Scenarios in Pilot Fatigue / Jet Journal: Sim or In-Airplane / Rare Piper Cheyenne 400LS

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TWIN & TURBINE

EDITOR
Rebecca Groom Jacobs
rebecca@twinandturbine.com

EDITORIAL OFFICE
2779 Aero Park Drive
Traverse City, MI 49686
Phone: (231) 946-7770

PUBLISHER
Dave Moore

PRESIDENT
Dave Moore

CFO
Rebecca Mead

PRODUCTION MANAGER
Mike Revard

PUBLICATIONS DIRECTOR
Jake Smith

GRAPHIC DESIGNER
Marci Moon

TWIN & TURBINE WEBSITE
www.twinandturbine.com

ADVERTISING
Jenna Reid
1-800-773-7798
Jenna.Reid@VPDCS.com

ADVERTISING COORDINATOR
Betsy Beaudoin
1-800-773-7798
betsybeaudoin@villagepress.com

GENERAL AVIATION ADVERTISING INFORMATION
Aviation.Publications@VPDCS.com

SUBSCRIBER SERVICES
Rhonda Kelly
Kelly Adamson
Jessica Meek
Jamie Wilson
P.O. Box 968
Traverse City, MI 49685
1-800-447-7367

To change mailing address,
email *rhonda.kelly@vpdcs.com*

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Editor's Briefing

by **Rebecca Groom Jacobs**

Feature Your Airplane in T&T

In this issue we introduce a new section of the magazine called the "Owner's Corner" – a space dedicated to stories written by you, the reader and owner-pilot.

The intent here is to stretch beyond a typical flight review and deeply explore various owner-flown aircraft through an operator's eyes. Whether its operational nuances, maintenance know-how or mission performance – who knows an airplane better than its longtime owner?

Kicking off our first owner story is reader Farhad Saba, based in Virginia. Farhad owns a coveted Piper Cheyenne 400LS – a powerful hotrod that outperformed the Citations of its day (you may recall Chuck Yeager shattered various climb records with the 400LS in the 1980s). With just over 40 built between 1984 and 1992, around half are believed to still be flying today. Find out more about the history and performance of this rare airplane on page 26. Thank you for sharing, Farhad!

So…have you already started brainstorming an article? Maybe it's sharing time-tested learnings about your airplane, discussing a recent upgrade experience or detailing a memorable trip. This is my formal invitation for you to submit a story (~1,500 words) for potential publication in Twin & Turbine. Submit to my email below and I will work with you directly throughout the process.

And a big thank you to the dozens who have reached out to me with their "votes" and advice as we shop for an aircraft. (If you missed my September briefing, my husband Jared and I recently embarked on a search for our first aircraft. An older Mooney, Bonanza or 210 are top contenders). Your firsthand experiences and insights are invaluable as we explore and modify our prospective list – of which there have been added considerations thanks to your intel.

No decision made as of yet, but stay tuned for a search update next issue!

rebecca@twinandturbine.com

Our first owner-feature goes to Farhad Saba and his Piper Cheyenne 400LS.

Airmail

In Response to Kevin Ware's "To Trade or Not to Trade"

Just read your piece referenced above. Your logic aligns with my own. I bought my 340A in 1980 and it does what I need and probably more economically than any of the reasonable alternatives. As you noted, however, older planes need occasional major TLC. In my case, it needs a paint job and new interior. I am in Texas but would like to hear whether you have any specific advice. Thanks.

John Alexander

I have had my '78 340 for 13 years. I keep spending money on it and loving it. My biggest issue is related to the lifters! I am excited to have just installed a new set of polished carbide faced lifters. Sure hope that fixes this problem anyway. Funny, your article is exactly the conversation I have with myself just prior to every upgrade! Loved it. Great job.

Philip Mattison

In Response to David Miller's "How Much Stress is Enough?"

Thanks so much. Really enjoy the magazine and your article this time brought back when I lived in Plano. In all my years of flying, I've never had to stop for weather 20 miles short of destination – brilliant. If only others would so readily bring a second pilot along.

Chuck Hosmer

In Response to Kevin Ware's "Stuff Happens"

Just read your article "Stuff Happens" in T &T. I really appreciated it and cut out the last paragraph to keep on my wall. I had an incident with my JetProp last year where I couldn't get the gear down despite using the emergency gear release and had to perform a gear-up landing. Luckily no injuries but just a bruised ego.

Ronen Elefant

Thanks for your recent article. I agree that those of us who have had stuff happen really look back to second guess ourselves as to what we could have done better. It is easy to become an MMQ as we sit in the comfort of our favorite armchair and take hours to resolve when the pilot had only a few seconds to minutes. Your comment matches the same advice I received several years ago from two Marine A-4 pilots (one retired as a 2-star general); it is a successful flight if everyone walks away without injury. Thanks again.

Allen Yourman

In Response to David Miller's "Belted"

David, a terrific reminder about seat belts. I'm going to circulate your article to our pilot team and our family and frequent business travelers. Thank you, sir!

Brian McCoy

Scenarios in Pilot Fatigue

by **Thomas P. Turner**

PHOTO COURTESY OF TONY LAVAN

From the NTSB:

During the approximately five-hour, 25-minute night instrument flight, the pilot of a Pressurized Beech Baron elected not to stop at his planned fuel stop. Upon reaching the destination airport, weather conditions were 300 overcast and two miles visibility in drizzle, which were worse than the forecast. The pilot diverted to his planned alternate airport and attempted an ILS approach. Given the lack of a fuel stop, the pilot may have felt personal pressure to land the airplane as soon as possible. The airplane initially intercepted the localizer for the approach but did not intercept the glideslope. The airplane then proceeded left of course, above the glideslope, followed by a continued left deviation and descent below the glideslope. The tower controller asked the pilot if he was still on the localizer course and the pilot replied that he was not. The tower controller then provided heading and altitude instructions in an attempt to guide the pilot onto a missed approach. The pilot acknowledged the heading instruction but failed to turn to the assigned heading or climb to the assigned altitude. The airplane subsequently impacted a residential area about a half-mile from the runway.

NTSB probable cause: The pilot's failure to maintain control of the airplane during an instrument approach due to spatial disorientation.

It's extremely rare for the NTSB to cite pilot fatigue as a contributing factor in an aircraft accident. In most cases, NTSB investigators simply don't have the time and budget to look into the pilot's behavior patterns in the days leading up to an accident. Five and a half hours, however, is a long time to be at the controls of an aircraft only to find yourself making an approach in LIFR. It's quite likely the pilot's awareness was impaired at least somewhat by fatigue. Here's another NTSB report where investigators come *this* close to citing pilot fatigue as a probable cause.

The commercial pilot of an E90 King Air had filed an instrument flight rules flight plan and was departing in dark night visual meteorological conditions on a cross-country personal flight. A witness at the departure airport stated that during takeoff the airplane sounded and looked normal. The airplane lifted off about halfway down runway 24, and

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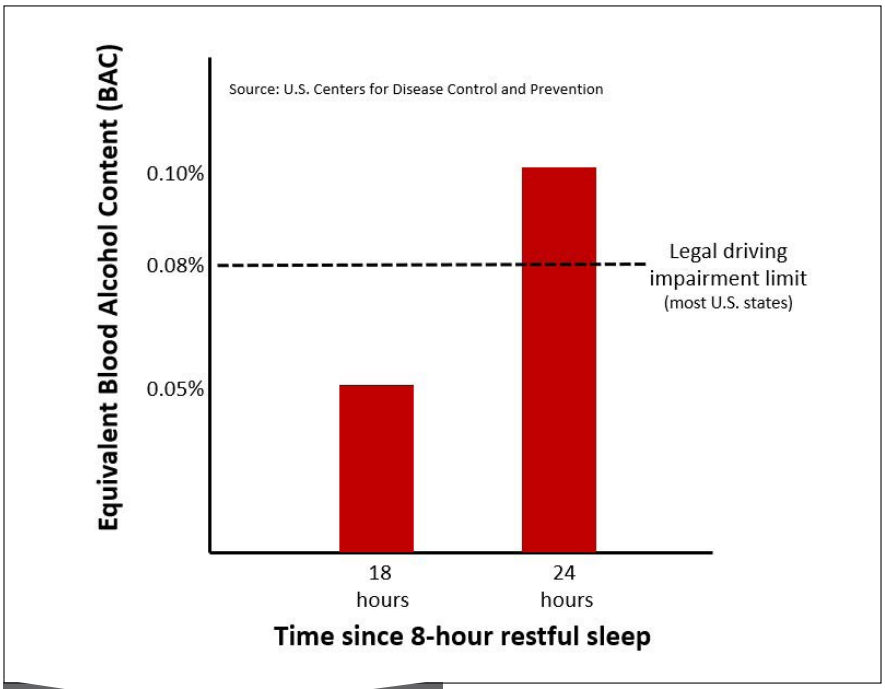

Industrial safety research concludes that after a restful, eight-hour sleep, being awake for 18 hours results in performance equivalent to that of someone with a blood alcohol content of 0.05. After being awake 23 hours, performance is the equivalent of a blood alcohol content of 0.12.

there was "plenty" of runway remaining for the airplane to land. The witness lost sight of the airplane and did not see the accident because the airport hangars blocked her view.

