Transport Canada Transports Canada

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AVIATION SAFETY LETTER

IN THIS ISSUE...

TP 185E

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Canada

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TIPS AND TOOLS

Staying Safe with Displaced Threshold

by Flight Training and Licensing, Civil Aviation, Transport Canada

Transport Canada promotes safe transportation. It is important to understand the purpose of displaced thresholds. Recent dialogue with the industry indicates that the motive of displaced thresholds may be misunderstood.

The mindset predominantly encouraged is that a displaced threshold published in the Canadian Flight Supplement (CFS) or as a NOTAM is caused by man-made structures such as powerlines, towers, road traffic, tall trees, degradation of the runway surface or noise abatement procedures. A temporary displaced threshold may be the result of work in progress nearby or at the aerodrome (i.e., construction cranes located on the approach path and thus necessitating a landing further down the runway). These are all reasons to abide and respect the displaced threshold, despite the legality aspect of it.

Caution must be exercised. Safe training practices advocate adhering to the displaced threshold, as it was most likely created to aid the pilot in avoiding obstacles on approach and assists the pilot in maintaining the stabilized approach criteria. You may review those criteria in one of the Flight Test Guides (i.e., TP 13723).

Guidance is available in the Transport Canada Aeronautical Information Manual (TC AIM—TP 14371). Although the guidance in the TC AIM are not regulations, it is there for a purpose. Ignoring it would most likely not stand in a tribunal.

For the avid readers, additional information is available in TP 312–Aerodrome Standards and Recommended Practices for further reading about displaced thresholds. In Chapter 5 on visual aids, white arrows or yellow chevrons markings preceding the runway threshold serve the purpose of not only alerting pilots to a displaced threshold but also indicating if the preceding surface is included or not included in the declared landing distance available in the CFS for a particular aerodrome.

Let's look at two examples.

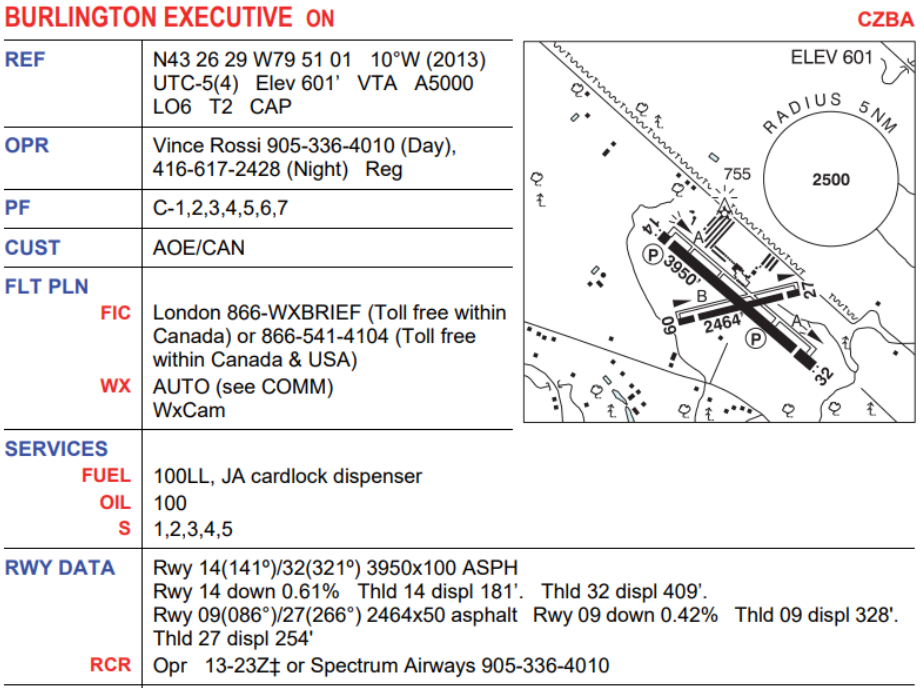
Burlington Executive, ON (CZBA) has white arrows that can be seen in a Google image (Figure 1) and in the CFS Runway 32 has a displaced threshold of 409 ft, which is included in the reported runway length of 3 950 ft. This means that 3 541 ft is available for landing and reported as the declared landing distance available (LDA). The arrows indicate that the threshold is displaced from the beginning of the runway. It is at the pilot's discretion, with safety in mind, if the surface preceding the threshold should be used or not. Best practice recommends not to use it.

Now, if we look at Oshawa Executive, ON (CYOO), we can see chevrons (in yellow, although the Google image (Figure 2) does not make it clear), and the CFS does not picture any displaced threshold, and that the declared landing distance available for Runway 12 is the full length of the runway, at 4 250 ft. If you look closely at the airport diagram, you can see that the runway begins at the taxiway, and the preceding surface is not there. It is important to note that chevrons indicate that the surface is not certified for aircraft movement.

The runway end or displaced threshold indicates the beginning of the declared LDA depicted on the aerodrome chart of the *Canada Flight Supplement* (CFS) or the Canada Air Pilot (CAP). Under CAR Part VI, pilots are responsible to ensure safe aircraft operation, including landings. If a pilot elects to land prior to the declared landing distance available (indicated by the threshold markings), then it is done so at the pilot's own risk.

There have been numerous accidents related to displaced threshold, and it is worthwhile to review the following Transportation Safety Board (TSB) report.

Figure 1: Google Maps image dated of September 17, 2024. Imagery ©2024 Airbus, First Base Solutions, Maxar Technologies, Map data ©2024.



