False Favorites

Smooth landing, great pilot . . . **NOT**

JOOSTIK

Deicing an Airbus A320, as seen from the cabin.

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The flying public has a lot of misconceptions about aviation in general and how we do our jobs in specific. It is even worse when pilots of any kind have some of these same misconceptions. The fact that you are reading this magazine probably means you are not likely to fall for any of these wrongheaded ideas. So, what follows may just be useful as a gauge of how poorly informed many of your passengers may be, helping to prepare you for the moment these questions come your way.

Salty Spray Protection

A few years ago, I was sitting in an airline cabin on a snowy Massachusetts day awaiting our departure from Boston Logan International Airport (KBOS). I was in an aisle seat, on the left side of the airplane, just aft of the wing. To my left there was a young man and to his left a young lady. She was already seated when I arrived, the young man took his seat last.

After everyone was boarded and seated, the airplane was pushed back and the captain came on the PA system to explain we would need to deice. After a few minutes we could hear the spray of the Type 4 above and forward of us and then the wings. The woman, nervously pointing out the window, asked to nobody in particular, "What are they spraying on the wings?"

The young man said, "It's heated saltwater."

"Why do they use saltwater?" she asked.

"It has a lower freeze point, there is no cause for concern," he explained. "I am a pilot; these are things we have to know."

"That is so amazing," she said.

I held my tongue as the young man went on to wax eloquently about flying. He explained that he was multiengine rated, which meant he could fly anything with more than one engine. "But isn't it dangerous?" she asked. "It's safer than driving," he said. I decided to tune them both out.

The author and his bride on a PA-23 cross country from Honolulu to Kona, Hawaii, 1983.

Road Wary

We often hear that the most dangerous part of any pilot's day is the drive to and from the airport since "Flying is safer than driving." But it really depends on what kind of flying you are talking about.

John and Martha King of King Schools Inc. have made it their business to educate general aviation pilots in everything from their initial private pilot's license to their Airline Transport Pilot (ATP) certificate, and they offer courses in risk management. The Kings argue that even experienced pilots do not have a realistic idea of flight risks and that the idea that the drive to the airport is the most hazardous part of any flight is simply wrong.

According to the Kings' research, the general aviation flight risk on a per-mile basis is on a par with motorcycles, about seven times greater than the risk of a car accident and 49 times greater than the chance of being involved in an airline crash.

This is important to us in business and commercial aviation because we

San Francisco, California (KFSO) to London, England (EGLL) as seen on a cabin passenger display

are not in the same high-risk category as general aviation. The general public associates any airplane crash as a blot on our industry. We would do ourselves some good if we rephrased that old fly-vs.-flivver chestnut to "Flying with two professional ATPs up front is safer than driving."

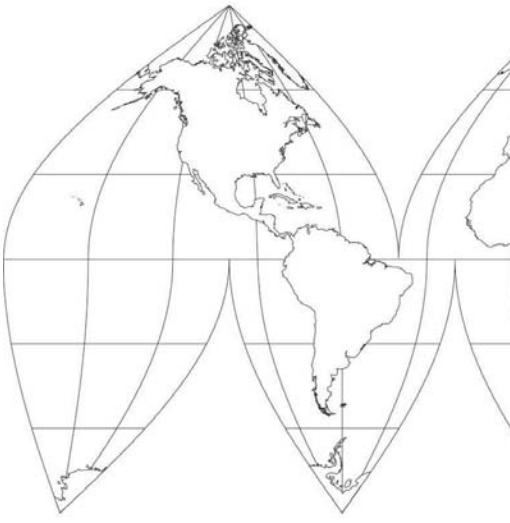
Flanders Curveball

I've heard this one from passengers, but even more alarming, I once heard it from a pilot with whom I was flying. The statement: Our route across the ocean is curved because of the winds.

You will likely hear this more on an oceanic flight since such crossings are less likely to be constrained by suboptimal airways and the distances are rarely as great when flying domestically. But if your cabin has a video map of your journey, you should be ready with the correct answer.