The wreckage was located about 2,400 feet southeast of the departure end of runway 24. Examination of the accident site indicated that the airplane impacted in a nose-down attitude with a left bank of about 20 degrees. A left turn during departure was consistent with the airport's published instrument departure procedures for obstacle avoidance, which required an immediate climbing left turn while proceeding to a navigational beacon located about 7 miles east-northeast of the airport. Examination of the wreckage did not reveal any evidence of preimpact mechanical malfunctions that would have precluded normal operation.

The pilot had reportedly been awake for about 15 hours and was conducting the departure about the time he normally went to sleep and, therefore, may have been fatigued about the time of the event; however, given the available evidence, it was impossible to determine the role of fatigue in this event. Although the circumstances of the accident are consistent with spatial disorientation, there was insufficient evidence to determine whether it may have played a role in the sequence of events.

NTSB probable cause: The pilot's failure to maintain clearance from terrain after takeoff during dark night conditions.

Occasionally NTSB reports do identify pilot fatigue as a contributing factor in an accident, such as this example.

The Cessna 414A, flown by an airline transport pilot, was approaching the destination airport after a cross-country flight in night instrument meteorological conditions. Destination weather about one minute before the accident included an overcast ceiling at 200 feet and half-mile visibility with light rain and fog. The flight received radar vectors to the final approach course for an ILS approach. The airplane's flight path did not properly intercept and track either the localizer or the glideslope during the instrument approach. The airplane crossed the final approach fix about 360 feet below the glideslope and then maintained a descent profile below the glideslope until it leveled briefly near the minimum descent altitude. The lateral flight path from the final approach fix inbound was one or more dots to the right of the localizer centerline until the airplane was about one nautical mile from the runway threshold when it turned 90 degrees left. The turn was initiated before the airplane had reached the missed approach point; additionally, the left turn was not in accordance with the published missed approach instructions. The airplane made a series of pitch excursions as it flew away from the localizer. A simulation study determined that dual engine power was required to match the recorded flight trajectory and ground speeds, which indicated that both engines were operating throughout the approach. The simulation also indicated that the airplane likely encountered an aerodynamic stall during its course deviation. The airplane impacted the ground about 2.2 miles east-northeast of the runway threshold and about 1.75 miles east of the localizer centerline.

The airplane impacted the ground upright and in a nose-low attitude consistent with an aerodynamic stall/spin. Wreckage examinations did not reveal any anomalies with the airplane's flight control systems, engines, or propellers. The glideslope antenna was found disconnected from its associated cable circuit. Laboratory examination and testing determined that the glideslope antenna cable was likely inadequately connected/secured during the flight, which resulted in an unusable glideslope signal to the cockpit avionics. There was no history of recent maintenance on the glideslope antenna, and the reason for the inadequate connection could not be determined.

Data downloaded from the airplane's EHSI established that the device was in the ILS mode during the instrument approach phase and that it had achieved a valid localizer state on both navigation channels; however, the device never achieved a valid glideslope state on either channel during the flight. Further, a replay of the recorded EHSI data confirmed that, during the approach, the device displayed a large "X" through the glideslope scale and did not display a deviation pointer, both of which were indications of an invalid glideslope state.

There was no evidence of cumulative sleep loss, acute sleep loss, or medical conditions that indicated poor sleep quality for the pilot. However, the accident occurred more than 2 hours after the pilot routinely went to sleep, which suggests that the pilot's circadian system would

not have been promoting alertness during the flight. Further, at the time of the accident, the pilot likely had been awake for 18 hours. Thus, the time at which the accident occurred and the extended hours of continuous wakefulness likely led to the development of fatigue.

The presence of low cloud ceilings and the lack of glideslope guidance would have been stresses to the pilot during a critical phase of flight. This would have increased the pilot's workload and situational stress as he flew the localizer approach, a procedure that he likely did not anticipate or plan to conduct. In addition, weight and balance calculations indicated that the airplane's center of gravity (CG) was aft of the allowable limit, and the series of pitch excursions that began shortly after the airplane turned left and flew away from the localizer suggests that the pilot had difficulty controlling airplane pitch. This difficulty was likely due to the adverse handling characteristics associated with the aft CG. These adverse handling characteristics would have further increased the pilot's workload and provided another distraction from maintaining control of the airplane. Therefore, it is likely that the higher workload caused by the pilot's attempt to fly an unanticipated localizer approach at night in low ceilings and his difficulty maintaining pitch control of the airplane with an aft CG contributed to his degraded task performance in the minutes preceding the accident.

NTSB probable cause: The pilot's failure to maintain control of the airplane during the instrument approach in night instrument meteorological conditions, which resulted in the airplane exceeding its critical angle of attack and an aerodynamic stall/spin. Contributing to the accident were pilot fatigue, the pilot's increased workload during the instrument approach resulting from the lack of glideslope guidance due to an inadequately connected/secured glideslope antenna cable, and the airplane being loaded aft of its balance limit.

The Federal Aviation Administration publishes rules for flight, duty day and rest regulations applicable to air carrier operations. According to the FAA, "Fatigue threatens aviation safety because it increases the risk of pilot error that could lead to an accident. The rule recognizes the universality of factors that lead to fatigue in most individuals and regulates these factors to ensure that flight crew members in passenger operations do not accumulate dangerous amounts of fatigue."

The FAA does not, however, publish fatigue-mitigation regulations for most Part 91 operations. The only fatigue rule for non-91K fractional ownership aircraft that applies to light aircraft is the prohibition against flight instructors conducting more than eight hours of "dual given" in any 24-hour period. The rest of us are on our own to determine whether we're alert enough to fly.

Pilot fatigue is a virtually unresearched and potentially major factor in general aviation accidents as well. Common symptoms of fatigue include:

- Measurable reduction in speed and accuracy of performance
- Lapses in attention and vigilance
- Delayed reactions
- Impaired logical reasoning and decision-making, including a reduced ability to assess risk or appreciate the consequences of actions
- Reduced situational awareness
- Low motivation to perform optional activities

The symptoms of fatigue are exactly the same as those of alcohol impairment. Industrial safety research concludes that after a restful, eight-hour sleep, being awake for 18 hours results in performance equivalent to that of someone with a blood alcohol content of 0.05. After being awake 23 hours, performance is the equivalent of a blood alcohol content of 0.12. Many states define "legally drunk" as a blood alcohol content of 0.08. Of course, there is no blood alcohol level permissible to serve as pilot-in-command.

It's not enough to get a good rest the night before a challenging trip. "Sleep debt," the negative cumulative effect of getting less than eight full hours of sleep, applies not only the night before a flight but for several nights prior to that as well. According to research cited by the FAA, "The average person requires in excess of nine hours of sleep [in a single] night to recover from a sleep debt."

