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# Rough Year, But We're Still the Lucky Ones

Last month, I was sitting with a group of aviation-centric friends talking about the state of affairs in our slice of the world above FL00. The conversation evolved (or devolved?) into a hilariously cynical version of the word association game, the one where a person says a word and the rest quickly say the word that comes to mind that is connected to the original word. You can imagine the responses that resulted from the root word “*re-accommodate*” (the United Airlines’ CEO unfortunate word choice) or “*Trump Tower*” (think ATC privatization).

It's been a rough year for aviation, with a number of misbegotten incidents, unfortunate accidents and near-accidents, an airline traveling public quick-drawing smartphones, and yet another exhausting fight over the future of the FAA's NextGen and control over our national airspace. The military is faced with its own problems: issues with oxygen systems, grounded aircraft due to the weight of sequestration and a looming dearth of qualified and ready pilots. For the most part, we're an industry that likes to keep its head down and name out of the press where uninformed reporters don't always get the story right.

Right now, it feels like there's not a lot of great news out there. My misery even went local. After spring straight-line winds destroyed hangars and aircraft (including mine) at my home airport, the airport director is floating the idea of not rebuilding the hangars, citing an unfavorable ROI due to ongoing management and maintenance costs. You don't have to be an economist to recognize that a thriving GA ecosystem will quickly shrivel up and fade away if there are dramatically fewer base aircraft to support local FBO's, flight training, flying clubs, charitable flights such as Angel Flight and other services. The kid hanging on the proverbial airport fence won't have much to watch or by which to be inspired. Those who care the most are outmatched and the community at large is blithely unaware of the treasure they are in danger of losing.

As one sage put it, GA doesn't have a perception problem, it has an awareness problem. The non-pilot public simply isn't aware of what general aviation means at the local level, how it's used, who is using it, who it benefits (again, think Angel Flight) and how insanely cool it is to fly a plane. How we fix that is the topic of a whole other article.

While some will debate politics and everything that's wrong with our aviation culture, I haven't heard a lot of hand-wringing among pilots I talk to. Yes, there are problems, but we're still the luckiest bunch. In the United States, we still have the unique freedom to fly when and where we want to, for the most part. Fuel is readily available, there are planes to buy and sell, new technology continues to make us safer, and the aviation industry economy, for all its weaknesses, is still percolating along. If you were at Oshkosh, you witnessed all of this on a grand scale. Yes, it's important that we preserve all of this, and there are a lot of smart people working on it on our behalf who deserve our full support.

This is what I find special and important to preserve: We as pilots have this beautiful relationship with our flying machines that allow us to escape the Earth's hold and see the world from far above FL00. Further, I love how flying connects me more closely with people. On Mother's Day, I took my mom, my aviation mentor and inspiration, for a gorgeous local flight in the plane that she bought new in 1975 and that I now own. A few weeks later, I got a repeat with my daughter, who was home for a few weeks from the Naval Academy. This time, she did the flying and I did the sightseeing. Both flights are the kind you tenderly replay in your mind and carefully store away among your most special flying memories. No records were broken, no important meetings kept, and no surprises sprung up. Just a few hours with two people I love who share this crazy passion for flying.

Quick, what words spring to mind when I say “flying?” Here's two for you: “Lucky us.”

*Dianne*



# Kudos to Archie

After finishing the excellent article on the hazards of thunderstorms and limitations of radar in the June issue ("The Long Tentacles of a Thunderstorm"), I realized that it had been written by Archie Trammell, the world's top guru on the subject. I used to write articles for Archie when he was editor of *Business & Commercial Aviation* back in the 1970s. If you can get a message to him I'd like to congratulate him on continuing to save lives by spreading what he knows to the pilot population and give him my personal regards and best wishes.

Bruce Ray

Boulder, CO

Wonderful to hear from you. And, yes, 42 years after BCA I'm still hammering away at aviation safety. In addition to an article now and then, I've been creating a free monthly website on thunderstorm hazards for 12 years ([www.radar4pilots.com](http://www.radar4pilots.com)) plus occasionally posting a safety message on another website ([www.radar4pilots.info](http://www.radar4pilots.info)) plus contributing to a couple of aviation magazines. I have a book out on aviation safety, a radar course for pilots on a CD and have just completed a "Quick Guide" on CD for pilots on avoidance of convective weather hazards.

It's been busy, satisfying and fun. And coming up on 89, I figure I still have an article or two and continuation of the free websites in me.

– Archie Trammell

# A Snort-worthy Column

I don't normally write fan mail (no pun intended), but now I've had to write both you and Dingman as a result of the same issue of *Twin & Turbine*. (*Learning to Fly Again*, April 2017)

I'm laughing out loud as a result of your article. I started pretty close to the beginning. By the end I was on the verge of snorting coffee out my nose. Thanks for another good one.

John Hinerman

Washington, DC

John, I snort coffee on a regular basis. You made my day! Thanks so much for reading.


– David Miller

# NEXRAD vs. Radar

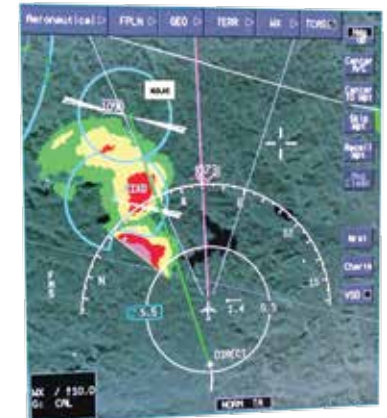
The article "Look Up, Look Down...Look Out" in the July issue implies the radar image has identified a storm not seen by NEXRAD. Cells cannot explode from near nothing to severe levels within four minutes. If so, no radar of any type would be of help. (NEXRAD images are produced every four minutes in Storm Mode.) The author fails to note the cells on the far-left edge of the NEXRAD screen. One must account for time-delay position error of about 5 miles, which would correctly match the location of the cells on his radar. A mental shift in position of a storm of 5 miles is a simple process...but one must remember to do it! A single 12-inch dish simply cannot compete with three 30-foot dishes digitally analyzing the same cell from three separate ground locations. Zoom out NEXRAD images, which excel in defining true size and intensity, to evaluate other storms off screen that might share energy with the cells of concern. Using only radar for close-in work without the aid of NEXRAD is a critical mistake.

Dr. David A Strahle

Flint, MI

Thank you Dr. Strahle for your response. As a well-known expert and presenter on the use of in-aircraft datalink NEXRAD, we look forward to a future article from you, delving more deeply into the use of NEXRAD in the cockpit. 

– Editor Dianne White



# Three Decades Later, the CitationJet Family Still Flying High

**Cessna delivers the 2,000<sup>th</sup>  
CJ, evolving the popular  
entry-level jet with new  
technology and improvements**

by Dianne White





**T**he famous English bard William Shakespeare once wrote, “No legacy is so rich as honesty.”

The rich legacy of the most popular light jet series ever built – the CitationJet – is among one of the great success stories in general aviation. Part of the reason why is that the CJ is an honest airplane you’ll ever find. Now with its 2,000<sup>th</sup> copy delivered, the CJ family, which includes the M2, CJ3+ and CJ4, has retained its trademark docile handling characteristics and bankable performance that made the original CJ such a revolutionary aircraft.

