Garmin Smart Glide / Environmental Systems / HondaJet Ownership

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

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WINGS OF HOPE

AVIATORS HELPING THE WORLD

TWIN & TURBINE

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Editor's Briefing

by **Lance Phillips**

What It Means to be a Professional in the Cockpit

The transition from the training environment, including as an instructor, to becoming a professional pilot (one that gets paid for transporting passengers) can often be defined by things like earning a commercial license or ATP, completing a degree, or getting a type rating. However, becoming a professional was more of a mindset change for me -- making the passenger the top priority for any flight. I was no longer thinking only about myself, my comfort, and my safety.

When I jumped to high-performance twins and turbine aircraft, I quickly realized the importance of those little twisty knobs that control pressurization and cabin temperature. And as many times as I learned about the systems affecting temperature and pressure, whether in college or initial or recurrent type training, the actual mechanical systems seemed foreign and above the pay grade for this non-A&P pilot. This month, T&T writer Elliott Cox takes us through complex environmental systems, makes them simple to understand, and provides some common-sense operational tips that aren't always known or followed.

Likewise, the decision to stay or go (the one that happens at V1) is not always understood clearly. We usually cross our fingers and hope not to screw up the sim session too severely. Our guru Kevin Dingman takes us through the process in our dopamine- and adrenaline-influenced minds during the seconds that seem like minutes throughout our decision-making processes at the critical moments of a takeoff. When a pilot has a plan and knows what to anticipate in almost any circumstance, they will be a better professional, meaning the passengers will be happier and more satisfied. That means that the pilot keeps their job a little longer.

Next, we're back again to that decision-making thing. This time we evaluate decisions before V1. That go/no-go decision while planning a flight. Do we go through, around or above? David Miller shows us that sometimes putting the myriad options at our disposal aside and taking a nap can be the best decision.

Single-engine pilots know the stress that occurs when a propeller stops spinning. Of course, we train for the occurrence often. But do we know we're going to make the right decision when it happens? How quickly can your brain process the infinite options when an engine-out occurs? Winds aloft at different altitudes, weather, runway lengths, and airport proximity are all questions that need an answer in seconds. Oh, and by the way, you need to fly the airplane and probably tell someone what's going on -- ATC, passengers. For pilots flying piston and turbine singles, Garmin has intelligently taken technologies readily available in existing components and combined them to create a one-button, get-me-to-the-right-airport-safely system. It's called Smart Glide, and it's smart indeed. And Cabin-class single instructor extraordinaire Joe Casey tells us how it differs from Garmin's new-aircraft offerings like Autoland.

Our Owner's Corner focuses on a HondaJet owner with unique perspectives about how he decided on the distinctive twin jet.

Finally, I had the opportunity to learn and write about an organization with such a rich history that evolved over the years to expand its humanitarian mission geographically and with new capabilities. Wings of Hope of St. Louis, MO, helps people live better lives in undeveloped countries and now brings its capabilities back home. And they're even helping bring awareness of aviation careers to young people in St. Louis and beyond. We all benefit from that.

Enjoy this issue.

lance@twinandturbine.com

Garmin Smart Glide

by **Joe Casey**

PHOTOS COURTESY OF GARMIN

In my 3-plus decades in aviation, there have been tremendous advancements that have made flying both safer and better. When I first learned to fly in 1990, I flew a straight-tail Cessna 172 with only a mostly-inoperative ADF for navigation. We never used headsets, instead opting to shout across the cockpit and use the ceiling-mounted speaker and a hand mike to "talk outside" the aircraft. There was no autopilot at all in that Cessna 172 but, industry-wide in single-engine airplanes, it was a rarity to see any autopilot beyond a "wing leveler" or unreliable pseudo autopilot that was more of a hazard than a benefit. Times have changed.

We've come a long way in aviation. Today, we not only have phenomenal noise-canceling headsets, but we have entire cabins that are noise canceled. We have GPS navigators that are incredibly intuitive and ridiculously precise, and almost all have WAAS-enabling. Autoland, Underspeed Protection, Overspeed Protection, Autothrottles, and Envelope Protection all are safety features that were only dreamed of in my early years of flying. Indeed, nothing I flew in the military or airlines compared to what we have today in general aviation's pressurized airplanes. In the old days, when referring to a really nice GA panel, we'd say, "That airplane's panel is almost like an airliner," alluding to the fact that the airlines then had the "best of the best." Today, most pressurized GA airplanes have far better avionics suites than any airliner.

Weirdly, the owner-flown pressurized community is leading the industry in avionics advancements, far ahead of the military, airline, and even over the General Aviation jet community. We were flying PA46s, TBMs, and

King Airs with complete glass screens while the Cessna Citation 5XX and Beechcraft Hawker communities were trying to figure out how to upgrade to ADSB and WAAS capability. For sure, the owner-flown, single-engine, pressurized community has led the way in avionics technologies and advancements. And the reason why is Garmin decided we were worth it.

Garmin has wholly taken over the avionics market by being better. That's not really an arguable point. They nearly have a monopoly in the avionics market, and it is not because they've leveraged a political position or bought up all their competitor companies. It is because they have simply come up with better offerings for the market, and the market has responded by making Garmin-equipped aircraft highly valued. So, what is the latest and greatest technology you won't find on any airliner, fancy jet, or military cockpit? It is a technology directed explicitly at the single-engine community, and it is excellent. If you want the latest and greatest from Garmin, you must fly a single-engine airplane. Garmin's latest and most significant offering is "Smart Glide," a feature that helps during an engine-out scenario.

Someone at Garmin came up with the idea to combine existing features into one package to create Smart Glide. I'd love to meet that person, for they took existing data inputs and existing capabilities of the avionics suite and simply packaged those data points and capabilities into one of the best safety enhancement technologies available today.

The latest GFC series of autopilots will all hold an airspeed, the GPS units will all determine the airplane's location in relation to nearby airports, and all GTN receivers will receive data about weather, runway length/condition, and winds aloft. What was needed was a way for the Garmin system to analyze all of that data, contrast that data against known algorithms, and determine which airport is best to fly in an engine-out scenario. With the Xi series of GPS navigators (G650i/G750i are the two most prominent navigators I've seen in the marketplace), Garmin makes Smart Glide available.

Garmin's Xi navigators continually monitor weather, winds, runway length and condition, winds aloft, and a whole host of other real-time data provided by FIS-B, XM Weather, or Garmin's own "Connext Weather," processing that data and continually presenting the top choice in that algorithm as the best airport to use in an engine-out scenario. If the worst happened and the pilot experienced an engine failure, that pilot can activate Smart Glide by pushing the "Smart Glide Button" on the panel or holding down the Direct-to button on the navigator. When activated, Smart Glide commands the GFC autopilot to turn directly to that selected airport and pitch the airplane for a preprogrammed best-glide speed.

When you lose your engine, push the Smart Glide button. It is that simple.

And there's more. Once Smart Glide is activated, additional data is preprogrammed for easy selection. For instance, the transponder will queue the emergency squawk of 7700, the appropriate frequency for the selected airport will be placed in standby, and the map will be programmed to show the route to the selected airport. It is all very intuitive and easy to both activate and manipulate.

As a CFI of advanced aircraft, I train in the Piper PA46 lineup and the TBM series of airplanes. About 200 pilots come to my company each year for training, which means we get to fly and train in some of the market's most advanced and diversified panels. We fly everything from the G3000-equipped M600SLS with Auto-throttle/Auto-land to steam-gauge piston Malibus and everything in between. And, in all of those airplanes, engine-out training is paramount. Simply put, we train engine-out scenarios in every single training event, so we've administered thousands upon thousands of simulated engine-out scenarios, and one thing is a constant while training an engine-out scenario...stress goes way up. And when encountering lots of stress, decision-making capability goes way down, especially when the big fan upfront stops moving.

That's right, all I have to do with most pilots is pull back the power lever or throttle, and most pilots will metaphorically "fumble the ball." The increased stress causes anxiety, and the human brain doesn't seem to behave optimally when all the chips are pushed to the center of the table. I'm no psychologist, so I cannot tell you why brain myopia occurs, but I can assure you it does occur. I have seen more bad decisions, poor reactions, and downright "ham-fisted

buffoonery" happen when the engine goes silent. This is a sad testimony because those first few responses are critical when an engine goes silent.

