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List of NTSB 'Most Wanted' Safety Improvements Languish

The status accorded the **National Transportation Safety Board** (NTSB) to its "Most Wanted" list of recommendations ranges from "unacceptable response" to "progressing too slowly." None of the board's aviation-related recommendations received a green light in terms of the basic **Federal Aviation Administration** (FAA) response or the alacrity with which the board's recommendations are being implemented.

At a Nov. 15 hearing to update the situation, Acting Chairman Mark Rosenker said, "We are encouraged by the progress that we have seen in the acceptance rate of our recommendations." However, he was referring to the total. On its "Most Wanted" list for aviation, the NTSB has 22 recommendations, and they have either been rejected outright or are receiving a slow roll in terms of implementation. The FAA's response may reflect a combination of industry resistance, dispute over the need, and maybe even a concern for the cost.

Indeed, there was some discussion among board members about whether the resistance to the recommendations is politically or financially motivated. However, the cost issue may be a canard, if one considers amortization over a period of years. Many of the "Most Wanted" recommendations have languished for nine years or more, and the cost of implementation, stretched over that period of time, is small. To be sure, accidents avoided is a huge cost saving for the industry.

Herewith, the box score on the "Most Wanted" recommendations:

► **Stop runway incursions and ground collisions of aircraft.** "There is an urgent need" for improved warning direct to aircrews, said Sandy Rowlett, an NTSB staffer. This need is based on three near collisions in the past six months, where the FAA's

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NTSB: New FAA Requirements On Ice Protection Fall Short

"Certification standards need to be upgraded" for flight in icing conditions, declared Dan Bower, a member of the **National Transportation Safety Board** (NTSB) professional staff. The problem that he and other members of the NTSB fear is that the notice of proposed rulemaking (NPRM) published Nov. 4 by the **Federal Aviation Administration** (FAA) may not go nearly far enough *(see ASW, Nov. 14, p. 8)*.

Most notably, the NPRM does not address the hazard posed by supercooled liquid droplets (SLD), which can overwhelm a current airplane's ice protection systems *(see related story at left)*. The NTSB wants SLD incorporated into Appendix C, which specifies the kind of icing that an airplane's ice-protection systems must cope with.

An FAA official, speaking on background, said, "The proposed rulemaking codified practices and guidance for demonstrating requirements … that airplanes operate safely in Appendix C icing conditions. ARAC [the **Aviation Rulemaking Advisory Committee**] has decided to forward proposed SLD rulemaking to the FAA, and airplane performance and handling requirements contained in the November 4th NPRM are used, in part, for defining requirements for safe flight in the proposed SLD icing standard."

However, SLD requirements are not contained in the proposed rulemaking, and will have to be incorporated after the fact, based on a plain reading

(See Icing on p. 5)

Editor's Note: Next Week *ASW* will take a Thanksgiving Holiday Break. Your next issue will be dated December 5.

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airport movement area safety system (AMASS) did not provide timely warning to air traffic controllers, who would then pass warnings along to aircrews. Either the AMASS was turned off to avoid false alarms in the rain, or it was not configured to provide alerts for intersecting runways. A good example of this was provided June 9 at Boston's Logan International Airport, when an **Aer Lingus** A330 and a **US Airways** B737 came frighteningly close on takeoff. A total of 336 people were aboard the two airplanes.

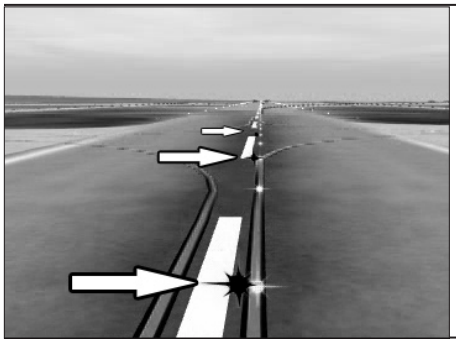
In his statement to investigators, the first officer on the US Airways jet said, "After passing V1, I noticed an Aer Lingus A330 rotating just prior to the intersection and stated 'keep it down' and pushed the control column forward to prevent the captain [the pilot flying] from rotating the aircraft. The Airbus passed overhead our aircraft with very little separation, and once clear of the intersection the captain rotated and lifted off towards the end of the runway." *(See illustration below.)*

The near miss as measured, laterally, from the right wingtip of Aer Lingus and the nose of USAirways, and the vertical separation as measured between the landing gear of Aer Lingus and the center of gravity of the USAirways B737. *Source: NTSB*

Rowlett said AMASS was installed without the capability of detecting impending collisions on intersection runways "to get something" deployed to curb runway incursions. The FAA designated Boston the test facility on 11 Nov. for assessing the intersecting runway software for AMASS. However, Rowlett pointed out that AMASS warns controllers, not aircrews, and that when this recommendation was made in 2000, the FAA was asked specifically to develop a system "that would provide direct warnings to flight crews, thus providing pilots with additional time to react to potential hazards."

NTSB Member Deborah Hersman pointed out that the FAA is recording three operational errors each day, and one severe operational error every nine days. "I think one severe high-risk event every nine days warrants a higher priority, and to provide direct warning to pilots," she said.

Rowlett noted that the **Mitre Corp.** is conducting experiments and simulations for the FAA of a lighting system on the runway centerline to provide this kind of direct warning to pilots *(see illustration below)*.



Recreation of the Boston incursion showing the possible use of 3,000 feet of AMASS-controlled red centerline lighting to alert the pilots of the US Airways jet about the conflict ahead and allow them to safely abort takeoff. *Source: NTSB*

Recommendation: implement a safety system for ground movement that will ensure safe movement of airplanes on the ground and provide a direct warning to the flight crew. Status: "Open – Unacceptable Response." The recommendation has a red color-coded timeliness classification, signifying an unacceptable response.

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► **Reduce dangers to aircraft flying in icing conditions.** The NTSB maintains that the FAA has not adopted a systematic and proactive approach to the certification and operational issues of transport-category airplane icing. As NTSB icing expert Dan Bower said, "The certification standards need to be upgraded." He noted the laggard response to the NTSB recommendation dating back to 1996 to account for supercooled liquid droplets (SLD) in certification.