The inspiration for the CJ was the original Citation, which took the market by storm in the early 1970s. While original wasn’t as fast as a Lear, it could land on short runways and be flown single-pilot (with a waiver). Keeping in mind those winning characteristics, in the late 1980s, Cessna went back to the drawing board to create a clean-sheet design for its next entry-level jet. The result was, of course, the CitationJet.

PHOTO CREDIT: PAUL BOWEN PHOTOGRAPHY



"The goal was to develop the next generation of entry-level jet. This is a market we owned, but we needed to keep up with technology. Also, our goal was to develop an unequivocally safe and less complex jet that could

be easily operated single-pilot," said Charlie Johnson, who was on the Cessna senior management team at the time. Today, Johnson serves on several boards and consults for Tamarack Aerospace Group.

"Our customers were telling us we needed a new answer. The CJ proved to be the answer."

Cessna's engineering and NASA developed an all-new natural laminar flow airfoil to cut drag and boost speed, yet retain good handling qualities. The wing was also designed to mate below the fuselage, eliminating the pass-through spar. This resulted in a more spacious cabin.

Cessna took another risk with the powerplant: They partnered with newcomer Williams International to develop a new application for its FJ44 engine, which was originally developed for military applications such as cruise missiles. Rolls-Royce also contributed engineering and manufacturing expertise, resulting just the right engine for the CitationJet: the FJ44-1A.

The CJ's striking T-tail was another big step, giving the aircraft a strong ramp presence. The original aircraft also featured a heated wing and engine inlets, and bleed air windshield de-ice.

The CJ was always imagined as a single-pilot jet. As such, Cessna built the cockpit around the pilot. Critical switches and breakers were logically grouped and placed within easy reach.

"Several of us had past experience flying high-performance military jets single-pilot, including myself, Milt Sills (chief of engineering) and then-CEO Russ Meyer. We took that single-pilot mindset and made sure it was applied to the cockpit," Johnson added.

Once the CitationJet was announced at the 1989 NBAA, Cessna was flooded with orders, validating that it was the right aircraft for the right market. "There were so many interested customers that we ran out of order forms and began writing them on napkins," laughed Johnson. "There is nothing that could compare to the CJ, and in my mind, there still isn't."

Today, with its state-of-the-art Garmin and Collins Pro Line 21 flight decks, cabin technology and tweaks to improve efficiency, reliability and performance, the CJ family continue to be among the most pilot-friendly jets on the market. And for thousands of owner-pilots, it's as honest as it gets. **T&T**



Unveiled in 1998, the CJ1 was the successor to the original CitationJet. The biggest upgrade was the Collins Pro Line 21 avionics that featured a primary flight display and MFD that incorporated engine instrumentation as well as AHRS.



In May 2017, Textron Aviation's production team commemorated the 2,000<sup>th</sup> CJ delivery.

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Jet Journal

# Meet My New CitationJet CJ3+

The inside story of watching the 2,000<sup>th</sup> CitationJet coming to life.

by Marc Dulude

Photos by Paul Bowen





I didn't start out knowing that I would be the owner of the 2,000<sup>th</sup> CitationJet produced when I decided to buy my next plane, but that's what happened. More on that later.

When I started flying in 2001, I had absolutely no idea the impact it would have on my life and my ability to do more with my time. Shortly after my first lesson, I bought my first airplane, a Cessna 182 Skylane, with two other friends. I was flying for pleasure and using it for business travel. As I gained experience and wanted more capability, I moved from the Skylane to a Mooney Ovation 2, then to a Piper Mirage (PA46), on which I later did the Rocket Engineering JetProp conversion powered by a Pratt & Whitney PT6.

PHOTO CREDIT: PAUL BOWEN PHOTOGRAPHY





After about 400 hours of JetProp time, I took over as CEO of a company that was in desperate trouble, and that meant I stopped flying for four years. Once the company was on a winning track, I decided to start flying again and was drawn by the desire to go farther, faster, while carrying more. I moved up to a TBM 700 but soon wanted still more speed and to be over most weather. That led to a Cessna Mustang, my first jet.

My Mustang was simply incredible. Cessna's design philosophy was clear in that the Mustang would exceed every single number in their marketing

materials or AFM. The Citation M2 was released a little later, though, and so I moved from a Mustang to the M2, which also outperforms every number in the book.

Amid all of this, I retired, and continue to serve on boards of directors and occasionally consult for companies to help them with their operations. Using my own airplane to get to meetings and engagements has been like the proverbial "magic carpet." Today, I am as busy as I was when I was CEO of some past companies.

## What Would Give Me More Range?

I have said it many times before, I simply cannot live my life as it is without my airplane. Many of my trips take me to various parts of the country from the southeast United States where I chose to retire. That led me to look for a plane with even more range. I knew that if I did so, I was moving into the category of biggest, most capable modern airplanes that still allow me to fly single pilot. Like many of us, I had also always harbored



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aspirations of buying a brand-new airplane and decided now was the time.

With each plane I have bought, I did detailed comparisons of all the available alternatives. I enjoy the process since all aircraft design represents a set of compromises intended to appeal to a target audience. I considered all the top contenders to determine which plane best fit my needs. That comparison document ended up being more than 60 pages.

One of the distinguishing features for me was the ecosystem surrounding the airplane. I was familiar with the Textron Cessna service centers, and I had never experienced a service organization that took better care of me and my plane. I have recounted story after story of the great experiences with the Cessna service group, and my own stories became pertinent in my analysis. Additionally, I had joined and participated in the Owner and Pilot Association (OPA) for every one of my plane types. For Citations, none is better than the Citation Jet Pilots (CJP) Association. My exposure to CJP gave me even more insight into the tremendous value it was bringing to owners and members and it allowed me to develop relationships with Textron management. So, when my technical analysis was complete and I was done weighing all factors, I decided to buy a new Cessna Citation CJ3+.

Textron Aviation was great to work with during the investigation and negotiation stages. At every step, my Cessna sales rep was ready with the materials I wanted to review to understand every aspect of the plane and the purchase process. I weighed every available option against my current and perceived future needs and discussed my impressions with



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Cessna's technical resources to ensure I was making informed decisions. With my preferences outlined against the resulting costs, at the end of 2016, I struck the best deal I could with Cessna and became the owner of a new CJ3+ with the forecast delivery date end of May 2017.

### Now the Real Fun Begins

From that point, the fun quotient only increased. One of the first things that made it real was that Textron sent me

a package containing sample boxes of all the various interiors I could choose if I wanted standard materials and designs. I laid out all the various choices in groupings all around the house and my wife and I compared and decided on what the interior would be.