A real-world engine-out scenario creates far greater anxiety than a training scenario, and the accident record of landings after an engine-out scenario in the PA46 and TBM world is not exemplary. Although you might think that the pilots in the PA46 and TBM world would be the best of the best in handling single-engine emergencies, the actual accident data shows that poor decisions made shortly after an engine failure can doom the possibility of a successful outcome. Some pilots turn the wrong way, some select inferior airports when exemplary airports are well within gliding range, and some pilots mismanage airspeed so that a successful glide to safely land at an airport is impossible.

I use several training scenarios to train engine-out landings near my home airport near Lufkin, TX (KLFK). Those scenarios usually begin with the airplane above 10,000ft MSL and many airport options within the gliding range. Some of those airports are short-runway (less than 3000ft) options with rough asphalt, and some are multiple runway airports with crash-rescue on the scene. I ensure that the location where I administer the engine failure affords many options, and sometimes the pilot chooses the lesser option. In fact, most of the time, the pilot chooses the lesser option. I can't tell you how often a pilot chooses the "nearest airport" when a much better airport is easily within range. Or, a pilot completely disregards strong upper-level winds and cannot glide to a seemingly in-range airport, only to end up short of the runway. The decision combinations can be mind-boggling, and most minds are truly boggled in an engine-out sequence.

And then it happened. In late 2021, I started to have pilots show up to training with Smart Glide installed as part of their new panel upgrade. It changed the game. These pilots wanted to see if Smart Glide would find the runway that afforded the greatest options for safety, and Smart Glide proved its worth by repeatedly guiding the pilot in distress to the best option. The plethora of data that Smart Glide filters continually to determine the best airport is far more robust than would be available to a pilot "in the heat of the battle" when the engine goes silent. Although you are certainly the pilot-in-command while flying, the airport selected by Smart Glide is usually the correct airport to select. When the engine goes silent, a pilot needs to decide which airport to turn towards, but that pilot also needs to know what airspeed to fly. The answer is best glide speed. So, SmartGlide pitches the airplane for the preprogrammed POH-listed best glide speed.

Best glide speed is found at the bottom of the drag chart, where parasite drag and induced drag intersect. It is the speed that a pilot should initially fly in an engine-out scenario. If the airplane is flown any faster than best glide speed, parasite drag increases exponentially, and the airplane won't glide as far. If flown any slower than best glide speed, induced drag increases exponentially, and the airplane won't glide as far. Best glide speed is where the airplane can glide the farthest. Sort of...

To avoid getting nasty grams from any of my astute and wise readers... yes, I know that best glide is actually an angle of attack (AOA), not an airspeed. And best glide speed can change based on weight and winds. If all of our airplanes had AOAs, I'd advise flying "best lift over drag" (Best L/D) AOA instead of an airspeed. But, most pilots reading this article don't fly airplanes with AOAs installed, so POH-published best glide speed is a good airspeed to fly. Certainly, in the "heat of the battle" after an engine out, best glide speed is an excellent speed to fly initially as you gain situational awareness. Then, you can adjust for the airspeed you desire to fly based on the conditions and configuration you are presently flying.

As you would guess, in both engine-out training and real-life engine-out scenarios, many pilots fail to fly a proper airspeed when the engine-out episode happens. Flying the wrong airspeed reduces glide distance, and that glide distance might be all the difference in determining a successful outcome. The old adage in aviation is, "There's nothing more precious in an engine-out scenario than altitude above you and runway behind you." When the engine goes silent, you'll want all the energy that altitude affords you. Spend that energy wisely. Smart Glide helps you by pitching the airplane for best glide speed.

Once a pilot can glide to the selected airport and range is no longer in question, I am a huge proponent of flying a slightly faster airspeed than best glide. There are many reasons for this decision, but the biggest is safeguarding an airplane from a stall. As the earth begins to fill the windscreen, the natural tendency for every human is to pull back on the yoke. Most botched engine-out scenarios land short of the runway in a stalled condition. Almost every engine-out stall scenario ends up with a fatal accident. The point is airspeed control is critical. Don't stall the airplane.

An airplane being operated under Smart Glide will fly directly to the airport chosen. When within 4 miles of that airport, the GTN will alert the pilot via aural and visual cues. When within 2 miles, the cues become more prominent. When this occurs, the pilot should be over the airport, and the pilot can take over and navigate the airplane to a safe landing.

The FAA is adamant about a pilot being able to spiral down from a "high key" (a position of undetermined altitude over the airport) to a "low key" (1000-1500ft abeam the runway on a left downwind) and then land the airplane. Private pilot students are appropriately trained to glide an airplane from a left downwind to a successful landing. Commercial Pilot students learn "180-degree precision approach and landing" and "steep spirals," both maneuvers required by the Airman Certification Standards during the Commercial Pilot Practical Test. The FAA Flying Handbook teaches how to do this with precision. The FAA Glider Handbook teaches the same method. Yes...it is a tried

and tested method to glide an airplane from a left downwind in an engine-out scenario. Every pilot of a single-engine airplane should be able to do this. Plus, Smart Glide navigates you to a point over the runway where the airplane can be spiraled down to a left downwind. Brilliant. Absolutely brilliant.

Smart Glide won't fly the approach and landing, but it will put the pilot in a position where a safe landing can be made, and that is 90 percent of the battle in an engine-out landing. The engine-out landing is "for all the marbles." There is no go-around. It is a one-shot opportunity to excel, and every single-engine airplane pilot should feel comfortable practicing the engine out landing from the left downwind. And, if your aircraft is so equipped, Smart Glide positions the airplane to give the pilot the best shot at making a safe engine out landing.

Interestingly, if you buy a brand-new airplane from Piper or Socata, Smart Glide will not be available. It seems that the logic required to process at the data rate required for Smart Glide is available in the GTNs but not in the G1000Nxi or the G3000 avionics suites. This shows that GTN-upgraded airplanes are just as, if not more capable, than brand-new airplanes. I can take an early Piper Meridian and remove the entire panel from the factory, then install a completely new GTN-based panel (G500Txi, GTN750i, GFC600) and have an extremely capable panel, as compared with a brand new M500 from Piper. Yes, the screens will be bigger in the M500, but Smart Glide will not be available in the latest airframes. Similarly, a new Socata TBM 960 will not have Smart Glide, but you can install a completely new panel in an older TBM and have an (arguably) equally robust panel.

The power of the GTN-based panels makes the older airframes extremely attractive. Autoland and Autothrottles are only available in the newest airframes, but some of the most intriguing features (like Smart Glide) are only available on the GTN-based panels.

As an instructor in pressurized, single-engine, turbine and piston airplanes, I love Smart Glide. It is a tool in the pilot's toolbox. Smart pilots have a toolbox full of solutions to solve the worst problems that can creep up while flying. If you have an engine-out scenario, Smart Glide is one of the most effective tools ever installed on an airplane. Can you live without Smart Glide? Sure. But, if my engine fails, I want all the tools I can muster to help me get on the ground safely. My hat is off to Garmin for developing a tool that makes the single-engine community safer. T&T

Joe Casey *is an FAA-DPE and an ATP, CFI, CFII (A/H), MEI, CFIG, CFIH, as well as a retired U.S. Army UH60 standardization instructor/examiner. An active instructor in the PA46 and King Air markets, he has accumulated 16,000-plus hours of flight time, with more than 5,200 dual-given as a flight instructor. Contact Joe at* **joe@flycasey.com** *or 903.721.9549.*

Piper Seneca III in flight

GHN partner Flying Medical Services serves Maasai in Tanzania by providing preventative healthcare

WINGS OF HOPE

AVIATORS HELPING THE WORLD

by **Lance Phillips**

SOAR into STEM students take their first flight with a certified flight instructor

As with many stories in aviation, tales describing the roots of organizations can be some of the most compelling. Wings of Hope is one of those organizations whose history provides such a rich retelling it might almost seem fictional. The characters in this story include astronauts; mid-century, profit-seeking businesspeople; flying nuns; hyenas; Nairobi, Kenyan officials; and single-engine, solo pilots flying across the Atlantic.