BURLINGTON EXECUTIVE ON **CZBA**

REF	N43 26 29 W79 51 01 10°W (2013) UTC-5(4) Elev 601' VTA A5000 LO6 T2 CAP
OPR	Vince Rossi 905-336-4010 (Day), 416-617-2428 (Night) Reg
PF	C-1,2,3,4,5,6,7
CUST	AOE/CAN
FLT PLN	
FIC	London 866-WXBRIEF (Toll free within Canada) or 866-541-4104 (Toll free within Canada & USA)
WX	AUTO (see COMM) WxCam
SERVICES	
FUEL	100LL, JA cardlock dispenser
OIL	100
S	1,2,3,4,5
RWY DATA	Rwy 14(141°)/32(321°) 3950x100 ASPH Rwy 14 down 0.61% Thld 14 displ 181'. Thld 32 displ 409'. Rwy 09(086°)/27(266°) 2464x50 asphalt Rwy 09 down 0.42% Thld 09 displ 328'. Thld 27 displ 254'
RCR	Opr 13-23Z‡ or Spectrum Airways 905-336-4010

Date: May 14, 2024. Refer to CFS for official navigation.

TSB recommends:

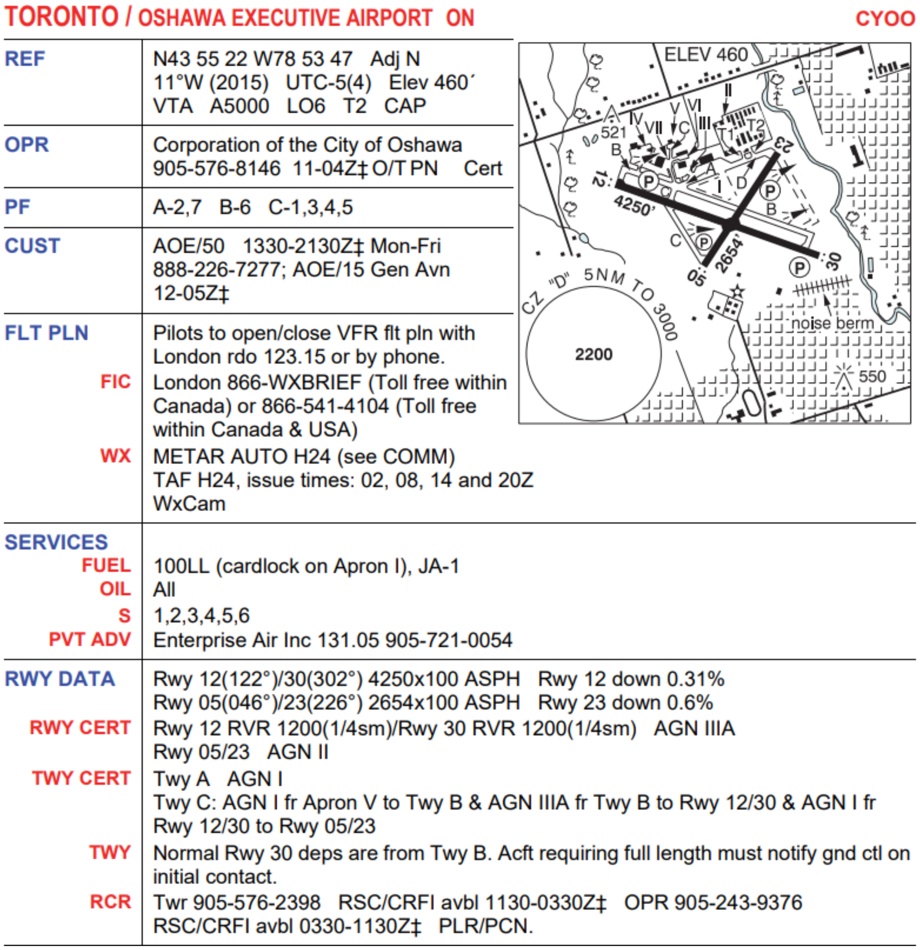
> **Safety message**
> Runway thresholds are often displaced to ensure that the approach slope is clear of obstacles. Therefore, it is important that pilots aim to touch down beyond the displaced threshold to help maintain obstacle clearance.

There could also be temporary displaced thresholds that would be published in NOTAMs. There are different ways these could be marked, depending on how long it will be displaced for.

As pilot-in-command, and for the best outcome for you and your passengers, it is your responsibility to know your aircraft's capability and to make the best decision.

Happy and safe flying to all.△

Figure 2: Google Maps image dated of September 17, 2024. Imagery ©2024 Airbus, First Base Solutions, Maxar Technologies, Map data ©2024.



TORONTO / OSHAWA EXECUTIVE AIRPORT ON **CYOO**

REF	N43 55 22 W78 53 47 Adj N 11°W (2015) UTC-5(4) Elev 460´ VTA A5000 LO6 T2 CAP
OPR	Corporation of the City of Oshawa 905-576-8146 11-04Z‡ O/T PN Cert
PF	A-2,7 B-6 C-1,3,4,5
CUST	AOE/50 1330-2130Z‡ Mon-Fri 888-226-7277; AOE/15 Gen Avn 12-05Z‡
FLT PLN	Pilots to open/close VFR flt pln with London rdo 123.15 or by phone.
FIC	London 866-WXBRIEF (Toll free within Canada) or 866-541-4104 (Toll free within Canada & USA)
WX	METAR AUTO H24 (see COMM) TAF H24, issue times: 02, 08, 14 and 20Z WxCam
SERVICES	
FUEL	100LL (cardlock on Apron I), JA-1
OIL	All
S	1,2,3,4,5,6
PVT ADV	Enterprise Air Inc 131.05 905-721-0054
RWY DATA	Rwy 12(122°)/30(302°) 4250x100 ASPH Rwy 12 down 0.31% Rwy 05(046°)/23(226°) 2654x100 ASPH Rwy 23 down 0.6%
RWY CERT	Rwy 12 RVR 1200(1/4sm)/Rwy 30 RVR 1200(1/4sm) AGN IIIA Rwy 05/23 AGN II
TWY CERT	Twy A AGN I Twy C: AGN I fr Apron V to Twy B & AGN IIIA fr Twy B to Rwy 12/30 & AGN I fr Rwy 12/30 to Rwy 05/23
TWY	Normal Rwy 30 deps are from Twy B. Acft requiring full length must notify gnd ctl on initial contact.
RCR	Twr 905-576-2398 RSC/CRFI avbl 1130-0330Z‡ OPR 905-243-9376 RSC/CRFI avbl 0330-1130Z‡ PLR/PCN.