Sleep debt and the effect of fatigue on pilot performance are likely huge as unidentified factors in aircraft accidents. Add long flights and dark conditions, and a pilot who took off in a reasonably well-rested state may not have what it takes to safely complete a flight when presented with adverse or unusual circumstances. Many owner-pilots tend to make trips after the end of a full workday, sometimes at the end of a long work week – exposing themselves, their passengers and the people they fly over to heightened risk from fatigue.

Pilot fatigue is a virtually unresearched and potentially major factor in general aviation accidents.

Because the FAA's airline pilot fatigue rules cover many scenarios for crew rest, travel across multiple time zones, and back-to-back work days, it is much more complex than we need to be concerned about in personal aviation. The underlying concept, however, is extremely relevant:

Your flight should be planned to conclude no more than 16 hours after you awoke from an uninterrupted eight hours of sleep. This includes the time to fly to any alternates. Once you are airborne, constantly evaluate your level of fatigue. If you are getting tired (yawning, find yourself missing radio calls, etc.) land right away. If your flight is delayed and you will reach the end of your 16-hour duty day, divert to land before reaching that limit.

The National Business Aviation Association (NBAA) publishes recommended guidance for business aviation crews. NBAA recommends no more than a 14-hour duty day, including no more than 10 hours of flight time in any 24-hour period. Not explicitly stated in NBAA's guidance, this assumes a two-person professional flight crew in turbine airplanes. Taking airline regulations and NBAA best practices into account, here's what I suggest for single-pilot business or personal aviation operators:

- 12-hour maximum duty day. This is 12 hours "alarm clock to engine shutdown," recognizing that while most single-pilot operators will not log multiple flight legs in a single day, they tend to fly later in the day after having expended some of their day on non-aviation but still demanding duties.
- No more than three flight segments in a duty day together totaling no more than eight flight hours.
- No more than two flight segments in a duty day together totaling no more than five flight hours, if the final segment will be flown at night and/or in instrument mereological conditions.

We need to get real about fatigue and learn to account for pilot fatigue as part of flight planning. Your "fatigue state" is as critical to the safe outcome of a flight as the airplane's fuel state. It's fairly easy to judge whether you feel rested enough to begin a trip, but far harder to predict how fatigued you'll feel at the end of a flight. Although the rules and suggestions for duty day limits are somewhat arbitrary, they are the starting point for a pilot not used to active fatigue management, until he or she is more experience determining how they respond to pilot fatigue. T&T

Thomas P. Turner *is an ATP CFII/MEI, holds a master's Degree in Aviation Safety, and was the 2010 National FAA Safety Team Representative of the Year. Subscribe to Tom's free FLYING LESSONS Weekly e-newsletter at* **www.mastery-flight-training.com.**

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CITATION M2

Flying the Heavy-Hitting Light Jet

by **Rich Pickett**

With more than 2,200 jets produced in the Citation 525 series, you can find one at almost every business airport around the world. The line encompasses the CitationJet CJ, CitationJet CJ1+ and Citation M2 (525), CJ2 and CJ2+ (525A), CJ3 and CJ3+ (525B), and CJ4 (525C).

Our focus here is the Cessna Citation M2, the current-production entry into the series. Since 2013, the airplane has proven to be a dependable and efficient performer for operators, with Textron Aviation celebrating the 250th delivery in June. Thanks to a recent invitation by the company, I traveled to Wichita to fly the latest M2 and provide an updated review.

M2 Overview

Following introductions with the Textron Aviation team, we jumped into a technical briefing on the aircraft. Though I have flown and taught in Citation 525 aircraft for several years, it is amazing what you can learn during an in-depth briefing.

The M2 is assembled at Textron Aviation's Independence, Kansas, facility, which was also the former home of the Citation Mustang. Building on the success of the CJ1+, Textron Aviation reinvented the model with new styling, avionics and powerplant enhancements. While the basic fuselage and systems are nearly identical to previous models in the 525 series, the M2 sports the Garmin G3000 avionics, an improved cockpit, a more comfortable cabin interior and, of course, winglets!

Textron Aviation also worked with Williams International to install the upgraded FJ44-1AP-21 turbofan engine. When compared to the CJ1+, the new variant offers up to 15 percent additional cruise thrust and a 5 percent improvement when operating at higher density altitude airports. One of the benefits of the improved performance is the ability to depart from Aspen, Colorado (KASE) at 24 degrees Celsius (75 degrees Fahrenheit) with a higher MTOW. As an example, if using one of the M2's I fly and Special Departure Procedures for Runway 33 or Textron's CESNAV app, it is possible to take off at a weight of 10,700 lbs, payload of 800 lbs, and 3,280 lbs of fuel. I prefer to take off at a lower weight and use less runway, however, this configuration also holds enough fuel to fly 1,335 nm. Very impressive for a light jet.

The M2 offers a number of avionics options, with most owners selecting Synthetic Vision, Surface Watch, Sirius XM Weather and Radio, Flightstream 510 and the upgraded Garmin GWX 80 weather radar with turbulence detection. Other popular options include TCAS II, the advanced TAWS A, and internet capabilities using either Swift Broad Band or the GOGO ATG 3000 systems. With more aircraft operating internationally, the HF, FANS-1/A options now offer expanded capabilities.

With the advent of the M2, CJ3+ and newer Citations, Textron Aviation provides a comprehensive system monitoring capability that continually records the health of a number of aircraft systems. The Central Diagnostics Maintenance System (CDMS) coupled with the Aircraft Recording System (AReS) also has the capability to transmit data via the optional Garmin GSR56 Iridium communicator or Wi-Fi using the Garmin GDL59. The system is so extensive that ground maintenance personnel can interact with the flight crew in flight on potential solutions or be ready to resolve it upon landing.

Preflight

For those familiar with the Citation 525 series of jets, the exterior preflight is very similar to other models. One distinction of the M2 is the factory installation of small winglets. Besides adding a nice look on the ramp, they contribute a small amount to the increased range of the M2 versus the previous CJ1+ model. With the ample engine thrust, the M2 is also designed with bleed air for both the windshield anti-ice as well as heating the leading edges of the wings. As with other models in the 525 series, the M2 uses 23 PSI service air to inflate the horizontal stabilizer deice boots.

Loading the M2 is easy with the two externally accessible baggage compartments. I've used the forward area of the 525 series to load very bulky items, including walkers and collapsible wheelchairs for friends. With a load limit of 400 pounds, it also helps when you need to adjust the weight and balance. When flying single pilot and no passengers, you generally need to carry some additional weight up front. The aft baggage area can hold 325 pounds. With the small extended cargo area, you can load a snowboard or shorter skis. I've found that if I want to keep items cold, I place them in the forward compartment. The rear area, with more protection from the cold, does a great job to keep items in luggage from freezing.

Interior

The standard interior of the M2 can accommodate six passengers, including one person on the belted toilet seat if needed. The toilet area can be separated from the cabin by a solid panel sliding door. Sharing the same fuselage design as the other Citation 525 jets, the cabin height is 57 inches with a width of 58 inches.

The club seating in the cabin is very comfortable, with some fore and aft track adjustment (a feature that is nice when compared with the Citation Mustang). If you don't need the side seat opposite the main cabin door, the M2 offers a nice side galley cabinet. The passenger seats in the Citation M2 utilize a similar design that is used in the CJ3+ and CJ4 with movable armrests.

Start-Up

After a thorough preflight, it was time to fly. On this flight our mission was from Wichita (KICT) to Colorado Springs (KCOS).

Turning left into the cockpit you immediately notice a difference from the CJ1 and CJ1+. The cockpit design is substantially cleaner with the integration of the Garmin G3000 avionics suite. The G3000 integrates control of many of the systems and enables the removal of many of the traditional switches found in the Citation cockpit.

My height is 6-feet 3-inches and the CJ1/1+ cockpit is tight for me. To add some space in the M2, Cessna modified the storage cabinet behind the pilot's seat, improved the seat design and reduced the size of the center pedestal. While not as roomy as the CJ3/CJ3+ or CJ4, I find it comfortable. The copilot seat has a few inches less leg room and can be tight if you are tall. Cessna has always designed a great view for the crew and the M2 is no exception. The large side windows provide one of the best views in light jets.