The FAA has recently proposed new certification standards for icing, but they do not include SLD *(see related p. 1 story)*. "The response to the [NTSB] recommendation is taking nine years," he pointed out.

On top of which, the notice of proposed rulemaking published Nov. 4 is only a proposal *(see ASW, Nov. 14, p. 8)*. Hersman asked, "Is there any confidence that the rule will get finalized?"

"I'm hopeful," Bower replied. He pointed out that the industry may not yet fully appreciate the danger of even a small amount of ice on upper wing surfaces. He cited the icing-related crash on takeoff Nov. 29, 2004, at Montrose, Colo., of a **Bombardier** Challenger CL-600 jet. Upper wing ice contamination is being investigated. Bower quoted from a Colorado news report, "A pilot, and president of a worldwide charter aircraft referral service, said the Challenger's engines were powerful enough to take off even with icy wings." The article had this individual saying, "The extra weight of ice and snow shouldn't have made a difference; it should have been able to bully its way through."

But as Bower pointed out, "Research results have shown that fine particles of frost or ice, the size of a grain of table salt and distributed as sparsely as one per square centimeter over an airplane wing's upper surface can destroy enough lift to prevent that airplane from taking off." And of course, in some aircraft types, a loss of smooth laminar flow over the wings will have a direct effect upon tailplane airflows and its effectiveness for generating rotation (nosewheel off on takeoff).

In addition to not covering SLD, Hersman noted that the new rule, if adopted, applies to new-production airplanes only. That is a far cry from "reducing the dangers to aircraft flying in icing conditions," which by definition applies to the existing fleet as well.

Recommendation: complete research on aircraft structural icing and continue to revise icing certification criteria, testing requirements, and restrictions on operations in icing conditions *(see related p. 1 story)*. Status: "Open – Unacceptable Response." The recommendation has a red color-coded timeliness classification, signifying an unacceptable response.

► **Eliminate flammable fuel/air vapors in fuel tanks on transport category aircraft.** "The issue before us is totally unacceptable," said NTSB member Ellen Engleman-Conners. Specifically, the short-term recommendation issued nine years ago, to modify operations "to reduce the potential for fuel-air mixtures in the fuel tanks of transport category aircraft" was closed by the NTSB after it became apparent that the FAA would not act on it. This recommendation basically involved near term actions to reduce the temperature in center fuel tanks (such as by loading them with chilled fuel).

The NTSB also called for "design modifications such as nitrogen-inerting and insulation between heat-generating equipment and fuel tanks." In response to this recommendation, the FAA developed an inerting system using nitrogen-enriched air three years ago, but it took until Nov. 14 for the FAA to issue an NPRM suggesting that the system be deployed on new and existing airplanes with heated center wing tanks, about one-third of the fleet *[this NPRM will be discussed in the next issue of ASW]*. Airplanes without heated center wing tanks, i.e., without heat-generating air conditioning packs under the tanks, will not need to be inerted. This caveat applies to wing tanks as well, which avoids the issue that overheated or faulting fuel pumps can occur in any tank (the scenario involving the fuel tank explosion in a **Phillipine Airlines** B737 in 1990). It also ignores dangerous electrical arcing outside the tank, whose energy may find its way into a low-power circuit within the tank (the likely scenario regarding the center wing tank explosion on a **TWA** B747 in 1996).

The NTSB's resident expert on fuel/air flammability, Bob Swaim, noted that the **European Aviation Safety Agency** (EASA) plans to mandate inerting as a production cut-in in 2008, but that does not include the **Airbus** A380, which does not feature a heated center wing tank, and no retrofit of inerting to the existing fleet is planned. "The EASA recommendation will cover 300-400 airplanes, and the safety board disagrees with the position taken on the A380," he noted.

Because the FAA took no action on the short-term recommendation, it was closed as unacceptable action.

Recommendation: complete rulemaking efforts to preclude the operation of transport-category airplanes with flammable fuel/air vapors in the fuel tanks on all aircraft. Status: "Open – Acceptable Response." The recommendation has a yellow color-coded timeliness classification, signifying that the response is acceptable but progressing too slowly.

► **Improve aviation audio and data recorders and require cockpit video recorders.** The NTSB wants five things: (1) retrofit 30-minute cockpit voice recorders (CVRs) to 2-hour CVRs, (2) provide 10-minutes of

(See Most Wanted on p. 4)

Most Wanted *(Cont'd from p. 3)*

independent back up power for recorders, (3) fit aircraft with fore and aft dual-redundant CVRs and flight data recorders (FDRs), (4) provide additional recorder parameters for the B737 to better discriminate between pilot control inputs and system flaws in the event of rudder reversals, and (5) equip aircraft with cockpit image recorders.

It's a lot, and so far the FAA has delivered very little. In February 2005 the FAA issued an NPRM calling for 2-hour CVRs to be retrofitted *(see ASW, Feb. 28, p. 8)*. However, the NPRM called for the 10-minutes of independent backup power to be installed only on new aircraft, and it did not call for dual redundant CVRs/FDRs.

Jim Cash, the NTSB's recorder expert, noted that the new **Embraer** EMB-190 and the **Boeing** B787 will have, or at least sport as options, both fore and aft recorders.

The FAA is now digesting comments submitted on the NPRM and is expected to issue a final rule in 2006.

The FAA has yet to issue requirements, proposed or otherwise, on B737 FDR parameters, although the FAA has not decreed that the rudder system redesign of the B737 meets the safety board's standard for "reliable redundancy."

Regarding image recorders, there are two parts to the NTSB's wish list. First, it wants the recorders in transport category aircraft to complement the voice and data captured by the CVR/FDR. The image recorders would enable investigators to see the instruments and controls, and to gauge pilot actions (and note movement in and out of the cockpit, and how many personnel are in the cockpit). The image recorder recommendation is an outgrowth of the **EgyptAir** Flight 990 accident, where a relief pilot is thought to have plunged the aircraft into its death dive, and of **Swissair** Flight 111, in which the cockpit crew was overwhelmed by an inflight fire and in which there was a critical 6-minute gap in recorded information as a result of the loss of power.

