



JEFF SKILES

COMMENTARY / CONTRAILS



Polar Flight

Crossing over the top of the world

BY JEFF SKILES

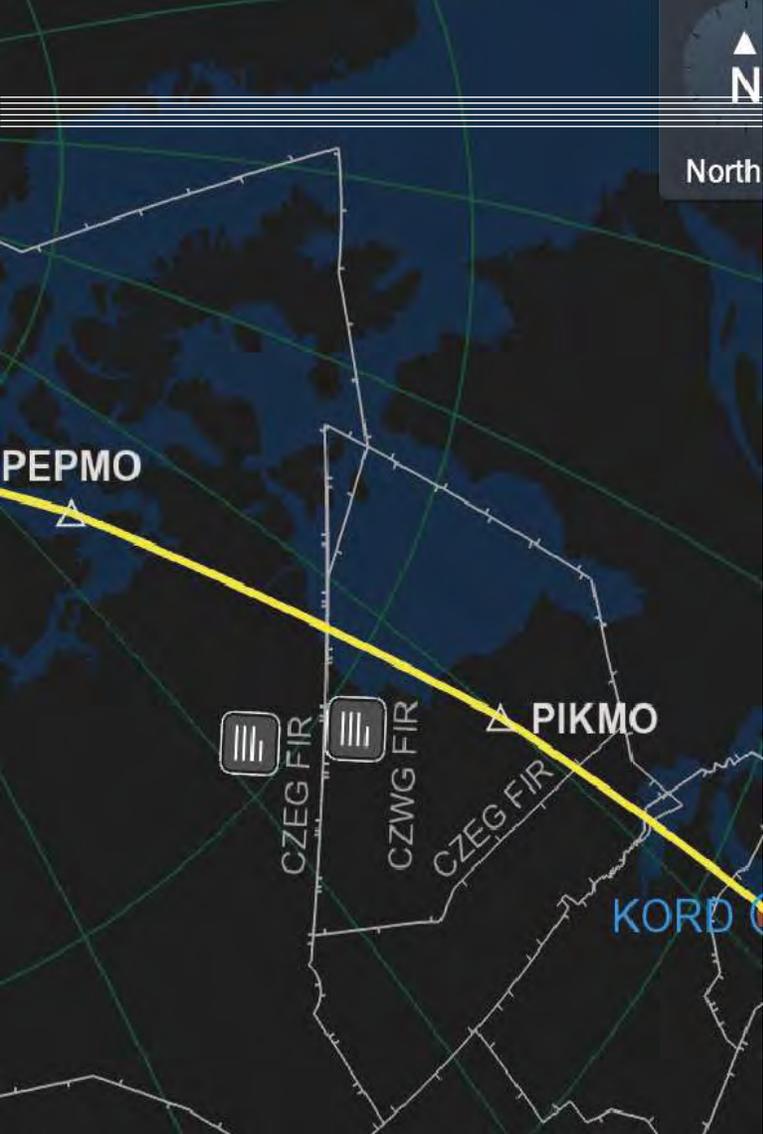
CLIMBING THROUGH 18,000 FEET, the cockpit begins to settle down as we pace ourselves for the 12-hour flight ahead. The hustle and bustle of the O'Hare International Airport departure with its jammed ground control frequencies and aircraft taxiing every which way is now behind us.

We're a four-man crew today, and the relief crew heads for the bunkroom to catch some sleep before they relieve us in roughly three hours' time. The crew will continue this three hours on, three hours off watch cycle until arrival at Tokyo's Narita International Airport tomorrow.

One would assume that a flight between Chicago and Tokyo would proceed westward passing over San Francisco before crossing the vastness of the Pacific. Maybe the tropical climes of Hawaii will be visible from our cockpit windows. Perhaps we'll see Midway or even Wake Island. But such visions of palm trees and clement weather would be dead wrong. The shortest distance between two

points on a map is not a straight line, but rather a sweeping arc across the globe called a great circle route.

The great circle route from Chicago to Tokyo curves up through western Canada and cuts through Alaska directly over Denali National Park. No tropical breezes there! It then hugs the Kamchatka Peninsula of Russia before passing over the northern islands of Japan and on into Tokyo. The great circle distance is roughly 5,500 nm. My westward route straight across the Pacific would be about 650 miles farther. But there are other factors to consider when plotting a route to Asia, like turbulence and the jet stream.