With the integration of so many systems, setting up the avionics for start is straightforward. Using the Garmin Touch Controllers (GTCs), the Garmin 3000 leads you through initialization of the aircraft, including systems tests, weight and balance, and takeoff performance and V-speed calculations. Once you have initialized the systems, entering a flight plan is quick. If you want to integrate your

Cessna Citation M2

By the Numbers

Max Speed*	404 KTAS(0.70M)/ 390 KTAS/ (0.69M) FL330/FL410
Fuel Flow Max Speed*	998 PPH / 684 PPH FL330/FL410
Maximum Range (High Speed Cruise, NBAA IFR Reserves)	1,360 nm
Max Ramp Wgt	10,800 lbs
MTOW (SL, ISA)	10,700 lbs
Basic Operating Wgt***	6,900 lbs
Useful Load	3,900 lbs
Fuel Capacity	3,296 lbs
Max Fuel Payload**	604 lbs
Base Price	$5.035M

*Weight 9,000 lbs
**Based on Max Ramp Wgt, single pilot - 200 lb
***Single pilot (200 lb), as flown
NBAA Range: Max weight, full fuel, single pilot, high speed cruise, 100nm alternate

PHOTOS BY AUTHOR

tablet with the FMS, simply opt for the Garmin 510 which provides wireless connectivity to your EFB flight planning software. Even with a battery start, I found you have sufficient time to complete these tasks before starting since it is equipped with two batteries to facilitate the process.

Starting the jet is simple: complete your checklists, press "Start," move the throttle to idle, and monitor the instruments. When you press Start, even the rotating beacon is activated. With both engines started, just a few more checks and we're ready to fly.

Flying the M2

At full throttle the Williams International FJ44-1AP-21 turbofans each develop 1,965 lbs of thrust. I've always enjoyed hand flying Citations and the M2 is no exception. The M2 has the same harmonious control feel as all the other models in the 525 series, providing great feedback while not being overly heavy.

With a direct climb to FL 410 in 24 minutes (using 435 lbs to get there) and a top speed of .70M/404 KTAS at FL330, the airplane offers pilots great operational flexibility. When flying at FL410 and midweight of 9,500 lbs, I usually see a TAS of 380 to 390 KTs and fuel flow of approximately 700 PPH at ISA temperatures. Alternatively, for higher speed but less range, flying at FL330 the M2 will have a TAS of 404 and burn 43 percent more fuel. My personal preference is to fly at FL 390 to FL 410 even though the cost tradeoff between fuel flow and engine/airframe time is not significantly different than cruising at slightly lower altitudes.

During our flight to Colorado Springs (KCOS), the optimal altitude was FL360 for this short hop. At this

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The upgraded G3000 features faster processors that allow the display of both VFR sectionals and IFR airway charts in the higher resolution displays.

altitude we cruised comfortably at 402 KTAS/0.71Mach, burning 440 PPH per side. The G3000 makes enroute flight planning easy, including the automatic landing elevation selection for pressurization. Descending to KCOS, we descended and leveled off at FL270 for ATC, where we flew at 370 KTAS with a total fuel flow of 1,000 PPH.

KCOS ILS 17L Approach (photo by author).

Preparing for the approach is simple: check the ATIS, automatically load the METAR for weather and performance data, activate V speeds, load the approach and chart and you are set. Setting up for landing, I accessed the performance features of the G3000 and at an elevation of 6,187 MSL. At our landing weight of 9,369 lbs, and V_{ref} of 106 KTS, our runway requirement was only 3,277 feet out of 13,501 feet available on Runway 17L. The M2 is easy to hand fly, and I set up the ILS 17L on the G3000 and intercepted the localizer.

Next-Generation G3000

Textron Aviation improved the avionics on its latest production M2s with the upgraded Garmin G3000. Starting with serial number 525-1048 (CJ3+ 525B-0610), they incorporated the latest G3000 hardware and software. This new version of the G3000 features faster processors that allow display

PHOTO BY AUTHOR

of both VFR sectionals and IFR airway charts on the higher resolution (1920 x 1200) displays as well as rapid redraw of the screen images and initialization time of 10 seconds. The concurrent software upgrade includes standard features such as Visual Approaches, ADS-B In, HSI map overlays, standby database capability and European Visual Reference Points (VRPs).

The new G3000 optional features are equally impressive. Sirius/XM

Avionics Prove Their Worth

With three 14-inch displays, of which each can be split, I feel I have full command of my airborne environment. As an example, I recently conducted an M2 training flight for my friend, Brandon Campbell, for his CE525S type rating. We flew around the Midwest and Texas with Hurricane Laura just east of our flight path, causing a large amount of precipitation on our return to Addison airport (KADS) north of Dallas.

It was like flying through a maze. We split Brandon's PFD to add vertical profile of the GWX 80 Radar, placed Sirius XM weather on the MFD, and selected horizontal mode of the GWX 80 on mine. Using my favorite procedure of using the bearing pointer to determine height and depth of a cell, we were able to navigate between the rapidly building cells with hardly a bump – and no icing.

weather can now display up to 20 weather products and some can now be animated, a feature I really like to detect trends. To keep up with the latest datacom requirements, FANS-1/A CPLDC, CPLDC FAA Data Comm, SATCOM Direct ACARS, Flightstream 510 and Garmin Connext Position Reporting are optional.

The good news for existing M2 and CJ3+ operators is that many of these software features, Flightstream 510 and Data Comm will be available as upgrades. That upgrade should be available by the end of 2020 or early 2021. The new G3000 displays, supporting higher resolution and VFR/IFR enroute charts, will not be available as a replacement on existing airframes.

Summary

The short flight from Wichita to Colorado Springs was representative of my other experiences flying the Citation M2. The G3000 not only makes the pilot's job easier, it enhances safety, especially flying in IMC and challenging weather. The smooth handling gives you a feeling of flying a much larger jet, and of course the trailing link landing gear makes landings a breeze. With just slight braking we were quickly off the runway and taxiing to the parking area.

Textron Aviation created a powerful upgrade from the CJ1+, offering owners a unique experience in the Citation 525 series. If you get a chance to fly one, don't pass it up. You will exit the plane with the same big smile I had following this flight. T&T

With 11,000+ 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. He is also a proud owner of an Eclipse and Cirrus SR22. You can contact Rich at* **rich@personalwings.com**.