Date: May 14, 2024. Refer to CFS for official navigation.

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PIREP (PIlot REPort)

by Nicolas Jean, Manager, ACC Operations Montréal, NAV CANADA

A PIREP (**PI**lot **REP**ort) is a report of actual weather conditions encountered by an aircraft in flight. It complements, in real time, existing and observed weather information. Used in combination with other weather products, PIREPs contain important, detailed information that is often more precise than Aviation routine weather reports (METARs), terminal aerodrome forecasts (TAFs) or information concerning en-route weather and other phenomena in the atmosphere that may affect the safety of aircraft operations (SIGMETs). The greatest benefits of PIREPs are associated with the fact that they provide current weather conditions as observed by aircraft in flight. In areas where no or limited weather information is available, the value of a good PIREP will increase the situational awareness the whole community: Crews & air traffic services (ATS).

Categories of PIREPs

There are two categories of PIREPs: UA heading (routine PIREP) and UUA heading (urgent PIREP). A PIREP is classified as “Urgent” based on the weather phenomena reported which is considered to be hazardous or potentially hazardous to flight operations:

- volcanic ash;
- tornadoes, funnel clouds, waterspouts;
- severe turbulence;
- severe icing;
- hail;
- low-level wind shear; and
- any other reported weather phenomena considered to be hazardous or potentially hazardous to flight operations.

A good PIREP increases the safety level for aircraft in flight. They also provide Environment Canada with relevant and valuable information that can help to establish more accurate weather forecasts, including SIGMETs. For NAV CANADA, PIREPs help to optimize traffic flow and increase the situational awareness of ATS (air traffic control [ATC] & flight service specialist [FSS]).

In the Montréal flight information region (FIR), the Québec flight information centre (FIC) is responsible for relaying PIREPs associated with weather conditions. ATS may request a PIREP or be informed by crews of conditions that require a PIREP. When notified, ATS must coordinate with the FIC to ensure dissemination of this valuable information to the entire community, including Environment Canada.

Type of PIREP

There is also another type of PIREP, one that relates to the reporting of runway surface conditions (good, medium, poor or nil), which are relayed to ATS after a takeoff or landing. Similar to PIREPs associated with weather conditions, this type of PIREP complements, in real time, existing runway conditions (RSC/CRFI) reported by airport authorities. If adverse weather conditions arise (solid or freezing precipitation), these PIREPs, communicated verbally by ATS, influence a flight crew's decision to proceed with or abort a takeoff or landing. A ripple effect of these PIREPs is that they also influence tactical planning for snow removal operations by airport authorities. At a site like Montréal-Trudeau (CYUL), a PIREP reporting "Poor to Nil" braking during peak traffic will have a considerable impact on an evening's operations. These PIREPs, which are only disseminated verbally by ATS to crews, will include the type of aircraft, the time of the arrival or departure and, finally, the braking qualifier as reported.

There is no doubt that a PIREP, no matter which one, offers many benefits to crews, airport authorities, Environment Canada and NAV CANADA and can make a difference in the safe conduct of a flight. △

INSTRUCTOR'S CORNER

High to Low: Look Out for Krazy Kollsman!

By John Picone, PPL / INRAT Ground School Instructor, Brantford Flight Center

This quest for understanding something, being able to conceptualize it, is especially evident in me as a ground school instructor. And whether it's the aerodynamics of a tailplane stall, accounting for carburetor ice even when the outside air temperature is +30°C, or why a pilot corrects to the right passing through a front, I want my students to *understand*, not just memorize the facts. How many pilots might still be alive if they had had a *deep understanding* of load factor and stall speed on that slow turn from base to final?

One area where understanding is important is altimetry. *"High to low, look out below!"* is certainly a good mnemonic, but an understanding of what lies behind this axiom is crucial. Helping students conceptualize how the altimeter works and how it changes is, for me, most uplifting (get it?).

Earlier in the course, students have already conceptualized that air is made up of molecules and that, due to gravity being stronger close to the earth's surface, the higher we go, the fewer air molecules there are. Also, those air molecules up high are pushing down on their buddies underneath. The closer the molecules are to the surface of the earth, the higher the pressure; the farther away the molecules are from earth's surface, the lower the pressure. The class is also already familiar with the mercury barometer, the International Standard Atmosphere (ISA) standards of temperature and pressure at the sea level datum as well as the standard pressure and temperature lapse rates from that datum. Add to this an understanding of the rudiments of the pitot-static system, and the stage is set to explore altimeter setting errors and the consequences thereof.

Now, how does the sensitive altimeter (has a Kollsman window) work with this air behaviour to accurately tell us how high we are? And what are the consequences if a pilot neglects to adjust the altimeter appropriately?

Step one is for students to understand just how the altimeter works. While the precise designation is “aneroid capsule,” I tell the class that the altimeter is simply a box with a balloon inside. It really doesn’t measure altitude but rather changes in pressure. Then, through the magic of linkages, needles and numbers on a dial, it converts changes in pressure to changes in altitude. Through the static port, the air in the box that surrounds the balloon is connected to the ambient air; that is, the air the plane is in at any given moment whether on the ground or in the sky. The pressure in the balloon is always the same. It pushes on the balloon wall with a pressure of 29.92” Hg (inches of mercury). The pressure surrounding the balloon changes as the pressure of the ambient air changes.