Recently, I learned that Village Press, Twin & Turbine's publisher, is committed to supporting Wings of Hope, an international aviation charity. Naturally, I had to learn more and realized this story deserved special attention. After talking with two of Wings of Hope's leaders, it became apparent that its past wasn't the only story. The current mission and future goals are just as important.

In Plato's Socratic dialogue Republic, it was famously written, "Our need will be the real creator." This quote eventually became the English proverb, "Necessity is the mother of invention." Necessity was rampant in Kenya's Turkana in 1960. The Turkana Desert in northern Kenya experienced a drought that killed 80 percent of its livestock and most of its vegetation, only to wither under the subsequent pressure of sickening flooding.

Disaster in Africa Creates Needs

Nairobian officials were historically and naturally protective of their territory and culture. [As an aside: The East African Rift, often called the cradle of humanity, includes Kenya's Turkana. "Turkana Boy" is an ancient hominin skeleton unearthed in the region, and the tectonic activity that caused the East African Rift also has made an environment ideal for the proliferation of life. The persistent erosion of the cliffs of the Rift often contributes to further discoveries.] However, it had come time for the

capitol city's officials to approve foreign aid to help their country's inhabitants, who were severely affected by the extreme weather patterns. In 1961, The Medical Missionaries of Mary were ready to act, establishing their first relief camp in Lodwar, Kenya, 158 miles north of Kitale, where the main hospital is located. A trip that takes about 15 hours by off-road vehicle.

The following year, several things occurred during the timeline that greatly influenced the creation of Wings of Hope:

- Mike Stimac, teacher of science and aviation at St. Joseph's High School in Cleveland, Ohio, arrives at the Mang'u mission school in the foothills of the Aberdare Mountain Range in Kenya (~20 miles NE of Nairobi.) From Mang'u High School, he founded the Amateur Radio Club, Electronics Club, and Air Program. Compelled to bring every experience to his new students, he would establish a radio station, train students to apply for amateur radio licenses, rent airplanes from Safari Air at Wilson Airport, and teach them to fly. These programs are still active at Mang'u High School to this day.
- Bishop Joseph B. Houlihan, whose diocese covers the Turkana, appeals for assistance from Catholics in the United States. Pacific Northern Airline pilot, Jerry Fay, corresponds with Houlihan, and when the question of transportation difficulties arises, Houlihan points out how valuable a light plane will be.
- Jerry Fay organizes the Marian Medical Aircraft Fund to raise $11,000 for a Piper Super Cub

Max Conrad receives a papal blessing in Rome

Sister Michael Therese Ryan pilots the Piper Super Cub

(PA-18-150), plus parts and high-frequency radio transmitters. He enlists the help of Pacific Northern Airlines pilot Bud Donovan. The purchase of the Piper Super Cub was transacted through B. J. Oswald of Oswald Flying Service in Tacoma, WA.

Initially, the Kenyan government couldn't understand the two men's motives. Jerry Fay said, "They thought we were going to start a flying service and make a killing [as a business]. Then Bishop Houlihan explained our purpose and that we'd help the natives who live so far from medical aid. Now they can't do enough for us."

Receiving the Pope's Blessing

Fay and Donovan soon left for Naples for an audience with Pope John XXIII in Rome before arriving in Addis Ababa, Ethiopia. At the same time, U. S. Senators Warren G. Magnuson and Henry M. Jackson got the project to qualify under the foreign aid program, which meant the U.S. Navy and Air Force could help out, too. The Navy agreed to move the crated Piper to Naples, and then the Air Force carried the crate to Addis Ababa. This mission was officially called "Operation Handclasp."

After unexpected delays, Fay had to return to the U.S., meaning Donovan was left to take care of the aircraft alone. "[The Piper Cub] arrived in a big crate on Saturday," Donovan said. "I had to wait until Monday to get started on it. But I had it together by Wednesday night. Thursday, I took it up for the first time – it felt good to be finally flying again."

Later, Donovan flew the little Piper about 700 miles to Nairobi. After some typical customs problems in Nairobi, he piloted it to Kitale, the town nearest the mission territory in the Turkana Desert. By the latter part of April 1963, Donovan was flying supplies into the mission stations and providing the priests and nuns as much information about the plane as possible. He accrued around 80 hours in three weeks. At the same time, Bishop Houlihan recruited Brother Mike Stimac to pilot the new Super Cub.

The Real Flying Nun

Stimac also trained two nuns to fly the plane. Sister Michael Therese Ryan completed her flying course in Boston. She passed her pilot exam on the first try, earning the distinction of becoming the first Catholic nun to do so. Sister Ryan (a.k.a. "The Flying Nun") would log over 40 solo hours before making her way to Kenya, where she would ferry supplies from the central hospital in Eldoret to three camps 800 miles apart. The sisters would fly missionary doctors, nurses, patients, medical supplies, and anything else needed. Soon they were dubbed "The Marianist Air Force," and stories about "the flying nuns" appeared in international newspapers.

Businessmen get Involved

Inspired by the story of tragedy in the desert, a group of St. Louis businessmen laid the foundation for the support of air mission service in Turkana. Joseph G. Fabick of the John Fabick Tractor Co. and William D. Edwards started the Turkana Desert Fund to raise money for a new, all-metal aircraft. The creation of this Fund is cited as the birth of what would eventually become Wings of Hope, which would officially be incorporated a few years later.

Since the Super Cub had arrived, it became apparent that the plane's fabric wings were not suited to the harsh desert environment of the Turkana. And oddly enough, Hyenas were fond of nibbling away at the wing's fabric material, attracted to the phenol in the covering.

Meanwhile, George E. Haddaway of Dallas, Texas, spearheaded a drive to supply the medical missionaries with a workhorse plane. Haddaway, an influential aviation publisher of Flight Magazine, was a director of the Turkana Desert Fund. He wrote, "In all my 30 years of aviation publishing, I've never found a greater need for an airplane."

Bill Edwards, Thomas Dwyer, and Joe Fabick receive the new Cessna

Max Conrad in Nairobi

Missionary Flight Training in Ohio

In 1965, Mike Stimac created UMATT (United Missionary Air Training and Transport), a flight training program in Dayton, Ohio, open to members of all faiths interested in becoming pilots and learning how small planes can be used more effectively in African missionary work.

Thomas Dwyer was the program director at the University of Dayton headquarters. The Turkana Desert Fund raised over $30,000 to purchase a new Cessna U206 for the newly formed UMATT organization. The Cessna was larger, more powerful, and better suited to withstand the desert conditions in Kenya than the little Cub. Dwyer explained, "UMATT is a service for men of goodwill in all Faiths, working to help those whose lives and hopes will take on new dimensions because of the miracle of the airplane. It means fleetness to doctors to heal the pained; it guarantees transport of bread and milk to the hungry; it means dignity to the youth of emerging nations; and it gives strength to the energies of the dedicated missionaries and Peace Corps workers in the field. UMATT is efficiency, union, strength, and peace."

Navajo in front of WoH hangar

Long Distance Flying

Max Conrad, a legendary pilot and holder of several long-distance flight records, flew the Cessna's ferry trip from St. Louis, Mo., to Nairobi, Kenya. The journey's itinerary was paired with press events and blessed by religious leaders of different faiths. The ferry began with a ceremony at the Ozark Airline Hangar at Lambert–St. Louis International Airport. Notable stops along the way included:

- UMATT headquarters at the University of Dayton
- Two days of public appearances and press in New York
- Medical Missionaries of Mary ceremony in Boston
- St. Patrick Missionary Society ceremony in Shannon, Ireland
- Papal blessing by Pope Paul VI in Rome
- Conrad's landing in Nairobi on June 10, 1965

Incorporation

Wings of Hope became incorporated in 1967 under the "General Not For Profit Corporation Law" of the State of Missouri, and its board of directors included Joseph G.Fabick, John C. Versnel, and William D. Edwards. According to the Wings of Hope articles of incorporation, "[we intend] to provide without charge, remuneration or profit, transportation and communication facilities for missionaries, medical missionaries,

Wings of Hope hangar panorama

teachers, and other religious, educational and medical workers, without distinction as to race or religion... to provide, maintain and operate an airplane service; to transport freight, passengers and baggage by aircraft ..."

