SUMMER - 2018 | VOLUME 23 NO. 2

TWIN COMMANDER AIRCRAFT LLC

FLIGHTLEVELSONLINE.COM

# Flight Levels MAGAZINE

For owners and operators of Twin Commander Aircraft

## From Yukon to Johannesburg in my Commander

What's the best way to get from Yukon, Oklahoma, to Johannesburg, South Africa, a Great Circle distance of about 9,600 nm? For Michael Johnstone, the answer was easy. He first did the reverse route—Johannesburg, which is home for him, to Yukon—by airlines so he could do the return trip his way, in his newly acquired Commander 695B.

Johnstone and ferry pilot Antony Maitland left Legacy Aviation Services in Yukon, where Johnstone had purchased the Commander, on December 13, 2017, and five days later landed at Lanseria International in Johannesburg after logging about 34 flying hours.

"The trip was an amazing experience for me as it was my first flight from the USA through Europe back to South Africa," Johnstone says. "Temperatures ranged from -40 C to +37 C with large snowfalls in Canada and Greenland, and seeing Mont Blanc in Switzerland, the Mediterranean, the desert in Egypt, the Nile River, Mount Kilimanjaro in Kenya, and Lake Malawi (bordering Malawi, Mozambique and Tanzania) were all wonderful sights."

*RJ Gomez, left, of Legacy Aviation Services, and Michael Johnstone, take a selfie before Michael flies his 'new' 695B to Johannesburg, South Africa.*

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## Brighten Up the PAX Cabin with LED Lights

Twin Commander Aircraft has developed lighter, brighter, longer-lasting LED lighting for passenger cabins that replaces older-technology fluorescent-bulb systems on 690A and later-model turboprop-powered Twin Commanders.

The drop-in LED package — Custom Kit 190 — includes lights and printed circuit boards. Converting to the LED lights is a simple remove-and-replace process. The LED lights replace existing fluorescent bulbs, using existing receptacles in the

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# Twin Commander Aircraft Names New President

Twin Commander Aircraft has a new leader. Allen Goad, an experienced executive in aerospace, defense, service, and industrial markets, has been named President of Twin Commander Aircraft LLC.

Allen replaces Matt Isley, who after 10 years at the helm has taken an executive position with another company but still remains within the Twin Commander family.

Allen has more than 20 years of experience leading complex businesses for high profile, public and private organizations. Prior to being named President of Twin Commander, he was the CEO at ATS Systems in California.

Along with leading Twin Commander Aircraft LLC, Goad has been named President of the Aerospace Technology Group (ATG) for parent company H-D Advanced Manufacturing. ATG is comprised of H-D subsidiary companies involved in the aviation, aerospace and manufacturing arena.

Allen holds a Bachelor of Science degree in Education and Chemistry from Arkansas State University and a Presidential and Key Executive M.B.A. from Pepperdine University. He also holds an FAA Private Pilot's certificate.

"Allen brings an incredible breadth of experience and capability to the senior leadership team," commented Michael J. Vincent, President & CEO of H-D Advanced Manufacturing. "His strong leadership background in operations, sales, engineering, finance, and strategic initiatives for multi-national firms fills a critical need as ATG endeavors to grow its business."

"I am excited to join the Twin Commander team," Allen said, "and look forward to meeting and getting to know everyone—especially our factory-authorized service center partners—responsible for making a Twin Commander such an incredible aircraft to own and operate. We are planning events including the Twin Commander University that are important to continue building the communication and support of our network for all involved—owners and operators, our authorized service center personnel, and our suppliers and vendors."

For more information contact Twin Commander Aircraft LLC at 1176 Telecom Drive, Creedmoor, NC 27522; 919-956-4300; 919-682-3786 fax; Brian Harbaugh, Sales bharbaugh@twincommander.com

FLIGHT LEVELS MAGAZINE

For Twin Commander Owners and Operators. Published quarterly with a circulation of 3,500.

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# Properly Preflighting Twin Commander TPE331

By Robert Erlick

The TPE331 engine that powers all turboprop Twin Commanders has been around for decades, but the operating principles that guided its design—simplicity, power, fuel efficiency, and safety—are as relevant today as when the first production engine appeared more than 45 years ago. The following article, which is adapted from Honeywell's TPE331 Pilot Tips booklet (available online or on the Honeywell App, Pilot Gateway at https://pilots.honeywell.com; register with name and email, point to "Engines" then "TPE331" and click on "Pilot Tips") takes a look at preflight inspection procedures.

## NORMAL OPS PROCEDURES CHECKLIST

### Preflight Inspection

The importance of a thorough preflight inspection by a flight crewmember cannot be overemphasized. Remember, in some cases it will be necessary to use a stepladder to adequately examine the engine inlet area.

- Cleared/Deferred write-ups—checked
- GPU (if use is intended)-check operation

If external power is being used for engine start, proper operation and setting, such as adequate fuel (internal- combustion-powered GPU), appropriate voltage and amperage (28 volt/800-1600 amps) is of great importance.

> ⚠ Caution: Consult the AFM/POH for the appropriate electric rating when using a GPU for engine starting or systems checks.

- Engine inlet/exhaust cover—removed
- Engine cowling—inspect security
- Oil level and filler cap—check level and security

If the engine has not been operated for several hours, the oil level should be checked prior to starting; however, care should be taken to avoid overfilling. Occasionally, oil may be trapped within the engine gear case and will not show on the sight gauge or dipstick. To assure a valid oil level check, the engine should first be motored up to 15 percent, or with a low battery the propeller should be pulled through by hand in order to cause residual oil in the gearbox to be scavenged back to the oil tank. The best time to check the correct oil level is within one hour after shutdown when oil is distributed throughout the engine as it is during operation and near operating temperatures.

> ⚠ Warning: Visually confirm a clear propeller before engaging the starter or before motoring the propeller.

> ⚠ Warning: Exercise extreme care when opening oil tank dipstick cap immediately following engine shutdown because hot oil can spill and cause injury.

- Oil/fuel filter bypass valves—check indicators

Oil filter bypass: An extended red pin or poppet indicates a restricted oil filter element. However, in very cold weather, due to increased oil viscosity, delta pressure across the filter element could exceed bypass filter values, causing momentary opening of the bypass valve.

Redesigned bypass valves (if incorporated) provide a thermal lockout, preventing bypass indicator extension at oil temperature below about 38 degrees C.

Fuel filter bypass: Some installations have a pin or poppet that extends to indicate that the fuel filter bypass valve has opened. Other installations have pressure ports on the bypass valve, causing a cockpit light to illuminate whenever restricted fuel flow is encountered, indicating an impending filter bypass condition.

- Fuel drains—check as per AFM/POH
- Oil cooler air inlet—check. Should be clean, unobstructed, no evidence of leaks
- Propeller blades—check (on the start locks)

On the ground only, prior to engine starting, verify that the prop is on the locks (flat pitch, 1-2 degrees). If the blades are in feather (85-90 degrees), move and hold the power lever in the full reverse position and then use the unfeathering pump. Remember that oil from the oil tank is used to pump the prop blades toward the start locks position. In other words, unfeathering will result in the transfer of oil from the oil tank to the gear case. Therefore, subsequent oil level check may be erroneous. (See oil level and filler cap check procedures above.)

- Propeller blades—condition

Check the leading edges of the propeller for erosion, nicks, cracks and/or bent blades. Any of these discrepancies can become worse over time and may cause propeller imbalance. Lack of propeller balance may impact engine wear.

- Propeller hub/spinner—check

Check for security and oil/grease leaks. Improper servicing can cause grease to leak, creating propeller imbalance.

> ⚠ Caution: Damaged or blocked sensors can send erroneous signals to the FCU/SRL and can cause erratic engine operations.

- Engine inlet—check sensors.

The inlet should be clear and unobstructed.

Check inlet surface for discoloration (possibly due to excessive use of inlet heat during ground operation) and for evidence of residual oil. (Minor compressor seal leaks are typically a nuisance and do not normally affect the airworthiness of the engine. However, the leak should be written up and brought to the prompt attention of your maintenance department or service facility.)

The P2-T2 sensor (T2 only with Bendix FCU) should be checked for security and to assure that they are undamaged and clean.

Tt2 Sensor (SRL/VRL)--check

If located in the inlet, the Tt2 sensor can be found opposite of the P2T2 sensor, in the oil cooler inlet or anywhere on the engine cowling, depending on the aircraft type.