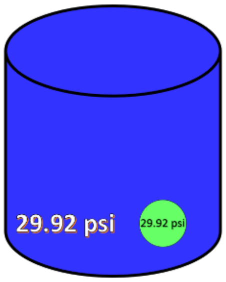

Image A

Imagine a balloon inflated at the bottom of a swimming pool to a particular size. Let’s imagine that the pressure inside the balloon is the same as the pressure of the water surrounding it (Image A). Now, if we allow the balloon to rise closer to the surface of the pool where the water pressure is less (Image B), then, because the pressure inside the balloon has remained constant, it will expand. The altimeter works in exactly the same way: the pressure inside the balloon/aneroid capsule remains constant and expands or contracts as the pressure of the surrounding air allows.

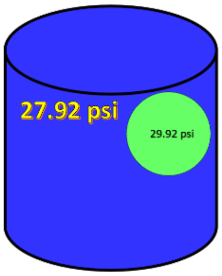

Image B

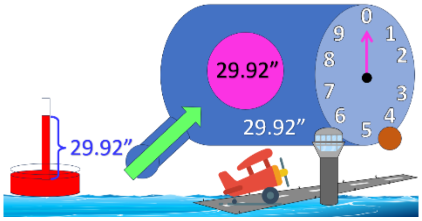

Figure 1: Airplane icon by SmashIcons. Airport image by ClipArt Library

Let’s look at the scenario in Figure 1: a sea-level airport on a day when the barometric pressure is 29.92” Hg. It just happens to be that one day of the century when we have a standard pressure day! The pressure in the altimeter box matches the pressure in the aneroid balloon and the needle says we’re at an altitude of “0” ft above sea level (ASL). If our pilot flies to and lands at a mountaintop field, with an aerodrome elevation of 4 000 ft ASL, the outside barometric pressure, and hence the pressure in the altimeter box, will drop. In this instance, as shown in Figure 2, the pressure has dropped 4” of mercury to 25.92” Hg, corresponding to our standard lapse rate of 1” Hg for every 1 000 ft. Naturally, the aneroid balloon will expand and, linked to the dial, will give an indication of 4 000 ft ASL.

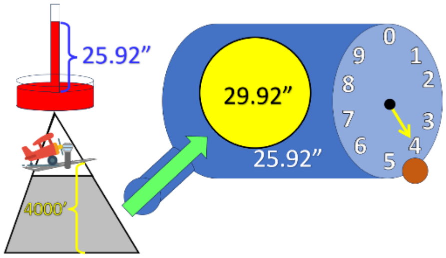

Figure 2

But this is all in a standard atmosphere where the mean sea level pressure is 29.92” Hg. But what happens when the mean sea level (MSL) pressure is NOT standard, when it’s greater or less than the pressure in the aneroid balloon? Let’s return to our sea-level aerodrome.

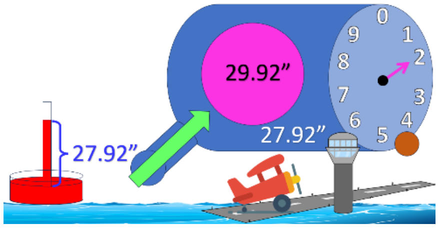

Figure 3

What we see in Figure 3 is that the barometric pressure at the airport—often referred to as *Station Pressure*—is now 2” Hg less than Standard Pressure: 27.92” Hg. 2” equals 2 000 ft, and so when the aneroid balloon expands, the needle indicates 2 000 ft. Which makes sense, since lower pressure—fewer air molecules—is higher. “Except,” cogitates our pilot, “I’m NOT higher! I’m still at sea level!” And this is where Mr. Paul Kollsman comes in! He invented the sensitive altimeter in 1928.

Turning the knob and moving the scale in the Kollsman window actually rotates the entire inside mechanism of the altimeter. In this instance, rotating the dial until the MSL of 27.92” Hg shows in the subscale will turn the needle back to “0,” which is the correct altitude, as seen in Figure 4.

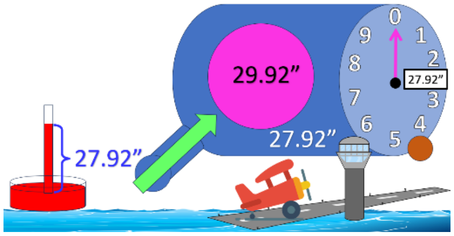

Figure 4

Although this is not a practice we use in aviation, another way to explain how the altimeter works is to ask the students what the Kollsman window would display if, no matter at what altitude an airport was located, we set the needle to “0”? In this instance, we are comparing the pressure in the aneroid balloon—29.92” Hg—to the pressure in the box, which is the outside air pressure as measured with a barometer. The scenario is the same as in Figure 4: the subscale would indicate the outside barometric pressure, or Station Pressure. This is sometimes referred to as QFE, “FE” an abbreviation for “field elevation.”

Now, if we were to do this—set the altimeter to “0”—at our mountain airport in Figure 2, we would read the Station Pressure of 25.92” Hg. But that pressure is idiosyncratic to that airport; it wouldn’t help much if we were taking off from here and landing at an airport with a different altitude. So, to keep us all on the same page, as it were, we need to set our altimeters with reference to a different datum–sea level, which is common to all aircraft flying in the area. This will keep us from bumping into each other. To find out what this sea level datum is, we simply turn the knob until the needle indicates the airport elevation. In other words, like Paul Kollsman in 1928, we are seeking a way to adjust the altimeter to account for changes in barometric pressure due to airport elevation. Adding 4 000 ft of airport elevation adds 4” to the indicated pressure in the subscale, and we get our sea level pressure of 29.92” Hg as in Figure 5. This is referred to as QNH, “NH” an abbreviation for “nautical height.” We usually refer to this as the “altimeter setting,” and it’s the number we read in a METAR weather report. It’s useful to know this relationship between station pressure and airport elevation; when flying out of an airport where no altimeter setting is readily available from a local weather station, simply setting the altimeter to the field elevation will give the QNH in the Kollsman window. Essentially, converting the field elevation ASL into inches of mercury will give the difference between the Station Pressure QFE and the Altimeter Setting QNH. In Figure 5, the difference is 4”; the field elevation is 4 000 ft. True altitude equals indicated altitude.