An Astronaut Gives Encouragement

Two years later, director Bill Edwards received a letter from Neil Armstrong in response to Bill's letter of encouragement and support before the launch of the Apollo 11 mission on July 16, 1969. Armstrong wrote, "I certainly want to send my congratulations on your efforts on behalf of Wings of Hope. I am certain that this valuable project is achieving brotherhood between nations in a way that cannot be accomplished by diplomacy or government aid programs. As an aviator, I sincerely salute this fine service as being one of the best achievements of the combination of general aircraft and dedicated individuals of good will."

Throughout the 70s, 80s, and 90s, Wings of Hope continued its work and was often recognized. The Associated Press wrote in 1973, "George E. Haddaway, editor and publisher of Flight magazine, Dallas, has been awarded the Federal Aviation Administration's highest honor, the gold medal for extraordinary service to aviation. The FAA said Haddaway was cited for leadership in the encouragement of the growth of civil aviation. He helped establish Wings of Hope, a charitable organization providing aircraft and flight personnel for needy people in remote areas, and also was a founder of the Air Force auxiliary, the Civil Air Patrol."

The MAT pilot corps

Challenges

As Thomas Dwyer learned initially, the Cessna 206 was the aircraft of choice for their missions. However, by the early 1990s, the 206 had ceased production, and many of the incentives available for charitable donations were gone. Until then, the organization enjoyed multiple aircraft donations every month, but the flow of donations had slowed considerably. Tom Haines of AOPA Pilot wrote, "Many of the tax incentives are gone now, and because 206s are no longer in production, they are extremely valuable. As recently as 1987, people donated an average of two 206s a month to Wings of Hope. Since 1988, a total of three has been donated. To stay alive, the 30-year-old organization takes whatever airplanes it can get in donation and refurbishes them using its skilled volunteer workers. Those airplanes unsuitable for field work are sold and the proceeds used to buy 206s."


MAT pilots in flight

boprop, we would certainly expand our operations to open up the area west of the Rockies."

A Global Footprint

Tiffany Nelson, Wings of Hope Director of Programs and Evaluation, oversees the Global Humanitarian Network for the organization and its educational programming. She started 4 years ago as the Global Programs Manager and quickly ascended the ranks to her current position. Born in St. Louis, Nelson attended Mizzou and completed bachelor's degrees in business and Spanish.

A New Millenium

Things changed in 2002. Wings of Hope had primarily conducted missions internationally, with a few supporting American Indians in the States. However, after a critical patient in Missouri suffering a severed leg from a boating accident needed emergency transport, Wings of Hope answered the call to assist. MAT was born. MAT, or Medical Relief & Air Transport, hangars two donated Piper Seneca IIIs (N8456H, N8048Q) along with a 1975 Piper Navajo (N61490). Angela Walleman, MAT's director, says, "Along with Rashonda Clark, our flight operations manager, we manage 16 pilots and 8 medics, mostly retired doctors and registered nurses. In April 2023, we have 21 missions scheduled -- in addition to the 40 missions completed in the first quarter of 2023." She went on to describe the staff. "We have 18 staff members including two full-time A&P mechanics, one part-time A&P, and an avionics manager. With such a small staff, Wings of Hope relies heavily on our 260 volunteers. We simply could not operate without the help of these dedicated individuals." Walleman holds two master's degrees from Lindenwood University and is a veteran of nonprofit leadership and has been with Wings of Hope for 8 years.

MAT helps people all over the country get to places like Houston's MD Anderson cancer treatment center, Shriners in St. Louis for pediatric orthopedic care, and the Mayo Clinic in Rochester, MN for brain tumors and cancers. If someone needs transport, Wings of Hope is ready to help. Walleman explained, "We're not an air ambulance operation; we provide comfort care." MAT gets referrals from doctors and direct requests from patients. The only restriction is keeping their U.S. operations east of the Rockies. Walleman says, "If someone out there would like to donate a tur-

Pilot, Fernando, waits for Alas de Socorro team in the Ecuadorian Amazon

After working with the Peace Corps in the Dominican Republic, training teachers and soliciting an aqueduct, she earned double master's degrees in Sustainable International Development and Women's Gender & Sexuality at The Heller School at Brandeis University in Boston.

The global network Nelson oversees is extensive and varied.

Wings of Hope's support in Africa includes the following:

- South Africa - Wings of Hope partners with Mercy Air South Africa, a nonprofit organization based in White River, South Africa. They provide aviation services to over 40,000 people annually, collaborating with humanitarian and mission organizations throughout southern Africa.
- Tanzania - For more than 20 years, Wings of Hope has partnered with Flying Medical Service (FMS), supplying planes, parts and yearly inspections. Their flying medical clinics serve 25 Maasai settlements, visiting each village every other week.
- Zambia - Wings of Hope supports FlySpec, the only orthopedic and reconstructive surgery service providing care via airplane to remote parts of Zambia – at no cost to patients.

SOAR into STEM students prepare an aircraft for maintenance

Wings of Hope provides the following in the Asia-Pacific region:

- Cambodia - Wings of Hope partners with John Givonetti Giving in an educational outreach program for students living in rural villages in Pursat Province.
- Papua New Guinea - Wings of Hope partners with Samaritan Aviation to provide emergency evacuation services, medical supply delivery, vaccine administration and community health initiatives to a region of 220,000 people along the Sepik River. Their two floatplanes provide emergency flights to the only hospital within 37,000 square miles (about the area of Ohio).

In South America, Wings of Hope partners with the following:

- Belize - Belize Emergency Response Team
- Colombia - Patrulla Aérea Civil
- Ecuador - Alas de Socorro
- Nicaragua - Adventist World Aviation
- Paraguay - Iglesia Centro Cristiano Siloh

Opportunities on the Horizon

"UAVs provide interesting ways to extend humanitarian efforts to serve communities, especially in Africa and Latin America," Nelson explained. "We're building partnerships now to grow in the newly available technologies. We want to bring urgent anti-venom treatments and medical supplies to forested or hard-to-reach areas that a typical piloted aircraft can't easily access."

Educational Programming

Everyone in aviation these days is looking for enthusiastic, well-trained employees. Wings of Hope is actually doing something about it. In addition to Nelson's responsibilities in global initiatives, she also directs the efforts of Wings of Hope's education programs domestically. SOAR into STEM (science, technology, engineering, mathematics), launched in partnership with Boeing, welcomes students into the Wings of Hope hangar in St. Louis for a dynamic hands-on learning experience that explores principles of flight, aircraft maintenance, aerodynamics engineering, and Unmanned Aerial Systems. "We are currently hosting two learning modules per year for St. Louis area schools; however, requests to duplicate what we have created are starting to come in from outside of St. Louis. Teacher recruiting and training efforts for our summer module are in full swing, and we expect to launch a new remote program in fall 2023. Our goal is equitable access to aviation education for all students", Nelson explained.

> "In all my 30 years of aviation publishing, I've never found a greater need for an airplane."