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COUNT	AIRCRAFT
36	AIRBUS ACJ319
30	ASTRA 1125
32	ASTRA 1125SP
57	ASTRA 1125SPX
29	BEECHJET 400
266	BEECHJET 400A
195	BOEING BBJ
503	CHALLENGER 300
40	CHALLENGER 600
26	CHALLENGER 601-1A
121	CHALLENGER 601-3A
54	CHALLENGER 601-3R
325	CHALLENGER 604
7	CHALLENGER 800
148	CITATION 500
340	CITATION 525
318	CITATION BRAVO
187	CITATION CJ1
96	CITATION CJ1+
240	CITATION CJ2
225	CITATION CJ2+
476	CITATION CJ3
174	CITATION CJ3+
368	CITATION CJ4
189	CITATION ENCORE
74	CITATION ENCORE+
392	CITATION EXCEL
14	CITATION I
280	CITATION I/SP
445	CITATION II
54	CITATION II/SP
155	CITATION III
124	CITATION LATITUDE
247	CITATION M2
467	CITATION MUSTANG
130	CITATION S/II
323	CITATION SOVEREIGN
105	CITATION SOVEREIGN+
310	CITATION ULTRA
285	CITATION V
31	CITATION VI
122	CITATION VII
329	CITATION X
38	CITATION X+
253	CITATION XLS
301	CITATION XLS+
1	DIAMOND I
32	DIAMOND IA
16	DORNIER ENVOY 3
304	ECLIPSE EA500
75	EMBRAER LEGACY 500
100	EMBRAER LEGACY 600
53	EMBRAER LEGACY 650
247	EMBRAER PHENOM 100
328	EMBRAER PHENOM 300
80	FALCON 10
22	FALCON 100
16	FALCON 200
242	FALCON 2000
27	FALCON 2000EX
34	FALCON 20C
15	FALCON 20C-5
17	FALCON 20D
1	FALCON 20D-5
10	FALCON 20E
49	FALCON 20F
75	FALCON 20F-5
197	FALCON 50
8	FALCON 50-40
118	FALCON 50EX
178	FALCON 900
24	FALCON 900C
116	FALCON 900EX
156	GLOBAL 5000
123	GLOBAL EXPRESS
25	GULFSTREAM G-100
239	GULFSTREAM G-200
14	GULFSTREAM G-300
24	GULFSTREAM G-400
313	GULFSTREAM G-450
11	GULFSTREAM G-500
602	GULFSTREAM G-550
27	GULFSTREAM G-II
12	GULFSTREAM G-IIB
111	GULFSTREAM G-III
175	GULFSTREAM G-IV
338	GULFSTREAM G-IVSP
204	GULFSTREAM G-V
38	HAWKER 1000A
2	HAWKER 125-1A
2	HAWKER 125-1AS
12	HAWKER 125-400AS
2	HAWKER 125-600A
1	HAWKER 125-600AS
61	HAWKER 125-700A
72	HAWKER 4000
223	HAWKER 400XP
44	HAWKER 750
153	HAWKER 800A
14	HAWKER 800B
398	HAWKER 800XP
42	HAWKER 800XPI
88	HAWKER 850XP
187	HAWKER 900XP
2	JET COMMANDER 1121
2	JET COMMANDER 1121B
2	JETSTAR 731
4	LEARJET 23
12	LEARJET 24
2	LEARJET 24A
7	LEARJET 24B
20	LEARJET 24D
8	LEARJET 24E
6	LEARJET 24F
4	LEARJET 25
19	LEARJET 25B
4	LEARJET 25C
45	LEARJET 25D
4	LEARJET 28
32	LEARJET 31
182	LEARJET 31A
26	LEARJET 35
398	LEARJET 35A
21	LEARJET 36
33	LEARJET 36A
32	LEARJET 40
243	LEARJET 45
225	LEARJET 45XR
92	LEARJET 55
6	LEARJET 55B
8	LEARJET 55C
307	LEARJET 60
623	PILATUS PC-12/45
149	PREMIER I
1	SABRELINER 40
7	SABRELINER 40A
2	SABRELINER 40EL
2	SABRELINER 40R
4	SABRELINER 60
5	SABRELINER 60ELXM
68	SABRELINER 65
7	SABRELINER 80
1	SABRELINER 80SC
67	WESTWIND 1
1	WESTWIND 1123
14	WESTWIND 1124
50	WESTWIND 2

TURBOPROPS - 12,801

CHIEF PILOTS & OWNERS

COUNT	AIRCRAFT
403	CARAVAN 208
1,523	CARAVAN 208B
155	CHEYENNE I
16	CHEYENNE IA
206	CHEYENNE II
56	CHEYENNE III
38	CHEYENNE IIIA
57	CHEYENNE IIXL
35	CHEYENNE IV
235	CONQUEST I
291	CONQUEST II
38	JETSTREAM 31
63	JETSTREAM 32
52	JETSTREAM 41
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387	KING AIR 350I
4	KING AIR 350IER
8	KING AIR 90
6	KING AIR A/B90
76	KING AIR A100
184	KING AIR A200
34	KING AIR A90
197	KING AIR A90-1
105	KING AIR B100
1,038	KING AIR B200
107	KING AIR B200C
99	KING AIR B200GT
5	KING AIR B200SE
8	KING AIR B200T
47	KING AIR B90
302	KING AIR C90
38	KING AIR C90-1
186	KING AIR C90A
378	KING AIR C90B
76	KING AIR C90GT
88	KING AIR C90GTI
150	KING AIR C90GTX
13	KING AIR C90SE
258	KING AIR E90
173	KING AIR F90
28	KING AIR F90-1
5	MERLIN 300
13	MERLIN IIB
8	MERLIN III
22	MERLIN IIIA
44	MERLIN IIIB
14	MERLIN IIIC
3	MERLIN IV
11	MERLIN IV-A
101	MITSUBISHI MARQUISE
18	MITSUBISHI MU-2F
1	MITSUBISHI MU-2G
15	MITSUBISHI MU-2J
37	MITSUBISHI MU-2K
12	MITSUBISHI MU-2L
25	MITSUBISHI MU-2M
24	MITSUBISHI MU-2N
29	MITSUBISHI MU-2P
47	MITSUBISHI SOLITAIRE
796	PILATUS PC-12 NG
197	PILATUS PC-12/47
296	PIPER JETPROP
74	PIPER M500
92	PIPER M600
602	PIPER MERIDIAN
198	QUEST KODIAK 100
2	ROCKWELL 680T TURBO
5	ROCKWELL 680V TURBO II
4	ROCKWELL 680W TURBO II
4	ROCKWELL 681 HAWK
85	SOCATA TBM-700A
90	SOCATA TBM-700B
381	SOCATA TBM-850
121	SOCATA TBM-900
38	SOCATA TBM910
136	SOCATA TBM930
6	STARSHIP 2000A
50	TURBO COMMANDER 1000
22	TURBO COMMANDER 690
131	TURBO COMMANDER 690A
135	TURBO COMMANDER 690B
73	TURBO COMMANDER 840
20	TURBO COMMANDER 900
19	TURBO COMMANDER 980

TWIN PISTON - 6,872 OWNERS

COUNT	AIRCRAFT
35	BARON 56 TC
1,566	BARON 58
446	BARON 58P
118	BARON 58TC
3	BARON A56TC
335	BARON G58
158	BEECH DUKE B60
150	CESSNA 340
480	CESSNA 340A
49	CESSNA 402B BUSINESS LINER
110	CESSNA 402C
20	CESSNA 404 TITAN
312	CESSNA 414
430	CESSNA 414A CHANCELLOR
36	CESSNA 421
30	CESSNA 421A
335	CESSNA 421B
713	CESSNA 421C
38	CESSNA T303
100	DIAMOND D42
65	PIPER 600 AEROSTAR
3	PIPER 600A AEROSTAR
44	PIPER 601 AEROSTAR
4	PIPER 601B AEROSTAR
182	PIPER 601P AEROSTAR
21	PIPER 602P AEROSTAR
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2,875	CIRRUS SR22
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Simulator or In-Airplane?

by **Anthony Cirincione**

PHOTO COURTESY OF MACH POINT ONE AVIATION

Which is more effective: training in a simulator or training in a real airplane? It's a common argument in our industry. And as one might guess, the providers of simulator training claim simulators are best, while providers of in-airplane training often say the airplane is better. With this article, I hope to challenge both ideas as most pilots should do *both*. Here's why.

Each platform offers strengths and weaknesses. In some cases, one platform is superior to the other. However, in all cases, training in both will result in a sharper pilot. Here is a comparison of some of the areas each platform does well and not so well. Let's first review the characteristics of simulators.

Simulator Advantages

- Great procedure trainers
- Ability to freeze the simulator at any point
- Training things that can't or shouldn't be done in reality
- Relatively more cost-effective

Simulator Disadvantages

- Simulation is simply not real
- Inaccurate representation
- Landings are not the same
- Other "sim-isms"
- Not representative of the customer's plane
- Training often "handcuffed" by Part 142
- Class demographics
- Higher time and travel costs

Simulators are great procedure trainers. Consider a pilot working toward their first jet type rating. A sim offers the ability to accomplish about 15 single-engine go-arounds in a half-hour. Most pilots can usually get the procedure down after that much repetition. To train that same event in a real airplane in the same time would result in maybe four attempts, as each would require a lap around the pattern to try again. The result would be increased fatigue, distraction, wasted time and expense.

The ability to freeze the simulator at any point allows the instructor to focus on a precise point in time to reveal an error and teach the correction. Considering the previous example of the single-engine go-around, after the instructional moment, they move the "plane" back to the 3-mile final, configured, on profile, and do it again. This can be far more effective than discussing the same event following a real flight while relying on notes and memory for the debrief.