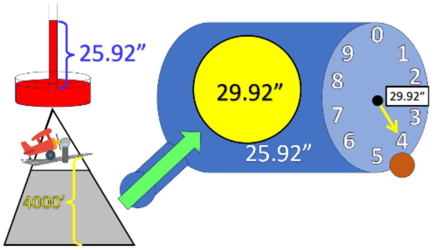

Figure 5

So, what about the errors a pilot can make in adjusting—or failing to adjust—the number in the Kollsman window? What are the consequences of having an inaccurate QNH? The fact is that, while the pressure in the aneroid balloon remains the same at 29.92” Hg, the ambient pressure entering the altimeter through the static port changes. Not only from day to day, but quite possibly from takeoff to destination. A useful way to approach this is to personify the altimeter: “At what altitude,” asks Albert the Altimeter, “do I think I’m flying?”

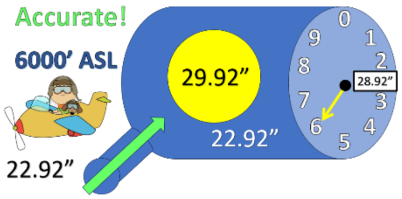

Figure 6

Image with permission of KindPNG

Let’s consider the scenario presented in Figure 6. Albert is at a TRUE altitude of 6 000 ft ASL; the QNH altimeter setting is 28.92” Hg; the outside barometric pressure is 22.92” Hg. The difference between the barometric pressure and the QNH is 6 inches; the needle registers 6 000 ft and Albert is flying at 6 000 ft ASL. Everything is accurate! TRUE altitude equals INDICATED altitude.

But let's attend to the consequences if Albert, in his flight from Brantford to Ottawa, flies to a region of higher pressure and neglects to update his altimeter setting with a revised QNH. In Figure 7, we see that the higher barometric pressure—entering the altimeter through the static line—is now 2" greater than it was at departure: 24.92" Hg. The increased pressure causes the aneroid balloon to shrink, and the needle goes down.

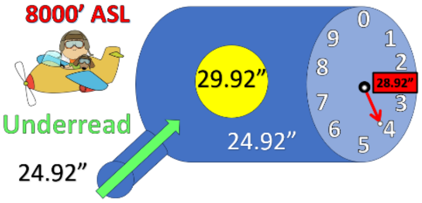

Figure 7

If Albert had checked with air traffic control (ATC) for a current QNH, he would have found it to be likewise 2" higher: 30.92" Hg. But Albert didn't make the adjustment and, as we can see, the difference between the outside barometric pressure and the altimeter setting is 4"; the altimeter underreads by 2 000 ft: there's the error of two inches! So, Albert the Altimeter "thinks" he's flying at 4 000 ft ASL and climbs 2 000 ft until he reaches his desired altitude of 6 000 ft indicated. I say "indicated" because that's only what's *indicated!* It is NOT Albert's TRUE altitude which is now 8 000 ft ASL. TRUE altitude does NOT equal INDICATED altitude. In flying from a low-pressure region to a high-pressure region—without making an adjustment—the altimeter will underread, and the pilot will compensate by flying too high.

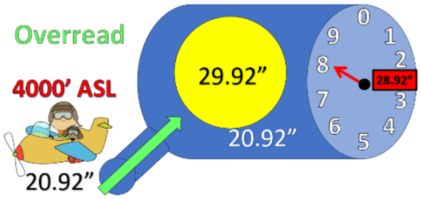

Figure 8

While this is bad enough, the reverse scenario—depicted in Figure 8—can be deadly; flying from a high-pressure region to a low-pressure region: the static pressure in the box diminishes and the aneroid balloon expands. In failing to adjust the altimeter setting QNH to the lower pressure—26.92" Hg—the altimeter now overreads: the difference between the number in the Kollsman window and the actual barometric pressure entering the altimeter through the static port is now 8": 28.92" minus 20.92". The needle indicates 8 000 ft, which is 2 000 ft higher than Albert wants to fly. Consequently, Albert descends to an *indicated* altitude of 6 000 ft when his *true* altitude is now 4 000 ft ASL.

As one can easily imagine, these altimeter setting errors can have serious consequences for joining a circuit and landing: an overshoot or an undershoot are on the horizon! The second scenario—when pressure changes from high to low—is particularly dangerous for obvious reasons, especially when flying in Instrument Meteorological Conditions (IMC–IFR). Flying too low can lead to CFIT: controlled flight into terrain.

The change from high to low not only pertains to changes in barometric pressure. The change from high temperature to low temperature is also a factor in altimeter setting error. Pressure levels change more quickly in cold weather; air molecules are closer together and the air has a higher density.