How we can Help

Awareness is crucial to helping Wings of Hope reach its goals. Twin & Turbine is playing that role in a small way, but we hope that after reading this story, others in our robust aviation community can take advantage of the opportunity to assist. Whether providing a gift of financial support personally or through your

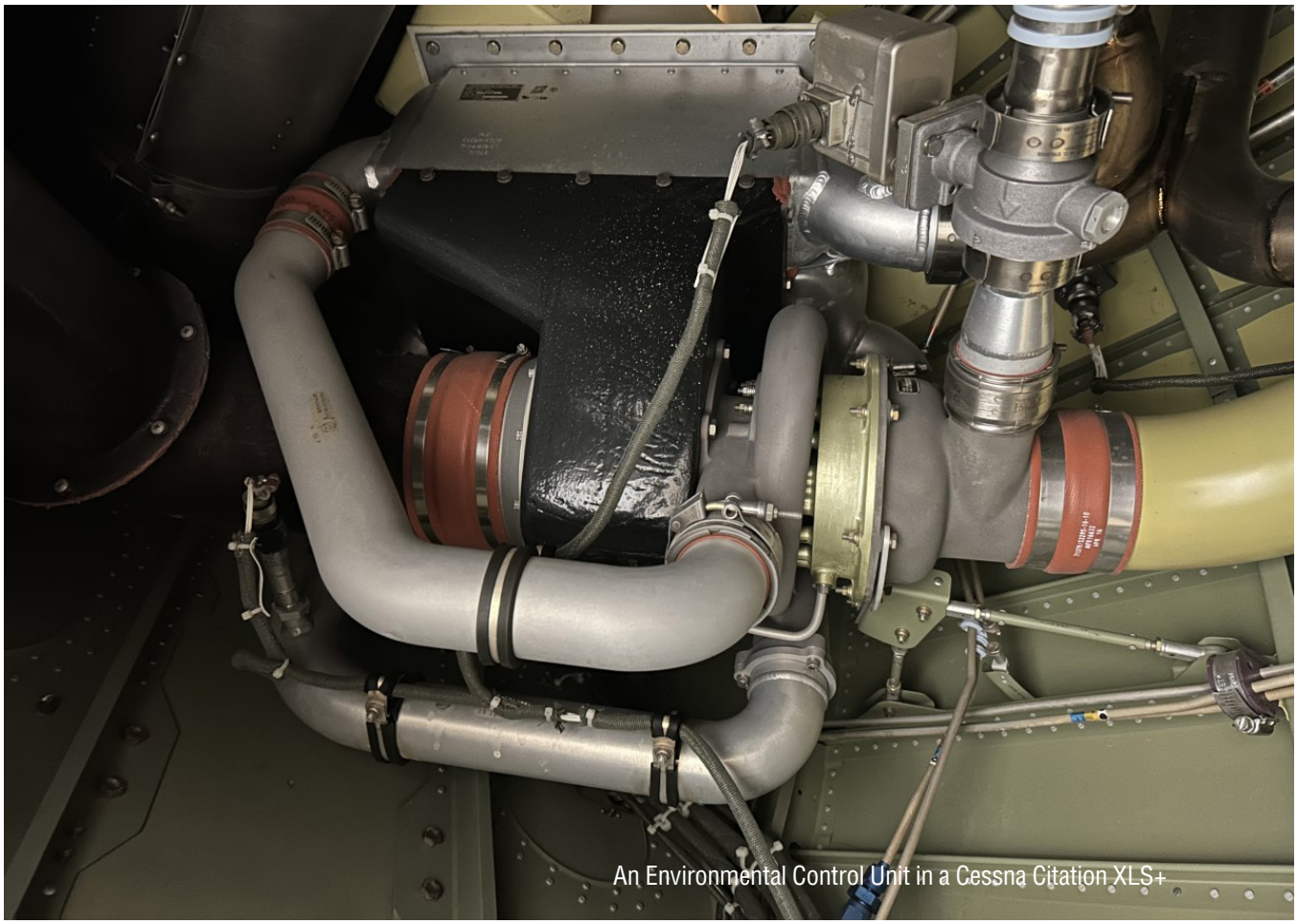
organization's charitable programs, including Wings of Hope in your legacy giving, donating an airplane for domestic aircraft or volunteer needs, or taking part in SOAR into STEM, there are myriad ways to help. T&T

Learn more and contact Wings of Hope via its website, *www.wingsofhope.ngo.*

Lance Phillips *is the Executive Director for the Pinnacle Air Network, a coalition of FBOs, MROs, and aircraft sales and charter organizations. He holds an FAA commercial license with instrument and multi-engine ratings and type ratings in the G100 and Beechjet aircraft. Lance has worked in management and executive leadership roles for pilot training and aircraft manufacturing organizations during his career. In addition to Twin & Turbine, Lance manages Phillips Aero Services and his creative outlet, Air & Asphalt. You can reach Lance by email at* **lance@twinandturbine.com.**

Staying Cool Under Pressure

by **Elliott Cox**



An Environmental Control Unit in a Cessna Citation XLS+

PHOTOS BY ELLIOTT COX

Spring is the time of year here in the Carolinas when we have ice on the windshields in the morning and heat shimmers from the roads in the afternoon, and we're constantly adjusting the settings on our thermostats to stay comfortable. A properly functioning environmental system can make flying in the heat of the summer much more enjoyable.

There are two types of environmental systems commonly used in airplanes. Vapor cycle systems are used in piston aircraft, turboprops, and smaller turbine airplanes. Air cycle systems are used in most turbine airplanes equipped with an APU.

Vapor cycle systems operate like the air conditioning systems in your house or car. These use refrigerant, typically R-134a, in a closed system to remove heat from one area (the cabin) and exhaust it to a different place (overboard.) The refrigerant is compressed, causing it to heat up and become vapor. The superheated vapor is sent through a condenser, where a fan blows air over the coils and cooling fins to cool the vapor inside. If you've ever held your hand over a running home air conditioner, the hot air you feel blowing out is the product of the fan blowing air over the condenser.

When the refrigerant vapor cools, it returns to a liquid state and flows through an evaporator. The evaporator is also made of coils and cooling fins and works like a condenser. The difference is instead of outside air blowing over the coils, recirculated cabin air is blown over the

evaporator and returned to the cabin as colder air. The liquid refrigerant inside the evaporator's coils absorbs heat and turns to vapor again before returning to the compressor to continue the cycle.

Of course, that's a very simplified description of how the system works. I don't want to go into too much detail because unless you have the proper certification(s), there isn't a lot you can do yourself to maintain the system.

Air cycle systems have the advantage of not having to contain a pressurized gas to condition air, but the tradeoff is that these systems utilize more moving parts to make everything work. These systems use the same thermodynamic principles as vapor cycle systems, but instead of compressing and expanding a refrigerant to remove heat from the air, they compress and expand the air itself. Gay-Lussac's Law states, "The pressure of a given mass of gas varies directly with the absolute temperature of the gas when the volume is kept constant." The pressure and temperature of a gas mass are directly proportional, so when we compress the air inside an air cycle machine, it heats proportionally to the amount we compress it, and vice versa when we expand it.

Air cycle systems typically use a combination of outside air and bleed air tapped from the engines and/or the APU. If you drilled a hole in your leaf blower and stuck a tube through the hole so it blew air over your face while you used it, you'd be using the same concept. When bleed air is pulled from an engine or the APU, it's at high pressure and high temperature, so the hot bleed air is plumbed through a "precooler," which looks and works like a car's radiator. The hot air passes through the inside of the precooler, and cold ram air is forced over its cooling fins, pulling a lot of heat from the bleed air. Bleed air leaving the engines can be over four hundred degrees Celsius and may lose a hundred degrees as it goes through the precooler. So how do we turn three-hundred-degree air

A ram air scoop feeds the ACM on this Falcon 900LX

Even a thin layer of dust on a cabin temperature sensor can cause the environmental system to operate erratically.

into super-cooled air to dump into the cabin? We run it through an air cycle machine, which is nothing more than a big heat exchanger.

Each manufacturer calls this piece of magical equipment something different. Air Cycle Machine (ACM) and Environmental Control Unit (ECU) seem to be the leading nomenclature in my experience. For simplicity's sake, I'll use "ACM" from here on.

The slightly cooled bleed air comes out of the precooler, and some of it is routed directly into the cabin via an emergency pressurization valve, while most of it is piped into the ACM. Allowing the capability to pump unconditioned hot air into the cabin might sound counterintuitive, especially if you've ever operated out of South Florida in the summer. However, if the ACM fails and won't allow any conditioned air into the cabin, you still have a positive air source for pressurization. It'll get hotter than South Florida in the summer inside the cabin, but everyone aboard will be conscious while the crew gets the airplane on the ground as soon as possible.

Some pilots use empty legs to check the function of the emergency pressurization. It can be alarming for the copilot, especially when he or she is staring out the window and not expecting a loud rush of air. I'm not condoning it – I'm just saying it happens, in theory.

