King Air

A MAGAZINE FOR THE OWNER/PILOT OF KING AIR AIRCRAFT

MAY 2020 • VOLUME 14, NUMBER 5 • $6.50

Long Haul

Follow a King Air 200's Trans-Atlantic Journey

King Air

May 2020 Volume 14 / Number 5

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SUBSCRIPTIONS
King Air is distributed at no charge to all registered owners of King Air aircraft. The mailing list is updated bi-monthly. All others may subscribe by writing to: King Air, P.O. Box 1810, Traverse City, MI 49685, or by calling 1-800-447-7367. Rates for one year, 12 issues: United States $15.00, Canada $24.00 (U.S. funds), all other foreign $52.00 (U.S. funds). Single copies: United States $6.50, Canada/Foreign $9.00.

COVER PHOTO
Courtesy of Textron Aviation

Going Solo

Flying a King Air on my First Multi-Continent Crossing Alone

by Deanna Wallace

The author piloting a King Air.

Every pilot remembers their first solo flight. It's a huge milestone where, after hours of training with a flight instructor, you are finally deemed ready to take the aircraft up on your own with no one else on board. Those first few moments, as your wheels leave the ground, are both exhilarating and terrifying as you realize you are completely on your own and there is no longer a more experienced pilot next to you making sure you do everything correctly. Truth be told, no pilot does everything perfectly on their first solo, second solo or any flight thereafter. The best pilots are those who recognize there is always room for improvement and are constantly striving to make their next flight even better. I am more than 6,000 flight hours past that first solo flight milestone, but I recently had another first solo milestone that will forever be etched in my memory.

Last summer, I made three trans-Atlantic crossings in private aircraft with experienced international ferry pilots and mentors, Joe Casey and Margrit Waltz. Two of those crossings were in Beechcraft King Air 200 models and one in a smaller, piston-powered, multiengine aircraft. Although each crossing had similarities, each trip was unique in its own way and I gleaned more information each time through slightly varied routing, changing seasons and different aircraft capabilities. Later, an opportunity arose for Joe and I to pick up two separate King Airs from India and ferry them back to the United States at the same time. This particular trip was supposed to be my first "supervised solo" multi-continent crossing, as I would be the sole occupant in the aircraft but have a mentor nearby in another aircraft watching and guiding when needed.

One of the first things I was taught on the initial crossing was not everything goes as planned and flexibility is the name of the game. In the case of the "supervised solo," only one of the aircraft was ready to go, Joe was unable to make the trip himself, and I was sent to India to make the more than 9,000 nautical mile trip back to the U.S. alone. In my head, just like when I flew my very first solo flight as a student pilot, I knew the experience and training I'd received on the previous crossings was sufficient and I was ready to make this trip, but until you're in the aircraft alone and doing it yourself it simply doesn't seem *real*.

The Mission Begins

I left the United States late on a Sunday night and arrived in Ahmedabad, India, early Tuesday morning. After a sufficient rest period, I was escorted to the aircraft for the first leg of the trip. My preflight inspection found an airworthy, but very dusty, aircraft that had been parked outside after months flying in India. The makings of a large, grass nest were found and removed from the nose wheel well (luckily, whatever made the nest was not discovered with it) and the aircraft was ready to be fueled before departure. In the U.S., most airports are well equipped with tugs to move general aviation aircraft without the engines being started. This was not the case at this particular airport.

Not only was there no available equipment to move the aircraft from the parking area to the fueling area, I was prohibited from starting the engines and taxiing the aircraft under its own power to the needed spot due to ongoing construction around the movement area. Although most of the traveling public would consider this King Air a small aircraft (compared to a Boeing or Airbus), it is still an aircraft of considerable size, weighing in at up to 11,500 pounds. I was asked to sit in the cockpit and watch from that vantage point as four Indian men pushed and pulled the aircraft more than 100 yards to the fueling station in 80-degree weather. This was no small feat, as the aircraft has no good points against which to push or pull and it took considerable time with several starts and stops as the men rested between segments.

Short final at Al Alamain International in Egypt (HEAL). It has an 11,500-foot runway providing access to a part-time passenger terminal.

A ForeFlight screenshot of the route between VAAH and OMAL, which included crossing into Pakistan and avoiding Iran by crossing 400 miles over the Gulf of Oman, then following its coastline into UAE.

Day One: Mentally Working Ahead

After fueling, I was ready to start the aircraft and get on the way to my first stop at Al Ain (OMAL) in the United Arab Emirates. It was an almost six-hour flight from Ahmedabad (VAAH) overflying a portion of Pakistan and crossing the Gulf of Oman. I requested my clearance and engine start and was feeling pretty good about everything until I taxied up to the runway and realized the onboard GPS unit still had not acquired a signal and was unusable in guiding me along the very specific track I would need to fly. I reluctantly admitted to the tower controller I would need to return to the parking area to sort out my issue, but did not expect to shut down the engines or delay long. Holding my breath, I powered down and restarted the GPS, double-checked the data cards and breathed a big sigh of relief when it powered back up and soon after acquired the satellite signals it needed. Within minutes I was airborne and on my way in the late afternoon hours.

As I settled in at my cruising altitude of 28,000 feet, with six hours of flight time ahead of me, the reality of this long, solo trek set in and I busied myself by mentally getting ahead of the aircraft, considering all routes, charts and potential contingencies I might run into prior to my destination. Satisfied all bases were covered, I enjoyed the view out the window as the sun set and darkness set in as I was leaving Pakistan's airspace for the 250-nautical mile leg over the Gulf of Oman to Muscat. Shortly after landfall, I began my descent into the UAE feeling good about the start of the trip.

Six months earlier, Joe and I had made this same trip heading the opposite direction, delivering an aircraft to India. One of the things I remembered most about that trip was the novelty of a female pilot at most of our stops through Asia and Egypt, particularly in the Middle Eastern countries. At almost every stop on the prior trip, Joe was automatically deferred to for fuel orders and operational questions. As this is not uncommon, even in the U.S., I was not bothered by the practice, but did take note that I did not stand out as an equal co-captain of the aircraft.