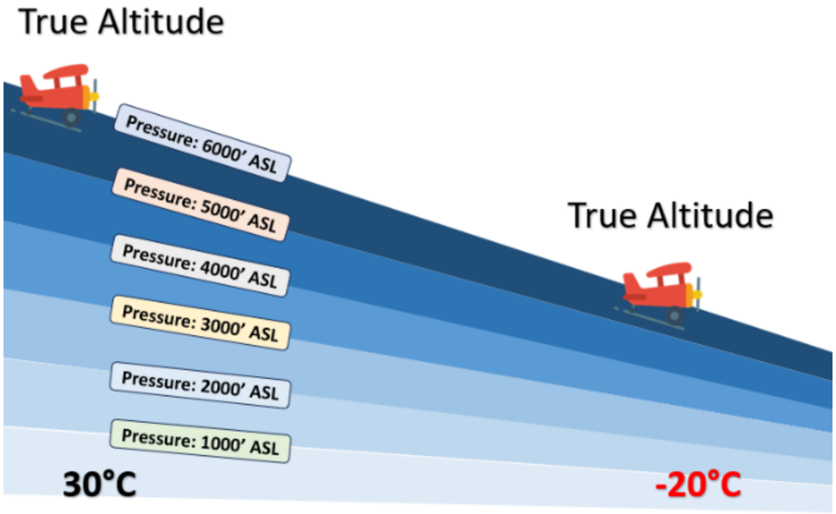

Figure 9

The pilot in Figure 9 is dialled in an accurate altimeter setting—QNH—on departure; the altimeter "thinks" it is at 6 000 ft ASL. While the QNH remains accurate throughout the flight, one can see how a change in temperature (exaggerated in this instance) can exacerbate the discrepancy between INDICATED altitude and TRUE altitude. This is why pilots apply Cold Weather Corrections to important altitudes especially in the world of instrument flight rules. The FAA in the United States even has a list of Cold Temperature Restricted Airports (CTRA).

The advent of such technologies as ADS-B permit ATC to bring aircraft ever closer together. Eradicating altimeter setting errors has never been more paramount. The pressure is on! △

Navigating the Hazards of Flat Light: A Guide for Aviators

by Jason Kowalski, Civil Aviation Safety Inspector, Transport Canada

In aviation, visual interpretation of the environment is critical for safe flight operations. However, certain meteorological conditions, such as 'flat light', present significant challenges. Common in featureless, snow-covered areas during overcast days, flat light can severely impair a pilot's visual cues. This article explores the nature of flat light conditions, integrating industry data and Canadian statistics, to provide an extensive safety guide for aviators.

Understanding flat light conditions

Flat light occurs due to diffused lighting that reduces or eliminates shadows and contrasts. It's prevalent in snowy or icy terrains under overcast skies, creating optical illusions that hinder a pilot's ability to perceive depth, judge distances and discern terrain features.

Industry data and statistics

- The Flight Safety Foundation identifies spatial disorientation, often caused by flat light, as a contributor to 10% of all commercial aviation accidents.
- The National Transportation Safety Board (NTSB) reports that Controlled Flight into Terrain (CFIT), frequently resulting from poor visibility conditions like flat light, accounts for about 5% of aviation accidents.
- Studies in arctic aviation operations indicate that over 30% of accidents in these regions relate to poor visibility, with flat light being a significant factor.

Canadian aviation statistics

- Transport Canada's data reveals that in the last decade, visibility-related incidents, including those influenced by flat light, have contributed to approximately 15% of aviation accidents in Canadian airspace, particularly in northern and mountainous regions.
- According to the Canadian Civil Aviation Accident and Incident Data, there has been an increasing trend in accidents attributed to disorientation in flat light conditions, particularly for small aircraft and helicopters in the Arctic and sub-Arctic regions.

Risks associated with flat light

1. Reduced visibility: Pilots struggle to see topographical features, making takeoffs, landings and low altitude maneuvers risky.
2. Spatial disorientation: The lack of visual cues can cause pilots to misjudge their altitude and orientation, increasing the risk of CFIT.
3. Increased workload: Pilots may rely more heavily on instruments, increasing workload and stress during critical phases of flight.

Safety strategies for flying in flat light

Immediate actions:

1. Slow down: Reducing speed can provide additional time to assess and respond to the environment.
2. Gain altitude: If the terrain allows, increasing altitude can help reduce the risk of a collision with terrain or obstacles.
3. Trust instruments: In flat light conditions, rely on instruments like the altimeter and attitude indicator.

Proactive measures:

1. Pre-flight preparation: Pilots should be briefed about potential flat light conditions and review instrument approaches for their destinations.
2. Instrument proficiency: Proficiency in using altimeters, artificial horizons and navigation instruments is vital in flat light conditions.
3. Avoidance and mitigation: If possible, rerouting to avoid flat light conditions is advisable. When encountering such conditions, reducing speed and altitude can help manage risks.
4. Enhanced terrain awareness: Technologies like Enhanced Ground Proximity Warning Systems (EGPWS) or Terrain Awareness Warning Systems (TAWS) can aid pilots in maintaining their situational awareness.
5. Crew communication: Effective communication among crew members is essential for cross-checking instrument readings and maintaining spatial orientation.

Conclusion

Flat light conditions present a significant challenge in aviation, demanding both heightened awareness and specialized skills from pilots. Understanding these conditions and employing robust safety strategies are critical for mitigating risks. The data from Canadian and international sources highlight the importance of continued focus on training and technology to combat these challenges. As aviation technology advances, integrating sophisticated instruments and consistent pilot training will further enhance safety in flat light conditions, ensuring safer skies for all. △

RECENTLY RELEASED TSB REPORTS

TSB Report A23C0048—Collision with terrain

History of the flight

On June 28, 2023, the Bell 206L helicopter departed on a visual flight rules (VFR) flight from Truelove Inlet, on Devon Island, Nunavut, to a glacier on the Devon Ice Cap, with a pilot and two passengers on board. The purpose of the flight was to transport the passengers, who would be performing an ice cap survey as part of the Polar Continental Shelf Program. The flight departed at 0936; however, when the helicopter arrived at the glacier, the pilot determined that surface definition was insufficient for a safe landing. As a result, he returned to the camp at Truelove Inlet to gather supplies and to make markers to drop onto the glacier to improve the surface definition at the landing area.

The observed local weather at the time was an overcast cloud layer above the flying altitude of 3 800 ft above sea level (ASL), with unrestricted visibility.