Second, the NTSB seeks image recorders in all Part 121/135 turbine aircraft not required to be outfitted with CVRs/FDRs. By this means, at least some record of the flight, instrument displays, control positions and pilot actions will be attained. The FAA has flight tested one such video recorder, and hopes to issue a technical standard order (TSO) sometime in 2006 indicating how the system will be set up and working. However, the FAA has not issued a proposed requirement for video recorders, either as a complement to existing CVRs/FDRs or as a stand-alone recorder for those aircraft not equipped with any CVR/FDR capability

Recommendation: In addition to adopting the 2-hour CVR requirement, require the retrofit of existing CVRs with Recorder Independent Power Supply (RIPS), and require that the existing FDR and CVR be on separate generator busses with the highest reliable power so that any single electrical failure does not disable both. Require the installation of video recording systems in small and large aircraft. Require the recording of additional needed FDR data for B737s. Status: "Open – Unacceptable Response." The recommendation has a red color-coded timeliness classification, signifying an unacceptable rate of progress.

The view captured by a video image recorder, showing instruments, controls and pilots' hands. Note that the pilots' faces are not recorded. Even though the pilots are thus de-identified, the **Air Line Pilots Association** (ALPA) is opposed to the notion of cockpit video recorders. *Photo: NTSB*

► **Require restraint systems for children under age 2.** The board members were visibly dismayed by the FAA's action Aug. 26 withdrawing an advance notice of proposed rulemaking (ANPRM) that would have required restraint systems for infants and small children *(see ASW, Sept. 12, p. 1 and p. 8)*.

In October, the FAA separately informed the NTSB that child restraints will *not* be required. The FAA's rationale is that making parents buy a seat for the at-present lap children will encourage highway travel, which is more dangerous and therefore more infants will be killed or injured. The FAA's argument was based on two academic studies of the increase in highway travel over air following the 9/11 attacks.

Member Engleman-Conners sniffed, "Anything based on 9/11 data is subject to significant review" regarding the diversion of air passengers to another mode of transportation.

Member Hersman pointed out that the diversion of passengers because of post-9/11 security requirements was not addressed. "The FAA hasn't raised the diversion argument for anything other than children," she pointed out.

In addition, she said, neither FAA-cited study addressed the deaths of children.

An education effort, which is all the FAA is willing to commit to, appears to have yielded very superficial results. The FAA has a Web page devoted to child safety, but one has to know of its existence.

Hersman said bluntly, "The requirement is what

makes people change their behavior."

Recommendation: all occupants should be restrained during takeoff, landing and turbulent conditions and all infants should be restrained in an approved child restraint system appropriate to their height and weight. Status: "Open – Unacceptable Action." The recommendation has a red color-coded timeliness classification, signifying the history of delay and obfuscation on this issue.

► **Update hours of service regulations.** The NTSB is concerned about the lack of progress in all modes of transportation. In aviation specifically, three facts apply:

1. Flight and duty time limits were set in 1938 and 1958.

2. The FAA issued an NPRM in 1995 to update flight/duty time regulations, but no rule was issued.

3. The FAA has conducted research on fatigue in maintenance, but no rulemaking has been proposed.

According to the NTSB, the laws, rules and regulations governing this aspect of transportation safety are archaic and in many cases not adequate to address the problem of fatigue.

Recommendation: establish scientifically based hours-of-service regulations that set limits on hours-of-service, provide predictable work and rest schedules, and consider human sleep and rest requirements. Status: "Open – Acceptable Action." The recommendation has a yellow color-coded timeliness classification, signifying that while intentions may be acceptable, the lack of timely progress is a concern.

In sum, the rate of progress on the "Most Wanted" safety recommendations is a combination of red and yellow, which is to say that the overall, combined color is orange, and hardly the green of a timely response. ✈

Icing *(Cont'd from p. 1)*

of the NPRM. In other words, the ARAC may have forwarded SLD standards to the FAA, but they have not been propounded in any rulemaking.

Not only is the NPRM deficient in this respect, it applies only to new aircraft. As such, according to NTSB Member Deborah Hersman, the impact of the NPRM may be "negligible." The new standards, which still do not feature the SLD phenomenon, will apply to maybe 400 or so new aircraft, with little done to upgrade the ice protection of the existing fleet. These aircraft continue to experience incidents and accidents, and existing technology does not appear to offer adequate protection *(see box, on p. 6)*.

Indeed, while the new NPRM does propose to codify and harmonize with Europe's existing standards, much in it bears comment:

► **Very light jets** (VLJ). These are the new aircraft expected to revolutionize air taxi and fractional ownership. The whole VLJ concept is predicated upon simplicity and light weight. Some manufacturers may be forced or persuaded to fit anti-ice/de-ice gear, or offer it as an option, but opt NOT to have the airplanes certified for flight in icing conditions. Therein lies a potential conundrum (which won't reduce the incidence of accidents in either standard *or* severe icing conditions). Passengers deserve a better break than a low-time pilot's wishful thinking.

► **Meteorology.** Perhaps not relevant to certification requirements, but the direction of turn to exit or escape icing conditions should be part of a route forecast (e.g., away from the areas of worse precipitation, and/or away from higher terrain). The turn direction can be a critical "out" if a pilot is experiencing heavy icing along his route of flight. Turn the wrong way and the situation can suddenly become much worse. Icing can vary greatly in its lateral and vertical extent.