The Tt2 sensor provides temperature-sensing information

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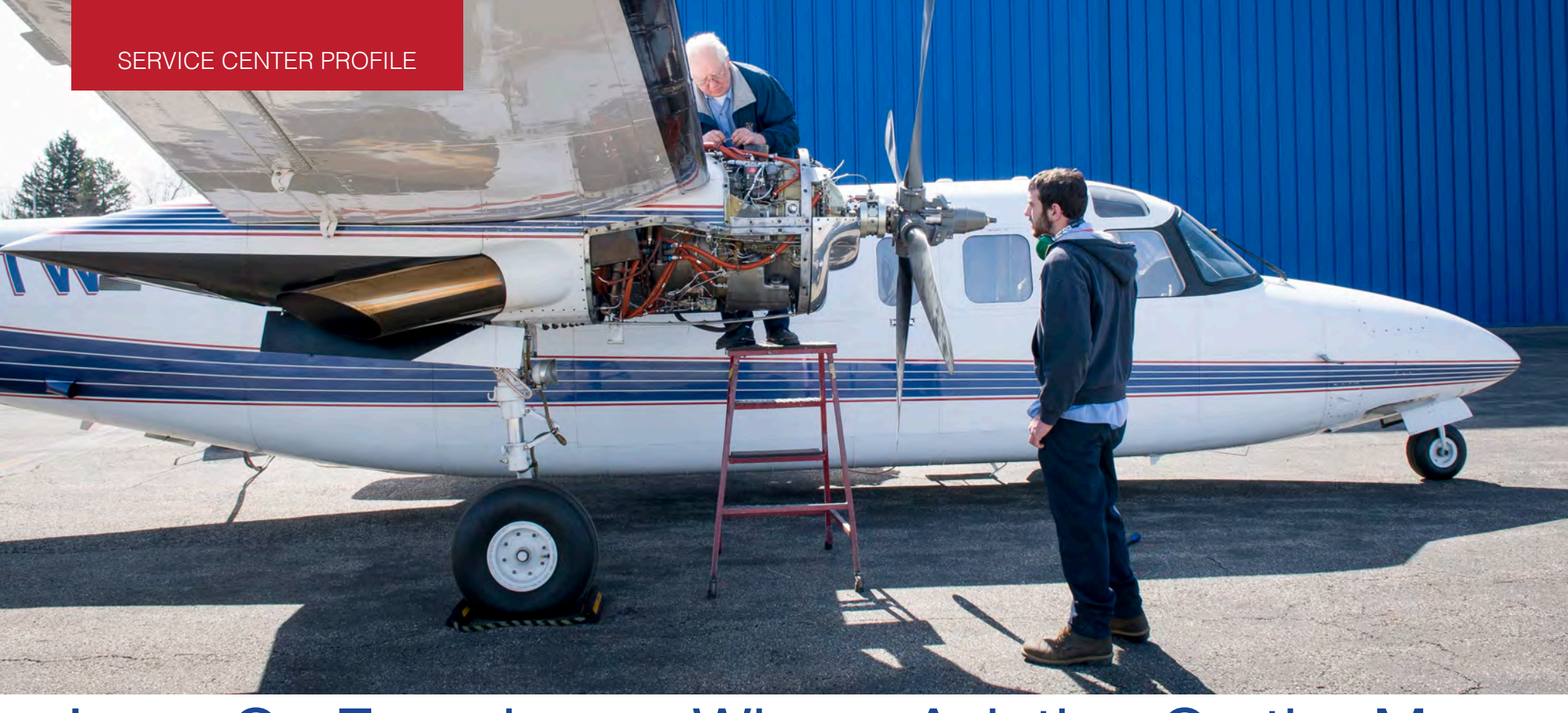


# Long On Experience, Winner Aviation On the Move

Winner Aviation, a factory-authorized Twin Commander Service Center located at Youngstown-Warren Regional Airport in eastern Ohio, is on the move. The company hasn't changed its physical location—it's been in continuous operation under a variety of owners and names since its founding in 1941 as Youngstown Airways, soon to become Beckett Aviation, named after founder Forest Beckett. In 1985 it became Aero Services, and in 1995 Winner Aviation.

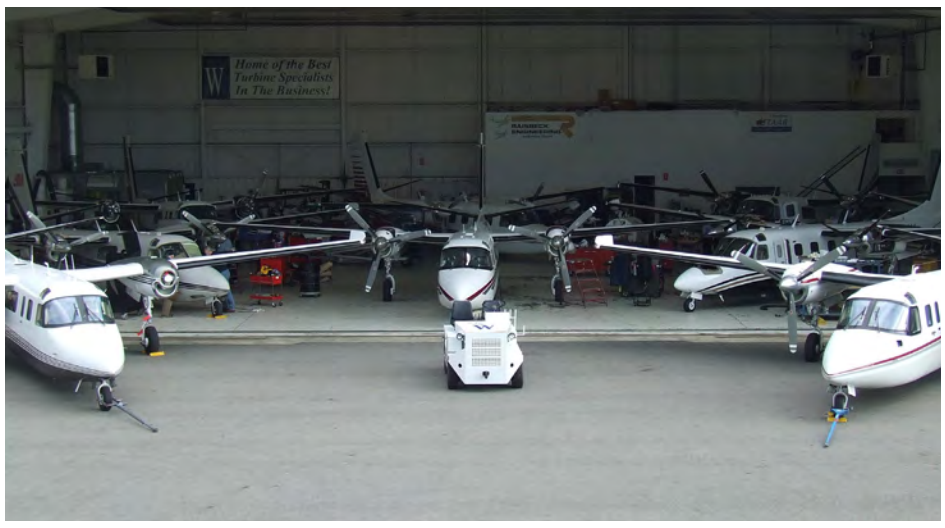
What is on the move is the company's scope and reach. Winner has aggressively pursued airline ground operations, and today has contracts at seven airports in addition to Youngstown-Warren Regional. "We are up to 300 employees," says Winner owner and Chairman Rick Hale.

Winner's Twin Commander focus also is on the move. Beckett Aviation became a factory-authorized Aero Commander service center and an AiResearch (now Honeywell) engine major service center in the mid-1960s, and Winner has continued with those relationships through the years. "We've seen steady growth," notes Service Manager Peter Quick. Winner recently picked up several new Commander operators as customers.

"It's easy to get and retain customers when you don't over promise and under deliver," Tobey adds, Winner's Maintenance Supervisor and a Commander technician who has been with the company 23 years.

It's not unusual to find a technician in Winner's shop who, like Tobey, has decades of experience at the company. The most senior employee was Ron Butler, who ran Winner's Honeywell engine shop for more than 40 years. Butler retired several years ago, but still comes in to help catch up during high-volume periods. Tom "Woody" Hudak, the next most experienced and knowledgeable person in the engine shop, succeeded Butler.

"Nowadays it's hard to fathom someone being at the same company 20, 30, 40 years," Quick says. "We don't lack for experience." Quick has been in the industry 44 years, the last 13 with Winner. Ronnie Backo, Winner's lead avionics technician, is a 30-year employee of the company.




Winner calls itself the "oldest independent factory-authorized Honeywell TPE 331 Engine Major Service Center in the world," and a key to Winner's Commander customer base is the engine shop, Tobey explains. "Whether it's rigging, odd issues with a fuel control, or whatever, between Ron and Tom they've see the majority of things when it comes to the TPE331."

"That's where we shine," Quick adds.

Winner also prides itself on airframe issues handled by a group of experienced, professional technicians specializing in heavy structural repair of damage from incidents, accidents, bird strikes, lightning strikes and any corrosion-related issues. Don Price, Winner's main structural technician and an all-around lead technician and inspector, is coming up on 30 years with the company. "His knowledge and experience are pretty impressive," Tobey says.

Winner is a full-service Twin Commander-authorized Service Center offering airframe inspections, modifications and repair; engine inspections and repair; avionics sales and installations; parts sales; and full FBO services at KYNG.

For more information see Winner's web site at https://winner-aviation.com/ or call 330-856-5000/800-837-4964.

Tim Tobey, left, and Peter Quick have decades of accumulated experience working on Twin Commanders.

# Quick –And Hot– Turns

By Mike Grabbe, Eagle Creek Aviation Services

You've just landed and shut down your TPE331-powered Twin Commander. It's a hot summer day, and you need to refuel and take off again in about 20 minutes. Given the conditions, is there anything special that needs to be done on the next engine start? The short answer is yes.

First, as soon as the passengers deplane and are well clear of the aircraft, pull the props through at least 10 revolutions. This is to quickly get as much cooling air through the engines as possible to avoid a condition known as shaft bow. This occurs when the underside of the engine cools faster than the top side, where the accessories are mounted. This uneven cooling actually causes a slight bending of the main shaft and may cause the rotating group components to come into contact with their shrouds.

This contact can be a light touch, or in extreme cases can cause such a binding that you might be able to perform pull-ups on the props without turning them until everything thoroughly cools and equalizes, and the props turn freely again.

Pulling the props through also helps to cool the fuel nozzles, which helps to lessen the potential for coking of the fuel nozzles.

Once the aircraft has been refueled you need to perform a simple check to ensure there is no shaft bow. With two fingers placed about halfway down the leading edge of a prop blade, see if you can pull the prop through several inches--at least one blade width. That's enough to turn the main shaft at least 180 degrees of rotation. If you don't feel any binding or hear any scraping sounds, you are cleared for the next step.

If, however, you do feel what may be binding or hear scraping noises, stop immediately to avoid damaging the compressor shrouds. Ignoring this check could result in the engines complaining when started, sometimes loudly, with a resulting loss of efficiency. Let's see, loss of efficiency means more fuel required to generate a given torque value, and a resulting higher engine operating temperature and operating cost. Not good.

Ok, you've checked the engines and found no shaft bow. What next? Remember what you were taught in ground school about maximum engine temperature prior to starting: ITT max indicated 300 degrees, and EGT max 200 degrees. If the temp gauge shows higher than that prior to start, there are three ways to get the temperature down below the max limitation:

1. Wait until the engine temperatures drop of their own accord.

2. Pull the engines through rapidly at least 10 turns, or

3. Use the starters to motor the engines.

To motor an engine, depress the ignition switch to the MOTOR position and hold it there while you engage the starter. Let the engine spool up to about 15 percent rpm, then rotate the start switch to the OFF position. DO NOT release the ignition switch until the prop has stopped.

Why? Releasing the ignition switch as soon as ITT or EGT temperature drops to or just below the pre-start limit can cause what we refer to as a "booming" start, sending a nice shock wave through the engine and causing internal damage. It may not be catastrophic the first time it happens, but some level of damage occurs. This shock wave can and does travel up the P3 sense line to the fuel control and does wonders to shorten the life of the bellows in the fuel control (Woodward). The Bendix FCU design is different, but the shock wave doesn't help it either.

Also, there have been instances where the speed switch calibration drifts. If the engine is turning just fast enough that the speed switch circuit thinks the engine is above 10 percent rpm, it could dump fuel into the combustor and fire the igniters, just when you don't want it to.

Once the temperatures are below the pre-start limits, go ahead and start. Do you remember the ground start modes to use depending on OAT? See the chart and explanation below.

## ENGINE START MODES

The hotter the ambient air temperature the less temperature margin we have for starting, so above 32 degrees C we need to get as much cooling air as possible through the engine during the start sequence to help keep temperatures within limits. Use Series mode.

From 0 to 32 degrees C we can use the Series start mode, Parallel start mode, or use a ground power cart for assistance.

From 0 to -7 degrees C use Series start mode only to account for battery energy loss due to cold temps.

Below -7 C we need to use a ground power cart to overcome the drag of cold oil and further loss of battery energy.

Happy flying.