The second flight departed at 1018. During this landing attempt, the pilot reduced the aircraft’s airspeed and used rocks as a visual guide for the initial approach to the glacier. The aircraft crossed the glacier at a height of 75 to 100 ft above ground level (AGL), at approximately 30 kt, in preparation to drop the markers.

Once the helicopter passed the rocks, the pilot lost visual reference to the surface and entered an inadvertent descent. At 1039, the helicopter collided with the rising terrain. It struck the snow-covered surface with a slight lateral motion to the right. This motion progressed to a dynamic rollover. The helicopter came to rest on its right side and the engine shut down on its own. The helicopter was destroyed by impact forces.

Weather information

The pilot did not have phone or internet access and was unable to check the weather before departure. The closest weather reporting station was at Grise Fiord (CWGZ), which is 52 nautical miles north of the occurrence location. At 1100, the following conditions were reported:

- Calm winds
- Visibility of 5 statute miles (SM) in light rain and mist
- Few clouds at 400 ft AGL, 900 ft AGL and 1 600 ft AGL
- Broken ceiling at 3 600 ft AGL and overcast cloud layer at 4 400 ft AGL
- Temperature 2°C, dew point 1°C
- Altimeter 29.76 inches of mercury

The graphic area forecast issued at 0629 and valid at 0700 indicated that the area of the occurrence site was forecasted to be the centre of a low-pressure system. The forecast indicated broken cloud layers between 14 000 and 22 000 ft ASL and visibility greater than 6 SM. The forecast for the area just off the east shore of Devon Island indicated broken cloud layers between 3 000 and 15 000 ft ASL, with visibility greater than 6 SM, isolated areas of altocumulus castellanus clouds with tops at 20 000 ft ASL and 2 SM visibility in light snow/rain showers, and mist and patchy cloud layers at 600 to 1 200 ft AGL.

Pilot information

The pilot held a commercial pilot licence–helicopter, the appropriate ratings for VFR flight and a valid medical certificate.

Wreckage and impact information

The main landing gear skids were bent, and the tail boom was broken and twisted. The main rotor separated from the helicopter, and one of the blades was trapped under the fuselage. The main rotor transmission was torn away. The fuselage was torn open at the cabin roof. The front windshield was shattered.

Visual flight rules weather requirements

The *Canadian Aviation Regulations* (CARs) outline the minimum visual meteorological conditions for VFR flight, which stipulate that, in uncontrolled airspace and below 1 000 ft AGL, a helicopter must maintain visual reference to the surface, remain clear of cloud and, during the day, ensure that visibility is at least 1 SM. However, the company is authorized by Transport Canada via an operations specification to operate in reduced-visibility conditions down to ½ mile in uncontrolled airspace in accordance with specific procedures outlined in its *Company Operations Manual*.

Instrument meteorological conditions

Instrument meteorological conditions are weather conditions that cause the visibility, ceiling and distance from cloud to fall below the minima required for VFR flight. Continued flight in these conditions requires the proficient use of aircraft instruments and navigational aids to maintain control of the aircraft and continue safely to a destination. Inadvertent flight into these conditions can be dangerous if a pilot is not trained and current in instrument flying, or if the aircraft is not suitably equipped. In these conditions, the pilot can become disoriented without clear references to the surface and may turn or descend into terrain.

Flat light

This accident occurred while the helicopter was crossing a glacier at low altitude. Once the helicopter had passed the rocks being used as visual reference, the pilot lost visual reference to the surface in flat light conditions.

The Federal Aviation Administration of the United States defines flat light as follows:

Flat light is an optical illusion, also known as “sector or partial white out.” It is not as severe as “white out,” but the condition causes pilots to lose their depth of field and contrast in vision. Flat light conditions are usually accompanied by overcast skies inhibiting any good visual clues. Such conditions can occur anywhere in the world, primarily in snow covered areas but can occur in dust, sand, mud flats or on glassy water. Flat light can completely obscure features of the terrain, creating an inability to distinguish distances and closure rates. As a result of this reflected light, it can give pilots the illusion of ascending or descending when actually flying level. However, with good judgment and proper training and planning, it is possible to safely operate an aircraft in flat light conditions.[1]

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[1] Federal Aviation Administration, Flying in Flat Light and White Out Conditions (2001) (last accessed on 21 February 2023).

Photos taken shortly after the occurrence show that flat light conditions were prevalent at the time of the accident (Figures 1 and 2).

Figure 1: Photo taken shortly after the occurrence, showing flat light conditions with the lack of surface definition (Source: Custom Helicopters Ltd.)
Credit: Transportation Safety Board

Figure 2: Photo taken shortly after the occurrence, showing the point of impact and flat light conditions with the lack of surface definition (Source: Custom Helicopters Ltd.)
Credit: Transportation Safety Board

Safety action taken

In response to this occurrence, the company added flat light training to its *Company Operations Manual* and now provides arctic meteorological training for pilots who are assigned to remote locations. A Flight Operations Instruction was also issued for arctic, glacier and winter operations with instructions and training for establishing, using and maintaining staking/flagging in remote landing areas. Improvements have been made to its flight monitoring and operational support via structured use of satellite communications for flight planning/following and weather reporting. Custom Helicopters Ltd. also made enhancements to pilot training by including the correct set-up and use of ForeFlight's synthetic vision system.

Safety messages

Pilots are reminded that the local meteorological conditions that produce flat light may meet the minimum criteria for VFR flight pertaining to flight visibility and clearance from cloud. However, flying in flat light conditions can affect a pilot's ability to detect and correct any changes in the aircraft's attitude, altitude or airspeed. The degradation of visual cues can result in a loss of situational awareness and possible collision with terrain.

It is important that air operators establish awareness and recovery training to reduce the risks associated with flying in flat light conditions.