THE JET STREAM

The jet stream is a fast-moving ribbon of air with speeds generally around 100 knots and occasionally more than 200 knots. The polar jet races from west to east in the mid-latitudes at prime cruising altitude for airliners. While it is only a couple of hundred miles wide, today the jet stream unfortunately overlays our great circle route to Tokyo. Rather than fly into the teeth of the jet, it will make a quicker passage to fly north or south of the great circle route. Taking all these considerations into account, the fastest way to get to Tokyo today is over the top of the world flying a polar route.

Leaving Chicago, we take up a course directly north — 360 degrees. In a couple of hours, we will pass over Hudson Bay and the far northern Canadian province of Nunavut. Only then will we turn northwestward toward the high latitudes of the Arctic Ocean. The route will touch 79 degrees north latitude before turning south and making landfall over the isolated mountains of western Russia. Unfamiliar names will mark the territory ahead as we fly over the Sea of Okhotsk and the Russian island of Sakhalin before arriving on the shores of Japan.

MAGNETIC UNRELIABILITY

Only two hours after takeoff we enter the area of magnetic unreliability in the northern reaches of the Arctic. Magnetic compasses

Dreams do come true!

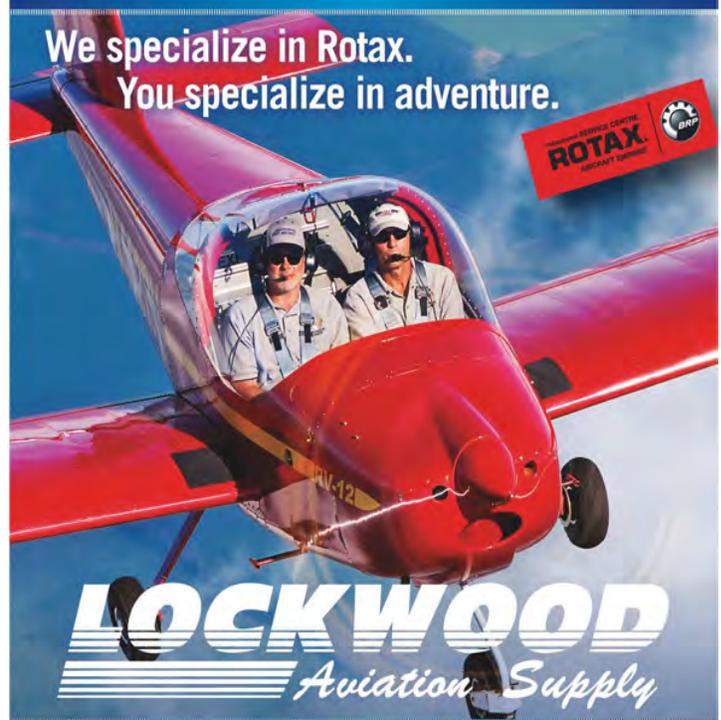


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swing fitfully so near to the magnetic north pole, and all navigation must be referenced to true north. We are prohibited from conducting an approach or landing in this area due to the inaccuracy of our directional reference. Beyond Churchill, Yellowknife, and Iqaluit to the east — all on the edges of the region of unreliability — there aren't any airports adequate for a Boeing 787 anyway.

EMERGENCY

The Arctic can be a lonely place for an aircraft with a medical emergency or an aircraft systems failure. Over the pole the closest runways are almost 1,000 miles away at Barrow, Alaska, or Svalbard, Norway. Both are reached by flying south even though they're on opposite sides of the planet, a difficult concept to wrap your mind around.

Barrow and Svalbard are also more than two hours' flying time away. The sparsity of available runways requires the crew to constantly plot and request weather updates for enroute alternate airports answering two questions. Where do you go if you're on fire? Where do you go if you have a medical emergency?

A medical problem can be a real conundrum. It's a long way from any kind of medical assistance over the pole, and neither Barrow nor Svalbard are suitable airports for a medical diversion. There's simply not much there. A true medical emergency would require us to divert even farther away to somewhere like Fairbanks with proper facilities.