*Mike Grabbe is a long-time Technical Advisor with Eagle Creek Aviation Services with extensive experience on Twin Commanders.*

# Tax Reform 201: Preserving 100% Bonus Depreciation in a Changing Tax Landscape

## A Closer Look at the Impact of the Tax Cuts and Jobs Act

By Suzanne Meiners-Levy

The 2017 Tax Cuts and Jobs Act (TCJA) provides a unique opportunity for business aircraft purchasers of both new and pre-owned aircraft to take 100% bonus deprecation on the aircraft purchase price.

The bonus depreciation can be taken in the year of acquisition pursuant to Section 168(k), provided that the aircraft is placed in service for business use in that year. This purchase incentive can serve as a valuable tool to free up capital, encourage business investment and activity, and facilitate the purchase of a more capable aircraft by significantly lowering business tax liability at the time of purchase.

Pursuant to I.R.C Section 280(f), to qualify for bonus depreciation an aircraft must be used predominately for business use, with at least 25% of the business use meeting a specific definition of "qualified business use." That is a term of art that excludes most compensatory use and use by related party lessees. After the 25% qualified business use requirement is fulfilled, some compensatory use and related party leasing can be used to meet the predominant (50%) business use test to qualify for accelerated depreciation and bonus.

While all personal use of company aircraft impacts the deductibility of both depreciation and aircraft operating expenses, a properly filed straight-line election pursuant to 274-10 can preserve close to full depreciation deductibility for almost all business aircraft with a mixed-use profile, provided that the aircraft is predominately a business tool and detailed flight logs are maintained to support the deductions. This allows a business to preserve almost full purchase price depreciation deductibility even in cases where personal use is significant.

Simple, right? Not so fast. For the unwary, what the Congress giveth, the IRS taketh away. New aircraft limitations on the definition of business flights, coupled with structuring hurdles or desires may jeopardize the ability for your company to take advantage of this incentive. This article examines a couple of ways that the TCJA interacts with existing law in creating potential tax traps for the unwary owner or operator.

### Narrowing the Definition of Qualified Business Use

First, the TCJA narrowed the category of flights that will be considered qualified business use for the purpose of determining business eligibility. It did this by declaring travel associated with business entertainment nondeductible pursuant to Section 274, the section of the Code that details both the recordkeeping requirements for business deductions and the impact of personal use on deductibility. Business entertainment flights, whether taking a client to a sporting event or to a ranch, have previously been considered business flights, provided that proper documentation was kept to establish an affiliated business meeting and a reasonable purpose for the entertainment. Effective

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# Tax Reform 201: Preserving 100% Bonus Depreciation in a Changing Tax Landscape A Closer Look at the Impact of the Tax Cuts and Jobs Act

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in 2018, most trips focused on or associated with entertaining clients will no longer be considered business use of the aircraft. This change, coupled with the fact that business entertainment trips often include a high passenger count, can dramatically alter the qualified business use percentage of a business aircraft.

Additionally, Section 274 was amended to make employee commuting travel non-deductible. While commuting trips have never been treated as the first category of qualified business use, generally they have been treated as deductible employment compensation when reasonable and properly taxed. This altered treatment may significantly shift the business use percentage of many business aircraft that were commonly used for commuting travel. The reach of this provision remains somewhat unclear and requires careful analysis in applying it to individual travel arrangements.

## Incentivizing New Ownership Structures

The cornerstone of the TCJA was the cut in the corporate tax rate, which was paired with an income-deduction provision for pass-through entities. The corporate rate cut is significant, from 35% to 21% in the top bracket, incentivizing the operation of business through a corporate structure for many taxpayers, especially those located in high-tax states that also favor corporate

# Transitioning to the Pattern

By Dr. Keith Thomassen

Have you ever wondered how you will make a transition from your enroute VFR flight plan to the favored runway at your destination? To do so efficiently you need a number of critical pieces of information: what are the traffic patterns (right or left) for the available runways, which runway is favored by the wind, and what kind of entry will you make to the pattern from your direction of flight. Fortunately, there are new tools available in ForeFlight and on the Garmin Touchscreen navigators to greatly simplify this chore.

On a Garmin 750 you can determine the traffic pattern to any runway by looking at the waypoint page for that runway, as in Figure 1 for Centennial airport, where we plan to land on a flight from Pueblo, Colorado. The fastest way to get to that page is from your flight plan (tap KAPA then select Waypoint Info). You can see here that runway 35R has a right-hand pattern. Tap the Runway box to see other runway choices.

On your iPad you can see the three runway choices (Figure 2) for KAPA on the Airports page in ForeFlight. From these three choices we determined that 35R is best (least crosswind and most length). The ForeFlight guide tells us the green arrows indicate the favored runway from the pair you selected (red arrows are for the opposite runway).

There is an 8-knot headwind on 35R (green arrow far right) and a 1-knot crosswind from the left (black arrow). Of course, you need to be connected to the internet to get current data, but perhaps you can tether to your iPhone and make that connection. In our case we could do that on the ground in Pueblo since that's a short flight. As you near KAPA you will also tune in the 1-minute weather on AWOS.

Having determined the winds, landing runway, and its pattern, you now need to figure out how to transition from your flight plan. Here, the new Traffic Pattern advisory feature in ForeFlight is a big help. First, make a flight plan from KPUB to KAPA, then display the pull-down flight plan. On the Edit option choose Procedure in the upper right corner. Here you can add an IFR procedure into the flight plan or a Traffic Pattern (our choice), as in Figure 3.

When you select Traffic Pattern, a set of six runway options appear, for both directions on three runways, and tells you which are best for current winds (see Figure 4).

At this time, winds favor runways 28 and 35 L/R. Selecting 35R gives the entry choices of Figure 5, where the best side to enter for each runway is indicated. It also shows that right traffic is the Default choice. We have highlighted the 45-deg entry option so that the map will show how to make that entry. Touching each option in turn will show you those entries on the map. Straight in is probably the best option, and tower would likely give that to you, but we selected the 45-deg entry for illustration purposes.

Enter this option into your flight plan with the "Add to Route" tab in Figure 5. That makes a change in your plan that can be seen in the FPL pull down shown in Figure 6. It has added a 45-deg entry to a right base turn at KAPA between the waypoints in the old plan. As also shown in that Figure, it modifies your flight plan route on the Map page to show the 45-deg entry to right downwind. I wonder how Flight Stream with the 750 deals with this addition?

*Dr. Thomassen has a PhD from Stanford and had a career in teaching (MIT, Stanford, UC Berkeley) and research in fusion energy (National Labs at Los Alamos and Livermore). He has been flying for almost 60 years, has the Wright Brothers Master Pilot Award, and is a current CFII.*

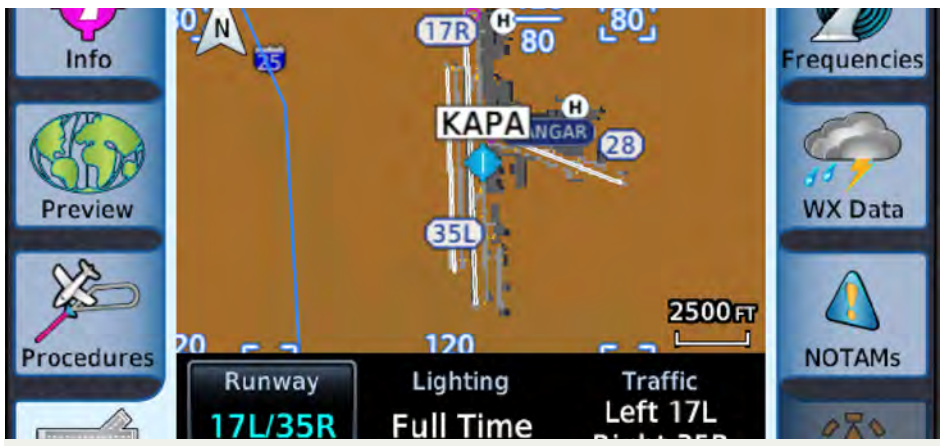


Figure 1. Waypoint page for KAPA, with traffic pattern directions for 17L/35R. For other runway choices tap the Runway box.

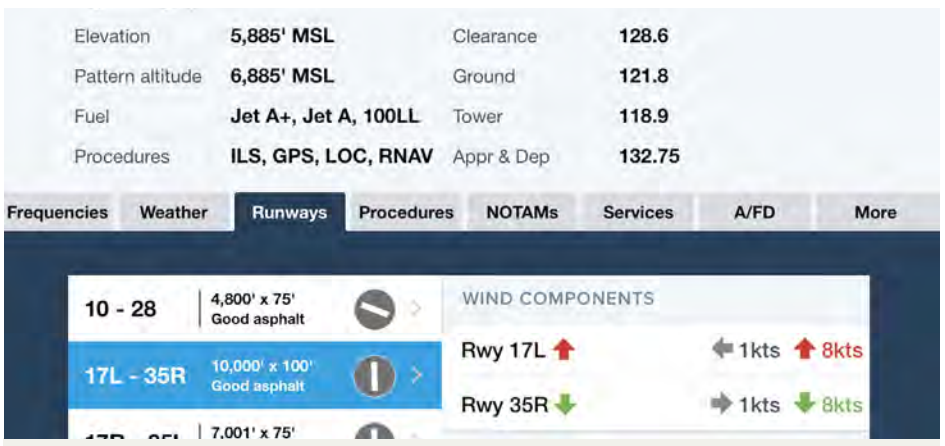


Figure 2. ForeFlight Runways page for KAPA, showing winds and traffic pattern for 35R.