Similarly, with the exterior paint scheme, I could choose from 25 different templates with a wide range of colors or develop my own scheme. I was convinced I was going to use the same blue paint

that I had on my M2 since I had received compliments almost every time I have pulled into an FBO. I selected some of the templates, various colors, decided where to put the registration number and any other markings, and Cessna's paint scheme team pulled together numerous looks from which I could pick. When I visited the facility, I met with the interior design team and paint scheme designer and saw all my choices on large screens, making it even easier to visualize.

I thought that whole step was behind me. However, when I was on the ramp at another airport some weeks later, I saw an amazing paint scheme and color on a much larger airplane. I took a picture and sent it to the scheme designer who came up with five different combinations to incorporate the colors that had so struck me. Right then, I changed the color choices and went with a brilliant red as the primary color.

Cessna management made sure I knew that I was welcome at any time on the production line, and that I was made to feel a part of the team as well. They assigned a dedicated customer account manager (CAM) as my primary interface for any questions, but the sales team,



sales management, production department, and program management remained close throughout. I got pictures of my plane being built at least every week and often much more frequently. I set up a shared online photo album because of all the people that had interest in following along with the progress as my airplane took shape.

I visited the Wichita plant many times and met the people that were building my plane. They took obvious pride producing this incredible machine and loved meeting its prospective owner. I was invited into every step of the process, encouraged to visit often, and was shown every step they were undertaking when I was there. The production staff were so accommodating that I found I missed being there whenever I was away for weeks on end (see sidebar). The pictures did make that distance bearable, though.

I don't want to give the impression that everything went smoothly. For instance, when I had decided on my options, I had wanted Wi-Fi capability and selected the GOGO ATG5000 unit. In reviewing the data plans, I had misunderstood their webpage and believed I was able to choose either a data-based package (pay by how many MB of data are transferred) or a time-based package (pay by how much time the system is explicitly turned on).

That turned out to be incorrect and the ATG5000 as permits data-based pricing, which is exceptionally expensive. I took this concern to Cessna management and we worked through a solution to find a win-win. The ATG5000 is the only unit approved for the production facility to build into a new airplane under their production certificate. So, we got the Cessna service group to come in after the airworthiness certificate was issued and replace the different components of the ATG5000 for those of the ATG2000 that permits time-based pricing with the same data throughput.

When I consider that I selected just about every system I could think of installed on this airplane including Sirius XM weather and radio, onboard radar with turbulence detection and ground clutter suppression, Wi-Fi, passenger briefing systems, TCAS II, TAWS-A and so on, it caused me to reflect on how far this platform has developed. That interest was piqued even more since shortly after I had placed my order to buy the plane, I received a call from Textron Aviation's worldwide senior VP of sales and marketing informing me that my plane was going to be the 2,000<sup>th</sup> CitationJet produced. Now, I was the visible beneficiary of all the prior CJ's that had been designed and built to put in place the means to produce the CJ3+.

### **CJ Line Benefits From Manufacturing Improvements**

Textron Aviation's investment in the "Factory of the Future" for its larger cabin planes is trickling down to each of the CJ's. For instance, Textron has invested tens of millions of dollars in better fabrication machines that not only demonstrates their commitment to building airplanes locally, but have also resulted in savings of 20 to 30 percent when compared to outsourcing the parts. And they produce higher first-pass inspection results. They have also invested in robots where it makes sense, starting



CJ3+ owner-pilot Marc Dulude in the left seat of his new stead. The Garmin G3000-equipped cockpit is built around the single-pilot operator.

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with the production of the aft pressure bulkheads of numerous models.

Those quality and production system improvements are evident when you walk through the production facility. Gone are the days of poor lighting and jig design that didn't account for workers' human factors. Now, everywhere you see, the conditions are well lit, well ventilated

and well designed. All this translates to happier workers, higher quality work and more predictable schedules.

On April 10, right on schedule, the plane left the production facility to enter the Completion Center for paint and interior. It was thrilling to receive a video of my plane being pulled out into the sunlight for the first time! Now, the

pictures I was receiving continued and even accelerated as the changes in the airplane's appearance were dramatic from one day to the next.

The most amazing pace of progress was during the installation of the interior. With that done, fuel filling and calibration along with P-static checks of bonding through the entire plane were prerequisites to start flight testing. That begins with simple engine starts, then ground runs, and finally taking to the air.

The last couple of weeks are the most painful. With all of the production, paint and interior complete, there is little tangible progress to report as the plane goes through all of the various test stages to ensure it meets the high-quality standards that aviation, and Textron specifically, demand.

Finally, the day arrived and I was able to see what being the 2,000<sup>th</sup> Citation Jet truly meant. A key presentation ceremony was held with hundreds of people, and I was asked to address the group.

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## Time to Fly!

When it came time for me to fly it, *Twin & Turbine* had arranged for world renowned aerial photographer Paul Bowen to take the pictures that you see accompanying this article. We met at Hot Springs, Arkansas airport (KHOT) to take advantage of the beautiful backdrop of Lake Ouachita and Arkansas mountains. We briefed the formation flight and planned out each minute over a period lasting about six hours.

When I reflect on the entire process between arriving for the ceremony and finally flying home by myself as the new owner of the most recently produced CJ, it was all a whirlwind. My experience with buying used aircraft had always been good, but having now bought a new airplane from the manufacturer and seeing the lengths to which they would go to ensure I was overjoyed by the process, it's an almost overwhelming experience. From my initial thoughts about buying a

new airplane through to now flying it around as my primary means of transportation, it's hard to imagine that there is anything else that will feel similar in my lifetime. I now also have hundreds of photos and videos of the entire process to enjoy.

Time to go flying again! **T&T**



## Mike Smith: A Member of the CJ Legacy

One of the people I met on the production line was Mike Smith, an Army veteran and now an aircraft structure mechanic that helps oversee the initial assembly of every CJ3+. He happily showed me the work he and other team members were doing assembling the fuselage. Mike has worked at Cessna for 18 years and his father, mother and brother also worked there, totaling more than 100 years of experience in the company.

Mike has witnessed the evolution of the CJ production and is keenly aware of care and meticulousness that must go into every step. He emphasized the focus on quality but also wanted to stress that they are always looking for ways to improve efficiency, accuracy and safety. Mike told me that "Attention to detail is a must. The entire team really works together to ensure we're putting out the highest quality possible."

I'm glad Mike is on Team CJ to help build my CJ3+

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# BEAM ME UP SCOTTY!

## A discussion on radar beam geometry

by Joe Ratterman

Even though spring thunderstorms are behind us this year, keeping your radar skills sharp is important all year-round. You never know when convective activity might pop up around you. In last month's issue, I described a basic approach on how to use your onboard airborne radar system to look up, out, or down, depending on which phase of flight you are in. Without getting into too much of the science and geometry of radar systems, I wanted to simplify how to use your radar system to navigate tactically through and around dangerous weather.



The green line in the images above shows the original flight path, prior to deviating to the left-of-course. Using the NEXRAD display, a pilot would be tempted to only deviate a few degrees left of the indicated weather, but using the radar display suggested a much greater deviation.

