# The Big Chill

**ACPA conference participants learn how to beat winter at its own game.**

BY RICK DARBY | FROM MONTREAL

Winter conditions annually promise — and unfailingly deliver — snow, ice, freezing rain, contaminated runways, frost and other predictable hazards to aviation. As with other threats, modern technology offers mitigation. But the ultimate defense rests on individuals performing their work with "lessons learned" firmly in mind, as several speakers at the two-day International Winter Operations Conference pointed out.

From 1968 to 2004, 22 accidents with 750 fatalities worldwide were associated with ground icing, said Bryon Mask, a former Air Canada captain and now president of Coranna Flight Safety Investigative Services. Like several other speakers, Mask identified the 1989 accident in Dryden, Ontario, as the beginning of a major re-evaluation and upgrading of Canadian regulations and practices.

Air Ontario Flight 1263, a Fokker F28-1000, made a refueling stop at Dryden. Snow began falling heavily. "The captain asked about available deicing, but did not request deicing," Mask said. "At least ½ inch [1.3 cm] of wet layered snow was on the wings at takeoff. As the aircraft


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Discussion panel (left to right): James Burin, Flight Safety Foundation; John Horrigan, Air Canada Pilots Association; Chet Collett, Alaska Airlines; Lars Kornsteadt, Airbus.

began its takeoff run, snow turned to dull grayish opaque ice on the wings." The aircraft was unable to gain enough altitude to clear the trees past the runway end. In the ensuing crash, 21 passengers and three crewmembers died.

A special commission of inquiry was convened, which resulted — after three years — in a 1,712-page report with extensive recommendations. The eventual results included implementation of flight operational quality assurance (FOQA) programs and flight data monitoring programs for Canadian air carriers.

Before Dryden, the Canadian Aviation Regulations said, "No person shall commence a flight when the amount of frost, snow or ice adhering to the wings, control surfaces or propeller of the aircraft may adversely affect the safety of the flight." That somewhat subjective requirement was strengthened post-Dryden to read: "No person shall conduct or attempt to conduct a takeoff in an aircraft that has frost, ice or snow adhering to any of its critical surfaces."[1]

But sooner or later, an aircraft in scheduled commercial service must take off. Many of the speakers discussed ways to ensure the proper conditions.

Deicing and anti-icing fluids are essential to winter operations, but research and testing continue. Arlene Beisswanger, laboratory manager, Anti-Icing Materials International Laboratory (AMIL), University of Quebec, illustrated some of the methodology. "AMIL is the only laboratory in the world that certifies aircraft ground deicing and anti-icing fluids to international SAE standard procedures," she said.

The laboratory contains two icing wind tunnels that can simulate aircraft takeoffs, and five climatic chambers to reproduce freezing rain, freezing drizzle, freezing fog, frost, snow, snow pellets, ice pellets and sea spray. Fluids are tested for anti-icing endurance, aerodynamic acceptability, viscosity at various temperatures and stability in conditions such as a heated wing leading edge or overnight exposure.

Critical flight-surface contamination is not always obvious, and its characteristics not necessarily easy to understand. Two major accidents in the past decade have involved frost, which may look benign. John Horrigan, a captain and winter operations specialist with Air Canada's Flight Safety Division, said, "Frost actively forms when the temperature of the skin surface is below the frost point of the ambient air. The frost point is the temperature at which moisture from the air is deposited as frost on a surface." The frost point can be warmer than the dew point, he added.

"Frost also has a residual phase," he said. "Active frost has ceased, but the skin surface is still below freezing and there is no opportunity for sublimation back to vapor."

Yet another variation is "cold soak frost," caused by a substantial amount of cold fuel

## Unseasonable Weather

When is winter? Usually, its conditions move in roughly from October to April in the northern hemisphere. But some long-haul flights follow a polar route, over territory where winter-like environments can extend well into spring and autumn. That is not a problem at cruising altitude, but in the event of a diversion, a crew can find itself suddenly conducting winter operations.

The seriousness of the situation can be amplified because far-northern routes have relatively few airports with runways and support facilities to handle large transport airplanes.