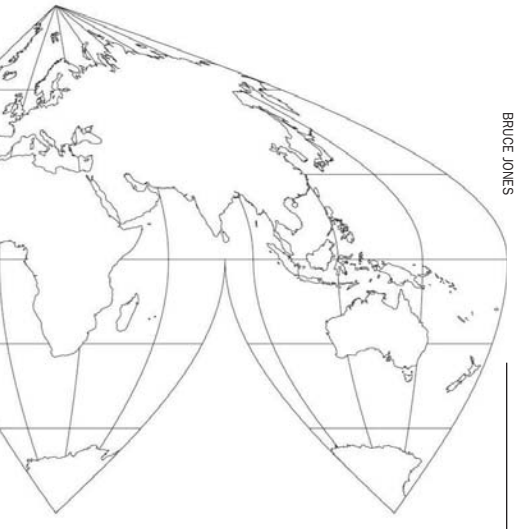
Let's say you are flying from San Francisco to London on an optimum route. The cabin map might display a route over Greenland. "Why are we going the long way?" one of your passengers might ask. It's clearly apparent to him that the shortest distance between the two cities is a straight line over Boston and the line on the map is anything but straight!

The visual confusion traces back to Geradus Mercator, a 16th Century Flemish cartographer, who solved a problem posed by earlier mariners needing to plot straight courses over relatively short distances. The earth isn't flat, but for the purposes of navigating several



hundred miles it might as well be. Visualize a globe that you have to unwrap and flatten so it can be scanned into a map. You will end up with not enough map at the poles.

What Mercator did was stretch everything to make the edges of these "peels" of map meet, distorting everything except the equator. The farther the location from the equator, the greater the distortion. This makes land masses and oceans near the poles



BRUCE JONES

A six-point sinusoidal projection of the Earth

appear larger than they really are, but it also allows a navigator to place a plotter along a line of longitude and derive an accurate course. It also serves to bend straight lines away from the equator. That's why the line from San Francisco to London curves to the north.

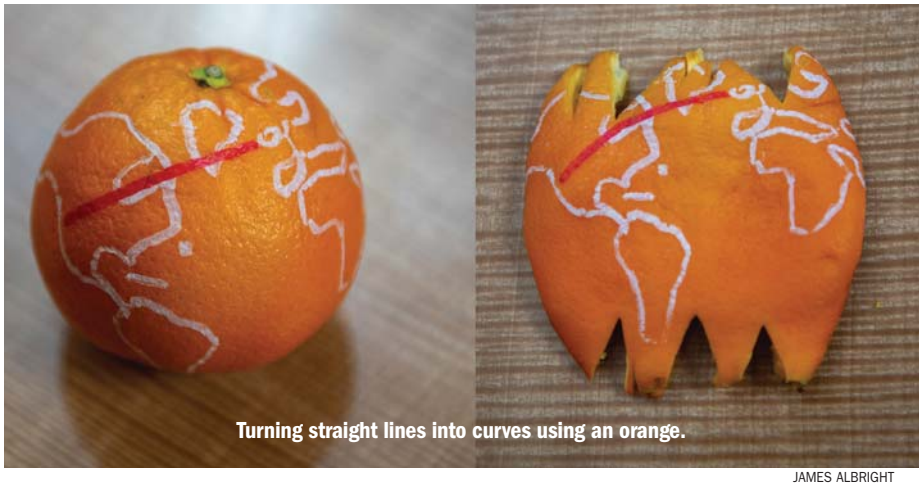
If we were to view the route from directly overhead its midpoint with an altitude high enough to view both cities, it would be straight. Mathematically, this view would be along the flat plane that carved the world into half by its great circle. In other words, it would be as if we placed a new equator along the line between these two cities. Viewing this along what is called "gnomonic projection," you would see a straight line that does indeed fly over Greenland.

I was once on a charter from San Francisco to London and was asked this question during my mandatory rest time away from the cockpit. I did my best to explain to the passenger the compromises Mercator had to make and that the maps we are accustomed to viewing are actually distorted. "Yeah I get that," the passenger said, "but why aren't we flying a straight line?" I thought about it and retreated to the galley for an orange.

Upon it, I drew a crude diagram of North America, the Atlantic Ocean, Europe and Africa. I then used the straight edge of a napkin to trace a straight line between our origin and destination. The passenger agreed that my drawing, while crude, did represent what would be an optimal route between those cities on our orange globe. I then sliced the orange in half, being careful to keep both cities on the same side. With a little effort, I managed to hollow the fruit from the rind. With scissors, I made a few radial cuts from each pole to help in the flattening process to come. I then placed the orange rind on a cutting board and pushed downward to flatten it. As the orange flattened. the cuts started to expand and the route of flight, as if reacting to a magical force, bent northward. "Wow!"

So, how do you explain this if you don't have an orange handy? Try this: "Most maps are distorted because it is pretty hard to show a three-dimensional surface on a two-dimensional piece of paper or video monitor. Because the world is a sphere," (make a sphere with your fist), "flattening a true representation widens everything close to the poles." (Expand your fist so the fingers spread out.) "Every straight line on the sphere except the equator will curve toward either the North or South Pole." (Trace a curve with a finger from your other hand. Then contract your hand back into a fist.) "So, the line looks curved because the flat map cannot faithfully represent a straight line on a curved surface."