Training things that can't or shouldn't be done in reality. The natural example here is an inadvertent thrust reverser deployment at V_1. Even if it could be set up in reality, I certainly hope nobody would risk trying it. Most other events can safely be practiced in the plane.

Simulators are relatively more cost-effective. Although more of that benefit usually goes to the company providing the sim than to the pilot. Twenty hours of sim training is always less expensive for the customer than 20 hours of jet time.

Now, let's look at some reasons simulators are not perfect.

Simulation is simply not real. The normal level of anxiety, discomfort and distraction is almost impossible to create in a sim. During some teaching moments this is actually an advantage. However, the realities of flight are always present in the actual airplane; a pilot must be able to function regardless. One of our most important skills as pilots is processing the vast amount of information and prioritizing our thoughts and actions.

Even the best simulators don't feel quite right. Although today's technology is impressive, several seat-of-the-pants cues, cockpit lighting/shadows and sounds we experience in flight are not accurately replicated. While this can make it easier to focus on some things, it removes information pilots frequently use to maintain situational awareness. The disconnect between visual and vestibular inputs can cause motion sickness in simulators.

Landings are not the same in simulators. This usually results in a student being given a mechanical technique to land the sim that shouldn't be used in a real plane.

Other sim-isms include instruments that may not move the same. For example, many ITT gauges don't realistically display a hot start. The temperature rise is often quite different than in real life. Is this critical? Not necessarily, but it does degrade training a bit. Another issue, more common in older sims, is that the sequences used for some tasks may be different from those in a real plane. This is often due to programming or equipment issues.

The simulator may not represent the customer plane. This is often the most critical issue. Simulators for say a new King Air 350, Phenom 300, Pilatus or CJ2 tend to very accurately represent the customer's plane. However, very few legacy airplanes like older King Airs or CE500 series Citations still have the original avionics. Almost all have since had one or more avionics modifications. Many also have other substantial modifications to include different engines.

Simulator training is often handcuffed by Part 142. It's not that the simulator can't be used to teach other things. It's simply because the "approved" training program is quite specific and must be followed until completion. Also, the pilot is usually one of several people in a given class. The schedule has to accommodate everyone in the class, leaving little extra time to cover additional material. That said, many of the simulator-based training providers will develop customized programs on request.

Class demographics and teaching to minimum training standards. Initial classes will often include pilots with vastly different experience and abilities. More experienced, highly capable pilots might be held back while the instructor works to help the less experienced (or less capable) pilots keep up with the material.

Higher time and travel costs. Training in a simulator requires the student to travel to the sim location – enduring airlines, hotels, restaurant meals, and more time away from home and family.

Now let's look at the good and bad about training in the airplane.

In-Airplane Training Advantages:

- It's a real, accurate representation
- There is no excuse for bad landings
- No sim-isms
- It is the customer plane
- Training is where the client wants
- Training is when the client wants
- Training is more personalized in the airplane

In-Airplane Training Disadvantages:

- First-timers do not get as much practice
- No ability to freeze the flight
- Items that can't (or shouldn't) be done in flight
- Operational cost

First, let's summarize the areas in which training in the airplane is not as good.

Pilots working toward their first jet type rating don't get as much practice on each event. There is considerable time spent burning jet fuel between each

training moment when flying a real plane. This can be good when a student needs a little time to catch up. However, it's usually just increasing the cost. For recurrent or transition jet pilots, this is less of an issue.

We haven't found a way to freeze time in flight. We have to deal with reality. This includes all of the distractions (ATC, weather, traffic, turbulence, etc.) while keeping the student focused on the task at hand.

Some items can't or shouldn't be done in flight. Nobody I know is going to try to practice a thrust reverser deploying at V_1 in a plane. Also, I have yet to meet a person who thinks shutting down both engines and gliding to a runway is a good idea. That said, dual engine failures and inadvertent thrust reverser deployments are not likely events.

Operational cost can be excessive. Direct costs plus fuel can add up quickly. Naturally, if a proficient pilot is simply completing a 61.58 Pilot Proficiency Evaluation, it's not bad. However, a new or rusty pilot that needs several extra hours can burn a bunch of fuel before attaining the required level of proficiency.

Let's now look at where in-airplane training excels:

It's real and feels exactly as it should. There is simply no better way to assess if a pilot can properly operate an aircraft than by watching them do it. Seeing how they deal with the problems and distractions in real-time is critical.

There is no excuse for bad landings. The pilot can either land the plane properly or we need to find and correct the problem.

There are no sim-isms. If something isn't working, figure out if it's a system problem or an operator problem. Then, fix the problem. This also presents a great opportunity to ensure the pilot understands how to use the Minimum Equipment List.

It is the customer's plane and usually the location where they fly it. These are the exact avionics and systems the pilot needs to operate proficiently. No time is wasted learning irrelevant information. Nothing is gained, and much is risked by learning material that doesn't apply to the plane the pilot will fly. This is especially critical when it comes to avionics or home airports with high elevation or short runways.

Training is where the client wants. Professional instructors who teach in the airplane usually travel to where the client wants to train. Naturally, most owner/operators get to sleep in their own bed and maximize time with their family and friends. The instructor deals with the travel.

Training is when the client wants. The schedule can be custom-fit to the client's needs, with dates, and even times of the day, easily adapted. Imagine calling one of the established sim schools and asking to skip class two days or start a day early.

Training is more personalized in the airplane. Typically, simulator courses entail up to 10 people at a time for academics, and two pilots for simulator sessions. The instructor must divide his or her instruction and attention between the pilots, which can result in missed training opportunities. Whereas, academic classes preparing for in-plane training rarely involve more than two pilots at a time. Then, in the airplane, it's always one-on-one training.

Summary

Bottom line, each environment offers a superior training experience in certain areas. If you're training only in simulators or only in the airplane, you're probably missing an excellent opportunity to quickly expand your skills and knowledge of your plane. Seek training from multiple sources and gather the best information and techniques you can from each source. T&T

Owner of Aeromania LLC, **Anthony Cirincione** *spends most of his time refining pilot's skills for the safe single-pilot operation of Cessna Citation aircraft. He is also an A&P with Inspection Authorization and holds a Master of Science in Aeronautical Science. Always working to maximize pilot performance, he published Advanced Flight Instruction – A Teaching Guide for Aviators. For more information visit* **www.aeromania.net.**

by **Kevin R. Dingman**

Bumps in the Night

Certain airplane noises can only be heard at night

Our nighttime perceptions encompass a complex cornucopia of psychological and sensory ingredients: flow experience (being in the zone), depersonalization (a sense that things around us aren't real), dissociative experience (lack of continuity between thoughts, surroundings and actions), visual deprivation, mind-wandering, disorientation and fatigue. All of which can result in summoning the Boogeyman. In a training environment, it's described as MOA – manifestation of apprehension. But after last month's dissertation on chemical equations, stoichiometric mixtures, CO poisoning and butter pecan ice cream, I think we're all ready for less of the "clinical" flavor and more of the "ice cream" flavor. Since dawn is coming later, dusk earlier and a ghoulish but candy-coated holiday approaches, we'll review our nighttime anxieties and piloting perceptions from a less clinical and a sweeter pilot-y vector.

Don't overreact when you hear bumps in the night – analyze the situation.

You Willingly Accept Some Risk

The phrase "things that go bump in the night" is used as a humorous way of referring to real and imagined nocturnal disturbances of all sorts. The commonly cited source of its origin is a British prayer that English poet Alfred Noyes includes in his 1909 anthology "The Magic Casement." To wit: "From ghoulies and ghosties and long-leggety beasties and things that go bump in the night, Good Lord deliver us!"

If you love flying, you willingly accept some risk from said ghoulies, ghosties, long-leggety beasties and things that go bump in the night. Flying at night offers some benefits, however. The air is generally smoother, less traffic, controllers are not as busy, and convective weather with lightning is easier to spot. The main difference is, well, it's dark, and the boogeyman lives there. Even though our pilot senses don't need coaxing from darkness to stay sharp, our diminished ability to see will cause our other senses to heighten. And some of our modern-day tech may exaggerate this effect.