Because of limited general aviation activity in that part of the world, another issue we had run into was explaining to security and customs officials that we were pilots of a small aircraft and gaining access to the aircraft after overnight stays. Uniforms carry a lot of weight and while our standard "uniform" is a polo shirt and a pair of slacks, this time I brought my traditional pilot uniform of white shirt, black pants and gold-striped epaulets identifying me as the captain, even though there was no one else on board. Wearing this, I had virtually no issues, despite the language barriers, getting through security measures to and from the aircraft in a much more efficient and timely manner than the previous trip. As a female pilot, I also chose to wear a scarf over my hair at some of the Middle Eastern fuel stops as a sign of respect for their customs and to make male ground crews more comfortable interacting with me. Surprisingly, the question asked the most was how I was allowed to fly the aircraft by myself, as all King Air models are flown by two pilots in those countries.

Day Two: Terrific Endurance and Range

Day two had me leaving OMAL, flying up the Persian Gulf, stopping for fuel at airports in Saudi Arabia (OEGS) and Egypt (HEAL), crossing the Mediterranean Sea, and landing at my final destination for the evening, Brindisi, Italy (LIBR). My greeter in Saudi graciously took ›

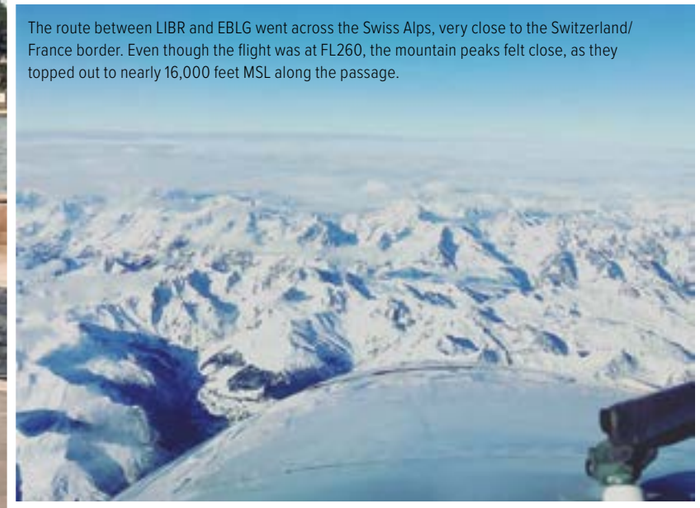
A street in Brindisi, Italy.

Getting fueled in Al Alamain, Egypt. The entire fuel crew came out for what they reported as their only fueling for the day.

the time to bring hot water, tea and accompaniments to the aircraft for me before my departure and helped me explain fueling instructions to a trainee fueler unfamiliar with the King Air. The next stop in Egypt gave me equally accommodating ground personnel and security guards that insisted I sit with them for a cup of hot tea after the plane was fueled and then tried to send me on my way with a stray cat, which I politely refused. This was one of the longer days of the trip because once you leave the UAE, there are no great overnight stops until you hit Europe.

The King Air 200 proved to be a great aircraft for endurance and range, even against moderate headwinds, as on this day I was able to cover more than 2,500 nautical miles in 12.5 hours of flight time. Much of that time was at a reduced power setting designed to stretch the fuel range on two of the legs that clocked in at just under five hours each. Although I had received great dinner recommendations from my ground handlers, I was too tired from the long day to do much more than shower and climb into bed, a common reality of single-pilot, international ferry flying. Days are long and nights are short, as you push toward your destination in as few days as is safely possible.

Wearing a scarf on Middle Eastern stops to follow tradition and help the ground crews feel a little more comfortable interacting with me.



The route between LIBR and EBLG went across the Swiss Alps, very close to the Switzerland/France border. Even though the flight was at FL260, the mountain peaks felt close, as they topped out to nearly 16,000 feet MSL along the passage.

Day Three: Handling Weather

The third flying day saw weather reports of overcast skies, scattered showers and a few icing reports along the route – nothing that a King Air can't easily handle. The skies started to clear as I made my way north from southern Italy, affording me great views of the Swiss Alps on my way to my next fuel stop in Liege, Belgium (EBLG). Liege, in my limited experience, is always an efficient tech stop where fuelers are quick to turn you and customer service reps pump you full of espresso and fill your pockets with snacks for the next leg. If you've never had a Belgium stroopwafel, you are missing out on a great treat!

My second leg of the day took me from Liege to one of my favorite stops, Belfast, Ireland (EGAA). I've found the fuelers there to be as equally fascinated by my thick, southern, Texas accent as I am by their Irish talk. Fuel stops always feel short as we have fun talking about life in our respective countries and actively encouraging each other to visit and stay longer. Although I was only five flight hours into my day, the sun was beginning to set. December days across the northern latitudes are short and darkness prevails. I enjoyed a brief sunset on departure, before the darkness set in to follow me the next three hours to Keflavik, Iceland (BIKF).

Thankfully, the ride was smooth and uneventful, leading to a typical, moderately high wind landing in Keflavik, ahead of predicted overnight snow showers. The ground

crews at SouthAir know their job and weather well and marshaled me to my parking stand pointed into the wind, so the likelihood of snow piling up on the airframe overnight would be somewhat mitigated. I made my way to a local waterfront hotel, also home to one of my favorite restaurants in Keflavik, Cafe Duus, and enjoyed a fresh seafood dinner before retiring for the night. I'll admit to a somewhat restless night, as high winds howled across the harbor shoreline and I kept rising to check on the snow accumulation outside my window.

Day Four: Dark and Frigid

The snow showers passed before my scheduled departure time the next morning and I arrived at an aircraft completely devoid of any snow accumulation or frost on the wings. I was very thankful for marshallers who knew their job and for high winds that kept moisture and snow from settling on my aircraft for long. It was still fully dark, as the sun doesn't rise until almost 11:30 a.m. at that time of year, and I took off toward my next tech stop in Kangerlussuaq, Greenland (BGSF) (or Sondrestrom, the much easier to pronounce Scandinavian name for BGSF).

In December, the sun doesn't even attempt to rise that far north, so my full leg and stop was entirely in the dark. The temperature was a chilly 16 degrees and my Texas heat-loving-self eagerly signed for the airport fees and called CANPASS to alert them of my expected arrival in Canada. After departure, I continued my trek southeast toward Goose Bay, Canada (CYYR), finally encountering some welcome daylight halfway across the Davis Strait.

Goose Bay is a small town located on the eastern shoreline of Newfoundland and Labrador. It boasts a population of just over 8,000, half of that being indigenous Canadian groups like the Inuit and Metis people. With an airport used since the early days of North Atlantic crossings and made famous by Earnest Gann's book "Fate is the Hunter," the town is a common starting and stopping point for aviators making the North Atlantic crossing to and from Europe, and for those travelers catching smaller flights out to remote fishing and hunting camps in the neighboring Canadian territories.