This month, I would like to introduce a little bit of the math behind your radar system in order to build on the basic knowledge you now have. We'll focus on "dish size," and the corresponding radar beam angle (basic cone geometry) that goes along with different dish sizes.

Before getting into the specifics of dish size, I would advance the view that airborne radar should be your *primary* tool for tactical weather navigation and avoidance. Last month, I showed you side-by-side screen shots taken on approach to my home airport, one with NEXRAD weather and the other with on-board radar. The photos to the left highlight how different your NEXRAD display can be when looking at the weather immediately in front of you. Below is another example that shows, once again, why pilots should never count on NEXRAD (the left image) for tactical weather avoidance. Notice the location and the intensity of the storms depicted at two o'clock in front of the aircraft in both images. NEXRAD is great for seeing the big picture, but use your radar for maneuvering through the weather 10-60 miles in front of you.



Understanding your radar beam's geometry starts with knowing the size of your radar dish. Since you are reading *Twin & Turbine* magazine, I'll assume you have a typical cabin-class airplane, and therefore you probably have either a 10-inch or 12-inch dish. Two very popular systems for airplanes in this class are the Bendix/King RDR 2000 and the Garmin GWX 68 (and the newer GWX 70). These are both excellent systems and can provide invaluable real-time weather information in the cockpit.

If you are wondering which system you have, refer to your AFM and any supplemental documentation that you received with your airplane. In my experience, most turboprop airplanes have a 10-inch dish (older Piper Meridians had the RDR 2000, newer Meridians have the Garmin GWX 68 or 70, newer TBM's have the Garmin GWX 68 or 70, and Pilatus PC-12's have the RDR 2000). Most small and medium-size twin-engine jets have a 12-inch dish, and late model Cessna Mustangs, M2s and C's have the Garmin GWX 68 or 70 installed.

In what will probably come as a surprise to most readers, the smaller the dish, the larger (or wider) the beam angle! If you have a 10-inch dish, then you have a 10-degree beam angle, and if you have a 12-inch dish, then you have an 8-degree beam angle (7.9 degrees to be precise). Larger jets may have a 24-inch dish with a corresponding narrow 4-degree beam angle. The smaller the angle, the more concentrated the area of radar coverage and the more precise you can be with scanning specific vertical regions of the sky in front of you.

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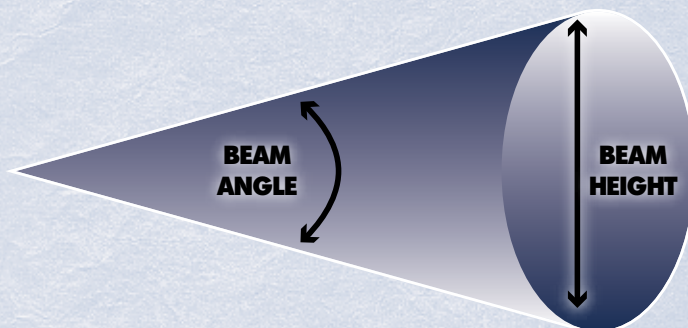
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Is a 10-inch dish better than a 12-inch dish, or is the 12-inch dish better? The answer is "not really." At least not for what we are trying to use these systems for. It does mean that the math changes on what portion of the vertical region in front of you is covered by the radar, but as long as you know what your radar can "see" at different distances in front of your airplane, then you can use either one effectively.

The geometric formula for beam height may look a little intimidating at first:



**Beam Height (ft)**  

$$2 \times \text{Distance} \times \tan (\text{Beam Angle} / 2)$$

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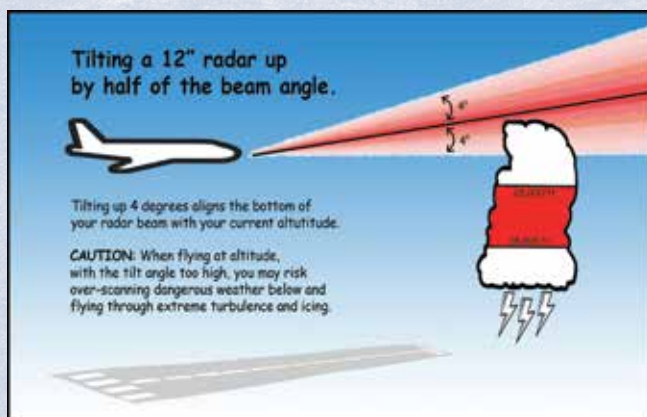
	Beam Angle	10 miles	15 miles	20 miles	40 miles	60 miles	80 miles
10-inch Dish	10-degree	10,600 ft	16,000 ft	21,300 ft	42,500 ft	63,800 ft	85,000 ft
12-inch Dish	8-degree	8,400 ft	12,600 ft	16,800 ft	33,500 ft	50,400 ft	67,100 ft

Following is a table that shows what the beam height is of radar coverage, for two different dish sizes, at different distances in front of an airplane. The resulting math will hopefully demystify the formula for you.

As your radar sweeps left and right, both the 10-inch and 12-inch dish sizes cover a large vertical area of the sky, even at just 40 miles out. At 80 miles out, your beam angle is encompassing an enormous vertical block of the sky.

It would be nice if this formula *precisely* defined the area covered by your radar's beam, but unfortunately these systems are prone to "scatter" on the edges of the beam, so you will likely pick up unwanted ground returns even when you have your tilt and range adjusted such that the radar beam should be scanning above the ground. That's ok, however, because most of our scanning should be done near the center of your radar beam anyway.

By understanding the shape and size of your radar beam's cone, you can begin to understand what's happening when you tilt your radar up and down. The first and simplest rule of thumb is that tilting your radar up by half of your dish's beam angle will essentially align the bottom of your radar beam straight out and level in front of the aircraft, with the top of the beam now angled up by the full beam angle. For example, titling a 12-inch dish up 4 degrees (8-degree beam angle divided by 2) will bring the bottom of the beam level with your altitude, and the top of the beam pointing up 8 degrees. At 40 miles out, this tilt angle is looking at the vertical slice of sky starting at your altitude and going up 33,500 ft from there. At FL200, you are looking at the portion of sky from your present altitude all the way up to 53,500 ft above sea level!



If you look back at the recommended tilt angles I presented last month, along with the math provided in this article, you can "do the math" yourself and see how your radar beam should

be scanning, at a minimum, the 7,000 ft convective hotspot (18,000 ft to 25,000 ft) at each of the different phases of flight (takeoff, level en route, and approach).