Escape from icing is especially important in conditions of freezing rain. It is literally a life or death decision. The rate of deterioration of handling qualities can be very rapid. With warm frontal occlusions, the pilot often needs to turn immediately 90 or 180 degrees to get out from under the downpour of freezing rain. This being the case, the threatening form of icing is:

a. A dynamic and deteriorating scenario (which is to say there is no point in talking about ¾ of a knot being a relevant test parameter).

b. Not able to be controlled by anything other than escape.

c. A lethal precipitation if it hits when the airplane is dirtied up (that is, configured for landing) and on approach (a frequent scenario for accidents).

d. Difficult to recognize, especially during the transition from a benign situation of controllable icing to one of a sudden accumulation (i.e., no alarms sound or visual signs indicate to the pilot the subtle transition from a tolerable ice accretion rate to a potentially lethal environment). This can occur solely due to a change in altitude, as in a descent for holding or approach. The insidious nature of this changing threat level is what catches pilots out. The NPRM admits that lower angles of attack (such as in a descent) foster formation of ice buildups further back on the upper surface (which is more dangerous and likely to lead to

(Cont'd. on page 6)

Icing *(Cont'd from p. 5)*

aileron hinge moment problems).

► **Asymmetric operations in severe icing conditions** (e.g., dead engine as non-rotating block of ice). There is a big difference in drag and subsequent handling (and ice buildup on that wing) if a jet engine or a feathered propeller and its turbine fails and quickly forms a non-rotating ice block. The NPRM does not appear to take this into consideration in its discussion of asymmetric factors.

Similarly, there does not appear to be a valid consideration of the spanwise dissymmetry of lift on propeller-driven airplanes due to similar left and right engine propeller rotations and the askew buildups of ice above and below the wings, as well as inboard and outboard of each engine nacelle. Remember that the classic loss of control in icing is entered due to one wing stalling well before the other and a pilot's use of countering aileron simply embedding the swiftly rolling aircraft more fully into autorotation. Twins don't spin recover well even when not asymmetrically iced up spanwise.

► **Noise abatement.** There does not appear to be any consideration of noise abatement procedures, such as steep/low speed/power reduced climbs to icing-affected takeoffs.

► **Contaminated runways.** By this is meant runways contaminated with snow and ice. There does not appear to be consideration in the NPRM of reduced thrust balanced field takeoffs on contaminated runways. For example, slush thrown up by the nosewheel(s) or main landing gear wheels and sticking to the wing undersurfaces, particularly on low-wing jets.

► **Acceptance of current technology anti-ice and de-ice methodologies.** The NPRM seems to blindly accept the efficacy of, if you will, "old" technology anti-ice and de-ice methodologies (inflatable boots, bleed air leading edge heating, etc.). These techniques may not be nearly as good as a thermal lasing system (fitted inside a small cupola, one below and one above the nose), which would enable measurement (i.e., ice detection) and a de-icing capability *(see ASW, Nov. 10, 2003, p. 7, "Thermal Laser Wiping")*. Such a system would retain the "clean" aerodynamic performance desired in all icing conditions, including SLD, as well as providing a ground de-icing option and a bonus solution to the sudden unexpected severe hazard of ice-contaminated tailplane stall (ICTS). The NPRM mentions, "If there is ice on the tailplane, the increased AOA [angle of attack] may lead to an ICTS." Laser ice detection and de-icing also would overcome the not-uncommon problem of de-ice fluids flowing into hinge-line recesses on elevators and freezing, causing pilot "stick freeze." Laser cleaning addresses the presently accepted hazard of intercycling ice, plus these two compromises in the NPRM:

1. "The general rule of Sec. 25.207(b) may result in a different stick shaker activation point for icing conditions because the airplane may

Simple Design Solutions Based on Old De-Icing Technology Just Don't Work

Two examples make the point that simple design solutions based on old de-icing technology don't work, essentially because no pilot can discriminate the severe icing that his airplane is supposed to stay out of until it is far too late:

The ultimate icing experience

Northern Thunderbird Air Beechcraft King Air 200, **Transportation Safety Board** (TSB) of Canada report of the Jan. 19, 2005, incident:

"During cruise flight at 15,000 feet above sea level the aircraft was in icing conditions. The aircraft's ice-protection equipment dealt effectively with the icing conditions until about 45 minutes after takeoff, when the aircraft began to accumulate ice at a rate that exceeded the capabilities of the ice-protection equipment."

"Accumulated ice, up to six inches thick, was shed during the approach to Kelowna, where an uneventful landing was made."

"The Transport Canada-approved flight manual … states, in part, that although the aircraft is approved for flight in icing conditions as described in the U.S. Code of Federal Regulations (CFR), it is not approved for flight in severe icing conditions or other conditions that exceed the capabilities of the aircraft ice-protection equipment."

Source: TSB report number A05P0018

Relevant to the icing design changes

Yampa Valley Air Ambulance, Rawlins, Wis., Beech BE-90, **National Transportation Safety Board** (NTSB) summary report of the Jan. 11, 2005, flight in which three were killed and one was seriously injured:

"Portions of the leading edge … showed clear ice adhering to the surface. The ice was about 1½ inch thick and completely covered the leading-edge deicing boot."

"The left and right wings' leading-edge deicer boots inflated normally as designed."

"Several witnesses in the vicinity of the accident site reported surface weather conditions varying from freezing rain to heavy snow."

ASW comment: air ambulance pilots aren't known for quitting in the face of bad weather. It is not human nature to up and cancel when weather is fluctuating around marginal. This may be what makes the old technology de-icing methodologies so lethal. Conditions are suddenly encountered with accretion rates that are beyond the system's capacity, or another system failure or emergency puts the situation into extremis (i.e., with an airplane that's handling very poorly and with flight control margins severely eroded).

In this case, the system was later proven to be serviceable and in use. The crew was simply overpowered and the thickness of the ice found post-accident would indicate that the airplane was ice-blocked and crashed due to a combination of loss of aerodynamics and weight accumulation, possibly compounded by gear/flap extension and maneuver into a stall/spin outcome.

Source: NTSB, report number DEN05FA051

stall at a different speed or AOA [angle of attack] with ice accretions. In order to maintain a safe margin above the stall speed and to provide sufficient maneuvering capability, an increase in the minimum operating speeds may be needed. Increasing the minimum operating speeds, such as takeoff and landing speeds, may result in a cost increase if operators have to reduce payload to comply with performance requirements at the higher operating speeds."

