Investigative authorities on two continents seek regulatory action on 10 anti-icing safety recommendations.

Chilling EFFECTS

BY LINDA WERFELMAN

Accident investigation boards in the United Kingdom and the United States, citing dozens of winter accidents, are pressing regulatory authorities to act on a series of safety recommendations involving aircraft operated in icing conditions.

The U.K. Air Accidents Investigation Branch (AAIB) said it had found numerous occurrences — during the past two northern hemisphere winters — of flight control restrictions on airplanes with nonpowered flight controls. The restrictions were "believed to have been caused by the freezing of the rehydrated residues of thickened de/anti-icing fluids that had accumulated in the aerodynamically quiet areas of the elevator and aileron controls."

The July 2006 AAIB *Bulletin* outlined 13 occurrences from the winter of 2005–2006 — 11 involving Avro 146/RJs and two involving Embraer EMB 145s — and restated four safety recommendations, previously included in the April 2006 AAIB *Bulletin.* The April *Bulletin* described 37 occurrences during the winter of 2004–2005 involving 25 Avro 146/RJs, two EMB 145s and three Bombardier DHC-8s — all registered in the United Kingdom — and seven other European-registered aircraft.

"The AAIB has repeatedly expressed its concerns to the U.K. CAA [Civil Aviation Authority], the JAA [Joint Aviation Authorities] and EASA [the European Aviation Safety Agency] that effective measures to address the airworthiness concerns posed by the residues of thickened de/anti-icing fluid have yet to be implemented," AAIB said. "Experience has shown that the currently available thickened deicing fluids, with their rehydratable residues, are not practically suited for use on aircraft with nonpowered flight controls and continue to pose a hazard to flight safety through their ability to cause flight control restrictions."

The AAIB recommended:

- "That the [JAA], in consultation with [EASA], issue safety documentation to strongly encourage operators of aircraft with nonpowered flight controls to use Type I de/anti-icing fluids,[1] in preference to 'thickened' fluids, for deicing";
- "That where the use of thickened de/anti-icing fluids is unavoidable, the [JAA], in consultation with [EASA], ensure that operators of aircraft with nonpowered flight controls who use such fluids invoke controlled maintenance procedures for the frequent inspection for accumulations of fluid residues and their removal";
- "That [EASA] introduce certification requirements relating to de/anti-icing fluids for use on aircraft with both powered and nonpowered flight controls"; and,
- "That, prior to [EASA] assuming responsibility for operational matters within Europe, they consider the future need for the training and licensing of companies who provide a de/anti-icing service so that anti-icing fluids are applied in an appropriate manner on all aircraft types but specifically to ensure that the entry of such fluids into flight control mechanisms and control surfaces is minimized."

'Deficiencies' in Cold-Weather Operations

In a related development, the U.S. National Transportation Safety Board

(NTSB) expressed concern about "deficiencies in the cold-weather operational procedures" used by Saab SF340 flight crews and about the airplane's performance in icing conditions. The NTSB statement followed a preliminary investigation of an incident involving loss of control of a Saab SF340 over California and a review of three similar SF340 incident reports by the Australian Transport Safety Bureau (ATSB) in the previous eight years.

NTSB proposed four new safety recommendations — including one urgent recommendation — and reiterated two earlier safety recommendations, also related to operations during icing conditions.

The urgent recommendation said that the U.S. Federal Aviation Administration (FAA) should "require all operators of Saab SF340 series airplanes to instruct pilots to maintain a minimum operating airspeed of 1.45 x V_S [stall speed] during icing encounters and before entering known or forecast icing conditions and to exit icing conditions as soon as performance degradations prevent the airplane from maintaining 1.45 x V_S."

The other new recommendations said that FAA should:

- "Require the installation of modified stall-protection logic in Saab SF340 series airplanes certified for flight into known icing conditions;
- "Require the installation of an icing detection system on Saab SF340 series airplanes"; and,
- "Require all operators of turbopropeller-driven airplanes to instruct pilots, except during intermittent periods of high workload, to disengage the autopilot and fly the airplane manually when operating in icing conditions."

In issuing the safety recommendations, NTSB cited the preliminary findings of its investigation of a Jan. 2, 2006, incident in which an American Eagle SF340B+ en route from San Luis Obispo, California, U.S., to Los Angeles, encountered icing conditions during climb at 11,500 ft in instrument meteorological conditions. The airplane entered a rapid descent, and the crew did not regain control until after the airplane had descended to about 6,500 ft. The crew continued to the scheduled destination and conducted a normal landing. No one was injured in the incident.

The airplane was not equipped with an icing detection system, and at the time of the incident, the flight crew was using the autopilot, which reacted to the buildup of ice on the wings by slowly increasing the airplane's pitch, causing a decrease in airspeed. The increase in pitch probably was so gradual that it was not detected by the crew, NTSB said.

"If the flight crew had been flying the airplane manually, the airplane's performance degradation would have been more readily apparent," NTSB said. "The flying pilot would have maintained a continuous scan of the primary flight instruments and would have been required to increase back pressure on the yoke or continuously manually trim the airplane to maintain the desired climb rate. The pilot also likely would have been aware of the resulting changes in pitch and any tendency for the airplane to roll. It is also more likely that he would have noticed the associated decrease in airspeed and reduced the airplane's pitch angle and climb rate to avoid further airspeed reductions."

NTSB said that, in addition, the incident airplane — like other SF340s outside Canada — was not equipped with stall protection logic and an ice speed switch, which were required by Transport Canada before the SF340 was introduced in Canada in 1994. The system provides a lower "trigger" angle-of-attack in the stall warning system for SF340s operated in Canada.

The reiterated recommendations — first issued in 2003, as a result of the investigation of an Oct. 25, 2002, accident in which a Raytheon Beech King Air A100 struck terrain in Eveleth, Minnesota, U.S., during an attempted nonprecision instrument approach in instrument meteorological conditions[2] — said that FAA should convene a panel of specialists in airplane design, aviation operations and aviation human factors to review the feasibility of requiring installation of low-airspeed alert systems in airplanes engaged in commercial operations under U.S. Federal Aviation Regulations Parts 121 and 135, and, if the panel found the installations feasible, establish requirements for installation of the alert systems.

If flight crews on the accident and incident airplanes had been alerted quickly to the rapid decrease in airspeed, they might have been able to take successful corrective action, NTSB said. ●

Notes

1. Type 1 deicing fluids are half ethylene glycol and half heated water, and are considered "unthickened." Other types contain thickening agents to increase their viscosity and therefore to enable them to remain on the aircraft throughout ground operations and then to be shed during the takeoff roll.
2. Eight people, including U.S. Sen. Paul Wellstone, were killed in the accident, and the airplane was destroyed. The U.S. National Transportation Safety Board said that the probable cause was "the flight crew's failure to maintain adequate airspeed, which led to an aerodynamic stall from which they did not recover."