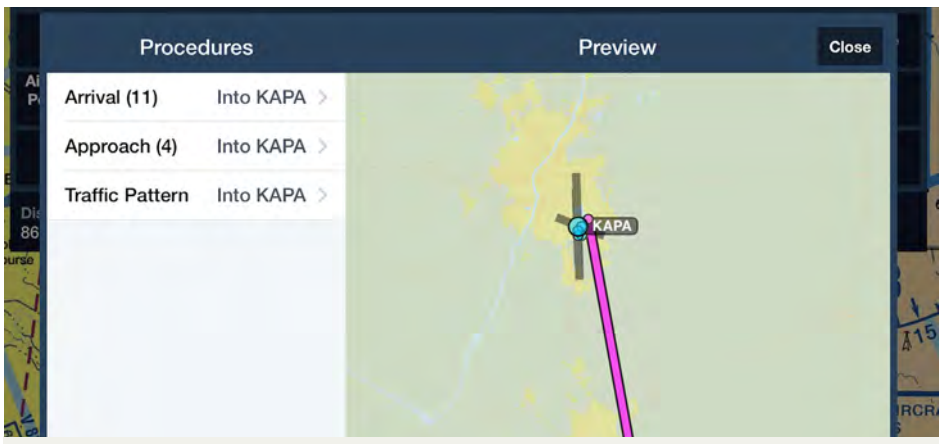


Figure 3. Procedure selection from the FPL pull down display (Edit page), where you can make the Traffic Pattern choice.

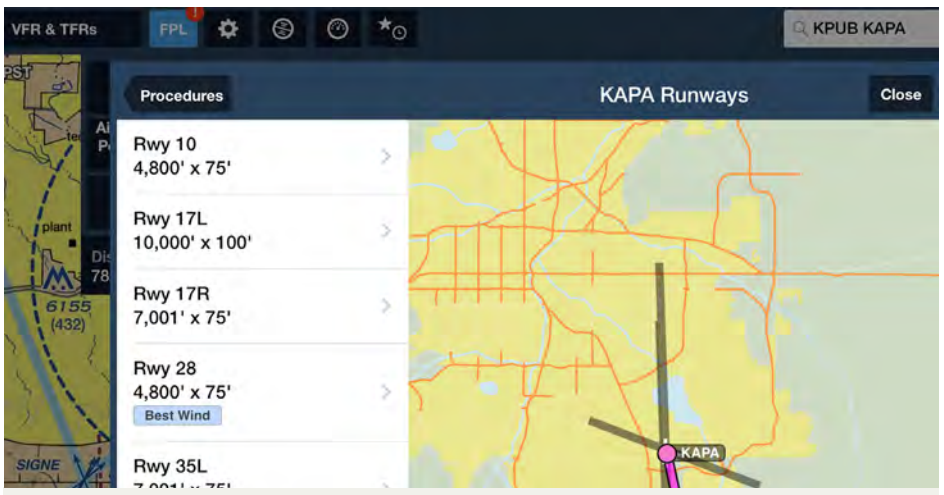


Figure 4. The 6 runway options at KAPA indicating the best-wind runways.

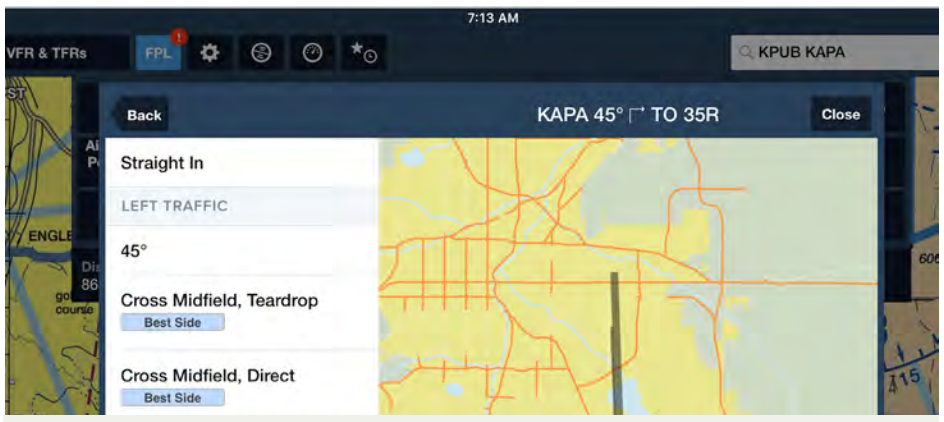


Figure 5. Entry choices for Rwy 35R, where we selected the 45-deg entry option. This shows that right traffic is the default, and shows on the map how you would make that entry.

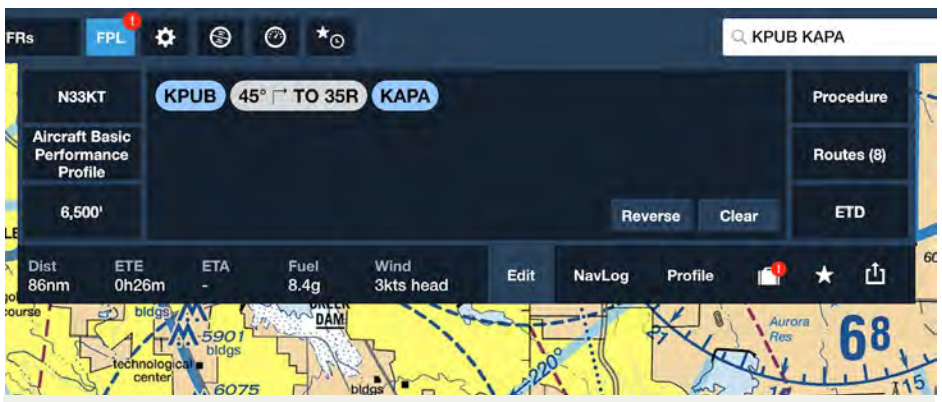


Figure 6. Flight plan modified by traffic pattern entry and shown on the map. Note also the addition between waypoints in the flight plan box of a 45-deg entry to a right pattern.

# DECADES OF COMMITMENT

The Eagle Creek family of companies has nearly four decades of commitment to the Twin Commander community, winning awards and top ratings for our service centers' performance and our innovation in keeping the fleet current. Simply stated, no other company can offer more services, experience, proven success and commitment to Twin Commander owners than Eagle Creek and Naples Jet Center.

- Twin Commander Authorized Service Center
  MULTI-YEAR TWIN COMMANDER AIRCRAFT SERVICE CENTER OF THE YEAR
- Avionics
  COMPLETE PANEL REFURBISHMENT, UPGRADES & SERVICE
- Sales and Brokerage Service
  TRUSTED PARTNERS IN AIRCRAFT OWNERSHIP
- One Stop Twin Commander Service & Expertise
  ROUTINE MAINTENANCE TO EXTENSIVE OVERHAULS

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# Garmin & Twin Commander Experts

## LEADING THE GARMIN G950 REVOLUTION

Eagle Creek Aviation and Naples Jet Center are proud to offer the Garmin G950 glass flight deck for the Twin Commander. This all-electronic Garmin panel integrates all primary flight, navigation, communication, terrain, traffic weather and engine instrumentation system on dual PFD's and a large MFD. The panel also includes an integrated Crew Alerting System (CAS) with messages displayed on the MFD and aural alerts replacing the old annunciator systems.

## FEATURES

- Dual 10.4" Primary Flight Displays
- 12.4" Multifunction Display
- S-Tec 2100 Digital Flight Control System
- Integrated Crew Alerting System (CAS)
- FlightCharts & SafeTaxi
- New Fuel, Oil & Hydraulic Pressure Transducers
- New Engine Fuel Flow Transmitters

NAPLES
JET CENTER

# Brighten Up the PAX Cabin with LED Lights

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passenger cabin. The LED system's printed circuit boards replace the four existing power supplies mounted on the aft pressure bulkhead. The boards plug into the existing wiring harness and mount to the aft pressure bulkhead in place of the old power supply boxes. No additional equipment or wiring is required to install the LED lighting package.

For more information about CK 190, the new Commander LED lighting conversion, contact your factory-authorized Twin Commander Aircraft Service Center, or Brian Harbaugh at Twin Commander Aircraft, 919-956-4385, bharbaugh@twincommander.com.

# Properly Preflighting Twin Commander TPE331 Powerplants

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to the SRL controller on Dash 10 engines.

The sensor should be checked for general conditions and security.

- Engine inlet/1st stage—check compressor

Inspect the entire 360 degrees of the visible area of the first-stage compressor/impeller, by turning the propeller slowly in the normal direction of rotation (to avoid damage to carbon brushes in the starter/generator). Any evidence of damage, nicks, cracks, bent or missing blades should be brought to the attention of a qualified technician prior to starting the engine.

- Propeller—rotate by hand

This is a valuable practice to develop a baseline feel for characteristic engine sound and rotational resistance so that, should a change be detected on future prop rotations, appropriate maintenance investigation should be initiated.

If an abnormal resistance is noted (for example, shaft bow; rotational freedom should be re-checked after about three minutes of additional cooling), hand rotation should be stopped at the point where the resistance is most obvious; representing 180 degrees displacement of the main rotating group (neutralizing the thermally caused imbalance as cooling continues. See "From the Shop Floor" this issue.). Note: Rotational resistance is unusual except for the initial few hours of operation following replacement of the inter-stage air seals.

Caution: Do not start the engine if the propeller is not free to rotate.

- OAT sensor—check

Inspect for security and a clean, unpainted probe.

**Note:**

Engine performance and operating characteristics are a function of OAT and PA. The OAT sensor may pick up reflected ground heat and thus may read a higher ambient temperature than the OAT reported from an official meteorological observation source. The error will vary with sun position and type of ground surface.

- Exhaust nozzle—check
- Turbine blades: condition

If visible, check (a) exhaust pipe for concentricity, (b) condition of rear (3rd stage) turbine blades and (eight) EGT thermocouples (only with EGT system; ITT system temperature probes are not visible), (c) evidence of residual oil in the tail pipe. Turbine seal (oil) leaks must be noted for maintenance follow-up prior to next flight.

- Aircraft orientation—into the wind

Strong tailwinds during a ground start can create excessive propeller loads against normal direction of rotation. Additionally, it causes back pressure in the tailpipe and may cause ingestion of exhaust gases.

A headwind provides windmill power, ram inlet air, and a clear exhaust path.

**Note:**

Except as noted in some AFMs and POHs, there are no wind restrictions for engine starts because maximum tailwind is a function of other start condition, e.g., start-bus voltage, residual turbine temperature and ambient conditions.