Day Five: Crossing North America

The next day, my final one, had me on the home stretch. One more stop in Montreal (CYMX) for fuel launched me onto my final leg to Fargo, North Dakota (KFAR), the new home for this King Air. Even with only two legs, crossing half of Canada and the United States from east to west is no short day, clocking in at eight

A view of flying over Greenland on a previous trip when it was light.

hours of flight time. I took the time on the ground in Montreal to gather all the requisite paperwork I would need to clear U.S. Customs and Border Patrol and to start corralling all the gear I had out for the trip.

As I was making my way across the snow covered Canadian and northern U.S. landscape, I was allowed ample time to reflect back on my newest "first solo." Crossing India, the Middle East, Egypt, Europe and the North Atlantic single pilot is no small feat. But while I was alone in the aircraft, this trip would not have been possible without the amazing support services provided by Shepherd Aero, based in Bellingham, Washington. Their dispatchers provided daily weather reports, knew preferred routes, filed international flight plans, pre-arranged fuel services and had my hotel room booked by the time I landed at the final stop each night. They tracked me each step of the way and constantly ensured that everything was going well with me and the aircraft. If anyone is attempting an international flight, I cannot recommend their expertise more. With planners and dispatchers available through every time zone for any unplanned events that might arise, they have the whole planet covered.

I also cannot say enough good things about how well the King Air 200 flew this mission. It may not be the fastest way to cross that distance, but it performed admirably and there was no environment in which it did not do well. The 200 consistently offered me an average true airspeed of 260 knots and a fuel flow of 260 pounds per side, with at least four segments of the route at a

A view of the Irish coast, on the way to a favorite stop in Belfast (EGAA).

reduced power setting for range. Final trip stats showed five flying days, 41 flight hours, four continents, stops in 12 countries, over 9,200 nautical miles flown and more than 22,000 pounds of jet fuel turned into noise! KA

Deanna Wallace has amassed over 6,000 flight hours since she started flying in 1997 and is a 20-year Gold Seal CFI/CFII/MEI with more than 2,000 hours dual given. She holds a Bachelor of Aviation Management from Auburn University and a Master of Aeronautical Science from Embry Riddle Aeronautical University. Deanna is single pilot typed in the King Air 300/350 and flies all King Air variants regularly, including the B100 with TPE-331 engines. Through her East Texas employer, Casey Aviation, she flies Part 91 managed King Airs, ferries aircraft worldwide and actively instructs owner-pilots in the PA46 piston and turbine series aircraft.

Aircraft Insurance and Pandemics

by Kyle P. White

Unprecedented times are upon us. In the past, *King Air* magazine has published dozens of articles on a variety of insurance topics. The content has revolved around experiences your fellow King Air operators have endured and we all have been able to learn from. Currently, the world is grappling to navigate COVID-19, which has sent the entire aviation community scrambling to protect our health, as well as our business. This virus is challenging each of us and providing no answers about how long this battle will last or what our "new normal" may look like. As we consider life "post COVID-19," we should also prepare ourselves for possible legal issues that may arise from this pandemic. While the aviation insurance industry may not have anticipated such a global challenge, there are hints of what may or may not be covered within your aircraft policy.

Third-party Liability

It doesn't hurt to look into potential third-party liability, how to manage it and ultimately, if your policy provides coverage.

You will find the term "sickness" used within your aircraft policy, so for the purpose of this article we will refer to COVID-19 as a "sickness." Like all risks, you should first focus on managing the exposure, in this case the risk of "sickness." As we have learned, social distancing is the backbone of the strategy to limit the spread of the "sickness." Staying 6 feet apart in any aircraft is difficult, particularly in business aircraft such as the King Air. Currently, some operators, particularly those who fly Part 135, are not flying because their clients or owners are staying close to home. However, many operators also want to be ready for a trip, should the need arise. Part of being prepared for a trip is making sure the necessary precautions are in place to protect both crew and passenger health. To ensure they are healthy and ready to fly, some crews are self-isolating. Other operators have explored operating single pilot to protect themselves, as well as their second pilot, to avoid inadvertently spreading the "sickness." For operators flying fellow employee passengers, many have implemented a self-imposed restriction of only carrying a 50% passenger load to maintain proper social distancing. Each of these options are good risk management strategies, but when our management of risk fails us, we turn to the insurance policy. What coverage do we have?

Insurance policies for King Airs are typically very broad. Below is specific wording from an actual King Air policy and the endorsements that clarify coverage. Remember, endorsements modify the policy to add or remove coverage to the policy. Near the beginning of every aircraft policy there is a statement: "When and where you are covered."

In the particular policy we reviewed, it reads:

"You are covered for occurrences that take place during your policy period while your aircraft described on the Coverage Summary Page is anywhere in the world. By an occurrence we mean any accident or continuous or repeated exposure to conditions which you don't expect to happen resulting in bodily injury, property damage or loss of or damage to your aircraft. All injuries or damage resulting from generally the same conditions will be considered one occurrence."

The policy starts with a very broad attitude toward expansive coverage. That coverage becomes more restrictive when the term "bodily injury," is further expanded and defined: *"bodily injury caused by your aircraft, including sickness, disease, mental anguish, personal injury or death."*

"Sickness" is the key word in the definition and would lead one to believe there is coverage in the event a third-party contracts a "sickness" onboard your aircraft. The difficulty will be the burden this places on the legal interpretation of the policy. The insurance policy is a legal contract and coverage is triggered upon determining an "occurrence" has happened. It is also worth noting, aircraft insurance policies are not designed to cover King Air owners and operators from perils covered under workers' compensation. The policy specifically addresses this with the following:

"EXCLUSIONS, unless otherwise provided in the policy of insurance, the liability insurance afforded under this policy shall not apply to: Bodily injury, sickness, disease, mental anguish or death of any employee of the Named Insured while engaged in the duties of employment, or any obligation for which the Named Insured or any company as Insurer may be held liable under any workmen's compensation or occupational disease law."