Now that hot air is coming into the ACM, we must decide what to do with it. To control the rate of air released from the ACM, we use temperature control valves which are modulating valves, meaning they can be in any position

A water separator "demoisturizes by centrifuging."

between fully closed and fully open. The more open these valves are, the more the air is expanded and thus cooled to varying degrees. The temperature control valves are normally operated by a temperature controller or computer, but they can be operated manually if there's a failure.

When in automatic mode, the temperature controller/computer looks at the temperature in the cabin and compares it to the temperature of the air coming out of the ACM. The controller will modulate the temp valves to adjust the air coming into the cabin accordingly. When I worked for one of the Cessna-owned service centers, we saw a lot of environmental write-ups throughout the year, and the fix for most of them, maybe 80 percent now that I think about it, was simply cleaning the temp sensors in the cabin and cockpit. If you want to save yourself a little time and money, find out where the temp sensors are in your airplane, lay your hands on them, and you'll see what I'm talking about. They're typically very easy to access because they must be in the open air to do their jobs.

The other favor you can do for yourself is to know where your temp sensors are so you'll know where NOT to throw a pile of coats. If the sensors can't get a good reading of the cabin's temperature, the computer's automatic function will be completely inoperative.

When the air leaves the ACM at the desired temperature, that air still contains a lot of moisture, especially if you're operating in humid climates, and spraying all

that moisture inside the cabin of your airplane could cause damage and premature failure to the interior soft goods. To prevent that, the air leaving the ACM is sent through a water separator where, in the words of the French person who wrote Dassault's manuals, the air is "demoisturized by centrifuging." Wow. I really need to step up my descriptions.

Dassault means that by "demoisturizing by centrifuging," the air enters a canister where it is expanded, causing the moisture to condense. The air is swirled, and any moisture is slung to the outside of the canister, where it's collected by gravity into a drain. From there, the water is vented overboard, or, in the case of the Falcon I maintain, it's sent into the ACM to assist in the cooling process.

When the air leaves the water separator, it goes into the cabin via ducts that distribute cooled and conditioned air to keep everyone comfortable. You also have a positive air source to keep the cabin pressurized as you blast through the flight levels. The only problem now is that the engines produce far more air than you need to pressurize the cabin, especially down low, so you must modulate it.

Someone much smarter than I am – a low bar, I know – decided that the answer to keeping a cabin pressurized at a steady and comfortable rate was not to modulate how much air comes in but rather to modulate how much air goes out. This is accomplished by using the aptly named "outflow valves."

Typically installed somewhere at the rear of the pressure vessel, these valves are controlled much like the temperature. A computer looks at the pressure inside the cabin and modulates the outflow valves to allow excess air to escape. Also, like the temperature control system, the outflow valves can be operated manually in case of a computer malfunction.

There isn't much in the way of preventative measures for the environmental / pressurization system other than keeping the temp sensors clean and unblocked. One additional note of caution: It pays to perform a thorough preflight inspection after any maintenance event, but pay special attention to the environmental controls. Besides the temperature control knobs, we rarely touch any other controls, so it's very easy to miss something that has been moved. More than a few airplanes have departed a maintenance event with the pressurization system turned off. That in itself isn't terribly dangerous, but the distraction it causes can be.

The environmental system is one of the greatest unsung heroes in an airplane because when it's working correctly, it is invisible, and that's how we like it. Happy flying, and stay cool. T&T

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

JonathanJet

Jonathan Schaff, of Bozeman, Montana, and his 2016 HondaJet

"Never would I have imagined that I would be flying a jet myself — single pilot — around the world, essentially. I've taken my HondaJet across the Atlantic, all the way around Europe, down to Tunisia and North Africa, and back. I am based in Bozeman, Montana, and flew from Iceland to Bozeman, Montana, in one day. It was nine and a half hours' worth of flight time, and I was exhausted after it, but it was very impressive for going against the wind!" noted Jonathan Schaff, the world's youngest HondaJet owner and operator.

This is the fourth aircraft that the blockchain security and vacation


Schaff transitioned to the HondaJet from a Piper JetProp. He loved that turboprop so much, that he purchased another – after transitioning to jet ownership

PHOTO COURTESY OF TIM CURTET

Jonathan Schaff's HondaJet in formation with an MU-2

rental entrepreneur has owned. But before ascending to cabin-class aircraft ownership and purchasing this 2016 model in August 2021, Schaff owned a share of a Mooney M20F and a Beechcraft Bonanza.

"I would be flying at night, around the mountains, and a single-engine piston at night around the mountains didn't seem to cut it. After six months in the Bonanza, which is a great plane, I got a Piper JetProp. And that's when I got de-icing and a turbine; it was pressurized, and that was an amazing aircraft. I sold it when I got the HondaJet, but then I repurchased the same exact plane because I missed it so much", said Schaff.

Purchasing a HondaJet was the most recent evolution for Schaff's aviation journey, who learned to fly at twenty-five years old. It wasn't until then, after leaving a job and having time to dedicate to flying, that he became a pilot. But he had wanted to fly ever since he was a kid.

"I had the opportunity to get into the HondaJet and got an older one, a 2016 model. It's serial fifteen, which I believe was the third one off the line. Honestly, I'm impressed every time I fly it. And it continues to impress me with the load, the amount of baggage it can hold, the ease of flying, and the aircraft's power. I'm mostly [operating at airports above sea level], so when I fly at sea level - I'm like, wow! For example, I was in Curacao a few days ago, flying at night with almost a full useful load, and rotated before the displaced threshold. I was laughing because, for a light jet, that's really impressive," Schaff marveled.

Schaff notes that he is impressed by the HondaJet's passenger and baggage-carrying capabilities. Jonathan (on the air stair) is pictured with friends and his HondaJet.

"I usually fly the HondaJet at [FL]400 or 410, but if I really have to stretch a leg — I will fly at 430. At 410, I typically see 407 knots true, maybe 410, and if I go to [FL]430, I will get 422. And at that altitude, I usually burn 320 to 330 pounds per hour per side. I'm learning to use the long-range fuel burn at lower altitudes to get even more efficient. In my experience, the advertised numbers are what you get," he reported.

These mentioned aspects are not the only positive thing Schaff has to say about the aircraft, which he carefully considered against the benefits of other jets and turboprops when looking for his first jet.

His sleek, red and white-accented jet has far exceeded his expectations of jet ownership.

"It flies higher than most weather and has a heated wing. Getting ABOVE the weather is great. So, if the airlines go, I can go. There is no comparison when you compare it against the [Citation] Mustang or the Phenom 100. Just even compare the baggage capacity to other aircraft. The cabin is also very nice. Although I try not to use the bathroom, it is definitely a plus," he advised.

Schaff explained, "I have seven seats in my plane (the Elite has eight), and I have taken seven people with bags from Coachella. So that trip was with their big bags, including outfits, which all fit into the baggage compartment. It was a shorter flight from Palm Springs, but the plane did well. You can't do that in a Mustang or a Phenom 100; everyone would have their bags in their laps. Every time I fly with people, I'm impressed by the HondaJet. It feels like a bigger airplane than it is. But when I fly it alone, [it feels so big that] I feel like I should be flying my JetProp."

All-weather capabilities, a well-appointed interior, and a large-sized baggage compartment set the aircraft apart from others, Schaff contends. But a signature aspect about the sleek light jet stood out to him.

"The HondaJet is a really cool plane with a great ramp presence," Schaff

Jonathan Schaff's 2016 HondaJet, serial number fifteen

claims. "The fact that it is unique was intriguing to me as well. I definitely get people saying things like, 'Is that a HondaJet,' or 'What is that?' When going to other countries, some people have thought it's a custom-built or a homebuilt aircraft."

Schaff notes that the industry's only HondaJet ownership group has recently focused on attracting new parties to the group, whether with or without model-specific experience. This association has positively influenced drawing in and retaining new HondaJet operators.

"I'm on the HondaJet Owners and Pilots Association (HJOPA) board, which we are currently revamping. HondaJet owners are unique and niche, so our pilots' association is a great group of people. We will have events every year, and we expect them to be lots of fun. Right now, our forum has a great 'Ask an Owner' section and a 'New Pilot' thread, and we will be making it even better soon," he foreshadowed.