2. "The proposed revisions to Sec. 25.237(a) would add a requirement to establish a safe landing crosswind component for use in icing conditions."

The acceptance of old technology anti-ice systems is all the more perplexing when one considers that the document is to be applied to new aircraft for which certification is sought.

The restriction on twin-engine turboprops is that bleed air is expected to provide cabin pressurization, air conditioning, and de-ice wing leading edges and empennage cyclically. The capacity to heat up enough air is limited. But rain-ice/freezing rain hits and sticks and forms spanwise runback ridges behind the boots or thermally de-iced leading edges. Any ridgeline formed spanwise forward of the airfoil's center of pressure means significant drag. It is not clear that extensible RATs (ram air turbines, or air driven generators) are capable of coping with icing conditions. Their essential role, abilities and limitations seem to have been left out of the argument.

► **MMEL** (master minimum equipment list). Perhaps not appropriate for a certification NPRM, one nevertheless has to wonder if the document should not discuss preflight unserviceability of ice detection and anti-ice gear. That discussion should also cover inflight unserviceability.

► **Engine and propeller anti-ice.** The NPRM says, "It must be assumed that the crew does not take any action to activate the ice protection system until the airplane is at least 400 feet above the takeoff surface." It should be noted that propeller and engine anti-ice would normally be on from the moment of takeoff roll, if not beforehand.

► **Degraded flight controls.** The NPRM appears to afford scant consideration (e.g., for ICTS) in degraded flight control modes when in icing conditions (for example, "hydraulics OFF, boost-out flight" or its equivalent in fly-by-wire aircraft).

► **Testing with one winglet removed.** There does not appear to be a consideration for testing with one winglet removed. We are talking here of the relevance of testing icing characteristics with high-lift leading edge devices extended. Many aircraft types have a dispensation to operate with only one winglet after, say, a ground-handling accident. Tip icing on a "wing with a winglet" would be quite different to that on a wing without one – reintroducing the specter of tip-stall and autorotation.

► **Takeoffs in icing conditions.** For most takeoffs with snow and slush present, pilots will pause significantly before retracting landing gear so as to ensure that the wheelwell is relatively clean before tucking the gear away, thereby avoiding a freeze-up of microswitches and such. The delayed gear retraction does not seem to get mention as a factor relative to takeoff performance.

The temperature used, -9° C, is considered too optimistic, as it's colder than 0° C and therefore does not take into account water runback and refreezing. As such, one icing expert believes 0° C would be a more appropriate standard. The present approach, he said, could be likened to "planning for headaches, not cancer."

► **Prescriptive guessing.** The NPRM says, "For the size of the water droplets, both industry and FAA icing specialists concurred that a mean effective diameter of 20 microns" shall be used. Nature may not be so cooperative as to abide by the NPRM. For the vagaries of nature, consider that hailstones can range in size from that of small pebbles to that of oranges. The NPRM may fail to accord with the reality and the history of the accident record. Maybe what's required is a new technology that can cope, rather than new standardized concepts of nature, which seem to have the sole advantage of assisting in justifying old technologies as acceptable.

Statements in the NPRM seem to pretend that situations will be recognized, and are therefore controllable:

"Proposed Sec. 25.143(j) would address airplane controllability between the time when the airplane first enters icing conditions and when the ice protection system is activated and performing its intended function. In developing the controllability criteria proposed in paragraph (j), we considered the likely duration of this time period and the means that might be used for detecting icing conditions and activating the ice protection system. The proposed advisory material for part 25, appendix C, part II(e) would provide additional guidance for determining the appropriate ice accretion for this testing based on the means of ice detection."

Such assertions are not borne out by the long-term accident experience utilizing the obsolescent technologies that are still being seen as state of the art.

► **Stall warning.** The NPRM does not seem to admit to any icing asymmetry caused by propeller rotation

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Icing *(Cont'd from p. 7)*

causing the classic autorotational "departure" that is seen in most icing accidents, with or without autopilot. Recall also that the classic startled pilot response is to attempt to pick up the dropped wing in any entry to an asymmetrically iced higher-speed stalling autorotation. Using aileron at the entry point of any stall only serves to embed the aircraft more deeply in the stall/flick/spin scenario. One of the first basic lessons in practical aerodynamics is that a pilot should never attempt to pick up a dropped wing at the stall with aileron, as it will cause an instant entry into spin. It should be noted that spins in twins are practically guaranteed to be lethal. This problem is manifest in the example of the 1997 fatal crash of a **Comair** EMB-120, in which the NPRM says, "This caused a rapid descent after an uncommanded roll excursion, resulting in a crash."

A similar criticism may apply to the NPRM's pretense that the sole threat is a clean 1G stall.

► **Safety margins.** The NPRM seems to feature much academic debate about the difference between using 3 knots (or 3 percent) and 5 knots (or 5 percent) speed increments as an arbitrary dividing line between "safe" and "unsafe." This approach, it would seem, tends to disregard the fact that icing is a dynamic scenario with accumulation rates and types very much dependent upon whether or not anti-ice/de-ice has been selected on, how late that is done, how heavy the precipitation is, and what the airplane flight attitude and configuration is.

As such, the discussion seems to fiddle at the edges of a potentially much larger proposition posed by unexpectedly encountering (climbing or descending) supercooled liquid droplet (SLD) conditions, and the pursuant sudden total loss or severe diminution of options, particularly when an aircraft with a critical accumulation of SLD rain-ice also has to cope with large airspeed transients due to turbulence.

SLD is mostly about unprotected surfaces and the polyglot aerodynamic flow effect of de-icing the leading edges but having to allow ice to build up on unprotected areas (leading to high-drag ridgelines and other excrescences that can blank out control surfaces or reverse their hinge moments). As the NPRM says, "Takeoff ice is the most critical ice accretion on unprotected surfaces."