Upon reviewing the policy wording as outlined above, an insured is certainly entitled to file a claim should they feel a third-party passenger was harmed due to a "sickness." If a claim like this does arise, it is possible the standard exclusion that is in all aircraft policies: *"Noise and Pollution and Other Perils Exclusion"* could come up for debate, specifically with focus on "other perils." While the exclusion is a lengthy and wordy endorsement, I encourage you to review it in your policy. Before the COVID-19 pandemic, my personal interpretation of the need for this exclusion was to avoid covering claims for things such as an angry homeowner next to the airport accusing an aircraft operator of being too loud. Or a King Air with an aging and cracked fuel bladder that seeped fuel onto the hangar floor that then flows to the drain leading to the sewer system. Now, reading the exclusion with the thought of "sickness" in mind, you have to wonder how the legal system may or may not apply "… and Other Perils Exclusion." The following are a few excerpts from the policy that includes "sickness":

"This insurance does not apply to any liability … including bodily injury, fear of bodily injury, damage or fear of damage, personal injury, advertising injury, sickness, disease … directly or indirectly arising out of, resulting from, caused or occasioned by, happening through, in consequence of, or in any way involving: Pollution or Contamination."

How the policy defines "contamination" could be worrisome as it specifically uses the words *"…'Waste' of any kind whatsoever, including solid waste, waste water, waste oil, infectious medical waste, and human."*

This is a new peril for all of us to consider and should be reviewed with your broker, underwriter and legal counsel to see how your policy may or may not respond to a claim involving COVID-19.

Possible Credit Endorsement

Despite aviation coming to a screeching halt amid this pandemic, we continue to see the insurance market hand out substantial increases. One way to reduce your outlay for the aircraft insurance policy is to look for the "lay-up" credit endorsement. The intention of a lay-up credit is to return premium dollars to the insured during periods of reduced exposure. Typically, this reduced exposure resulted from the aircraft being out of service for extended maintenance. There are many variations of the formula used in calculating the lay-up credit. A typical endorsement could look something like this:

"In the event an aircraft described on the Coverage Summary Page is laid-up and out of service for any reason other than loss or damage covered by 'Your Aircraft Physical Damage Coverage,' and you have received prior written approval from the Aviation Managers, we will suspend the in-flight portions of your Coverage and refund premiums for the period the aircraft is out of service, computed at fifty percent (50%) of the pro-rata premium which applied to the aircraft. You also agree to advise the Aviation Managers, in writing, as soon as the aircraft is returned to service. However, no refund will be made for any lay-up period of less than thirty (30) consecutive days."

The lay-up credit is causing the insurance underwriters a great deal of pain, both financially and administratively. The actuaries most likely did not anticipate their entire portfolio of clients would be seeking a portion of their premium back, due to the effects of a global shutdown of travel. These refunds could further exacerbate the need for the insurance underwriters to seek even higher premiums at your renewal and pushing to eliminate the lay-up credit endorsement in the future. Talk to your broker about what you may be entitled to if you currently have this endorsement. If you don't, it may be something to inquire about in the future. Especially if you have a lengthy phase inspection on the horizon or other time-consuming maintenance scheduled.

Again, these are unprecedented times. There has been both social and political pressure on the insurance companies to cover COVID-19 related claims and provide premium relief. While this sounds enticing initially, if these payouts become precedence, we will continue to see eyebrow raising rates continue into 2021, with potentially fewer carriers competing for your business. KA

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Tips for Using the C90 Fuel System

by Tom Clements

Photo credit: Banyan Air Service

The fuel system on the new C90GTx models that are being delivered in the year 2020 is nearly identical to the fuel system that first appeared on the King Air A90 when it made its appearance in 1966 … a "mere" 54 years ago. The A90's predecessor – the Straight 90, the first King Air model of all – had a similar but different system, one that had two electric boost pumps per side instead of one. Yes, from the A90 to the C90GTx there are some significant differences – many of which will be presented in this article – but overall, the system remains the same. Whether you fly an A90, B90, C90, C90-1, C90A, C90SE, C90B, C90GT, C90GTi or C90GTx (did I forget any?), this article is for you. Other King Air models? Feel free to read these pages, but they will not be directly addressing the fuel system of other models.

I will begin by reviewing the tanks, all of which are rubberized bladders. For most of these models the POM or POH lists the nacelle tank quantity as 61 gallons and the wing tank quantity as 131 gallons. That yields 192 usable fuel gallons per side or 384 gallons total. All A90s and B90s, and C90s up until LJ-529, had individual gauges that displayed left and right nacelle quantity and left and right wing tank quantity – a total of four gauges. There were marks on the face of the gauge showing *Empty* and *Full* as well as *quarter*, *half* and *three-quarter* quantity; no numbers for gallons nor pounds were presented. The gauges received information from float-type sensors in the tanks. As is true for most float-style gauges, their accuracy and reliability were rather horrid. Starting with LJ-529, the gauging system was changed to one that used capacitance probes instead of floats. (Note: LJ-502, the very first C90, was the prototype test airplane for this system so it, too, has the newer style system.) The two separate gauges per side were replaced with a single gauge per side that reads in pounds of fuel. The scale went up to 1,400 pounds. Since one side's full fuel would be 1,286 pounds – using the common conversion factor of 6.7 pounds per gallon of Jet A fuel – there should never be a situation in which 1,400 would be insufficient to display the side's total quantity, even when the fuel is very cold and hence very dense. A two-position toggle switch lies between the two gauges. Its top position is labeled "Total" and its bottom position is labeled "Nacelle."

I want to divert for a moment to insert a critical warning. For you pilots who perhaps fly a 200 or 350 on a regular basis and only do occasional fill-in duty in a C90, there is a nasty "gotcha" waiting for you on that fuel panel. You are used to using a switch – not a two-position toggle, but rather a two-position switch spring-loaded to the upper position – that reads the main tank quantity in its normal, "Up" position and reads aux tank quantity when held down against the spring force that holds it up. There is no "total" reading. Of course, most of the time the auxes are empty, so the main reading *is* the total reading.

There is a possibility that a fuel exhaustion accident that put a C90 into the Caribbean was caused by the pilot's misunderstanding of the gauges. It would be easy to think that the 800 pounds showing with the switch in the "Up" position was main quantity and the 400 pounds showing with the switch in the "Down" position was aux. *Hmmm … 800 plus 400 is 1,200. Yeah, I have close to full fuel on board, good to go.* But no! The 800 pounds being read was the total on that side. Instead of 2,400 pounds the plane departed with 1,600 pounds … not quite enough to complete the long overwater leg.

Please read the labels on the selector switch carefully and remember that in the C90 system the nacelle reading is *already included* in the total reading.

Why do we even *have* a reading for nacelle quantity? So long as we know the total per side, that's enough, right? Never let the total reach zero and we will never run out of fuel, right?