As seen in this occurrence the use of helmets, safety belts and cargo restraints are essential for improving survivability outcomes. △

Submission of *Aviation Safety Letter* (ASL) articles

Do you have an aviation safety topic you are passionate about? Do you want to share your expert knowledge with others? If so, we would love to hear from you!

Credit: iStock

General information and guidance

The ASL's primary objective is to promote aviation safety. It includes articles that address aviation safety from all perspectives, such as safety insight derived from accidents and incidents, as well as safety information tailored to the needs of all holders of a valid Canadian pilot licence or permit, to all holders of a valid Canadian aircraft maintenance engineer (AME) licence and to other interested individuals within the aviation community.

If you are interested in writing an article, please send it by e-mail to TC.ASL-SAN.TC@tc.gc.ca in your preferred language. Please note that all articles will be edited and translated by the Transport Canada Civil Aviation (TCCA) Aviation Terminology Standardization Division and will be coordinated by the ASL team.

Photos

In order to captivate our readers' interest, we recommend that you include one or two photos (i.e., photo, illustration, chart or graphic) for each article, if possible. Please send us your photos as an e-mail attachment (preferably as a jpeg).

We look forward to receiving your articles. △

Civil Aviation Documents Issued Recently

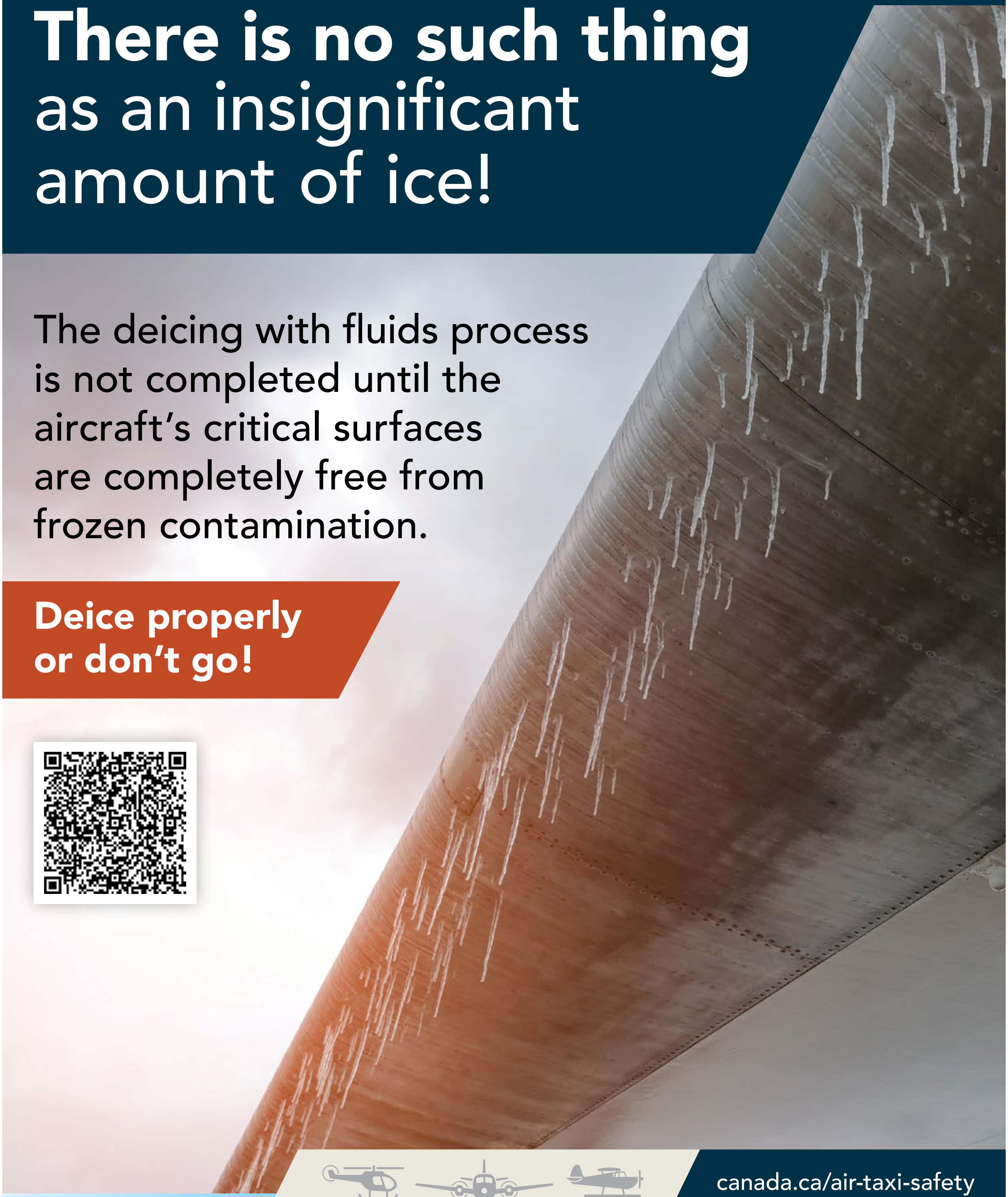
Civil Aviation Safety Alerts (CASAs)

Document Nº	Issue number	Subject
CASA 2024-13	Issue 01 2024-11-29	Maintaining accessibility to portable oxygen bottles
CASA 2024-12	Issue 01 2024-11-21	Electrical Shock Hazard
CASA 2024-11	Issue 01 2024-11-15	Localizer Tracking Anomaly

Advisory Circulars (ACs)

Document Nº	Issue number	Subject
AC 573-010	Issue 01 2024-11-15	Maintenance Annex Guidance–Bilateral Aviation Safety Agreement between Canada and the European Union

There is no such thing as an insignificant amount of ice!



The deicing with fluids process is not completed until the aircraft's critical surfaces are completely free from frozen contamination.

Deice properly or don't go!

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