FUEL FREEZE

A couple of hours into the flight the dispatcher sends a message with the fuel freeze temperature. If the fuel was allowed to cool to the point that it started to freeze in the tanks or fuel lines, it would obviously be very bad. On polar flights the airline takes a sample of the actual fuel onboard and cools it to determine the exact freezing temperature. This temperature is relayed to the crew in flight to insert into the flight management computer. Should the fuel temp drop to within a few degrees of this value, we will receive a warning. Our options to warm the fuel are fairly limited, though. We can descend to a warmer altitude or fly faster. Neither is optimal as it will cause us to deviate from the carefully calculated fuel plan and perhaps eat into our arrival fuel.

FUEL PLANNING

Long-distance flying of any sort requires constant attention to the flight log. Time and fuel is calculated for every navigation fix or waypoint on the flight plan, and there may be 50 or more on a long flight. The crew notes the actual time and fuel next to predicted values upon passing each fix, thereby maintaining a running record of fuel burn.

Occasionally the numbers don't add up, and a fuel stop short of the destination is required to ensure enough gas on the other end for FAA mandated reserve and alternate fuel. This is particularly common over the North Atlantic with the shorter-legged Boeing 757s. Returning westbound against the strong prevailing winds of winter, a fuel stop in St. John's, Newfoundland, or Bangor, Maine, is occasionally required.

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Our route doesn't hold any good alternatives short of Sapporo, Japan, on the northern Japanese island of Hokkaido. No one would relish a fuel stop at Petropavlovsk or Magadan in Russia. We dutifully plot them on our chart as emergency airfields because there's simply nowhere else to go, but the lack of services make these remote outposts a poor alternative.

COMMUNICATIONS

The flight passes through 10 different large scale ATC sectors called FIRs (Flight Information Region), each of which has its own rules regarding position reports and communications. There are five different communications systems onboard. Obviously, very high frequency (VHF) communications are preferred, and they are generally available by repeater stations when over dry land, but VHF is line of sight transmission and isn't available offshore.

The old standby high frequency (HF) radios are still commonly used. As you'd expect, HF radios operate at a lower frequency than VHF radios. HF transmissions

bounce off the ionosphere and can be propagated for quite a long distance — albeit at very low sound quality. It is very much like listening to a VHF radio without any squelch.

Controller Pilot Data Link Communication (CPDLC) and Automatic Dependent Surveillance Contract (ADS-C) are both data transmission networks. CPDLC is the wave of the future and essentially is text messaging with controllers. ADS-C allows us to send data stream position reports. Lastly there's the SATCOM (satellite phone) if all else fails.

Each ATC sector supports some or all of these communication networks and we must have at least two available at any one time. Language and accents can still be a problem however. Russian controllers in particular often only know pilot-controller English. Anything apart from standard operating phraseology instantly leads to a failure to communicate. You're not going to have a conversation with these people.

NORTHERN RUSSIA

Coming down from the high latitudes we make landfall off the Arctic Ocean over the Sakha Republic, part of an area more popularly known as Siberia. Peaks the size of the Rocky Mountains stretch on for 400 miles, and the mountainous terrain is smothered by a thick blanket of snow. The vast and empty scene below is completely unbroken by evidence of road or hamlet. Nothing but pure white. There are those who say there is no room for adventurers in our world; there is nothing left to discover on our small planet. Such laments could only emanate from people who have never been suspended aloft over western Russia.

TOKYO

Three hours of further flying brings us to the southern edge of Russian airspace and the beginning of our long descent into Tokyo. The sun has never truly set on this 12-hour flight across the Arctic as we traversed 9 time zones into tomorrow. Sol's vast orb dipped briefly below the horizon only to rise again as we left the upper latitudes east of the International Date Line. Below our wings the ordered farms and well-manicured towns of Japan welcome us back from the edges of our planet after 12 hours suspended aloft on this polar flight. *EAA*

Jeff Skiles, EAA Lifetime 336120, is an airline pilot who also flies the B-29 *FIFI* for the Commemorative Air Force and owns a Cessna 185. Jeff can be reached at JeffreyBSkiles@gmail.com.