Wrong! Realize that every bit of fuel the engine ever consumes comes from a nacelle tank. If that tank reaches zero, we are either going to lose engine power or we must use crossfeed to supply the fuel from the other nacelle tank.

Since wing tank fuel is useless until it gets transferred into the nacelle tank, how is that accomplished? Two ways: (1) The electric transfer pump; (2) Gravity flow.

Gravity Flow

Since liquid "seeks its own level" the nacelle level must drop before any wing fuel flows into the nacelle. When one looks at the location of the two fuel filler caps – one about half-way out on the outboard wing and the other atop the nacelle – it seems that the nacelle level is only marginally above the top of the wing fuel. In regard to height, that is correct. But in regard to volume, it's not even close. Realize that the nacelle tank becomes quite narrow near its bottom. Why? To allow room for the main wheel and tire to retract. Most of the nacelle tank's volume is in the upper half. Before gravity flow moves fuel from the wings into the nacelle, the nacelle tank must decrease to about 150 pounds, or 3/8 full.

Think again of the 200- or 350-experienced pilot filling in on a C90. In the bigger models, fuel transfer from aux to main is automated, usually requiring no pilot action at all. If this pilot forgets that the C90 is different, he or she may take off without turning the transfer pump switches on. When will the mistake manifest itself? Probably not for a long, long time.

First, the no fuel transfer annunciator(s) receive no power with the transfer pump switch(es) off, so no warning light will advise of the error. Looking at the total or nacelle quantity on the gauge will show no problems for at least 30 minutes. In fact, if the pilot is not quite familiar with normal readings on the gauge, he/she could go for over two hours without noticing anything amiss. So, what would/should be noticed? This: That the nacelle tank level is not staying between 300 and 400 pounds.

Without the transfer pump keeping the nacelle relatively full, its quantity will drop to the 150-pound figure mentioned previously. A rule-of-thumb is that a PT6A-20 or -21-powered 90 will use about 600 pounds the first hour,

total – 300 pounds per side (closer to 700 pounds for the -135As of the GTs). Thus, within the first hour it should be obvious that something is wrong since the nacelle will have decreased to about 150 pounds. "Gee, the nacelle is going to be empty in less than another hour if it keeps decreasing at the rate I've observed!" No, it won't. Remember that the 150-pound figure represents the point at which gravity flow will begin. As the nacelle level decreases further, the wing fuel will seek its own level and start to be used. You might say that we are now drawing fuel out of a very large tank since all five bladders contain fuel at the same level. What's wrong with this?

Actually, not much. Rarely do we land with less than 300 pounds of fuel remaining per side and usually it is quite a bit more. But here is the important fact to know: When the nacelle tank goes empty, reading zero, the total quantity should still be reading about 200 pounds. This 200 pounds – actually, 28 gallons or 188 pounds – is sitting too low in the center section wing tank to flow by gravity feed to the nacelle. The legal and comfortable fuel reserve for which you planned has been significantly compromised, hasn't it?

What is the takeaway here? In addition to not making the mistake of forgetting to activate the transfer pumps, I am trying to emphasize the importance of regularly checking not just the total fuel quantity but the nacelle quantity also. That step should be done at least every half-hour. I tend to combine it with a deliberate check of the loadmeters and voltmeter.

Transfer Pumps

These impeller-type pumps (one per side) are located at the low spot of the center section tank … the lowest spot in the wing tank complex of bladders. In normal operation the pump cycles on and off so as to keep the nacelle tank within about 10 gallons full. Since full nacelle fuel is 61 gallons or 409 pounds, when it drops to about 51 gallons or 342 pounds the pump should automatically activate to refill the tank. The pump has a 550 pounds per hour (pph) flow rate so even with the engine at a high power setting the pump will be able to supply more fuel into the nacelle tank than the engine is taking out. There are actually two high-level shutoff switches in the nacelle. If we had only one and it failed, the pump would run continuously, decreasing its expected lifetime. (There are vent lines at the top of the nacelle that allow extra fuel to return to the wing tanks so no pressurizing of the tanks nor venting overboard of fuel would occur.) One high-level switch should activate a tad below 60 gallons and the other a tad above.

Let's be realistic. With the typically not-too-stellar accuracy of even the capacitance type fuel gauges, can you tell the difference – the difference of a couple of gallons? Of course not! But here's what's important: Every time you check the nacelle fuel level it should be between about 300 and 400 pounds. If ever it drops below 300, be aware that something is probably wrong … either the gauge is in error or the transfer pump is not working. (As discussed, the inoperative transfer pump may be because we forgot to turn it on!) Similarly, there is a problem if the nacelle is always reading 400 pounds … the transfer pump seems to be running continuously.

The C90A and after models use three-position transfer pump switches – override, auto and off. The previous models had only two positions – on and off. The "On" position is exactly like the "Auto" position … that the pump cycles on and off as required to keep the nacelle within about 10 gallons of full. The "Override" position keeps the pump running 100% of the time, keeping the nacelle 100% full and returning the excess back where it came from via the vent lines. (More about the usefulness of this is to come.)

If we did indeed turn the transfer pump switches to "On" or "Auto" after starting as we should, then here is how the system should operate. Unless one of the high-level switches in the nacelle is activated, then the pump will begin immediately. It does not wait for the low-level switch to be hit; it starts now unless it is broken or the nacelle is full. Once the nacelle is full – one of the two high-level switches activated – then the pump stops until triggered by the low-level switch.

In the line connecting the transfer pump to the nacelle tank is a pressure switch. The switch's setting is at about 2.5 psi, not that it matters very much. The pump typically puts out about 25 psi of pressure. When the pump begins pumping air instead of fuel – as the wing tank complex of bladders is finally empty – the pressure drops below 2.5 psi. A signal is sent to an electrical printed circuit board (PCB) that activates a 30-second timer. Anytime within the next 30 seconds, if the pressure rises above 2.5 psi the system resets and returns to normal. This allows for the momentary lack of pressure due to sloshing fuel when the tank is approaching empty but is not yet totally there.

When the output pressure drops below 2.5 psi and stays low for the full 30 seconds, then the printed circuit board does two things. First, it turns off the pump to prevent possible damage caused by the pump spinning too fast and creating excessive heat. Second, it activates the "No Transfer" annunciator. In my opinion, this light does not warrant the warning, red status, yet in all models up to the C90B it is indeed a warning light. In the C90B and later models it was changed to a caution, yellow light. Good move, Beech!