The U.S. Federal Aviation Administration and most other national or regional regulatory agencies require air carriers to obtain approval for polar operations, and a condition for approval is defining a set of alternate airports capable of providing for crew and passenger needs. Edgar Vaynshteyn, a native of Kiev, Ukraine, has built his business Global Aviation Consulting (GAC) on helping operators develop contingency planning for diversions from cross-polar, Russian far east, trans-Asia, trans-Siberia and central Asia routes.

For each potential diversionary airport, GAC has detailed data such as runway length and width, aircraft rescue and fire fighting capability, lighting, deicing equipment, medical facilities, and security — as well as food and hotel accommodations for passengers and crews. The company can contact an English-speaking "go to" person at each supported airport to assist with arrangements.

"We perform airport assessments, maintaining field condition reports and updating our airport information database," Vaynshteyn said. "We're up to date on NOTAMS [notices to airmen], closures and other critical airport information." The company has diversion coordinators available at all times.

—RD

## Deicing Then and Now

Gordon

*AeroSafety World* spoke with one of the conference's presenters, Denis Gordon, who was with Air Canada for 33 years and is now director, standards and procedures, with deicing provider Aéromag2000.

***ASW:*** When did you first become involved with winter operations?

***DG:*** I started in 1977, at 19 years old, being a deicer in a bucket 90 ft in the air. I worked my way up to training and was an instructor for 15 years in the deicing world.

***ASW:*** How did deicing in those days differ from today's methods?

***DG:*** We didn't have much in the way of standards. Information was never passed down to the people doing the frontline work. I'll give you an example. My first day on the job, I was told, "There's the truck, there's the bucket, get in the bucket. There's some handles in there and you just move the handles. You're young, you'll figure it out. There's a hose. When you open the hose, water will come out." In those days, we deiced with hot water. That was my training.

***ASW:*** Did the training become more formal later?

***DG:*** Yes, trainees might have received a couple of cups of coffee, a 15- or 20-minute briefing, some pictures and a 10-question test.

***ASW:*** But deicing training has become more rigorous since then?

***DG:*** Now our Aéromag training could be, depending on who we work for, five days up to five weeks. We do evaluations, we monitor staff regularly. Initial and recurrent, theory and practice.

Another change is that the personnel who can conduct contamination inspections are specified, must be trained and must be qualified. There's more emphasis on the person who does the job, so that the person has the right tools, the right training, and can be certified to be accurate at his position.

With the better education, we're getting more calls for re-inspection. Sometimes, it's a passenger who's noticed ice on the wings, sometimes the flight crew. It may turn out to be no matter for concern, but we're glad to be cautious.

With standards and procedures, we're going into more and more detail. It's a lot different from how we used to write manuals, like a series of bullet points. Now there's more information, which is great. The employees are involved in the deicing operation. They ask questions: "Why this? What about that?"

***ASW:*** Has deicing efficiency improved?

***DG:*** With today's regulations and standards, better training, the better information we're getting, both quality and efficiency are miles ahead. We've gone from taking sometimes 20 or 30 minutes to deice an aircraft, to about eight minutes — that is typical now.

So we've changed a lot in our way of deicing compared with how we used to. Unfortunately, it took a major accident to get us to that point.

***ASW:*** Yes, you mentioned in your presentation that the Dryden accident [p. 20] was a game changer.

***DG:*** It opened a lot of minds. After the accident report, it was evident that there were many holes in the procedures. And even now, the changes keep coming. We see more standards coming in. Why? For one thing, to provide more education for the people working in this field. It's amazing how the deicer himself, right now, knows more than some of the people in charge of the deicing. The frontline deicers get all that education. Pilots get the same training.

***ASW:*** What lessons have been learned?

***DG:*** Training is no. 1, in all its aspects, including the safety of the ground deicing operators themselves. We have employee accidents, too. Employees have lost their lives during deicing operations, such as at Mirabel [Montreal] in 1995. Three deicers died when a Boeing 747 started to move forward while two deicing vehicles were still in front of the horizontal stabilizers. A communication issue caused that accident. After that, procedures were changed. Before, one radio frequency was used for every part of the operation. Now we have different frequencies for every part of the operation we do.

Communication of the kind we're seeing here [at the conference] is also important. We're sharing information — that's another thing we never did before.

With organizations like Air Canada Pilots Association and SAE, if something happens to you, the networking starts and everyone gets involved. Say I'm working in Calgary and some freak thing occurs, I'll let the industry know, to make sure it doesn't happen to anyone else. Sharing information also saves time; before you had to dig and dig and do everything yourself. Now you have a whole group of people. While we're at the conference, we all have one big goal, working for the industry's safety.