*For additional information concerning TPE331 design and operation, please contact Rob Erlick at 480-399-4007, or send an e-mail to Robert.Erlick@Honeywell.com*

# NBAA Seeks Clarification of Provisions in New Tax Law

The National Business Aviation Association (NBAA) is requesting guidance from the Internal Revenue Service (IRS) and Department of the Treasury on several provisions of the Tax Cuts and Jobs Act that directly affect business aviation.

In a June 13 letter to the IRS and Treasury Department, NBAA focused its guidance requests on two main areas: 100 percent bonus depreciation, and the disallowance of deductions for certain entertainment and commuting expenses.

Last year, NBAA successfully advocated for the extension of 100 percent bonus depreciation to used property as part of tax reform. Under the law, ownership of the used property must start with the taxpayer – in other words, while the property can be used, it has to be new to the taxpayer claiming the depreciation. In the guidance request, NBAA explained that incidental use by the taxpayer of the used property should not disqualify it from bonus depreciation.

"For example, there are situations where a taxpayer could charter or conduct a demonstration flight on a business aircraft that it later acquires," NBAA wrote in its request to the IRS. "For these types of flights, the taxpayer would not be the operator of the aircraft, so the aircraft should not be viewed as having been 'used' by the taxpayer for purposes of the original use requirement."

NBAA also sought guidance on technical issues related to the bonus depreciation provision, such as effective dates and self-constructed property.

Other sections of the tax reform law that will affect business aviation include provisions that disallow employer deductions for business entertainment and commuting expenses. NBAA requested guidance to clarify how these provisions will apply and to assist with tax administration.

On the business entertainment issue, NBAA urged the IRS to issue guidance that clarifies how trips are treated when there is a combination of activities, only some of which are entertainment. "For example, if an employee travels to a business meeting, and one evening during the trip the employee goes to a movie for entertainment, the company should not be subject to a disallowance for the travel costs related to the trip," NBAA wrote. "Only the cost of the movie ticket should be a non-deductible entertainment expense."

For the commuting expense disallowance, NBAA explained that since business flights often include travelers with different destinations and purposes, it makes sense to look at the specific marginal costs to the employer of providing the commuting benefit:

"For example, suppose an employer provides a flight on the company plane for five employees from its headquarters location to destination A. At destination A, four of the employees attend business meetings, while one of the employees is commuting to destination A." NBAA argued that in the above situation, only the marginal cost of providing the commuting flight to the employee, which would be negligible, should be disallowed.

"While the Tax Cuts and Jobs Act provides significant benefits to business aviation, there are also challenges as the industry seeks to understand the complex legislative changes," said NBAA's Senior Director of Government Affairs Scott O'Brien. "This guidance request is critical as it lays out NBAA's positions on the tax reform issues of most interest to our members."

Photo Credit: Matthew Guay on Unsplash

# MODEL 680W “TURBO II COMMANDER”

By Barry Collman

The Model 680W, named “Turbo II Commander”, was the eighteenth Commander model to be placed into production. The first three were built by the Aero Commander-Bethany Division of Rockwell-Standard Corporation at Wiley Post Airport in Oklahoma City, and the last 43 by the Aero Commander Division of North American Rockwell Corporation.

All 46 680Ws produced were built between February 1968 and December 1969, with serial numbers in the range 1721-1 through 1850-46. Of these, 37 were certified in 1968 and the final nine in 1969.

A factory document describes the Model 680W, under Wing Drawing 5170045 with removed 32-inch wing tip extension, as “identical to the previous Models 680T and 680V in weight, C.G. range, aerodynamic certification, and engine performance; therefore, there is no formal TIA for the 680W. The basic difference between the 680W and 680V is the change to the TPE331-43BL engine. Certification was obtained on February 5, 1968 under the same basis as the 680T. Loads and stress substantiation reports refer to this model as the ‘9400lb’ 680T.”

It also adds, “The 680W is a 9400-lb Turboprop aircraft, which has the internal wing strap except for the first 3 (s/ns 1721, 1722, 1723), which have the external strap. The 680V and 680W are identical structurally, except for the wing lights and strap configuration.” (photo/ caption: 01843 – 680W)

The Model 680W was indeed certified on February 5, 1968, under Type Certificate 2A4, and had AiResearch TPE331-43BL engine, each turning the 90-inch-diameter Hamilton Standard 33LF-325/1033A-0 propeller. The “B” in the engine designation indicates a product improvement, while the “L” indicates that the 75-pct low ground idle kit is installed.

Gross weight is 9,400 lb. Cabin pressure differential is 4.2 psi, giving a 13,000-ft cabin at 27,955-ft altitude and a sea level cabin at 9,025-ft altitude.

Some 680Ws have been modified to a “Century Turbo” configuration with the TPE331-43 series engines replaced by the TPE331-1-151K.

The 680W wasn’t built with the “cockpit overhead” or “eyebrow” windows, but at least two have had these installed under Factory Drawing No. 5310418 or STC SA3322WE.

Originally, N5416, s/n 1774-12 680W had the “Long Ranger” auxiliary fuel tanks installed at the factory, before its Certificate of Airworthiness was issued on June 28, 1968. It was sold to North American Rockwell Corp., in Pittsburgh, Pennsylvania, on July 24, 1968 and on January 14, 1971 was re-registered as N54163. At the time the shot was taken (January 1, 1975) it was registered to Western Airmotive Co Inc., based in Oakland, California. Later, on August 5, 1982, it had Hartzell HC-B3TN-5K/T10178B-13Q Q-Tip propellers installed under STC SA924NW. The following day it was officially signed off as being a Century Turbo when the TPE331-43BL engines were replaced with AiResearch TPE331-1-151Ks. Later still, further modifications were installed—nose recognition lights (June 3, 1987); Commander-Aero winglets (September 26, 1990) and cockpit overhead windows (October 16, 1992). The current owner is Spur Aviation Services LC., of Twin Falls, Idaho

Also, the nose landing lights were replaced with flush-mounted, electrically-operated retractable types located underneath each outboard wing.

*Barry Collman’s lifelong interest in airplanes began when he was growing up in a house located underneath the downwind leg to busy Northolt aerodrome, an R.A.F. base near London-Heathrow airport. As a young teenager he discovered airplane “spotting”–hobbyists’ observation and logging of aircraft by make, model, and registration number. The hobby began to grow into a passion as Collman joined a club of like-minded spotters. At one point he purchased a copy of the January 1966 U.S. Civil Aircraft Register, and thumbing through it came upon the Aero Commander. He was hooked. Eventually he acquired every available FAA microfiche file on Commanders, and since 1995 has made annual pilgrimages to Oklahoma City to sift through FAA records. He now has a database with about 100,000 records as well as a collection of negatives, slides, photographs, digital images, magazines, brochures, knick-knacks–and a very understanding wife. This series on Commander production history originally was written for the Twin Commander Flight Group, of which he is an enthusiastic member.*

Originally, N9018N, s/n 1843-42 680W, had auxiliary fuel tanks installed at the factory before its Certificate of Airworthiness was issued on April 12, 1969. It was re-registered as N300CF on April 6, 1971 and on January 3, 1975 it became a Century Turbo with AiResearch TPE331-1-151K engines replacing the original TPE331-43BLs. It was further re-registered as N20ME on November 12, 1977 and then as N20MB on March 13, 1980. A month later, on April 15, 1980 a Wild RC-10 aerial survey camera was installed under STC SA1584SW by Downtown Airpark. Having been re-Registered again as N8416B on July 15, 1980, it was bought by the University of Oklahoma, Department of Aviation and based at Norman, Oklahoma, which changed the registration to the current N940U. The airplane was sold on April 17, 2006 to current owner Sanborn Map Company Inc., of Colorado Springs, Colorado.

# From Yukon to Johannesburg in my Commander

< Continued from page 1

The trip was the culmination of a long process to progress from the Cessna 402C Johnstone had owned and flown for 10 years to a more capable aircraft to travel throughout Africa with more weather-avoiding performance and comfort.

Johnstone, who in 1984 along with his brother Andrew founded Cranbrook Flavours, a successful sweet and savory food-flavoring manufacturing company based in Johannesburg, has been flying for 21 years. He began by renting various aircraft, then purchased a share of a Cessna 210, which he held for seven years. In 2008 he earned a Multiengine rating and bought the 402C. Two years later he added a Commercial certificate and followed that up with an Instrument rating. Meanwhile, visions of a turboprop began dancing in his mind.

"I fly from my business in Johannesburg to my home in Knysna regularly and it's quite far, 550 nautical miles," he explains. "Also, my family is getting bigger with my son recently getting married. I like the idea of flying above the weather, or closer to the tops of it—we often get heavy thunderstorms over here. And, avgas is expensive and not always easy to get in parts of Africa, where Jet A1 fuel is available pretty much everywhere."

Johnstone was thinking about purchasing either a Beech King Air 200 or Cessna Conquest II when he had a "good chat" with his maintenance provider, Skycare Maintenance (Pty) Ltd.'s Dave Bellinghan at Lanseria International. Bellinghan, who has been through formal Commander technician training, had an unequivocal recommendation: the Model 695 Commander 1000.