As all of you have probably experienced near the end of a long flight – or even a short one if you have a large cabin load – it is expected and normal to have the left and right "No Transfer" annunciators illuminate when the total fuel quantity gets down to just nacelle fuel. With the main tanks empty and the low-level switch activated, the pumping of air obviously takes place. It is fun to see how much time passes between when the first side's and second side's light appear. How close was the consumption rate of the two engines? How even was the left and right fuel quantity when the fueler finished doing his task?

When the first "No Transfer" light appears – as was expected; no surprise – the proper action is to turn off the transfer pump switch. This does two good things: First, it assures that the pump is indeed no longer running and perhaps shortening its life. Second, it kills the annunciator. No need for that light to stay on, burning out the bulbs and making the passengers nervous. (Remember what I wrote earlier?

C90 Fuel Panel

If we never turn on the transfer pump switch the annunciator cannot operate, cannot give us a reminder of our mistake.)

Another thing to do when that first "No Transfer" light illuminates is to start a timer. **If you are shut down on the ramp within no more than one hour from now, you will never run out of fuel.** Yes, "never" is a powerful word and if the nacelle bladder sprang a big leak now, I reckon we could still run out of fuel. As we have presented, the nacelle should contain *at least* 51 gallons of fuel when the transfer pump started pumping air due to the wing tanks being empty. Even the powerful -135A engines won't burn that much fuel in an hour, especially since some of this time will be at the lower powers associated with the descent, approach, and landing phases of the flight.

What about the times when we have more total than nacelle fuel so we are *not* expecting the "No Transfer" annunciator yet it illuminates? This indicates failure of that side's transfer pump. Expect the nacelle level to drop significantly so that gravity feed begins and keep a careful eye on nacelle tank quantity. You need to be shutdown well before it reads zero, even though the total will still be reading about 200 pounds when the nacelle goes empty. (Reading the 28 gallons that won't flow uphill.)

To desire an absolutely full fuel load is somewhat rare unless we have a max gross takeoff weight limit at or near 10,500 pounds or we have a light cabin load. But presume that we do indeed desire to top the tanks entirely on our *next* flight. There is a neat little trick that saves the fuelers' time – and perhaps our nacelle's paint – that works when we start the descent for landing if the "No Transfer" lights had not previously illuminated. If you have a C90A or after, just place the left and right transfer pump switches up to "Override." Doing that will force the transfer pumps to run continually until we complete the shutdown checklist. By doing this, we will know that the nacelle tanks are totally full so all the lineperson must do is top off the wing fillers. There'll be no need to drag the hose on the nacelle's nice new paint job.

Almost the same thing can be accomplished in the earlier models that have just the "On" and "Off" transfer pump switch positions. Here's how: Leave the switches in the ON position and tap the transfer test switch out of its spring-loaded, center position to both the left and right sides. I will talk more about this test switch in the remaining paragraphs, but for now what this action does is to start the transfer pump immediately, without waiting for the low-level switch to be activated. Once activated, the pump won't stop until the high-level switch is hit. Since there is no way to accurately know if the nacelle tank is totally full or just relatively close to being full, tap that switch again a couple or three times during the approach and landing before you stop on the ramp. By doing so you can guarantee the nacelle tank will be darn close to full.

Now about that transfer test switch …

Somewhat like the "No Transfer" annunciator, the transfer pump switch must be "On" for this switch to have any function. What exactly does it do? Two things. First – as was taught in a previous paragraph – it starts the pump running immediately, without waiting for the low-level switch to be activated. (If you read carefully what has been previously written in this article, the same outcome could be achieved by cycling the transfer pump switch to "Off" and then back to "On.") Second, the transfer test switch changes the operation of the "No Transfer" light. The 30-second delay and the 30-second shutting off the pump are eliminated entirely. Instead – and quite simply – the "No Transfer" light will be on if the pump's output pressure is less than 2.5 psi and it will be off if the pressure is above that 2.5 psi switch's setting.

Based on this insight into what the switch accomplishes, there are three different scenarios that may be encountered when the switch is tapped to the side of interest. (1) Nothing noticeable takes place; no illumination of the "No Transfer" annunciator. (2) The "No Transfer" annunciator blinks on for a moment then goes back off. (3) The "No Transfer" annunciator comes on and remains on with steady illumination.

The explanation for scenario No. 1 is that the pump was already in the process of filling the nacelle tank. The light never came on because the pressure was already above 2.5 psi. Situation No. 2 indicates that the pump was still in a "waiting" state, waiting for the low-level switch to tell it to start resupplying the nacelle. Without the pump running, there was less than 2.5 psi at the sensor switch so the annunciator came on. Immediately however, the pump began operation, output pressure rose

above 2.5 psi, and the light extinguished. No. 3 indicates one of two things – try to figure out the reasons before I present them …

The first reason is that the pump is inoperative. Its motor gave up the ghost or perhaps its impeller is jammed and cannot rotate – time to have maintenance do some troubleshooting. The second reason is that the wing tanks are still empty from a previous flight or from some maintenance that involved draining the wing tanks. How did you do on this pop quiz?

Here's another quick quiz. Why is scenario No. 2 – the blink of the annunciator when the switch is tapped – so often followed by scenario No. 1 – no light at all – when you hit the test switch more than once? Answer: The first tap of the test switch took place when the pump was waiting to operate because the low-level switch had not yet been reached. Remember that once the pump starts operating, it doesn't stop until the high-level switch is hit. So, the pump was already running, putting out positive discharge pressure, when the subsequent taps of the switch were made.

A couple of closing thoughts:

The first-flight-of-the-day test of the transfer pumps is more satisfying and instructive by doing it in this manner: Take one hand and hold the transfer test switch to one side and use the other hand to now turn that side's transfer pump switch to "On" or "Auto." Unless the wing tanks are still empty, it should *always* result in a blink of the annunciator to verify that the pump is OK.

The second closing comment is to understand the danger inherent in the use of auto crossfeed. If you have not already done so, read "The Crossfeed Trap," an article in the *Clements' Corner* section of the King Air Academy's website and view the King Air Academy's YouTube video channel about that topic. I strongly encourage your standard operating practice be to leave the crossfeed switch in the bottom, closed position. KA

King Air expert Tom Clements has been flying and instructing in King Airs for over 46 years and is the author of "The King Air Book" and "The King Air Book II." He is a Gold Seal CFI and has over 23,000 total hours with more than 15,000 in King Airs. For information on ordering his books, contact Tom direct at twcaz@msn.com. Tom is actively mentoring the instructors at King Air Academy in Phoenix.