Now it's time to go out and practice and put your new-found knowledge to the test. Do a bit of research to confirm which radar system you have, what your specific dish size and beam angle are, and then use the math from this article and have a little fun with your radar system in-between calls to ATC on your next flight. **T&T**

*Joe Ratterman is an ATP pilot, type-rated in the Cessna Citation Mustang C510, with 2,500-plus hours in his logbook. Joe retired from a successful corporate executive career in 2015 and now flies as a professional charter pilot for Kansas City Aviation Company (KCAC) based in Overland Park, Kansas. He is also the current board chairman/president for Angel Flight Central.*

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## FIVE on the FLY

by Rebecca Groom Jacobs

### WHO:

Andrew Broom

### WHERE:

Greensboro, North Carolina

### POSITION:

Executive Director of the  
Citation Jet Pilots Owner  
Pilot Association

### CAREER HIGHLIGHTS:

Senior Marketing and  
Communications Roles at  
Honda Aircraft Company,  
AOPA, Hawker Beechcraft,  
Eclipse and GAMA

### 1. Can you tell us how the Citation Jet Pilots Owner Pilot Association (CJP) got started?

CJP formed nine years ago when a group of pilots progressing from turboprops decided to join together to share stories and organize events as new jet pilots (the Mustang had just come out around that time, of which a few of the them had taken ownership). The goal was to share flying experiences and information similar to what they were seeing occur in other successful owner associations. Today, the CJP consists of a volunteer Board, around 900 members and a large number of partnerships. One of CJP's most important roles is as a conduit between owners and companies that support the Citation fleet.

### 2. What are the core benefits a CJP membership provides Citation owners?

So, our members fall into two buckets: owner-member and non-owner member. The owner-members receive impressive discounts toward Citation parts, service, training, fuel and more. For example, a \$500 voucher toward Textron Aviation parts/service. Non-owner members (whom want to learn more/possibly make the jump) are able to interact in the online forums, earn fuel discounts and browse the Russ Meyer library – the largest online repository of articles pertaining to Citation history and operational information. We also put on multiple fantastic regional events for our members throughout the year in addition to our annual convention.

### 3. What's on tap for the 2017 CJP Convention?

This year, the convention is being held October 4-7 in Phoenix at the Biltmore, a Waldorf Astoria Resort. The highlights will be A) incredible content, and B) a gorgeous hotel and location. The program involves numerous events including a safety stand down led by retired



NASA astronaut, Charlie Precourt. We'll also have speakers that include Textron Aviation CEO Scott Ernest, former SR-71 driver Brian Schul and representatives from partner companies like FlightSafety, Garmin, jetAviva, Rockwell Collins, TRU Simulation + Training and Tamarack. And you can't forget the parties, auction and live entertainment. This is truly a cannot-miss event for Citation owners.

#### 4. In what ways does CJP give back to the general aviation community at large?

CJP attends and supports industry events such as Young Eagles, Veteran's Airlift Command and others. We set forth a budget each year specifically for giving back to charitable flying organizations such as these. CJP also awards college scholarships to Embry Riddle students in cooperation with the Bob Hoover Foundation. Not only do these scholarships provide students with monetary support, but we will actually take them under our wing, introduce them to the general aviation and bring them to our convention. We want to help expose young people to the world of general aviation.

#### 5. Why is the Executive Director position a perfect fit for you?

My entire career has been in business aviation, and lucky for me, I have spent time on both sides of the spectrum with OEMs and associations. This role at CJP allows me to bring all of that experience together in a leadership position where I think I can truly make a difference and grow the organization.

Having worked on both sides, I am able to see things from a few different perspectives when looking out for our members and partners to find those win-win opportunities. With such a great volunteer Board and amazing group of members, this organization has blue skies ahead. **T&T**

You can contact Rebecca at [rebecca@groomaviation.com](mailto:rebecca@groomaviation.com)



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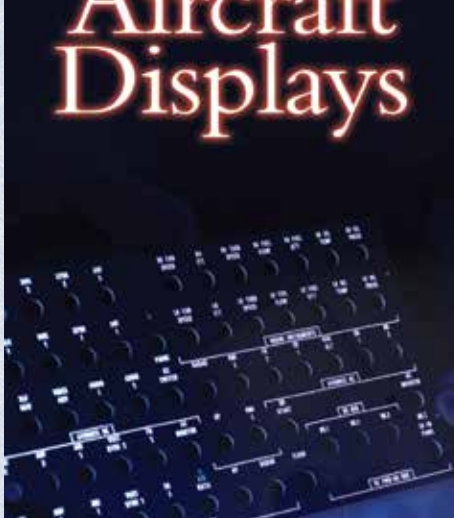
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# Rule of 10's

**Try this technique to maintain precise control when hand-flying an approach.**

**F**lying an accurate instrument approach is an exercise in precision. Whether flying an ILS or a nonprecision approach, it takes tight control of aircraft pitch and heading to arrive at the Missed Approach Point (MAP) in a position to land if the runway is visible. Yet many times IFR training launches into approach navigation without first teaching or reviewing the vital skill of attitude instrument flight. Consequently, many pilots “chase the needles” on navigation displays instead of precision attitude flying. The result is often an airplane off heading and/or altitude at the MAP, and a tendency to wander off the safe approach path when transfixed solely on needles instead of basic aircraft control.

Even some highly experienced IFR pilots become “needle-chasers” in the final stages of an instrument approach — especially if they have become dependent on autopilots or flight directors and are flying a “raw data” approach. As I tell my instrument students, however, flying an approach is done by flying proper attitudes, headings, speeds and rates of descent. The navigation

instruments are a backup; they just tell us where to aim the airplane using the primary flight instruments.

For the novice IFR student; the newly minted instrument pilot; the experienced IFR pilot wanting to fly tighter, more accurate approaches, I present the “Rule of Tens.”

## **What is it?**

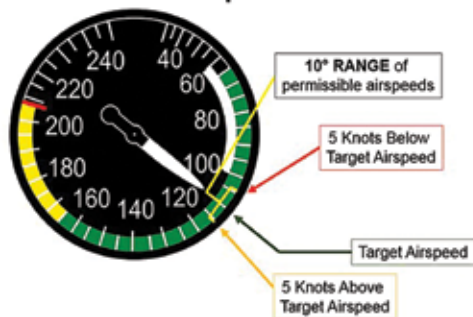
The Rule of Tens is a technique instrument pilots may use to maintain precise *pitch, heading, airspeed* and *vertical speed* control when flying an IFR approach. It is especially helpful in low IFR and in windy or turbulent conditions near the ground. Specifically, the Rule of Tens defines a range, or bracket, for each control and performance variable. Staying within the brackets leads to a more accurate, safer approach, and eliminates wild excursions close to minimums that often result from hand-flown needle-chasing.