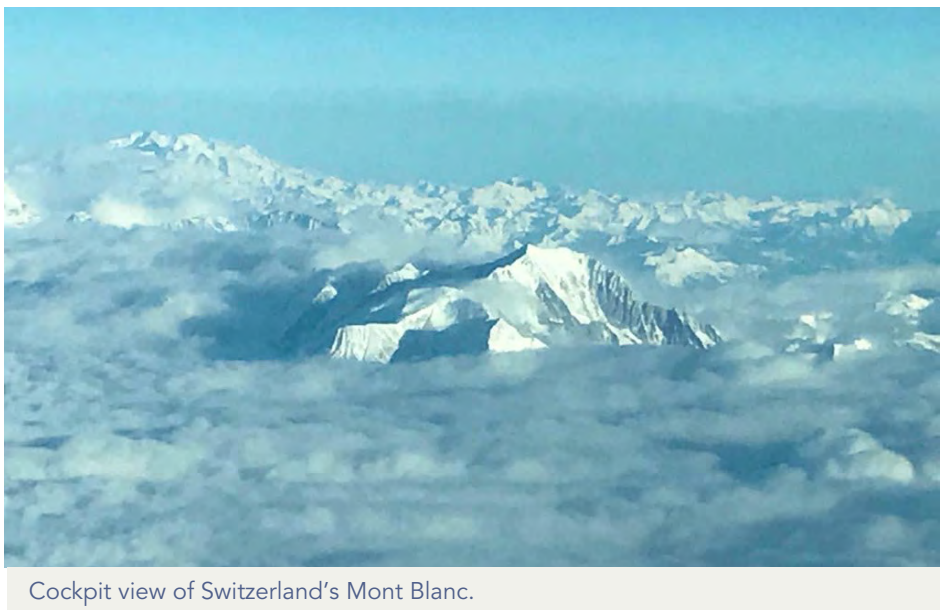
"Dave just told me that the Commander is a great aircraft with unbelievable power," Johnstone recalls. "Dave has always looked after me and I trust him explicitly. He understands me and knows what I like."

With Bellinghan's strong endorsement Johnstone began researching Commanders, often consulting with Commander 1000 owner Ken Clarke, who owns Twizza, the South African soft-drink company. Eventually Johnstone settled on the fourth-to-the-last Commander built, a 695B being brokered by Legacy. The B-model's extra gross weight and fuel capacity compared to earlier Commander models especially appealed to Johnstone.

The flight to South Africa with Maitland was the first real experience Johnstone had in a turboprop, much less a Commander. It was an excellent foundational learning experience, which he followed up by flying with Mark Waberski, an experienced Commander pilot in South Africa. Last February Johnstone came back to the United States to do formal Commander initial training at Simcom in Orlando.

Soon after arriving in South Africa with the Commander Johnstone had the aircraft repainted, which coincided nicely with having new South African registry markings applied. The Commander then went in the shop for a new panel layout to include a Garmin 750, and some interior work including installation of a rear bench seat and new carpeting.

When the updates are completed and Johnstone begins flying the Commander regularly, he will use it for Cranbrook Flavours business. But with his sons now involved in the company Johnstone describes himself as semi-retired, so he has some pleasurable personal flying in mind as well. "I want to travel around Southern Africa so this is the right aircraft for my needs. I often go to Mozambique, Zimbabwe, Botswana, and Namibia so I will use the Commander all the time for this as my wife and I travel regularly to the wildlife parks. I also fly up north to Zambia and the Zambezi River as I'm an avid Tiger fisherman, and that's rather far. Now it's obviously going to be a lot quicker."



Cockpit view of Switzerland's Mont Blanc.

Sean Johnstone with a toothy Tiger fish from the Zambezi River.

Sidebar:

## A FERRY PILOT'S PERSPECTIVE

*Following is a personal account of the ferry flight in Johnstone's 695B written by Antony Maitland, an experienced Commander pilot who for years worked for a British company flying the last Commander built.*

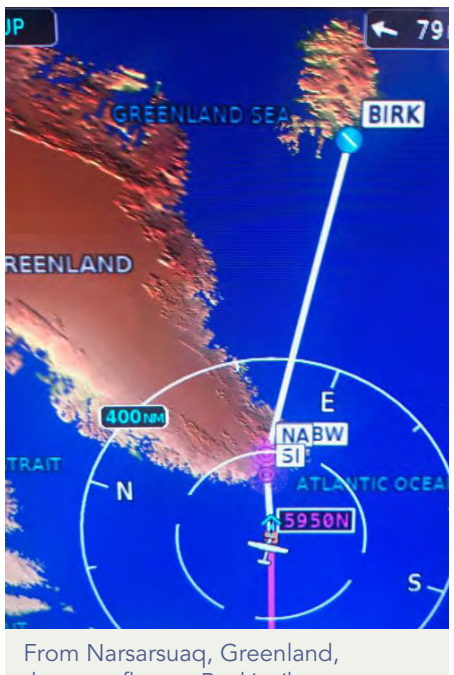
Refueling the 695B on a snow-covered ramp in Ontario, Canada.

…I left Kiripotib [Namibia] on Wednesday 6th December… by taxi at about 0830 local time (0530 GMT) for Windhoek, Johannesburg, Heathrow, Dallas and Oklahoma, arriving there at 1830 local (0030 GMT) the following day, completely exhausted! However, I achieved what I wanted, which was to get to the airport at Yukon/Page for a working day to see what needed to be done to get ourselves underway as soon as the new owner, Michael Johnstone, arrived to fly back with me. He arrived very late on the Sunday, having been delayed four hours at Heathrow by one inch of snow; an interesting comparison with what the Canadians coped with a couple of days later!

The aircraft concerned was a very late-model Commander 1000B, four serial numbers earlier than the one we had operated for Control Techniques. It had had a complete avionics refit with modern flat-screen Garmin sets, only retaining the original autopilot. We saw just shy of 300 kts in cool air at 27,000 ft.

We eventually set off on the Tuesday December 12 for London, Ontario, and Goose Bay, Labrador. Our preferred 2nd stop, Sept-Iles, Quebec, at that time was -23 C, 40-kt wind and ¼ mile in snow. Not very attractive. In the event, after takeoff, the pressurization failed to work on climb out, so we returned to Page, feeling thankful that at least we were somewhere it could

Continued on page 16 >




From Narsarsuaq, Greenland, the crew flew to Reykjavik, Icelandwhen Johnstone purchased the Commander.

# From Yukon to Johannesburg in my Commander

< Continued from page 15

be fixed. It was a very unusual failure of a pneumatic valve in the door for the seal. By the time it was rectified, it was too late to set off.

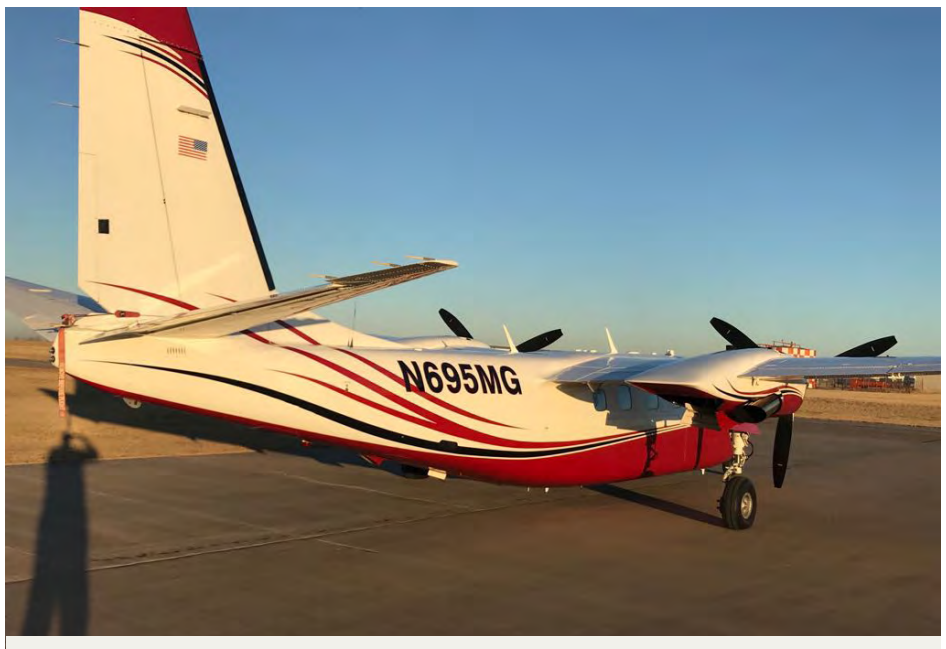
We tried again the next day, and this time all went well: we reverted to plan A and night-stopped at Sept-Iles. Even they said the previous day had been a bit rugged. We were most impressed by the efficiency of the ground handlers who had the aircraft in a nice heated hangar before Michael had time to get out.

They were equally efficient the following morning. We got in our seats and shut the door. Whereupon the hangar opened, we were refueled, and as we did not need deice we set off for Narsarsuaq, Greenland, where the weather was good, though not as spectacular as I have seen it. I had been hoping to go direct to Wick in Scotland, but looking at the winds, decided to go to Iceland; a major disadvantage of Wick is it closes at 2030 and costs £69 per 15 minutes thereafter. With the 5-hour time change from Canada, it would have needed a very early start to make it anyway.

As it turned out, we had an easy run to Reykjavik, Iceland, with a pretty visual night arrival, followed by a dark departure the next day for a fast run to Fairoaks, an airport in Surrey, England, for fuel and then on to Brindisi in southern Italy. We made up some of the flying time to southern Italy via the London area by pressure-pattern flying round a depression over middle Europe.

Brindisi turned out to be an attractive town, with few people about, not what it might have been in July or August. We left Brindisi the next morning for Luxor. I had not tried this stop, having been through Cairo a number of times, slightly for nostalgia as I was born there. But Cairo is a busy airport with the Middle Eastern overly bureaucratic nightmare, so I decided to make a change. We had a night stop in Luxor. So we did the Temple, and then retired to the hotel for a bottle of wine beside the Nile.

New interior with updated avionics.




Registration and paint scheme when Johnstone purchased the Commander.

Egypt must have been really suffering; there were no Europeans in the hotel and the airport apron was empty. In hindsight, had I not been fixed on Wilson airport in Nairobi, we could have, with the winds as they were, have done Brindisi, Luxor, Khartoum and Nairobi International in the day.

Khartoum was somewhat surprisingly very efficient, with the cheapest fuel in Africa. The tanker drew up in front of us as we shut down, plans had already been filed by the handlers, and we were ready for takeoff in about 30 minutes.

I have been through Nairobi's Wilson airfield a number of times and whilst busy and somewhat chaotic, it has had a certain attraction. This time, partly because we had no handling arranged, it was dreadful, with everyone with their hands out and extremely irritating bureaucracy. Both Michael and I lost our tempers! To cap it all, we found ourselves in a dry hotel.