If you have a question you'd like Tom to answer, please send it to Editor Kim Blonigen at *editor@blonigen.net*.

Cessna: The Postwar Years – Part Two

The model 140 prototype reveals the new Cessna's simplistic design that favored functionality and economy of operation over performance. The tail stand was installed to facilitate adjusting the magnetic compass. (Textron Aviation)

The two-place Model 120/140 were modern, all-metal designs that established Wichita's Cessna Aircraft Company as a leader in the highly competitive personal, training and business aviation markets.

by Edward H. Philips

After five years of massive bloodshed, incalculable destruction and indescribable human suffering, World War II had ended in victory for the allied nations. During that terrible time the aircraft had come of age as a lethal weapon and contributed heavily to bringing the Axis powers to their knees.

Dwane Wallace (left) and his famous uncle Clyde V. Cessna were photographed in the early 1950s shortly before Mr. Cessna's death. In 1933 Dwane and his brother Dwight resurrected their uncle's defunct company and set it on a path to success. (Textron Aviation)

Priced at only $3,385, the Model 140 was a lot of airplane for the money.
(Robert J. Pickett Collection, Wichita State University Libraries, Special Collections and University Archives)

In the wake of that hard-won triumph, many officials within America's light aircraft industry hoped that thousands of bomber, fighter and transport pilots would be eager to swap their Boeing B-17, North American Mustang and Grumman Hellcat for Beechcraft, Cessna, Piper, Aeronca and Taylorcraft airplanes (to name only a few). To assist returning service personnel in winning their civilian wings, Congress enacted legislation, known as the GI bill, to provide financial assistance to men and women seeking a pilot's license.

Almost overnight the GI bill would spawn hundreds of new flight schools that would, in turn, need thousands of new airplanes. For America's general aviation industry in 1945, such possibilities boggled the mind and conjured up fanciful visions of overflowing corporate coffers awash in cash. There was, however, one serious problem: the law of supply and demand. When the United States government finally began releasing stocks of strategic materials to the nation's industries, Wichita's airframe manufacturers found themselves pitted against other companies in a bidding war for their share of the steel, aluminum alloy, wood, rubber and chemicals that were available.

The result caught small airframe manufacturers unprepared to deal with suppliers who, well aware that when wartime contracts evaporated so would their profits, demanded that huge quantities be ordered or they would get none at all. For example, piston engine suppliers wanted each lightplane manufacturer to buy hundreds of engines, as did companies selling propellers, tires, wheels, brakes, fabric and instruments. To buy in such large quantities posed a serious and potentially devastating threat: If demand failed to materialize, small manufacturers could be facing financial ruin.

Fortunately, the aviation optimists of 1945 proved to be correct – the light airplane industry had more business than it could cope with and anticipated a bright future. A multitude of flight schools were operating from coast-to-coast, many operated by former pilots of the United States Army Air Forces and the U.S. Navy and Marine Corps. Factories were operating at full capacity and could not meet demand. It is interesting to note that in 1946 there were more than 30 different types of light aircraft available (including helicopters) for the private owners to consider when buying a flying machine. At least 17 manufacturers were competing for sales, and it was actually easier to buy an airplane than it was to buy an automobile!

By contrast with today's production levels, it seems almost incredible that during the months of August and September 1946, airframe manufacturers reported delivering more than 4,000 aircraft per month, not including hundreds of large, transport category airliners rolling off assembly lines at the Boeing and Douglas factories. Postwar flying fever in America was so pervasive that one aviation leader predicted that flying "… is the most flexible means of transportation the world has ever seen. You can travel by boat only where there is water, by automobile only where the highway leads, by train only where the tracks are. The air is everywhere."

Into this economic boom stepped the Cessna Aircraft Company. As with other aviation executives after the war, Dwane Wallace and his management team were quick to realize that demand for training aircraft would likely skyrocket to unimaginable levels. The chief challenge facing Cessna, however, was to design and build an entry-level airplane that was more attractive, modern and appealing than the competition but at an affordable price. It did not take the engineering department long to come up with an airplane that fit those requirements – the Model 140.

Designed around the small, reliable and economical Continental four-cylinder, opposed engine rated at 85 horsepower, the prototype Model 140 was a blend of the old and the new. Although it featured an all-metal fuselage but retained a fabric-covered wing of semi-cantilever construction to save weight, the wing was built around aluminum main spars and stamped aluminum ribs that significantly

The four-place Model 170 was a logical outgrowth of the two-place Model 140, and filled a gap in Cessna's product line between the Model 140 and the larger, more powerful Model 190 and Model 195. (Robert J. Pickett Collection, Wichita State University Libraries, Special Collections and University Archives)

reduced manufacturing costs and helped reduce the selling price. The side-by-side seating arrangement was cozy yet made comfortable enough for two average-size occupants, and visibility outside was good thanks to large windows in the doors and the windshield. The airplane sat on a spring steel main landing gear and a steerable tailwheel supported the aft fuselage and empennage.

The prototype, registered NX41682, first flew June 28, 1945, followed by an intensive flight test program. Two additional pre-production airplanes were built that incorporated changes dictated by operational experience with the first ship. These included a slight redesign of the fuselage to accommodate a new tail cone, the addition of aft cabin windows and an entirely new engine cowling.

When introduced early in 1946, the Model 140 was priced at $3,385 for a standard airplane and included an electrical system, manually operated wing flaps, deluxe upholstery and the rear cabin windows. The airplane received its Approved Type Certificate (ATC) March 21, 1946, and soon dozens of airplanes were making their way down the production lines. By August, workers at Cessna were completing 22 of the airplanes per day, and initial sales were excellent. The Model 140 was a major success for the company, and by comparison made the Piper, Taylorcraft and Aeronca ships appear quite antiquated.[1] Production peaked at 30 airplanes per day in September and the workforce had increased to more than 1,800 men and women working hard to build the handsome little monoplane.

By 1949 the Model 140 had become the Model 140A with an all-metal wing and a single lift strut for each panel replacing the original two-strut configuration. The change enhanced the airplane's overall appearance and increased not only its sales appeal but its price to $3,495 for the 85-horsepower version and $3,695 if the optional 90-horsepower Continental C-90-12 engine was selected. After delivering more than 4,900 units, Cessna terminated production of the Model 140, followed by the Model 140A of which 425 had been built.