"If you want to get into a HondaJet, turbine experience is the biggest obstacle or advantage. I had a lot of experience, and it was an effortless transition into the plane. If you don't, it might be worth going up before you get your type rating and getting really experienced with the plane by flying in the right seat or another avenue. After you understand the plane, it's too easy to fly. It's a lot like flying my JetProp."

A look outside from the HondaJet cockpit at altitude

He followed with some additional advice for those considering moving into the model from others.

"[Pay special attention to] crosswind landings. Really get proficient at that. Tailwheel training helps you with that since it lands similarly to one. Once you understand the G3000, the thing basically flies itself."

Schaff reported that his initial type rating training in a simulator was a good first step towards understanding some of the aircraft's nuances. He now has more than six hundred hours in type.

"As far as limits, there is the crosswind limitation. But after a while in the airplane, I'm not afraid of the landings. You get used to it, and once you are, you don't notice the difference from other planes. The aircraft performs well as long as you have the experience." T&T

You can follow Jonathan's flying adventures on Instagram at *@jvation.*

by **Kevin R. Dingman**

Decide

Aircraft High-Speed Aborts, Dopamine and Time in a Bottle

Super 80 on takeoff. It's sometimes better to continue rather than abort.

PHOTOS BY AUTHOR

Before we begin this month's story about the decision to abort or continue a takeoff, and before explaining our eccentric subtitle, we should thoroughly understand these takeoff-distance definitions:

Accelerate-go distance is the total distance to accelerate from a stop, lose an engine (or other reject criteria) just before V1, recognize the failure as you reach V1, and continue the takeoff to cross 35 feet AGL at the end of the runway and at your takeoff safety speed (V2). Note: after liftoff, if your airspeed is slower than V2, pitch to accelerate to and maintain V2. If your airspeed is faster than V2, pitch to maintain an airspeed no faster than V2 + 10. Some flight guidance systems will recognize an engine failure and display this profile through the flight director's V-bars.

Accelerate-stop distance includes the total distance to accelerate from a stop, lose an engine (or other reject criteria) just before V1, recognize the need to reject as you reach V1 (officially, a three-second delay is acknowledged, but the reject must begin at or before V1) and stop the airplane using idle thrust, wheel brakes and speed brakes/spoilers before reaching the end of the runway. Note: most aircraft performance data for an abort (reject) do not include using thrust reverse, so if used, a single thrust reverser (single engine, remember?) is a bonus in reducing stopping distance, but directional control may become an issue. Also, the commonly accepted order (after throttles idle) for the use of deceleration devices is: 1. max braking and 2. simultaneously deploy speed brakes & spoilers, and then 3. thrust reverse.

Balanced field length is where the accelerate-go and accelerate-stop distances are identical.

Now that we've had our refresher, on to the story.

> The most difficult thing is the decision to act; the rest is merely tenacity. -Amelia Earhart

Unless engine parameters fluctuate, a bird strike typically does not warrant an abort.

There I Was

I was trying to analyze, rationalize, and explain away the offending engine parameter as being 'close enough' so that we could continue. Continue how we have for the last eight or nine thousand takeoffs, comparing left to right and assessing limitations. Why won't it just quit—or give me a fire light, an overtemp, or at least something out of limits?

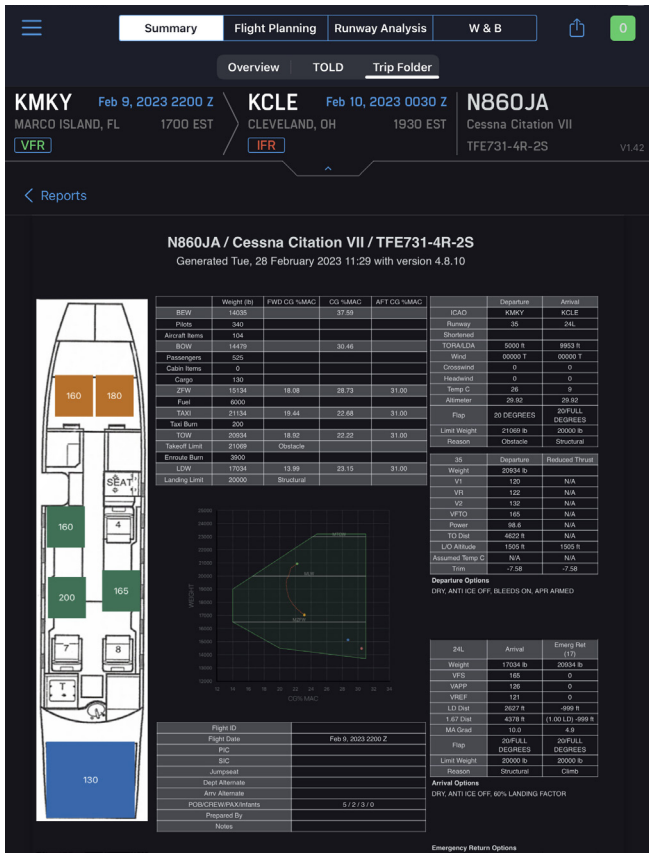
I know this airplane better than I've known any other machine in my life, better than the back of my hand. I know what close enough looks like. Maybe this is close enough. Nope, this is not close enough—in fact, it's getting worse, further away from 'close enough.' It's acting too different from the previous nine-thousand times. The right engine N1 was slowly decreasing, and the EGT was increasing. In three seconds, it will be too late to stop. In another eight, it will quit; I know it will.

Reject! Throttles idle and max manual brakes. Verify the auto-spoilers deployed and throw out the buckets. My FO tells the tower we're aborting as we're pushed slightly forward into our shoulder harnesses. The instant I made the decision, I was mad. Not mad at myself for making the wrong decision. Ironically, I was mad at the engine for not failing more definitively—more deliberately, more exuberantly. A dramatic failure that the passengers could see and be grateful that we stopped.

Dopamine Singularities

Everything you have read so far transpired in three seconds as we accelerated from 110 kts to 120 kts: 25 kts below V1. Seven seconds later, we were below 50 kts and had more than one-third of the runway remaining. I moved my hand from the yolk to the tiller and steered onto the high-speed taxiway at 20 kts, made a PA to the folks, and waited for ARFF to check us for hot brakes. Total elapsed time from brake release to taxi speed: 40 seconds. Perceived time: five minutes. I've had eight engine failures: two in the Duke and the rest in turbines—and two of the turbine events were during takeoff. One of them happened at gear retraction (see T&T September 2010), and the above event was my only engine failure, a high-speed abort. And it's always the time compression that amazes me. I've had a handful of events, like this one, that were intense enough to cause the linear time anomaly. If you've never experienced it, you will. Can it be explained away as simply an adrenaline and dopamine-induced change in perception?

Black and white is easy; gray is much more difficult. Fires, engine failures or flight control problems are easy; they're all on a short list of reasons to stop. A sickly engine that is dying a slow death, a funny noise or vibration, or a strong smell as you approach V1 means you must use judgment and decide; is it safer to fly or stop? (more in a bit about botching the abort) You're the one that must decide, often in a hurry. The decision is made using the knowledge, training, current conditions and experience you can muster in the few seconds you have before V1.



Reasons to Stop: Fire, failure, stall, controllability, wind shear

The weight and balance and takeoff performance software used by my part 121 carrier provided minimum runway lengths and V-speeds to define the accelerate-stop/go and balanced field length parameters. The program I use in the Citation instead provides a maximum takeoff weight and V-speeds for a user-specified runway to meet the balanced field length definition—any weight below that calculated weight gives you runway to spare. Also, an engine failure is not the only reason to reject a takeoff. The commonly accepted reasons to abort include fire, failure, stall, controllability and wind shear. That is ANY fire (cockpit, cabin, cargo, or engine), engine failure, wing or compressor stall, aircraft controllability concerns and wind shear or micro-burst.