This explanation doesn't always work.



Turning straight lines into curves using an orange.

JAMES ALBRIGHT

GOOGLE EARTH

San Francisco to London on a Gnomonic projection map

Some people have a better understanding of three dimensions than others. Many passengers — and some pilots — are comfortable assigning things that aren't intuitively obvious into the magic category. Another act of magic is the air we breathe. If you can't see it, how do you explain it?

A Cup of Consciousness

I've heard this one on airline flights and in the business aviation world, too: Those passenger oxygen masks that look like dangling Dixie cups will keep your passengers from passing out if the cabin depressurizes. That is only true if the pilots up front remain conscious so they can get everyone down to an altitude with breathable air.

Most flight attendants have the spiel memorized; on my last airline flight I realized I had it memorized too. "In the

Passenger oxygen "Dixie Cup" masks

unlikely event of a sudden loss of cabin pressure, oxygen masks will automatically drop down from the panel above your head. To start the flow of oxygen, pull the mask toward you. Place it firmly over your nose and mouth, secure the elastic band behind your head, and breathe normally. The plastic bag below the mask may or may not inflate, but oxygen is flowing regardless."

The flight attendant had the mask in the general area forward of her face and the straps above her head, making her point without marring her makeup or hair. With that, she went on to explain those very complicated seat belts and I continued to read the novel I brought onboard.

Most passengers assume those plastic cups will be able to keep them conscious for as long as it takes. Then there are the cynics who believe the masks are nothing more than placebos to give us something to do before we pass out. Those of us up front with the real oxygen masks know better; those little cups do work for a limited time and will keep our passengers conscious, provided we do everything just right.

Getting the airplane from cruise altitude to an altitude with breathable air requires pitch attitudes that we normally tend to avoid and immediate action: Push the nose down, accelerate to maximum speed, pull the throttles to idle and extend the speed brakes. We practice this in the simulator regularly to the point we hope it becomes automatic. Some airplanes do this automatically, but most require actions by a conscious pilot. As long as they remain conscious, I think most professional pilots will do this correctly. But remaining conscious in the cockpit is not assured.

Listening on the radio to my fellow professional aviators I am amazed by how rare it is to hear a pilot talking to air traffic control through an oxygen mask. The least restrictive rule (14 CFR 91.211) requires at least one pilot wears and uses an oxygen mask above 41,000 ft., or above 35,000 ft. if one pilot leaves the flight deck. A good technique in this situation is to hand off ATC duties to the pilot not wearing oxygen, but I am still surprised at how rare it is to hear a Darth Vader-like pilot checking in at high altitudes.

We in business aviation often say that Part 91.211 is the most often violated FAR in the book. Part of the justification is that our Time of Useful Consciousness (TUC) as given in the most popular tables is a generous 15 to 20 sec. at 40,000 ft. Lots of time! Lost on many of these pilots is the fact that those times were based on an old U.S. Air Force study involving extremely fit (and young) test pilots. I very much doubt most pilots these days will last half as long and if the two pilots up front pass out, those cup masks won't do the folks in back much good.

But let's say you are in the depressurized cabin with that cup mask attached to your face while the airplane descends nicely because the pilots up front have their masks on. Will you have enough oxygen for the ride down? That depends. The masks in most airline cabins are the same as what we have on our corporate jets, but the oxygen source might be a bit different. On our Gulfstreams, for example, passenger oxygen masks are plumbed into bottles that will last for a while, depending on how many passengers are on board, the cabin altitude, and the speed at which the pilots descend to an altitude where the masks are no longer necessary.

The weight and physical size of oxygen bottles and the lines to each mask assembly introduce costs and maintenance issues that make them poor choices for some airline cabins, but not all. Some models of the Boeing 787, for example, do have gaseous passenger oxygen systems that can last 60 min. But most airline aircraft have chemical oxygen generators installed above each seat row with much less capability. These oxygen generators do not require heavy bottles and the connecting hardware, nor do they require refilling. In either case, when the cabin altitude reaches a predetermined level (typically 14,000 ft.) or if the system is activated by the flight crew, overhead panels open and oxygen masks drop out. Pulling the mask down also tugs at a lanyard that releases a firing pin to activate the oxygen generator.

A typical oxygen generator includes an oxidizer of sodium chlorate ($NaClO_3$) mixed with barium peroxide (BaO_2) and potassium perchlorate ($KClO_4$) that is heat activated. That heat is generated by chemicals activated by a small explosive charge that is triggered by pulling that lanyard. Once activated, the chemical cocktail produces oxygen

A Virgin Atlantic Boeing 747 touching down at Manchester Airport, United Kingdom, May 2008.