The company also offered a utilitarian version of the Model 140 known as the Model 120. Aimed at competing against the popular Piper PA-11, PA-12 and the ultra-pedestrian PA-15 *Vagabond* that sold for a mere $1,990, the low-cost Cessna had a base price of $2,485. It featured no wing flaps, the aft quarter windows were deleted and an electrical system was optional. Otherwise, construction of the two-place Cessna was identical to its Model 140 sibling. Certification was granted under the Model 140's ATC. Flight schools bought the Model 120 as did fixed-base operators (FBOs), and many of the airplanes built lived a hard life teaching fledglings how to fly. After delivering 2,171 units, Cessna terminated Model 120 production in 1949.

Unfortunately for Cessna and its competitors in the entry-level segment of the marketplace, the early postwar sales boom that began in 1945 went bust in 1947. After 18 months of record sales and deliveries, naysayers were predicting dire times ahead for the lightplane industry. By 1946 the prophets of doom were prophesying an economic downturn of biblical proportions: "Woe to those who overproduce, woe to those who build airplanes with reckless abandon, for there shall be wailing and gnashing of teeth across the land when the day of famine arrives."

That day arrived in March 1947. Seemingly overnight and without any recognizable warning, the market collapsed in a replay of the drastic crash on Wall Street in October 1929. What had happened that would cause such a major calamity? There are a number of reasons, one common thread was the fact that manufacturers had lost touch with what the postwar buyer wanted in a personal aircraft. In short, the chieftains in Wichita, Lock Haven and Alliance, Ohio, had failed to realize that steel tube and fabric airplanes designed in 1940 could not compete effectively for sales in 1947. Another reason was the flood of as many as 35,000 war-surplus aircraft of all types offered by the U.S. government at bargain prices.

In short, the market had become saturated with too many airplanes that found too few buyers. By early 1947 Piper, for example, was building fewer than half a dozen airplanes per week and soon found itself in serious financial distress. Cessna, however, possessed an ever-expanding product line of modern monoplanes that withstood the storm, as did Beech Aircraft Corporation. Wichita remained the "Air Capital of the World" and was positioned to enter the fabulous 1950s with a gusto that would thrust it to the forefront of general aviation. KA

Notes:

1 The Cessna Model 140 was similar to the highly successful Luscombe Model 8 that was designed in the late 1930s. Don Luscombe was one of the first light airplane designers and manufacturers to produce an all-metal, two-place, side-by-side airplane powered by a four-cylinder, opposed piston engine.

Ed Phillips, now retired and living in the South, has researched and written eight books on the unique and rich aviation history that belongs to Wichita, Kan. His writings have focused on the evolution of the airplanes, companies and people that have made Wichita the "Air Capital of the World" for more than 80 years.

From Multi-Engine Turboprop Communiqué ME-TP-0019

Issued: March 2020

ATA 5 – Flammable Fluid Carrying Hoses Replacement Requirement

All

Textron Aviation Engineering has approved the removal of the five-year requirement to replace the engine flammable fluid carrying hoses. This change has already taken place on the King Air 90, 200, B300 and 1900 Maintenance Manuals. Other manuals will be evaluated on a case-by-case basis when they are revised.

ATA 31 – Fusion PFD MISCOMPARE crew alerting system (CAS) message

On Fusion-equipped King Airs, PFD MISCOMPARE is an amber CAS message alerting the pilot that redundant data from dual systems is not agreeing between limits. There are several conditions that can trigger this "collector" message.

For troubleshooting, it is important to know which specific display parameter was flagged when the message occurred. Another PFD annunciation (ALT, IAS, FD, ENG, ROL, PIT, HDG, RAD, LOC, FPV, FMS, VNV or GS) will be shown in conjunction with the PFD MISCOMPARE. An amber box around torque, ITT, prop or N1 indicates a mis-compare between engine instruments. The tolerance for each comparison is described in the Pro Line Fusion King Air Aircraft Maintenance Manual. Descriptions of each PFD flag and associated crew actions are described in the MISCOMPARE FLAGS section of the King Air Fusion Pilot's Operating Handbook, section 3A.

ATA 56 – Storm Window Installation to Prevent Water Ingress

All

The King Air storm window, if not closed or aligned correctly, can let water into the cockpit while the airplane is parked in the rain. The King Air uses a two-seal system, a .22-inch neoprene seal on the frame side attached with 1300L adhesive and a thin rubber seal attached with RTV 103 attached to the window.

The neoprene seals over time can become crushed and deformed, once this occurs, adjustment of the window to overcome a leak can become ineffective. By applying more force at the window latch area and consequently the window hinge opposite of the latch it tends to create a bow in the window over time creating leaks on the window sides adjacent to the latch.

It is recommended that once a leak has developed on the storm windows that the airframe side seal be replaced, if the window side rubber seal is not damaged or deformed it should not be replaced. To prevent future leaks and ensure longer life of the seal, adjust the window to the seal using the following method:

Utilize a 1-inch wide by 6-8-inch long piece of paper to go around the periphery of the window closing the piece of paper in the window .

Slowly drag the paper out of the window seal feeling the tension of the seal against the paper. A medium drag should be noted; if the paper slides too easily, the window needs to be tighter, if the paper is too hard and it feels it may tear, the window is too tight and may damage the seal and bow the window.

If after replacing the airframe side seal and there are still areas of the window that do not make contact with the seal it may be necessary to replace the rubber on the window itself.

Once the proper tension is determined a water leak check should be carried out to ensure proper sealing of the window.

Service Bulletin MTB-57-01 A: Wings – Inspect the Aft Upper and Lower Wing Bolts for Correct Washer and Replace if Needed

Original Issue: March 5, 2020

Revision A: April 14, 2020

Effectivity: Beechcraft King Air Model 90, 200 and 300 Series Aircraft Owners

Reason: To do an inspection of the left and right wing, aft, upper and lower wing bolts for incorrectly installed 95-110025-3 Washer.

Compliance – Recommended: This service document should be accomplished during the wing bolt inspection of the aft, upper and lower wing attach points outlined in the Structural Inspection and Repair Manual, Chapter 57.

Airplanes previously modified by this service bulletin should complete Steps 4 and 5 (listed on MTB-57-01 A online), if the right wing, aft, upper and lower wing bolts have not been inspected.

The information provided in this column may be abbreviated for space purposes. For the entire communication, go to www.txtavsupport.com. KA

ADVERTISING INDEX

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