Other Bad Things

Up to a predetermined speed early in the takeoff, we are trained to watch for any reasons to stop, not for reasons to go. In high-performance twins and most jets, the first

> [A pilot] must have good and quick judgment and decision, and a cool, calm courage that no peril can shake.
>
> -Mark Twain

pilot-elected 'decision point' is around 60-80 kts—while our kinetic energy is still relatively low. A typical list of reasons to stop before 60-80 kts would begin with the big things: fire, failure, stall, controllability and wind shear. But, at that first slow-speed decision point, we can also add other potentially bad things: slow acceleration, tire failures, unusual noise or vibration, a sudden, strong smell, bird strikes, and possibly a call from your cabin crew or a scream from the passengers. In other words, just about anything.

Once we exceed that predetermined, slow-speed decision point, we will continue accelerating to V1. In the time from our elected decision point to our official, performance-based decision speed at V1, we will then only abort for the big ones: fire (cockpit, cabin, cargo, engine), failure (engine and maybe total electrical), stall (wings or engines), controllability (flight control issue: runaway trim, failure to set the flaps, a deployed thrust reverser, rudder hard-over), and wind shear or microburst. I hear you

Flight control issues are on the short list of reasons to abort.

asking: how can we have a wing stall during takeoff? I don't know—wing ice or possibly AOA failure. But do you really want to leave the ground with the stall warning blaring and/or the stick shaker going off? Once we reach V1, we are taking the vehicle into the air, no matter what, lest we attempt an abort above V1, exiting the paved surface at a kinetically energetic (½ mv2) and likely deadly velocity. Now, about botching that high-speed abort.

We Totally Botch them

A low-speed, low-altitude, heavy-weight engine failure is dangerous and difficult to manage. So why even have this discussion about whether to go or stop? Why not simply

decide right now to abort for just about anything? Why is the decision not black and white? Because of that (½ mv2) thing, my dear Watson. And our propensity to totally botch the abort—despite practicing them in the sim. We perform aborted takeoffs least often of all the maneuvers. I bet you have never practiced a high-speed abort in an actual aircraft; at least, I sure hope not. We botch them for a variety of reasons: no experience, low ability, late decision, bad decision, bad abort techniques, bad runway conditions, bad aircraft equipment, bad runway components and sometimes, just bad luck.

We are encouraged to continue the takeoff in jets and turbines because we have plenty of power to fly all day long on one motor—if done properly. If the airplane is capable of flight and not on fire, statistically, we will have a better outcome if we continue the takeoff and work the problem in flight. The reason we're encouraged to continue the takeoff between those slower 'criteria' speeds and V1 is because, as a group, we have shown that, more often than not, we will totally and completely botch a rejected takeoff and depart the paved surface anyway—either off the sides or off the end. And we will catch the tires, wheels and brakes on fire and hurt a bunch of folks during an evacuation. Sometimes we catch the whole blasted airplane on fire.

> It's better to be on the ground wishing you were in the air, than in the air wishing you were on the ground

If you 'go' when you should have stayed, you will likely regret it, maybe a lot. If you 'stay' when you could have gone, you may also regret it, but probably much less, unless that is, you totally botch the abort. Remember: each runway, your takeoff weight, the wind & weather, your level of tiredness and time-of-day will affect your plan. Once you appreciate that (½ mv2) thing and have a personal list of low-speed and high-speed decision events, and you have a plan for when one of them happens, stick to it. The confidence you gain from simply having a plan will serve you well. And whether you stay or go, when one of your 'events' does happen, the changes in your body's adrenaline and dopamine levels will almost certainly alter your perceptions and give you a moment of 'Time in a Bottle.'

Author's note:

Grateful acknowledgment to Jim Croce for his classic 1973 folk-rock tale, "Time in a bottle".

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

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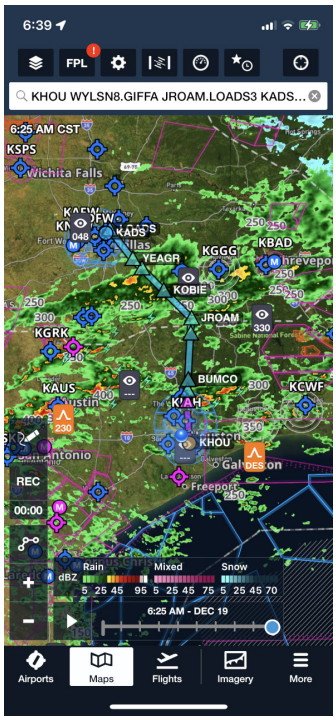
Just Take a Nap

You wake up at 6 a.m. for your morning flight and discover a very large area of unforecast embedded thunderstorms between you and your destination, only two hundred miles distant.

How do you handle the challenge?

That was my dilemma on a return flight from Houston to Dallas the week before Christmas. The flight down the day before was simple, under clear skies and light Sunday traffic. But a low-pressure system was developing in south Texas, necessitating an early morning Monday return to beat potential afternoon thunderstorms. Unfortunately, the actual departure day weather was much angrier than forecast.

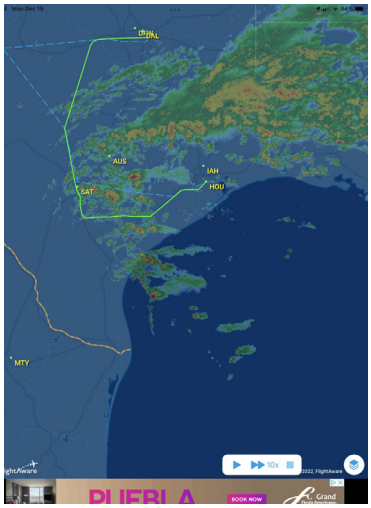


PLAN A
Just go through it.

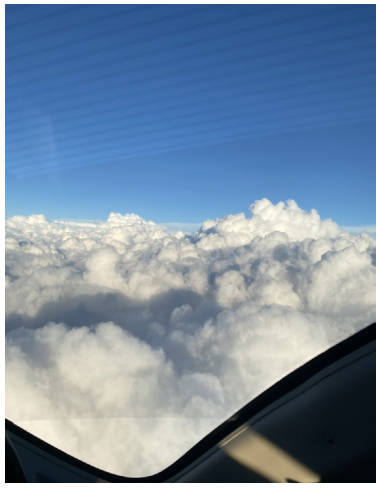
The 6 a.m. picture at left was just the tip of the iceberg. Within 2 hours of this photo, a line developed just north of Houston, Hobby (KHOU), with tops to FL500. On FlightAware, the only aircraft flying the route shown were Southwest flights. An urgent PIREP of severe turbulence from a regional jet made my decision much easier. General tops were above FL 350, and on a 240 nm trip, there was no way I would get over this weather system.

PLAN B
Just go around it.

The picture at right depicts what it would take to go around the system. Fly west to San Antonio, then north to Dallas. Several jets were doing this at FL400, adding half an hour to the trip.



But by the time I had this idea figured out, numerous cells were developing to the west of Hobby, blocking my departure route. Over coffee, I consulted with our host, Randy Broiles, CJP Safety Foundation Chairman. He invited Patty and me to stay another night if I would pay for dinner. But Randy has expensive wine habits. I pondered the offer. It was the wisest choice. We made dinner reservations.



PLAN C
Just take a nap.

After a nice lunch punctuated by a loud clap of thunder and moderate rain, it was time for a short nap. An hour later, I checked my iPhone. To my surprise, the thunderstorms had moved just east of Hobby, creating a less threatening path to Dallas. I woke Patty up. "If you can get packed in five minutes, we can get home to feed Peaches," I said. Patty loves our thirteen-year-old dog, Peaches. You should have seen her pack. She even packed my stuff. We hugged the Broiles and jumped in an Uber, filing the flight plan on the way to Hobby. Galaxy FBO had the Mustang ready in minutes.

Hobby Ground told us to expect a twenty-minute delay for in-trail spacing to Dallas due to weather. But thirty seconds later, the tower cleared us to depart. The picture above shows the tops at ten thousand feet just after takeoff. An hour later, after a descent in light icing and light turbulence, we shot the ILS 16 approach to Addison to a setting sun.

Sometimes, all you need is a nap.

Fly safe. T&T

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

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corpangelnetwork.org

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-Henry Maier, President and CEO, FedEx Ground

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