There is anecdotal evidence that ANC (Active Noise Cancelling) headsets increase our awareness of previously unnoticed or new sounds. I'm always amazed when I power up my Bose A20 and note which sounds disappear and which remain. For example, when I wad up papers the sound is crisp and clear but the sound of the instrument gyros is gone. We all know that ANC headsets cancel out certain frequencies common to aircraft interiors by using a trick of physics called "anti-phase." That is, they listen to cockpit sounds and produce a balancing sine wave. Consistent noises like the low hum of engines, gyros and fans are easier to cancel when compared to sudden, random sounds like a pop, bang or bump.

Bump
(as a pilot-y noun)
A protuberance in flight; a light blow, impact or jolting collision. Often used to describe anything unknown that might be frightening to a pilot, especially a noise.

We have all heard the aviation adage about sounds and bumps that can only be heard at night, and we all understand its meaning. Usually, we have no significant follow-on bump but sometimes the noise becomes relevant and will precipitate a reaction, checklist procedure or a decision –particularly if the noise is recurring. Perhaps the bump/noise causes a "skipped heartbeat," the implementation of a checklist procedure or, if we have simply heard too many bumps in the night this night, an early landing. After all, our heightened awareness at night can be frightening and fatiguing. Here are a couple of stories from readers about such events:

From Ray A.

I departed Owensboro, KY, at 0300 with a planned arrival of 0600 in Charleston, SC. It was a solo flight at FL190 in my Duke. About 45 minutes into the clear, half-moon night, I heard a solid thump that seemed to originate on my right wing. Man, I was startled! The darkness then seemed to close in as the night time psyche kicked in. I crosschecked the instruments to get a sense of how the aircraft was performing. Systems were normal; the aircraft continued to perform perfectly, but I still worried and wondered what happened? What could be wrong? What is going to happen next! I was never so happy to see the sunrise. It was a beautiful sight and all my worries dissipated. I never discovered what caused the bump in the night or if it was just my mind playing tricks on me.

From Peter M.

I was flying from SAV to DPA one moonlit night above a cloud layer at FL200 when I heard a bang followed by a hissing sound. Hearing a bang through the Bose headset made me think that it must be something serious, possibly a pressurization issue. But cabin psid seemed ok and cabin rate of climb was zero. Then I thought maybe I hit a bird and the hissing sound was related to a bird strike. I put on my O2 mask just in case. Then I thought, since I came from Georgia, maybe there's a snake in the airplane – a very loud snake! I was perplexed and ready to make the mayday call as I kept mentally and visually chasing the sound. But the remainder of the flight was normal. The hissing sound was there on the next flight and the flight after that. I didn't realize it until I took off my headset and noticed a difference in the sound. Turns out my headset ear cup wasn't making a good seal and that was causing a hissing sound. It probably had been that way all along and I never gave it a second thought until that night when my nighttime senses let the boogeyman come to scare me. The bang that I heard is still a mystery.

This next event, while not after civil twilight, typifies the confusion and anxiety we may encounter after hearing an unfamiliar noise.

From Michael H.

Crossing the Sierra Nevada mountain range in a C-152, I was climbing through 12,000 feet when there was a loud explosion. Even with a noise-canceling headset, it sounded as if the engine had come apart. Training kicked in and I recited my ABCs aloud: Airspeed, Best place to land and Cockpit. Then I realized that the engine was still running. A further check of the airplane revealed no defects. The rest of the flight was one of heightened senses and paranoia. Several hours later, while unpacking my luggage, I discovered that the bag of Keebler Soft Batch cookies that I had purchased in the Central Valley of California (240' MSL) had exploded in the grocery bag right behind my head.

Why Do We Hear More Things at Night?

> Flying is hypnotic and all pilots are willing victims to the spell.
>
> – Ernest K. Gann

Hyperesthesia is an increase in the sensitivity of any of your senses: sight, sound, touch, and smell. It can affect just one or all of the senses. Often, the heightening of an individual sense is referred to by a separate name. For example, increased sensitivity of touch is called tactile sensitivity, and increased sensitivity of sound is called auditory sensitivity. However, when surrounded by silence, the brain creates noise to fill the silence and we hear this as tinnitus (the perception of noise or ringing in the ears). But tinnitus is not our issue at night because the airplane produces enough white noise to override tinnitus. It's the noisy, nighttime goblins threatening to increase drag, remove lift, destroy thrust, get us lost, run us out of gas or fill our airplane with smoke that we always think about and hear at night. But why do we hear, or think we hear, more things at night?

It could be our pilot sense as described by Ernie Gann: "It's when things are going just right that you'd better be suspicious. There you are, fat as can be. The whole world is yours and you're the answer to the Wright brothers' prayers. You say to yourself, nothing can go wrong...all my trespasses are forgiven. Best you not believe it."

So perhaps it's our senses telling us to hear and feel every single thing lest the ground riseth to smite us. Hearing an unexpected noise in the dark is scary. Sometimes the things that go bump in the night are not quickly identified, and thoughts of fatal failure modes enter our mind. Maybe it's because the night seems still, the radios are quiet, and in the middle

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of nowhere in our airplane, the only company we have is our mind, so our senses become focused inside. Our emotions become much bigger and more powerful because they're being amplified by solitude. During the day, we're bombarded with visual input to occupy our thoughts and we talk to ATC more often. We are more likely to find ourselves alone with our thoughts at night.

> "I sit far back in my seat, my right foot braced comfortably against the instrument panel, listening to the steady thrumming of the engines, content to reflect…"
>
> – Ernest K. Gann

In his August T &T article, David Miller talked about stress and how important it is to evaluate all conditions affecting our trip both before and during the flight. Especially if challenges seem to be accumulating. This includes the IMSAFE items, changing weather, developing fatigue and our anxiety. Your airplane doesn't know or care that it's dark. But due to our complex cornucopia of psychological and sensory ingredients, if flying at night, we should also consider how many bumps in the night we've heard from the ghoulies, ghosties and long-leggety beasties. Happy Halloween, my friends. T&T

Kevin Dingman *has been flying for more than 40 years. He's an ATP typed in the B737 and DC9 with 24,000 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 organiz tion Wings of Mercy, is employed by a major airline, and owns and operates a Beechcraft Duke.Contact Kevin at* **dinger10d@gmail.com**.

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Piper Cheyenne 400LS:
Outpacing the Test of Time

by **Farhad Saba, Owner-Pilot**

With its 351-knot max cruise speed, efficient Garrett engines, fastest climb rate in its class, FL410 service ceiling, long range and short/uniåmproved runway capability, the rare Piper Cheyenne 400LS can still outperform many turboprops and light jets in various phases of flight and missions.

Up front, N7222F boasts RVSM approval, ADSB-In and Out, Garmin Active Traffic, weather radar, two G600s and two GTN750s completely integrated with the original jet-level Collins APS 65 Autopilot.

Background

From 1973 to 1974 America faced an oil crisis, driving fuel prices through the roof. The Cessna Citation became the economical jet of choice for business travel. By the late 1970s, operators also turned to turboprops for even more efficient engines and better payload and range than most business jets, albeit a slower speed.

At the time, Piper Aircraft was improving on its unpressurized and pressurized piston-twin line of the Piper Navajo and Mojave. The first Piper Cheyenne was flown in 1969 by essentially hanging two PT6 turbine engines on the Mojave. The early Cheyenne's were later refined with some aerodynamic improvements, but the PT6-28s produced only 10 to 15 percent faster cruise speed than their piston siblings and at a much higher fuel consumption. The Cheyenne could not compete with Cessna Conquest II's top speed of 300 KTS, service ceiling of 35,000 feet and higher payload. The King Air models did not win the speed race but won big on their luxurious interiors and ramp presence.

Piper continued to improve the Cheyenne by certifying different engines, lengthening the fuselage and adding a T-tail. The resulting aircraft included the Cheyenne I (500 SHP engine to eliminate the troublesome stick shaker), Cheyenne II (620 SHP PT6s and a stick shaker), Cheyenne IIXL (750 SHP PT6s de-rated to 620 SHP and 18-inch longer fuselage), and Cheyenne III and IIIA (720 SHP PT6A-41s and -61s, nine seats and a T-tail).