We escaped the following morning for Lilongwe, Malawi, my usual stop on this route. Here we found, as ever, a nice big empty airfield with charming helpful people in the office and efficient refueling. I told them that they made it a joy to stop there. I rather regret not having ever stayed there; it always looks like a lovely green pretty country. Then it was on over Mozambique and Zimbabwe to Lanseria, and back to first-world air traffic.

Having cleared customs and packed the aircraft into Dave Bellingan's hangar, I went into the city to stay the night at Michael Johnstone's house. I was off on the late London flight the next day, but before that I had a fascinating hour-and-a-half with Michael's food chemist at his food flavours company.

The great circle sum of the sectors was 9,689 nm (this compares with a theoretical 8,000-nm direct); the aircraft time was 34.37 hours at an average of 282 kts. I had looked at a Southern route via Brazil. There is a theoretical possibility of flying from an Island off Recife to Monrovia in Liberia, but that is right on the limit of the range, with no prospect of any wind. Somewhat surprisingly, because of the dogleg to Recife, the southern route only saves about 3-400 miles without any real prospect of any wind assistance whereas, even though the winds were not brilliant over the Atlantic, we probably averaged 30 kts tailwind for 20 hours, worth 600 nm.

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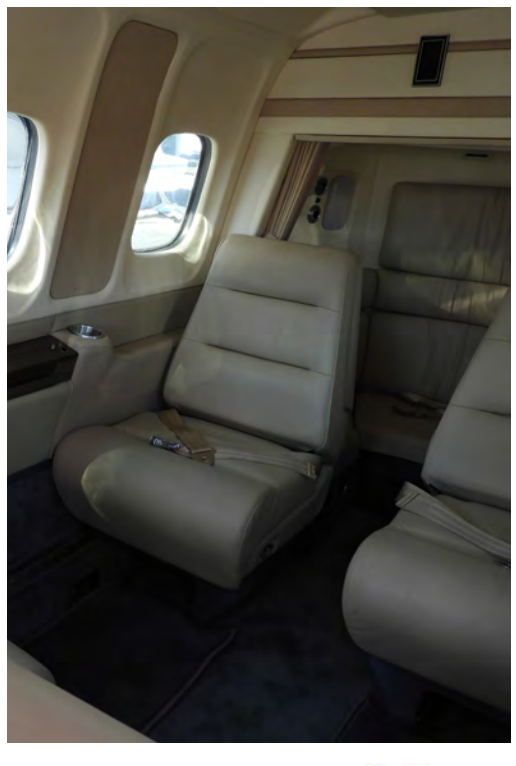
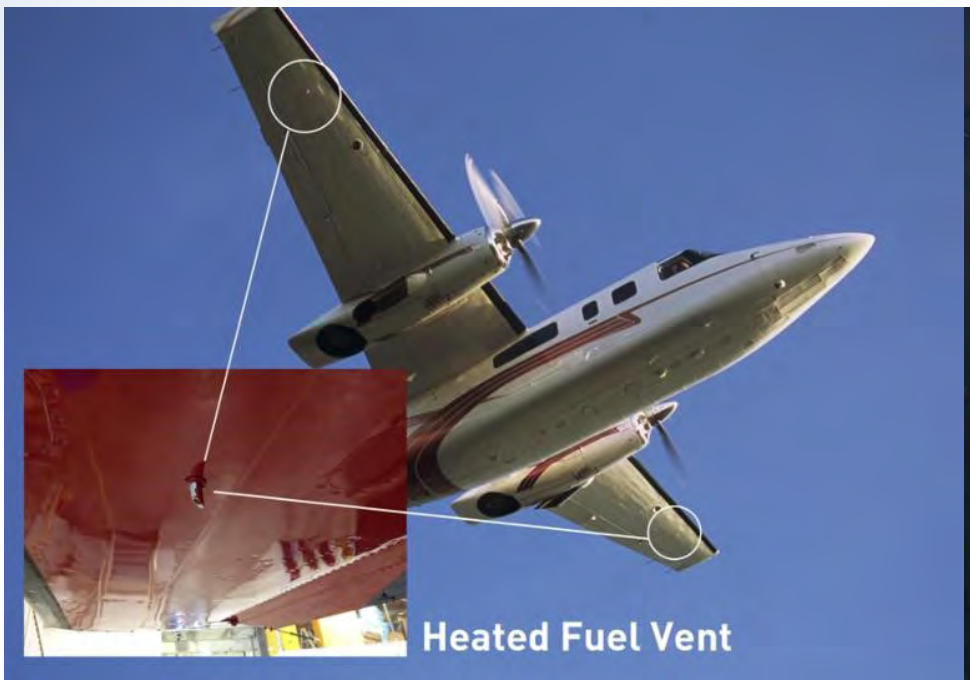


# Anti-Icing: More than Windshield and Pitot-Static Heat



Anti-ice measures on a turboprop Twin Commander protect lots more equipment than the windshield, pitot static probes, and engine inlets. Generator inlets and the rudder trim tab are protected by thermostatically controlled heated rubber boots. The fuel vent tubes are wrapped in a heated metal foil. And, the top of the horizontal stabilizer and bottom of the rudder horn have heated metal plates.

It's important to make sure all of these components are in good condition and working properly before venturing into known icing. Generator inlets, for example, are located on the engine nacelle directly behind the prop and therefore subject to significant erosion. Fuel vent tubes are exposed to the slipstream and also suffer from erosion. The rudder trim tab and upper and lower rudder plates protect these surfaces from accumulation of ice between very closely spaced surfaces.

Checking and testing anti-ice components is best done by a Twin Commander-authorized service center, and not just because some of the components—the upper and lower rudder plates—are difficult to reach. Service centers are trained and equipped to test the components properly using the right tools and methods. Plus, they have access to improved versions of some of the components that have been developed recently by Twin Commander Aircraft LLC.

For more information about anti-ice components on your Twin Commander, contact your authorized Twin Commander Service Center

# How Icing Can Lead To Wing Stall

Freezing temperatures and the weather phenomena associated with it—snow and ice—have just about disappeared with warmer months. Except in the flight levels.

Airframe icing can be a real concern in the spring and early summer when ambient temperatures and moisture saturation aloft can be ideal for the formation of ice on wings and tail leading edges, propeller blades, engine inlets, and windshields.

As all pilots know, airframe icing belongs in the same category as thunderstorms as a flight condition to be treated with utmost respect. Knowledge is key to safely avoiding ice or dealing with it in an airplane approved for flight into known icing, as is the case with Turbo Commanders.

The FAA has just added to the icing knowledge base with a new "Ice-Induced Stall Pilot Training" film. Despite the government-gray title, there is much to learn in this 30-minute production, accessible on YouTube:

The film is an update of NASA's original 1998 video on tailplane icing, and in the introduction the FAA says the update was prompted by a 30-year study of icing-related accidents that concluded that most such accidents resulted from wing stalls and not tail stalls. Thus, the film aims to help pilots understand the phenomenon of wing and tail stall while flying in icing conditions by examining icing certification rules and recommending cockpit procedures to mitigate the potential for icing-induced stalls.

Some interesting points made in the film:

- The majority of the general aviation fleet, including aircraft previously certified for flight into icing conditions, may not meet the latest icing certification standards. Many aircraft flying today were certified before the latest anti- and deice certification rules were enacted. A study of non-fatal ice-related upsets over the past 25 years found that the stall warning did not activate before a wing stall occurred. The study involved many different aircraft models in the cruise, approach, and landing phases of flight.
- The study concluded that an airplane's susceptibility to tailplane stall may not be known, and that the stall warning system may not activate prior to a stall in icing conditions.
- An ice-contaminated wing increases stall speed significantly—as much as 20 knots.
- One of first signs of airframe icing is an increase in drag, resulting in the need for more power, loss of climb performance, and loss of airspeed.
- Tail stalls are very rare, but can occur, usually with full- or nearly-full flaps deployed, which moves the center of lift aft on the wing. Control forces will feel lighter, the pilot may have difficulty trimming, and could experience PIOs. The recovery from a tailplane stall is opposite that of a wing stall—pull back on the yoke, gradually reduce flaps, and decrease power.

The FAA is leading a rulemaking effort to both update training for wing-stall recognition and recovery, and cockpit procedures in icing conditions. In the meantime, devote 30 minutes to adding to your knowledge of, and respect for, airframe icing. Watch the film.

Thierry Pouille in Ahmedabad awaits refueling.

# The Air Journey 2017 Around the World Westbound Journey

By Thierry Pouille

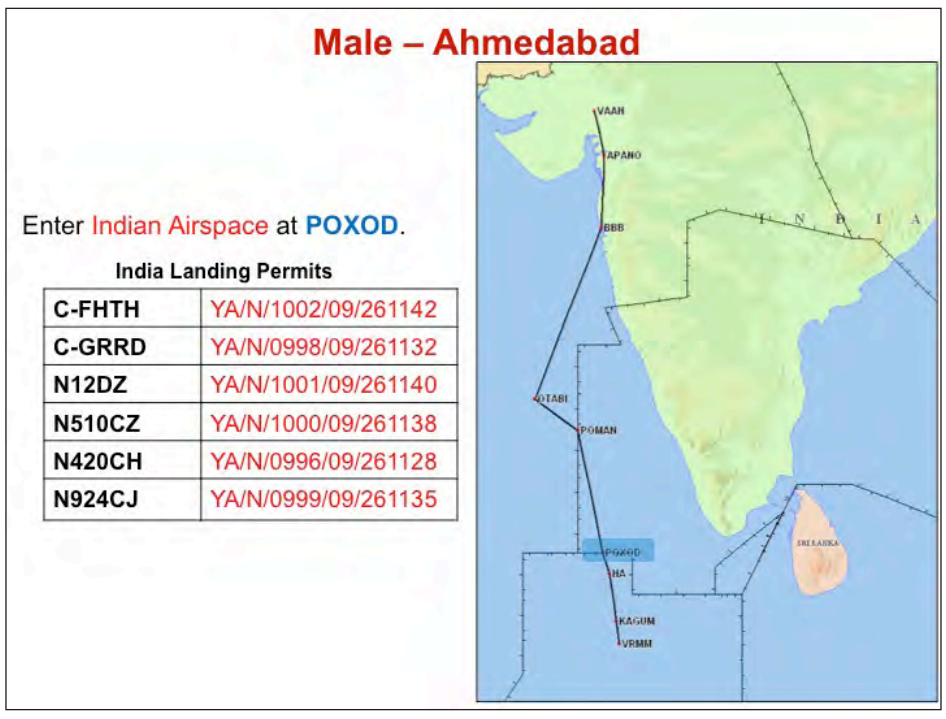
Let's continue the story of our 2017 Air Journey Westbound Around the World flight by exploring the leg from Male in the Maldives to Ahmedabad, India. If you talk to pilots flying the world you soon realize that India's approach to air traffic control, customs, culture, and everything surrounding their way of doing things is totally different from what we are used to elsewhere in the world. The only common element is their use of the English language, even in ATC terminology, thankfully.