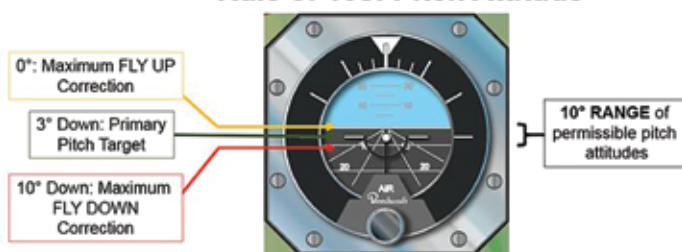
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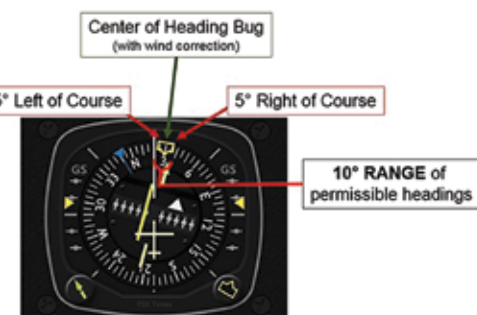
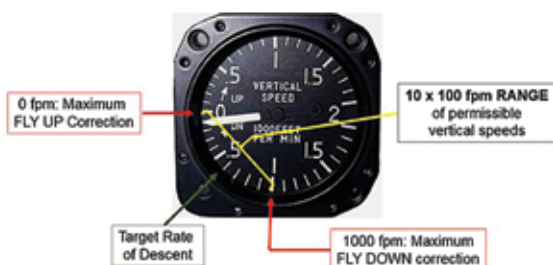
## Rule of 10s: Airspeed



## Rule of 10s: Pitch Attitude



## Rule of 10s: Vertical Speed



## Rule of 10s: Heading

The Rule of 10s first applies to the **attitude indicator**. Once established on the approach, **pitch attitude** should never vary outside a 10-degree range. In most piston twin and light turbine airplanes the pitch attitude necessary to maintain an ILS glideslope or GPS glidepath is slightly below the horizon, from 3 to 5 degrees nose down. This results in a 500- to 600-foot rate of descent at typical piston-twin approach speeds. If you find yourself low on the glideslope, you may elect to pitch the nose slightly upward to regain guidance (with or without a power change as needed). In no case, however, should you pitch the nose higher than the horizon, because without a significant increase in power this will likely result in a dangerously low airspeed and an out-of-trim condition that will destabilize your approach.

Conversely, if you are high on glidepath, do not lower the nose below 10 degrees below the horizon. This is actually a quite steep descent, and will result in 1,000 foot-per-minute descent or more.

Consequently, you have a maximum 10-degree range of allowable pitch attitudes for stabilized precision during an approach. Any greater excursions result in unsafe airspeeds

and the likelihood of “blowing through” the glideslope, to be out of trim and either dangerously low or unacceptable high before reaching the missed approach point.

The higher descent rate required for a traditional nonprecision approach requires a slightly lower pitch attitude, about 5 degrees below the horizon. This results in an 800-1,000 foot-per-minute rate of descent. Use the corrections range: level on the horizon at a maximum “up” limit, 10 degrees below as a maximum “down.” The Rule of Tens still applies.

## Heading

Similarly, precise **heading** control is vital to maintaining course guidance, especially when following a localizer as it gets increasingly sensitive closer to the airport. The Rule of Tens for heading means maintaining heading within 5 degrees either side of your inbound course. This provides a 10-degree wide range of headings to avoid large intercept angles that will likely cause you to “fly through the needle” to the other side.

Most heading bugs define this 10-degree spread, 5 degrees either side of the selected heading. Stay within the limits of the heading bug

to precisely follow the heading Rule of Tens inbound on the approach. As you determine a wind correction angle, set your heading bug to the necessary, revised heading. From there, use the limits of the heading bug as your maximum heading changes to reacquire or maintain course guidance. If you need to correct left, align the white “lubber line” with the left edge of the heading bug. If you need to correct to the right, align the lubber with the right edge of the bug.

## Speed and Vertical Speed

The Rule of Tens also gives us ranges of safe **airspeed** and **vertical speed** to monitor the results of our attitude-flying inputs.

If you hold a constant pitch attitude, airspeed will remain constant, assuming you don't change power or the position of landing gear or flaps. This is your target airspeed for the approach. If you need to correct UP by briefly raising the pitch to the horizon, you'll get a roughly 5-knot reduction in airspeed in most cases. Correct DOWN by lowering the nose to 10 degrees down for a moment, and the speed will increase about 5 knots from target. Hence there is a 10-knot range of airspeeds to use as a backup to pitch control.



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Now, let's look at vertical speed. Normally it will indicate a 500 to 600 feet-per-minute descent on a precision approach, maybe as much as 800 to 1,000 feet per minute on a nonprecision approach. If you're descending more rapidly than desired, for instance, you're starting to go below the glideslope, raise the pitch to the horizon and confirm that your vertical speed indicator shows reduced to zero rate of descent. You don't go up, you just *don't go down* until you've reacquired glideslope. When the glideslope needle centers, re-establish your descent with pitch and cross-check the result with vertical speed and airspeed.

If you're high on glidepath, or flying a nonprecision profile, the steepest descent you should allow is 10 degrees nose low, which will result in about 1,000 feet per minute down in light twin airplanes in the approach configuration. Keep it even shallower in the last 500 feet. If you're high go down, but don't go down too rapidly, until the glideslope centers and you return to the normal pitch attitude, with predictable airspeed and vertical speed results.

Therefore, there's a Rule of 10s for the vertical speed as well: from "zero Tens" (level flight) to "10 Tens" (1,000 feet per minute descent) as a maximum range for flying an approach.

### Using the Rule

OK, let's have an example. I'm flying a Beech Baron 58 inbound on an ILS approach. My pitch is at 3 degrees nose down, my heading dead on, gear is down and flaps are at approach in configuration at my target airspeed (120 knots) and 600 feet-per-minute descent. My glideslope and localizer needles are centered.

Now the wind changes, and I'm blown left of course. Seeing the needle begin to move to the right, I adjust heading to 5 degrees right of my selected heading, as indicated by the right edge of the heading bug. This provides a slight intercept angle that I'll hold until the needle



again centers. Meanwhile I keep my attitude scan going to hold my precise pitch, and the glideslope remains centered. Airspeed and vertical speed remain constant.

The localizer returns to center but a slight increase in headwind causes me to drift below glideslope. I raise the nose to the horizon line and notice my vertical speed go to zero, with a slight reduction in airspeed. If the airspeed falls more than 5 knots below my target, I'll add power while holding the pitch correction. When the glideslope centers again, I'll set power back where it should be and lower the nose to 3 degrees down. Fly that attitude and crosscheck heading, airspeed and vertical speed.

Want some reinforcement? Fly a coupled ILS or WAAS glide path approach. You'll see your autopilot does drift with wind changes, and for corrections uses the Rule of 10s. It's probably closer to the Rule of Fives or even Threes, but you get the point. Clearly, successful approaches to minimums result in maintaining small tolerances (five units to each side of target) in all axes of movement.

### Rules Violation

If your deviation from course guidance or glidepath is so great that you can't re-center the needles without violating the Rule of Tens, this is grounds for missing the approach. Low altitude and converging with the earth is no place to be making wild corrections or massive airspeed changes. Don't delay your decision. Miss the approach, set up and try it again.