Then, in 1984, the Cheyenne 400LS was born – the queen of the Piper Aircraft fleet. It outperformed all turboprops and even Cessna Citations of the day with 351 KTS at 25,000 feet (or 290 KTS at 41,000 feet) on 60 gallons of Jet A/hour, and a range of 1,800-plus nm with IFR reserve.

The Perfect Match

Today, my wife and I are the proud owners of N7222F, a 1987 PA42-1000. Ours is one of only 44 total Cheyenne 400LS models built by Piper Aircraft between 1984 and 1992. The airplane has two imposing TPE331-14 engines, each capable of producing 1,600+ SHP de-rated to 1,000 HP at its five-bladed MT propellers.

When it came time to upgrade from our Cessna 340A, our primary mission of flying from Northern Virginia to South Florida had expanded to include transcontinental and European flights (as well as a flight around the world thrown on the bucket list for good measure). Two engines being a must, I quickly honed in on two aircraft, both with the more efficient Garrett engines: the Cessna Conquest II with TPE331-10s, and the Cheyenne 400LS with TPE331-14s. Ultimately, the superior pressurization system in the 400LS (under 10,000 feet at flight level 410) was paramount in the decision-making process to safely conduct international and oceanic flights above most weather and busy traffic altitudes, along with 50 KTS faster speed available on demand.

The previous owner of N7222F (C-FGKS) flew the aircraft from Edmonton, Canada, to Northern Virginia to show us its beauty. Upon arrival at our home airport (KJYO), it was love at first sight.

Owner Insights

A 900 nm flight from Northern Virginia to South Florida typically takes about 2 hours and 45 minutes.

Record Holder

With its six-pound weight to horsepower ratio, well in excess of the Extra 300 competition acrobatic plane, General Chuck Yeager set the time to climb record in the 400LS in the mid-1980s. This record is still standing after 35 years. N7222F often pleasantly surprises ATC with its initial 4,000 fpm climb rate when asked for an expedited climb.

We cruise around 340 KTS between flight level 300 and 340, consuming 2,000 pounds of fuel for the trip. With a full fuel capacity of 3,825 pounds, a fuel load of 2,750 pounds allows an hour of IFR reserve accommodating 1,300 pounds of payload for this typical trip. This equates to six adults and 250 pounds of luggage. The 400LS is the only twin-engine turboprop that can outperform single and twin-engine civilian turbine and light jets in "door to door" speed and piston twins in efficiency for a given payload.

The Honeywell (Garrett) TPE331-14 engine and its fuel control unit are controlled by a computer for ease of operations. Full power is set for takeoff and can be maintained all the way up to altitude and cruise. Engine limiters take care of torque and temperatures with minor pilot input, if any. Engine gauges are monitored for safety. The power is reduced if leveling off below 25,000 feet to avoid over-speeding, as well as during descent and landing. The Negative Torque Sensing feature provides a level of safety similar to autofeather, reducing prop drag by approximately 80 percent in case an engine is lost immediately after takeoff. The Cheyenne 400LS is a very stable IFR platform with the control inputs on the firm side. Full Reverse allows for landing in shorter distances than even many single and piston twins.

The majority of the Cheyenne 400LS aircraft were fitted with nine seats, including a potty seat that can be completely enclosed by an accordion door neatly hidden in its furniture cabinet. The plane is easy to load through its large rear and nose baggage doors, allowing a wide range for CG. Despite the very noisy reputation of TPE331 on the ramp, passengers can comfortably carry on conversations without headsets during cruise. Up front, most remaining 400LS models have been updated with some level of glass

avionics. N7222F boasts RVSM approval, ADSB-In and Out, Garmin Active Traffic, weather radar, two G600s and two GTN750s completely integrated with the original jet-level Collins APS 65 Autopilot, bringing its automation to 21st century standards.

It's a shame Piper stopped manufacturing the PA42-1000 in 1992 due to a continuing economic downturn, forcing most aircraft manufacturers into bankruptcy. Many aircraft including the 400LS were put to the wayside never to be manufactured again. Of the original 44 aircraft, just over 20 are believed to be flying in the United States today. A fleet of this size does not provide the manufacturer and maintenance shops enough incentives to produce parts and specialized maintenance support. The 17-foot high tail also makes finding a T-hangar at most GA airports a challenge. Today, the 400LS averages a purchase price under $1 million, with total fixed and variable hourly operating expenses of $1,500. And at 12,050 pounds MGTOW, it is approved for single-pilot operations without a type rating, although insurance companies require annual training.

World Traveler

The Piper Cheyenne 400LS is uniquely positioned to adapt to our various missions in payload, distance and speed. Within our first year of ownership, my wife and I traveled to Bermuda, multiple Caribbean locations, and a 1,400-nm nonstop from Aspen, Colorado to Leesburg, Virginia. In October of 2019, with four occupants, we traveled through Canada, Greenland, Iceland, Ireland, Italy and back to Leesburg. The majority of the flights were flown above most airliners in comfort, style and at a fuel cost less than economy class tickets for the same itinerary.

Although becoming an Earth-rounder has been postponed by the COVID-19 crisis, we are looking forward to completing the mission in a post-pandemic world. T&T

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A Companion's Guide to Survival

She must have walked by the tiny children's play table a hundred times, muttering something under her breath. My wife Patty was stressed. Laid out on the table was a color poster of the cockpit of a Citation CJ3. Patty would soon have to land one all by herself in a full-motion simulator, courtesy of FlightSafety Textron Aviation Training (FSTAT) in Wichita.

I had convinced her that in my new role as Director of Programs and Safety Education for CJP, I needed a guinea pig. We needed to see how a non-pilot would handle the stress if the pilot passed out.

Landing the plane by herself had only become important in the last few years. For the first 38 years of our marriage, she told me that if I died in the cockpit, she would just die with me.

That's true love.

Then we had grandkids.

"Good luck to you," she offered. "But I want to live to see Hayden and Evelyn." And so, she took a couple of one-hour courses in my Mustang and CJ1+ to experience landing from the right seat.

But this event was something very different. She would be required to do everything by herself. Her simulator instructor would become incapacitated at just the worst time.

Patty would be on her own.

She hadn't been in a cockpit with Collins Pro Line 21 avionics in 10-plus years. "Don't worry," I urged. "It's just like riding a bicycle." She gave me that "you're full of crap" look that I have seen so many times. She walked by that tiny table constantly for 30 days.

Patty convinced her non-pilot friend Bonnie Tria to go with us to Wichita so both could attempt to survive the ordeal. First was a three-hour ground school. FSTAT Director of Training, Jack Tessmann, explained that the simulator event would be fun for all.

Patty and Bonnie exchanged unbelieving looks.

Then, off to the simulator. CJ3 instructor, Rusty Owen, carefully explained how each system operated while this reporter sat in the back with several instructors monitoring. No one was sure if Patty and Bonnie could pull it off.

For over an hour, Rusty's kind voice reassured them as he demonstrated turns, autopilot use, checklists and how to communicate with ATC.

During Bonnie's session, Rusty suddenly "passed out." Now Bonnie, all alone, had to save the day. But first, she shook Rusty violently one last time and yelled, "Rusty, before you die, I have one more autopilot question!" The guys in the back held their laughter in check. Bonnie did great, and we all walked away from the landing.

During Patty's session, we heard a rapid beep, beep, beep warning. "That's the overspeed warning," she said. Rusty looked straight at me and asked, "How do you know that, Patty?"

"Oh, I hear it when David flies," she replied.

I did not hear any laughter in the back of the simulator.

On a five-mile final, Patty hand-flew the CJ3 to an almost perfect touchdown on Wichita's Runway 1R. Immediate applause broke out, and high fives waved throughout the simulator. Patty and Bonnie said exactly the same six words as they coasted to a stop.

"I want to do this again!"

I think our male pilot egos are missing out on just how valuable our companions can be in the cockpit. Times are changing. And I think we are going back to Wichita soon.

Fly safe.

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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