MATT BIRCH/VISUAL APPROACH IMAGES

until the generator has been exhausted, which occurs in the range of 12 to 20 min., depending upon the type and size of generator installed, the starting cabin altitude, the descent rate and the inhalation rate of the user. Your inhalation rate depends on your physical conditioning and how calm you remain.

Calm? What does that have to do with anything? There is only so much oxygen in either system, and once it's gone, it is gone for good. The more rapidly and deeply you breathe, the faster it goes. How easy will it be to remain calm as your aircraft is pitched steeply down, the wind is rushing over the fuselage, and the speed brakes are adding to the perceived turbulence?

And what about the plastic bag? The reason it may or may not inflate is because of the user's respiration rate. If you remain calm and don't use all of the oxygen generator's output, the excess gets put in that bag, ready for you should you need it or once your generator is empty. There is a chance some passengers will run out (and pass out) while others are still being supplied oxygen.

Up front, our oxygen masks are certainly more capable than those little cups in back and are designed to keep us conscious and functioning. Among many pilots it is fashionable to dismiss the need to use oxygen at high altitudes because the chances of a sudden loss of pressure are low. I used to think that; it has only happened to me once in 40 years. But now that I have access to several aviation news websites that give me daily updates, I see that sudden depressurization isn't so rare after all. I've also heard that while the oxygen is pure, it is dry and the masks are not sterilized. We keep alcohol wipes in the cockpit to keep our masks clean. That may not be as good as a freshly sterilized mask, but the wipes do help.

I think the real reason most pilots are reluctant to use their masks is that they are uncomfortable. We replaced our masks with the most comfortable ones we could find and we trade oxygen duties between pilots at 1-hr. intervals. I agree that all of this will be for naught if we never lose pressurization at altitude. But it is a responsibility we have accepted in our duties to get our passengers safely from Point A to Point B, and that duty isn't complete until we have landed, the passengers have disembarked, and our aircraft is put to bed for the day.

Cheers for the Gentle "Chirp!"

When I was stationed in Hawaii with the U.S. Air Force, I often found myself airlining to the mainland to pick up an airplane that had been broken or in extended maintenance. Most of our pilots hated these trips because you ended up having to do long preflight inspections to make sure the airplane was OK and, even worse, waiting for what had been repaired to really be repaired. I didn't have much choice in the matter at first because I lacked seniority, but after a while I figured out this was a great way to learn. So, I tended to volunteer for these assignments.

Back then it was next to impossible to get a direct flight from Hawaii to anywhere on the continent other than Los Angeles or San Francisco, so we tended to fly to California and then hop on another airplane to get to where we needed to report. I once had the good fortune to be on an airplane going from Honolulu to KLAX and on to Wichita, my true destination. I was seated in the cattle car class between a window and a talkative fellow who had been on a business trip to Hawaii and was on his way back home to Wichita. I learned his life story before we even leveled off. I told him I was an Air Force pilot but not much else. I opened a book and he took the hint.

The Los Angeles skies were docile for our descent and approach. As we rounded out and flared, I grimaced as I watched the fixed distance markers of the runway slide by. The airplane finally kissed the runway about halfway down to the applause of most of the passengers, including the one seated to my right. He concluded his clap with a thumbs up aimed my way, "Nice!"

After a few hours we boarded the same airplane and for those of us continuing on, in our same seats. The winds were howling at Wichita and the pilot did a good job putting us down in the touchdown zone with a firm thud. My seat-mate gave a bit of a chuckle and laughed. "Not as good as the first pilot," he said. "I hope he catches hell for that!"

"Why do you say that?," I asked.

"Didn't you notice?" he asked. "That was a lousy landing!"

"It's hard to judge from the cabin of the airplane," I said. "But it seemed OK to me."

He laughed some more. "Well maybe you weren't paying attention. But he clearly landed on one set of wheels before the other."

"Oh," I said. After a long day of traveling, I didn't feel like going into the details of the wing-low crosswind landing technique or the importance of landing in the touchdown zone.

The author at 45,000 feet abiding by 14 CFR 91.211.

JAMES ALBRIGHT

Turning a False Favorite Into a Truth

It may not be the end of the world if your passengers don't understand the intricacies of the Mercator projection or the benefits of ethylene glycol. But you should be prepared to answer these questions thoughtfully. Your credibility is at stake when part of the audience knows the answer and you don't. **BCA**