This method both supports and is dependent on flying a stabilized approach. A stabilized approach means establishing and trimming for the target airspeed, and setting the aircraft configuration before or as you cross the final approach course inbound. Maintaining that speed (within a small range during corrections) and configuration until the missed approach point or when you can transition to a visual landing. A few hundred feet above decision

height isn't the time to be changing flap positions, power settings or trimmed airspeeds, any one of which is destabilizing to an approach.

"Chasing the needles" is a common, and dangerous, way to fly an instrument approach. The Rule of Tens is a technique you can use to *command* extremely precise approaches while avoiding the hazards of overcontrolling and becoming destabilized close to the ground. **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](http://www.mastery-flight-training.com).*

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## Altered States

### Flying the redeye without reverting into a Neanderthal

**Fa • tigue:** / fuh-teeg / **Noun**

**1a** *Extreme tiredness; typically resulting from mental or physical exertion, sleep deprivation or illness. Known to cause irritability, poor judgement and blabbering like a caveman.*

**T**he first time I flew while tired (the word fatigue wasn't in vogue at the time) was as a teen in a Cherokee 140. We left Kalamazoo one evening and flew all night to Billings. Having survived unscathed, later that summer I flew another all-nighter to New Bedford and then several to Denver in the fall. That would be Stapleton, when it still existed.

My fatigue exposure in the military also came while flying long distances after midnight: Nellis AFB, Nevada to central Florida in a practice run for the Libya bombing, Vegas to Italy for a NATO exercise (see *Passing Gas* T&T January 2011) and another to deliver four, factory-new F-16's from Texas to Greece. While young and bulletproof at the time, this Captain is no longer knobby-kneed nor Kevlar encrusted. And now, with the new and not-so-improved rest rules, a professional pilot's schedule can be fatiguing.

### Burning the Midnight Jet-A

When I first upgraded to Captain on the MD-80, my low seniority forced me to fly all-nighters. I'd flown plenty of them as an FO in LAX 17 years earlier, mostly to the East Coast and Guadalajara, Mexico. I quickly discovered the trips to be more painful than I had remembered. The young FO's attributed it to my age. Of course, they were right, those darned knobby-kneed, bulletproof and insensitive whippersnappers. Today, with the integration of our two airlines and a transition to the B-737, I find myself junior once again; returning to ORD from SFO, PDX, SEA or LAS at 5:30 a.m. I arrive tired and grumpy, feeling like I've battled a woolly mammoth. Luckily for those around me and unlike the Air Force missions, the arrival is without ordnance or that sticky thing from the *Passing Gas* article. In the Air Force, we learned that flexibility is the key to air power. A similar respect for flexibility is needed as we attempt to squeeze more work and play into each flying day while avoiding fatigue.





## Stupid is As Stupid Does

Due to my post-merger juniority, and having no choice but to be flexible and adapt when faced with an all-nighter, I've embraced the philosophy of a famous shrimp boat captain and long-distance runner: Professor Forrest Gump. Not the box of chocolates one; the "stupid is as stupid does" adage. To ensure proper rest, my layovers no longer include all-day leisure events like stupid golf or stupid tours of the city and countryside. And no stupid socializing and staying up to buy the crew dinner. Nor does our new/old T&T editor benefit from my elucubrating over articles all-daylong at that stupid all-inclusive resort in Cabo (as demonstrated by her need to edit my incessant use of parenthetical statements, creative as they may be, my grammatical legerdemain and the ingenious application of made-up words—like juniority for example). Strategic time management, which feels a lot like being bored, has usurped this geriatric captain's eating/playing/writing regimen. Perhaps with fewer parenthetical statements, such as this and a power nap, I can transform from a blabbering, cryptograph chiseling caveman to Professor Gump's humble and contrite persona in order to finish this story.

## The Power Nap

Do they work? Well, the FAA, airlines, and military have considered allowing cockpit napping for some time with strict guidelines for the remaining, awake, pilot(s). It's a fine idea, but extremely difficult to sell to the public. The AOPA Air Safety Foundation related the story of a GA pilot whose "power nap" ended when he awoke, unhurt, in a corn field. And another when a CFI's micro-nap on final allowed his student to collide with a snow bank. Obviously, strategic napping should only be employed with another awake and alert pilot able to monitor the airplane. At one point, official guidance for power-napping was to rest to the point at which a pencil would fall from between your fingers. More recently, it was shown that 15 to 20 minutes is needed to put us at the proper place on the sleep, sine wave chart without developing "sleep inertia," which makes you feel worse after the nap than if you hadn't napped at all. Without the luxury of a power nap, how do we combat fatigue to avoid missing a radio call, forgetting a checklist item, or waking up in a cornfield? Here's a list that is so easy, a cave man could do it (thank you Geico Insurance advertisement):

- Get 7-8 hours of sleep every day;
- Limit alcohol;
- Avoid a large meal;
- Stay hydrated;
- Use a noise-canceling headset;
- Bring along a pax, or better still, another pilot;
- Turn on the overhead lights;
- Park the plane by 10 p.m.



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## Obstructive Sleep Apnea (OSA)

Even if we do all the right things, physical and mental demons may lurk in the sleep-inducing realm of fatigue. Apnea and hypopnea can be defined as total and partial obstructions of the airway. When you stop breathing while asleep, your brain sends a wake-up call after about 10 seconds. Time zone changes and alcohol can delay that call by as much as 30 seconds or longer. This can result in significant fatigue as well as serious long-term health issues. Why did the Feds get all wound up over sleep apnea a few years ago? Because OSA can result in strokes, depression, arrhythmia, high blood pressure, congestive heart failure, obesity and impotence. That last one shouldn't affect our flying much, but it's nice to know that the Feds are looking out for our, ahem, performance.

OSA can be diagnosed through a sleep study and corrective actions include: losing weight, adjusting sleeping posture or environment, use of dental appliances or a CPAP (continuous positive airway pressure) machine as well as surgical remedies. Notice that neither alcohol nor sleep-inducing pharmaceuticals are on the list of remedies. I recently started using an app on my phone called Sleep Cycle to quantitatively monitor my rest. The phone app tracks not only total sleep hours, but sleep cycles (the deep and light sleep sine wave). It also monitors and records snoring, which can be indicative of OSA.

## Body Clock

Summer means pancake breakfasts, poker runs, golf fly-ins, camping with the plane, and the airshow season, along with the accompanying carnival-like food. It brings longer days and we may start flying at sun-up and not put the airplane to bed for another 10-15 hours. A disruption to our normal sleep cycle is inevitable. This means a tired, sunburned and dehydrated pilot, with a tummy full of marginal food, at the controls making the decisions.

Circadian rhythm is a physiological cycle. It's the involuntary result of our need to regenerate for about one-third of each 24 hours. It recurs naturally, even in the absence of light fluctuations. There is no way to immediately adjust that rhythm to the needs of our schedule. Current thinking is that it takes one full day to move the cycle by one time zone.