***ASW:*** Have airlines changed in connection with deicing?

***DG:*** Yes, as you see in Canada. They're adapting to central deicing facilities, one company taking care of everything, when in the past, it was the airlines deicing their own airplanes. Air Canada had their own deicing, or they'd have their own service provider do the deicing.

***ASW:*** Does the move to central deicing facilities have anything to do with airlines' litigation fears around icing-related accidents?

Photos: Rick Darby

***DG:*** No. It's still the airlines' responsibility to make sure that we're doing our job. We're audited by the airlines. A lot of people think that because we're the provider, the liability goes away. It doesn't. The regulations say the airlines are responsible.

***ASW:*** Which airports in Canada have a single provider for deicing?

***DG:*** Montreal, Ottawa, Vancouver. Edmonton will adopt single-provider deicing next year, Calgary in 2014.

I always think deicing and recovery of fluids go hand-in-hand. A centralized deicing facility has both, so it's good for the environment and good for the operation.

***ASW:*** What sort of oversight do you, as a service provider, face? You mentioned auditing.

DG: Last year Aéromag was audited 54 times by the airlines. In Montreal, we are audited by every major airline that flies there, which is a good thing. The audits are important for me as a provider, because they show me weaknesses that I need to correct. People think audits are bad. But they're not to catch you not doing your job, they're to make sure you are doing your job. We have also started internal audits, auditing ourselves. All of it makes our company stronger.

***ASW:*** What remaining challenges do we face?

***DG:*** Our biggest challenge is that everything seems to be going so well. I'm afraid we're going to stop pushing forward. I remember the first meeting I went to in 2005 at the SAE conference. I'd been in the industry for so many years, I thought I was up on the subject of deicing about as well as anyone. When I sat in that meeting and started listening to the topics, about testing of glycol, testing of aerodynamics, I realized I still had a lot to learn.

—RD

remaining on arrival. "Heat is conducted away from the surface by wing structures that are immersed in the fuel," Horrigan said.

"Type I [deicing] fluid is the most common means of removing frost," Horrigan said. "Unless the minimum fluid thickness of the holdover timetable is applied, active frost can reaccrete within minutes of Type I application. As Type I has no thickeners, even proper application will result in exposure roughly 45 minutes after application."

Earl Weener, member, U.S. National Transportation Safety Board (NTSB), reminded the audience about one of the most dangerous of all winter threats: supercooled large droplets (SLD; *ASW*, 12/09–1/10, p. 32). The investigation of the 1994 crash of an ATR-72 with 68 fatalities at Roselawn, Indiana, U.S., drew attention to SLD. In that accident, SLD produced large ice ridges aft of the deicing boots, causing the ailerons to deflect with a subsequent loss of control.

"Accretions can cause stall or control anomalies at higher airspeed than normally expected," Weener said. "Ice can accrete aft of the ice protection system, and it's sometimes difficult to see or detect."

SLD accumulation lies outside the parameters for continuous maximum icing in U.S. Federal Aviation Regulations Parts 23 and 25, Appendix C. "Airplanes are operating in SLD environments for which they are not certified, particularly in lower layers of the atmosphere," Weener said.

Among the many icing-related recommendations from the NTSB over the years are these: The industry should further develop effective detection and prevention systems; cockpit systems, particularly aural and stick-shaker/pusher warnings, should be developed and installed; pilots should hand fly their airplanes in icing conditions for improved sensitivity to any performance degradation; and pilots should increase speed and activate the boots when entering in-flight icing.

Meeting the season's special demands on aircraft operations was the goal of conference, with the slogan "Safety Is No Secret," hosted by the Air Canada Pilots Association/Association des Pilotes d'Air Canada (ACPA) in Montreal. Organized by Barry Wiszniowski, an Air Canada captain and chairman of the airline's Flight Safety Division, the conference was attended by pilots, technical researchers, deicing service providers, air traffic management specialists, manufacturer representatives and other interested parties. It was the second biannual conference under the same auspices (*ASW*, 10/09, p. 24).

Horrigan, Weener and Mask

## Note

1. Canadian Aviation Regulations 602.11, "Aircraft Icing."