► **Departure from reality.** The NPRM claims, "The revised text would clarify that any airplane approved to fly in icing conditions must be capable of operating in the icing conditions of appendix C of part 25 regardless of whether or not the airplane has an ice protection system."

Yet all the provisos of the NPRM assume a fully operative anti-ice/de-ice system, and that the pilot recognizes the severity of icing before it is too late.

Comments on the NPRM are due Feb. 6. An NTSB official said his agency is going through the NPRM in detail and will submit comments, most likely including remarks to the effect that SLDs are still not included in the icing certification criteria. ✈

BRIEFS

● **Shared concern about runway safety.** The **National Transportation Safety Board**'s (NTSB) concern over lack of progress in deploying technology to combat runway incursions is matched by John Carr, president of the **National Air Traffic Controllers Association** (NATCA). Speaking before the Wings Club in New York City last week Carr said:

"Just like [controller] staffing, it has taken years for the FAA to even acknowledge the problem. Finally, last week, after a barrage of negative publicity on runway incursions – and another plea from air traffic controllers – the FAA announced that some airports would be getting the [ASDE-X] system [a ground radar system similar to AMASS]. Unfortunately, the emphasis here is on SOME airports. In fact, only 16 airports will be getting the technology, leaving dozens of other major airports completely uncovered. If you need proof that even medium sized airports desperately need these systems, I invite you to look at Tampa, where some of the recent incursions occurred. According to the FAA, that airport simply does not deserve ASDE-X." ■

● **A partial solution?** During the hearing on its "Most Wanted" safety recommendations, NTSB officials discussed the use of "belly belts" to restrain lap children.

The supplemental loop belt is affixed to the adult's seat belt, and goes around the child. Three lap children on the **Air France** jet that overran the runway at Toronto Aug. 2 were restrained by belly belts, and all survived *(see ASW, Aug. 8, p. 1)*. An NTSB official said the belly belts are mandated, in the case of Air France, by the regulatory authority, the **Direction Générale de l'Aviation Civile** (DGAC), and that they are similarly mandated in the UK. However, Europeans are divided on the use of the belly belt, and the FAA does not believe belly belts are effective, as the belt can aggravate internal injuries in the event of a serious crash.

However, rather than do nothing, which the FAA has done by eschewing child restraint systems altogether, one wonders if there isn't at least a partial solution. Consider establishing a row of seats – maybe the front bulkhead row – where adults are restrained by both lap and shoulder belts, to which a smaller lap and shoulder belt is attached

for the small child. This arrangement would allow for lap children but would avoid the dangerous concentration of force associated with the belly belt. Obviously, such an arrangement would not apply to babies, who still need a rearward-facing seat, but it might apply to children who are still small enough to be carried on the lap. ■

ACCIDENTS AND INCIDENTS [1]