This leg is 1,215 nautical miles following the airways, which doesn't give us a straight-line route even over the ocean. We have to follow the published routing.

In the Cessna Citation CJ3 flying at flight level 450, we are hoping to get direct routing whenever possible. Well, that doesn't happen in India.

We had to use the old trick of claiming weather ahead of us and ask for deviations in order to get any kind of shortcut.

Also, the clarity of the country's communications equipment is very weak. We're wondering if they're still using 1950s-vintage radios! It's not unusual in that part of the world




for private airplanes flying at altitudes above the airlines to be used as an airline repeater since the airline pilots often cannot reach ATC. As the flight follows its path, we were soon cleared for the approach. The handling from one sector to the next goes pretty smoothly, with one exception when we were asked to reconnect with the previous controller. Apparently, the landline, or whatever they use on the ground, is not as sophisticated as is the case in the rest of the world. The landing happened with no issue.

Ahmedabad is a pretty busy airport and we are soon taxiing into one of the largest parking areas that we've seen lately but, amazingly, it is totally empty.

Through ground communication we parked in a unique spot on the edge of the runway. We shut down after requesting fuel and were met by numerous people from the handling company. That's one of the characteristics of

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# The Air Journey 2017 Around the World Westbound Journey

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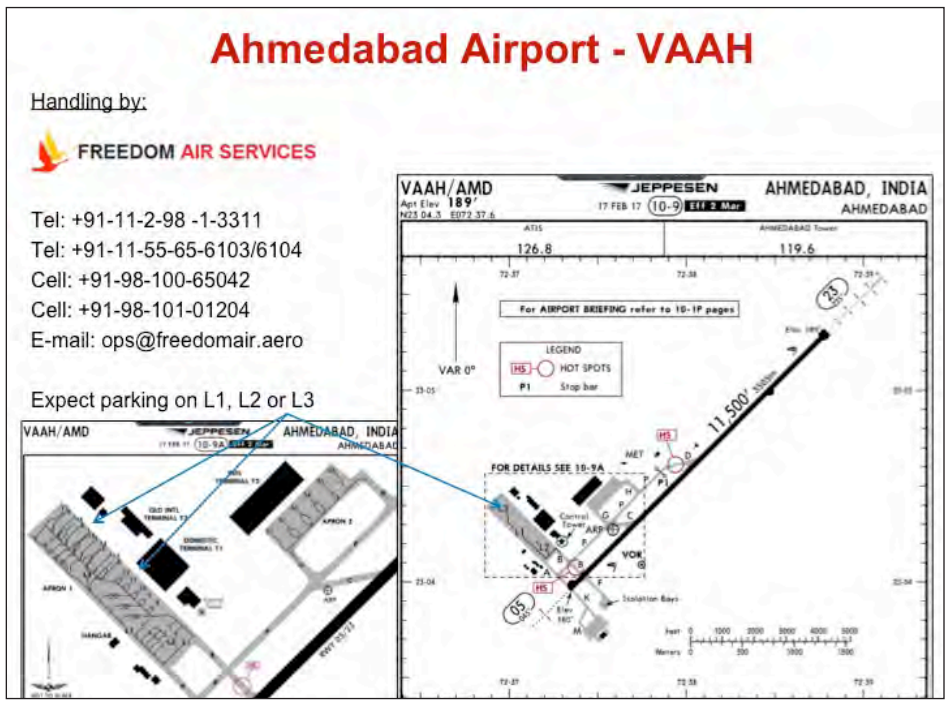



India—to do any one job requires at least 15 people.

As the other airplanes start to follow us and arrive, they are not parked next to us but

directed to another corner of that big expansive area. Being the organizer of the journey, I walked my way up to the other corner wearing my yellow vest so I could easily be spotted by the Air Journey participants in case there would be any other traffic on the tarmac. But there was none—it is only our six airplanes. When I reached the corner we were told that there is no parking available on this long tarmac and we have to push the airplanes by hand into a gravel-surface parking lot usually reserved for buses.

After arguing with some airport staff and meeting with the director of the airport, no one would allow the turboprop to be parked on the tarmac. As for the jet, we decided to go ahead and park at one of the many empty spots and told them we would not move the plane.

After long argumentation, waiting a long time for fuel and a long time for transfer, here we are in India at it again! While a beautiful country culturally and physically, there seems to be total disorganization on the ground where the right hand doesn't know what the left hand is doing.

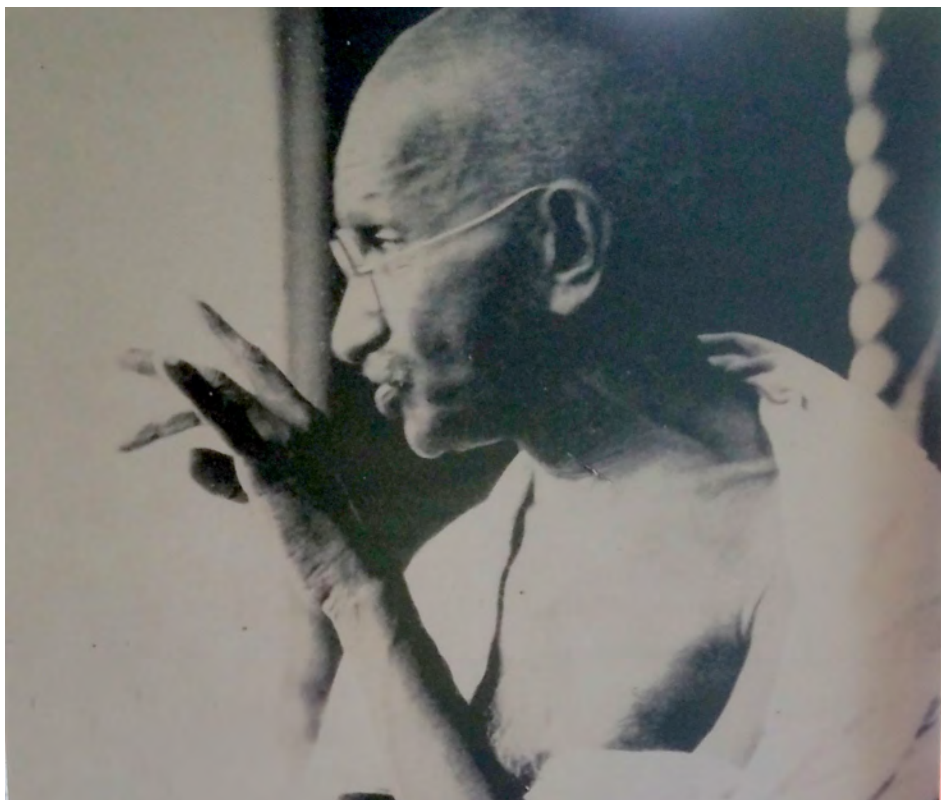
To this day, the only explanation we can come up with for that absolute nonsense over parking is the fact that Ahmedabad is the home town of the prime minister of India. He has his own tarmac and own

hangar, and since he can show up unannounced, or at least with very short notice, it was therefore important that the whole tarmac area should remain clear.

On our day of departure I was extremely surprised to see a CJ2 Citation with India registration parked in the gravel area. No tug is in sight, only manpower available to move the plane around. The bottom line for our next flying journey we will be to avoid a layover in Ahmedabad but, still, it's an airport that can be used for a tech stop, refueling, or clearing customs.

Looking forward to our next leg on the 2017 Journey Around the World. (photo: Photo of Ghandi over door – crop out door)

*Air Journey founder Thierry Pouille has visited 172 countries and landed in more than 95 in his or Air Journey participants airplanes.*



# Time to Upgrade Your Aircraft Seat Belts?

Aircraft restraints—seat belts—typically don't get much consideration when it comes to adding style and presentation to your interior. Aircraft Belts, Inc. (ABI) can change that perception, and you can find out how at EAA's AirVenture.

A sister company to Twin Commander Aircraft, Aircraft Belts manufactures and sells custom designed and built aircraft restraint systems for both crew and passengers, as well as providing replacement components for standard restraint systems on a variety of aircraft models. Configurations range from traditional lap belts to three-point restraints (lap and shoulder harness) to five-point crew restraints. Restraint buckles are available in lift-lever, push-button, and rotary configurations.

ABI also is offering replacement restraint systems that feature distinctive custom-engraved lift-lever lids featuring your 2-D unique design or artwork.

ABI will have booth 3070 in Hangar C at AirVenture Monday, July 23 through Sunday, July 29 in Oshkosh, Wisconsin, to showcase its capabilities to custom-design restraint systems. ABI also will introduce its new line of competitively priced standard restraint system substitute parts for various aircraft including Cessna and Piper singles.

If the restraints in your aircraft are looking a bit worn, or are a mismatch with your interior colors, plan on a visit to the ABI booth at AirVenture. You also can contact Greg McCulloch at Aircraft Belts at 919-692-5006, or email him at gmcculloch@airbelts.com. He will provide a quote on a stylish and distinctive set of new restraints.

EAA AIRVENTURE OSHKOSH
JULY 23-29, 2018

For more information see http://aircraftbelts.com/.

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