Continuing activity into the sleep portion of the cycle increases risk of fatigue. Also, darkness changes the rules and the risks. Our visual inputs are less; at a time when we have been awake longer. Let's admit it: night flying is more like instrument flying than not, even with a full moon or visible horizon. Add to the darkness a disruption of our circadian rhythm, and fatigue with the resulting degradation to our performance can turn the night into a nightmare.

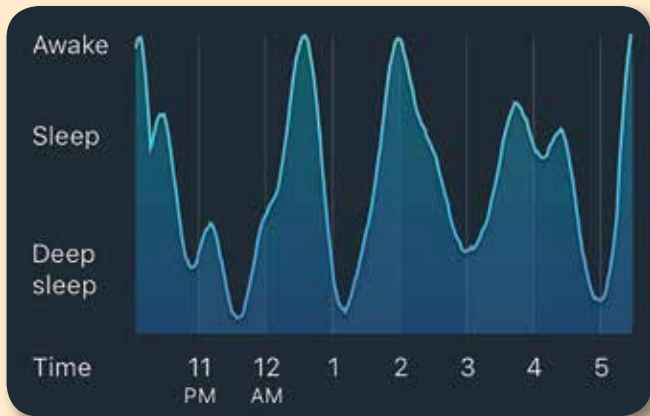


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### Get A Room


Sometimes we try to squeeze as much recreational time or business efficiencies into the trip as possible before we head home, and it's easy to let our judgement become distorted. Fatigue is similar to hypoxia: we simply don't notice or care as much as we should. We can convince ourselves that fatigue has value that is worth the risk. One of our readers mailed me about his fatigue experiences. While driving home one night from the airport, he found himself following the centerline of a road as we would in our airplanes while taxiing. On another flight, he stopped short after recognizing his fatigue. We've all been that tired, usually finding a rest stop for a few hours while driving or landing short of our destination when

flying. Like practicing a go-around or a divert, once you have landed short a couple of times to sleep, the consternation of adding a day to your trip becomes less of a conundrum and more like a normal procedural decision.

### Eaten

The airplane doesn't know that the weather is crap, it's dark or that it's 2 a.m., and you're falling asleep. It also doesn't know that you overflew the destination during your power nap. If you become fatigued, rest. If you don't, the risks increase exponentially and bad things can happen. To survive, the early hominids learned that stupid is as stupid does. Fatigue can put you into an altered state of consciousness and revert you to a blabbering Neanderthal. Don't be the stupid one that gets eaten.

#### Authors note:

**An acknowledging head-nod to Ken Russell's 1980 sensory deprivation film, *Altered States*, starring William Hurt. The *Sleep Cycle* app is free at the app store. **

*Kevin Dingman has been flying for more than 40 years. He's an ATP typed in the B737 and DC9 with 23,000 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 employed by a major airline, and owns and operates a Beechcraft Duke. Contact Kevin at [dinger10d@gmail.com](mailto:dinger10d@gmail.com).*



# En Route

## Jeppesen and ForeFlight Join Up

**J**eppesen and ForeFlight have joined forces to combine their capabilities and worldwide content.

Starting this summer, ForeFlight subscribers will see Jeppesen global navigational, terrain and obstacle data in ForeFlight Mobile. ForeFlight subscribers on individual plans will be able to link their Jeppesen license in ForeFlight Mobile and purchase standard worldwide Jeppesen charts for use inside the app through a simple e-commerce experience on [foreflight.com](http://foreflight.com).

General aviation pilots will be able to choose between Jeppesen Mobile FliteDeck and ForeFlight Mobile as their preferred cockpit solution. Subscribers to ForeFlight Business Plans will purchase chart coverages through Jeppesen and then link them to their ForeFlight subscription for use inside the ForeFlight Mobile app.

"We're excited to bring Jeppesen charts and data to ForeFlight Mobile customers. The combination makes ForeFlight Mobile the premier all-in-one mobile solution for planning, briefing, filing, flying, and logging flights across personal and business aviation. Over the years, many customers have requested Jeppesen charts and data in ForeFlight Mobile, and we're so pleased that we can now meet that need," said Weihs.

"This strategic alliance will enable ForeFlight and Jeppesen together to bring advances in capability to customers globally that neither company could accomplish on its own," said Tyson Weihs, co-founder and chief executive officer, ForeFlight. "Both companies share common values and purpose – delivering next generation power and productivity to pilots with superior customer service." **T&T**



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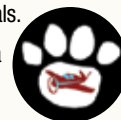
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# Meet November 4-1-6 Delta Mike

**B**uying a new car can be a wonderful experience. After you get over writing the check, that is. An undeniable new vehicle smell permeates the interior. The slick paint glistens under rows of hot white lights in the showroom.

And if that new vehicle is an airplane, you can multiply the sensations by 10.

Such was the experience for me as I walked into Textron Aviation's new aircraft delivery hangar in Wichita in mid April. In my case though, I was buying a used airplane, the very last Mustang demonstrator. But since the owner was Cessna, I was treated to a "new" airplane acceptance process.

Welcoming me into the building, I glanced at my name engraved in a Lucite display with other visiting high-rollers. "Would you like some water, Mr. Miller?" came the question from the receptionist at the front desk. "Yes, some Perrier please," I said, "with four cubes of ice."

I was getting the hang of this pretty quickly.

Soon, I was escorted by Chris Lee, director of Citation Sales for Texas and Louisiana, to the immaculate white-painted floor of the delivery hangar. There she was. November 416 Delta Mike. Roped off so no unwanted characters could approach. A small red carpet led me to the open door.

"Mr. Miller," shouted the voice from behind me. "Could you stand next to Chris so I can get a picture?" This was no vagrant with an iPhone. This was a professional photographer with a flash bulb! "Certainly, why of course," I agreed. "Which side of my face looks best?"

Delivery memorialized, I stepped inside. There was that new airplane smell. And not a speck of dirt. I looked again. Surely I could find at least one and complain about something. For an airplane with 1,200 hours, it was immaculate.

Easton Julian, customer account manager, handed me a paper form with each delivery item noted. A large table nearby was covered with all the manuals, tie-down ropes, coat hangers, static wicks, etcetera that come with a new airplane. We checked each one off the list.

It was impressive.

"For your departure this afternoon, how much fuel will you need and can I assist you with any catering?" offered Easton. "Certainly, yes," I stammered. "I will need some Perrier and four ice cubes." I looked around the hangar for another airplane I could buy. This was just too much fun.

Dining on a catered lunch in a reserved meeting room overlooking the delivery floor, we talked about airplanes and what a wonderful person I was. Mike Pierce, technical marketing advisor, told me I could even have the last cookie on the dessert plate.

Taxing away from the delivery hangar into the sunset, I wanted this day to last forever. I took a sip of my Perrier with ice and smiled.

Fly safe.



*With 6,000-plus hours in his logbook, David Miller has been flying for business and pleasure for more than 40 years. Having owned and flown a variety of aircraft types, from turboprops to midsize jets, Patty and David currently own and fly a Citation Mustang. You can contact David at [davidmiller1@sbcglobal.net](mailto:davidmiller1@sbcglobal.net).*



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