DATE/SITE	AIRCRAFT & REGN	CIRCUMSTANCES	DEATH & INJURY	PRELIMINARY ANALYSIS[2] Imagery at www.iasa.com.au/211105.htm
03 Oct. 1100L Dulles, Virginia	EMB170 of United Express	**Climbed abruptly from 3000ft to 3500ft in response to a TCAS alert**	1 ser inj/ 45 o/b	Reg: N650RW. Resolution advisory for a head-on with traffic 500ft below
06 Oct. 0340L East Midlands A/P	A300 of Channel Express	**Fire crews were called out to extinguish a brake fire after landing**	Nil	Arriving from Cologne, Germany
19 Oct. 1845Z Houston, Texas	HS125 Reg: N564BR	**Pilot dragged the right wing on the asphalt when landing in light winds**	Nil/10 o/b	Minor damage (Houston Hobby A/P). Owner: Kaleidoscope Aviation Corp
25 Oct. ~1200Z Wildwood, N.J.	Caribou DHC4 Reg: N56NC	**Caribou struck by a "parked" Piper PA25 N6220Z in the tie-down area**	Nil	Parked a/c moved by high winds. Minor damage
28 Oct. late night Olympia, Wash.	Agusta A109 Mk2 of Airlift NW	**Crashed on takeoff fm Providence-St. Peter Hospital's roof helipad**	1 inj / 4 o/b	A Sept. 29 crash of another Airlift NW A-109 in Puget Sound killed 3 crew
28 Oct. 1720L Cheongju, Seoul	ATR72-200 of Hansung Airline	**Flt HA303 deflated 2 LH tires on arrival at Jeju International Airport**	Nil/64 pax	Regulator checking on reports that HA is wearing out tires way beyond limits
29 Oct. 1130Z Nashville, Tenn.	King Air 200 Reg: N5LE	**A/c went off the far end after landing too far in -- in foggy conditions**	Nil	Arriving from Smyrna, Tennessee. Operator Executive Air Express Inc
29 Oct. 0917L Boston Logan A/P	EMB145 of US Airways Express	**Plane lost cabin pressure shortly after t/off, descended and returned Logan**	Nil / 37 pax +3	Plane taken out of service for checks. Flt 31-55 was bound Savannah, Ga.
01 Nov. 1445Z Laredo, Texas	DC9 of SkyTrain N989XA	**L wing hit a large metal container while parking in non-movement area**	Nil/2 o/b	Minor damage to port wing
01 Nov. Auckland, NZ	767 of Air NZ Reg: ZK-NCO	**NZ76 from Hong Kong circled A/P whilst damaged nosewheel inspected**	Nil/156 o/b	Landed uneventfully after 30 mins. Faulty nose-gear downlock sensor
02 Nov. 1606L Rostov-on-Don, Russia	TU154 of Aeroflot Don	**Diverted and landed Rostov-on-Don Southern Russia with an engine fire**	Nil/69 pax	Sochi to Moscow flight
02 Nov. Vancouver B.C.	A340-300 of China Eastern	**Returned soon after take-off (and a fuel dump) with an engine problem**	Nil/273 pax +16	Headed Shanghai
02 Nov. 1058L Malmö, Sweden	737-800 of Ryanair	**737 diverted in to Malmö/Sturup with an engine failure**	Nil/111 pax	Tampere,Finland, to Stansted UK flight
02 Nov. 1630L Mumbai, India	ATR42 of Air Deccan	**A/c returned from point 150 kms out with port engine failure**	Nil/39 pax	Flt DN-323 Mumbai to Bhavnagar, Gujarat, India
02 Nov. 0755L Sioux Falls, S.D.	A340 of UPS Flt: UPS491	**Following a bird strike, port engine vibration caused a return to land.**	Nil/3 o/b	Joe Foss Field airport, Sioux Falls, South Dakota
02 Nov. 1657L Osaka, Japan	777-200 of JAL Flt: JL1870	**Emerg diversion Itami A/P following a left engine hydraulic system failure**	Nil/181 o/b	Engine shut down 15 mins out of Osaka. Kagoshima to Tokyo (Haneda)
03 Nov. 2325Z Colorado Springs	757 of UPS Flt: UPS28	**Struck a goose at FL360, desc FL280 due cracked windshield & continued**	Nil/4 o/b	Louisville, Ky., for Sacramento, Calif. No emergency declared.
03 Nov. SCQ Galicia Spain	MD-88 of Iberia Reg: EC-EZA	**Port wing destroyed by fuel-truck collision with stationary a/c on ramp**	Nil	Santiago de Compostela A/P. A/c was "Ciudad de Segovia"
03 Nov. 1220L Kathmandu, Nepal	SAAB 340 of Yeti 9N-AHM	**Landed Tribhuvan A/P after a port MLG wheel dropped away after t/off**	Nil/21 pax +3	Headed Pokhara, Nepal. Minor damage
03 Nov. Heathrow UK	747-400 of Virgin Atlantic	**C-VWOW engine #1 podstrike while landing r/way 27R at Heathrow**	Nil	Flt: VS4 from NY (JFK) hit turbulence from a crosswind over the hangars
04 Nov. 0845L Dong Xuyen Vietnam	PZL M-28-05 AJE-003-09	**Crashed into a field near Dong Xuyen village near Hanoi's Gia Lam district**	3 fatal/3 o/b	Operator: VNAF (medium twin utility transport)
04 Nov. 1842L Calgary, Alberta	A319 of Air Canada	**A319 lost its #1 (port) engine after t/off due to flying into a flock of geese**	1 goose cooked	First stage fan blades chewed. Departed r/way 10 & landed back on r/way 16.
04 Nov. ~1300L Austin, Texas	Citation II of unknown	**Emergency landing Austin Bergstrom airport after hitting a bird on t/off**	Nil	Holed wing causing fuel leak. Problem is rubbish dump on extended centerline
05 Nov. 1845Z Bermuda	A320 of USAir Flt: USA1476	**Encountered severe turbulence in vicinity of Bermuda, injuring a pax**	1 serious injury	Barbados for Philadelphia, Pa.
05 Nov. 0440Z Miami, Fla.	747-200F of Tradewinds Intl	**Flt TDX151 lost an engine cowling on dept & continued to Bogota, Colombia**	Nil	No point scowling over a cowling
05 Nov. 0958L Houston Hobby A/P	Citation 1 of HCEA. N505K	**Told to expedite due SWA 737 flt 422 inbd with eng oil problem –& crashed**	2 fatal/2 o/b	Maint test flight appears to have lost an engine (or had a flt controls failure)
05 Nov. Lagos, Nigeria	777-200 of KLM	**Intl airlines banned flts into Lagos soon after a KLM a/c was damaged**	Nil	KLM 777 engaged a hole on the main runway and damaged its MLG
05 Nov. Anchorage, Alaska	MD-11F of EVA Air	**Crew mistakenly took off from a taxiway parallel to assigned r/way 32**	Nil	Headed Taipei, Taiwan, from Ted Stevens Intl Airport, Anchorage
06 Nov. 1238Z Heathrow UK	777-200 of American	**N781AN struck on elevator and port wingtip by passing A340, Reg: TC-JDK**	Nil/243 pax	In hold area. Turkish A340 speedtaped missing winglet and departed.
06 Nov. 0935L New Delhi	A330 of Gulf Air Flt: 132	**Declared an emerg and re-landed after an engine failure on climb-out**	Nil/ 230 o/b	Bound Abu Dhabi UAE
06 Nov. 1132L Kathmandu, Nepal	Fokker 100 of Cosmic Air	**Emergency landing at Tribhuvan Intl A/P with hydraulic failure**	Nil	Bound for Biratnagar, Nepal

ACCIDENTS AND INCIDENTS [1] (Continued from p. 9)

