approach to Runway 34 at Addison, the winds were 300 at 28 knots.

"Caution, pilots reported gain of 10 knots at 100 feet for Runway 34," said the tower. I made a fairly nice landing on a wet runway.

Just a few minutes made all the difference. Sometimes waiting is the best choice.

Fly safe. T&T

David Miller *has owned and flown a variety of aircraft from light twins to midsize jets for more than 50 years. With 6,000 plus hours in his logbook, David is the Director of Programs and Safety Education for the Citation Jet Pilot's Safety Foundation. You can contact David at* **davidmiller1@sbcglobal.net**.

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