08 Nov. 1545Z Eureka, Calif.	Cessna 421 Reg: N47CA	**Golden Eaglet ran off the runway to the right on takeoff**	Nil / 1	Minor damage
08 Nov. ~1400L Sokoto, Nigeria	747 of Kabo Air	**Plane was diverted to Kano Intl after 2 dicey attempts to land in reduced vis**	Nil	Returning from Saudi (Umrah aka lesser Hajj) with a VIP load
08 Nov. 0720L Manchester NH	EMB-110P1 of Air Now	**A/c bound Bangor Maine crashed into a Walmart store soon after t/off**	1 inj	UPS freight contractor Business Air Freight, Flt: RLR3352. N7801Q writeoff
09 Nov. ~0710 Melbourne, Aust.	737-7Q8 of Virgin Blue	**Flt DJ809 returned soon after take-off with fumes in the cockpit**	Nil	No further details. Flight was Sydney bound.
09 Nov. am hrs Windsor Locks, Ct	737 of Delta Flt: DL1718	**A/c struck birds on t/off, an engine was damaged so a/c relanded Bradley**	Nil/134 pax	Headed for Cincinnati
09 Nov 0835L Melbourne, Aust.	737-7Q8 Reg: VH-VBI	**Experienced a rapid decompression at FL400 and carried out emerg desc**	Nil	Sydney New South Wales to Melbourne Victoria
09 Nov. 1400L Schiphol, Holland	747 of Polar Air	**Freighter aborted t/off on 37L, blew tires & damaged runway lighting**	Nil	Amsterdam runway taken out of service until jet could be moved
09 Nov 0915L Stewart, N.Y.	727 of FedEx Enrt from Boston	**Runway was cleared off for an emerg landing with severe fumes in cockpit**	Nil/3	Construction workers cleared the 11,818ft r/way of debris in six minutes
09 Nov. 1520Z New York JFK	767 of Delta Flt: DAL73	**F/A received unknown injuries when a bio-hazard fluid splashed her face**	1 inj	Unknown circumstances. Aircraft arriving from Istanbul, Turkey
09 Nov. Ft. Lauderdale, Fla.	737 of US Airways	**NTSB reports plane came within a few seconds of landing on a Comair CRJ**	Nil	CRJ was lined up. ATC tumbled to the conflict and sent the 737 around
11 Nov. 0400L Kak-e-Shahidan Afghanistan	IL76MD of Royal Airlines Flight: 1102	**Cargo plane flying comms equipt from Bahrein to Bagram Airbase flew into a hill 30km north of Kabul**	8 dead / 8 o/b	Reg: 4L-ZIL was on military charter Bahrein-Kabul-Bagram and onward to Sharjah UAE as RPK1102
12 Nov. 1015L Ottawa, Canada	A320 of Air Canada	**Touched down at 1100L after an engine problem enroute to Halifax**	Nil / 98 pax & crew	4th major Air Canada serviceability incident in 5 months (one was birdstrk)
12 Nov. ~0600L Dublin, Ireland	A330 of Lufthansa	**Precautionary shutdown of #1 engine in cruise due low oil press**	Nil	#1 engine replaced
13 Nov. night Manchester, N.H.	737 of SWA Flt: SW530	**Flt lost cabin pressure, masks came down & continued to Manchester**	Nil / 131 pax	@14K feet. No fault found on arrival; more 737 pressurization switchology?
14 Nov. Belfast City A/P Ir	Dash 8 of Flybe	**Engine was shut down due to a prop overspeed and a/c returned to BHD**	Nil	FlyBe BAe146 aircrew admitted to hospital after a fumes incident
14 Nov. 0646L Catarman, Philippines	BAe146 of Asian Spirit	**Plane skidded off rain-soaked runway into a padi-field on arrival Catarman**	Nil / 32 pax +6	Minor damage to gear and fuselage on arrival from Manila
14 Nov. ~1045L Dublin, Ireland	ATR42 of Aer Arran	**Landed r/way 28 with LH engine shutdown (frozen power lever?)**	Nil / 4 crew	Returning from maintenance work in Sonderborg, Denmark
15 Nov. p.m. hrs Akon Sthn, Sudan	Twin Otter UN Charter	**Landed short in the rough, tearing the right-hand gear totally off**	Nil	Probable write-off
15 Nov. Auckland, NZ	747-400 of Qantas QF25	**Los Angeles-bound flt turned back after 4hrs due to a fuel leak**	Nil / 348 pax	NZ PM Helen Clark was aboard [and missed an LA meeting]. Left next day
15 Nov. 1340L Pittsburgh, Pa.	Saab 340B of Colgan Air	**N242CJ damaged its L wingtip when it struck Colgan's Saab 340 N346CJ**	Nil/1	Minor damage (taxi/reposition is a two man job)
15 Nov. Antioquia, Colombia	C206 of Sade Charter	**Crashed 15kms after t/off from Olave Herrera A/P in Medellin [for Ituango]**	6 dead / 6 o/b	In mountains between Girardota & Copacobana in NW Prov of Antioquia
15 Nov. Damascus, Syria	A320 of Gulfair Flt: GF901	**4 Australian women detained due to gun parts discovered in a child's toy**	Nil	Damascus to Bahrein. Iraqi-born women had a dismantled hand-gun
15 Nov. night Hamilton, Canada	Gulfstream 100 of Jetport Inc.	**Ran off the runway while landing in fog, mist and heavy rain**	Nil / 2 o/b	Undamaged
15 Nov. 1003L South Hampton, N.Y.	C208 of ShoreLine Avn	**Seaplane N117SA crashed in Little Peconic Bay, Long Is. & partially sank**	Nil / 3 o/b	Occupants rescued by fishermen. Caravan is a write off
16 Oct. >2200L Johannesburg, S.A.	A340-200 of SAA. Flt 274	**Returned after dumping fuel for an emergency landing on runway 03 Left**	Nil	Forward cargo-hold fire warning
16 Nov. morning Kanoya AB, Japan	YS-11A of JMSDF	**Had a 9.1mtr airmiss with civil helo while on appch to Kanoya Airbase**	Nil / 9 o/b	In Kagoshima Prefecture 985km SW of Tokyo (Maritime Self Def Force a/c)
16 Nov. 2328L Gaylord, Mich.	AC50 Commander 500	**N1153C crashed short of runway on instrument appch in icing conditions**	1 dead	¾ mile visibility in snow & mist (broken cloud at 600ft) with temp below freezing
17 Nov. 1207L Savannah, Ga.	King Air 100 of JRT Group Props	**Returned for a belly landing shortly after leaving Charlie Brown A/P**	Nil	After circling since 1120L trying to extend the RH gear
17 Nov. Vologda, NW Russia	MI-2 of GAZProm Oil	**Found crashed on a copse near the village of Baklan close to the pipeline**	4 dead + 1 inj	Inspecting Ukhta-Torzhok gas pipeline
17 Nov. 0708L Ft. Myers, Fla.	757 of UPS	**Cargo jet declared an emergency 10 mins out with a hydraulic failure**	Nil / 4 o/b	RSW (Southwest Florida Intl A/P). Aircraft was towed to a hangar

[1] Air carrier accidents, or other incidents involving serious failures or fatal injuries.

[2] DISCLAIMER: These assessments are not intended to assert probable cause or liability, but rather are intended to provide insight pending publication of a final report of investigation. *Preliminary analysis by John Sampson - International Aviation Safety Association (IASA).*