



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

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In reply refer to: A-04-64 through -67

Honorable Marion C. Blakey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

From 1987 to 2003, 26 icing-related accidents and incidents involving Cessna 208 series airplanes¹ occurred, resulting in at least 36 fatalities.² As a result, the National Transportation Safety Board became concerned about a possible systemic problem with the airplane's design or with the operation of the airplane. In late 2003, the Board initiated an in-depth assessment of these 26 icing-related events. The Board's assessment focused on certification of the Cessna 208 for in-flight icing conditions,³ the atmospheric conditions often encountered during cold weather ground and flight operations, airplane dispatch considerations, and Cessna 208 pilot experience and training information.

The Safety Board's assessment revealed that 15 of the 26 icing-related events resulted from ice⁴ that had accumulated while the airplane was in flight.⁵ Further, the Board's assessment found that most of these icing-related loss-of-control accidents occurred during flight in icing conditions that appeared to be within the parameters of the Federal Aviation Administration's

¹ Cessna 208 series airplanes are high-wing, turbopropeller-driven, single-engine airplanes that can be configured for cargo, passenger, or mixed-use operations.

² The Safety Board investigated 21 of the 26 events. Of the remaining 6 events, 3 occurred in Canada, and one each occurred in Norway and Argentina. Cessna provided the Safety Board with additional information regarding these events. More information about the 21 events investigated by the Safety Board (ANC88FA022, NYC90FA060, NYC90FA061, DEN90FA068, FTW95FA094, FTW95FA129, ANC97MA161, ANC98MA008, CHI98LA084, MIA98FA091, CHI98FA119, ANC00LA017, DEN01FA094, DCA02MA003, IAD02LA021, ANC02FA020, CHI02FA093, DEN03FA012, FTW03FA089, DEN04MA015, and NYC04SA023) can be found on the Board's Web site at <<http://www.ntsb.gov>>.

³ To operate in icing conditions, Cessna 208 series airplanes must have operational leading edge deice boots on the wings and horizontal and vertical stabilizers, propeller anti-ice boots, windshield anti-ice panel, heated pitot-static and stall warning systems, a standby electrical system, a wing ice detection light, and an engine inertial separator.

⁴ The terms "rime," "clear," and "mixed" are used to describe types of ice accumulations. According to the *Aeronautical Information Manual* (AIM), rime ice is "rough, milky, opaque ice formed by the instantaneous freezing of small supercooled water droplets" and has a rough surface. Clear ice is "a glossy, clear, or translucent ice formed by the relatively slow freezing of large supercooled water droplets" and is usually smoother than rime ice. Mixed ice "has the characteristics of both rime and clear ice."

⁵ Ten of these 15 events occurred during the approach and landing phases of flight

(FAA) icing certification envelopes.⁶ The assessment also revealed that 10 of the 26 events involved inadequate removal of ice that had accumulated while the airplane was on the ground before takeoff.⁷

The Safety Board's findings raised concerns about possible deficiencies with the certification standards applicable to the Cessna 208 series airplane, the cold weather operational procedures used by Cessna 208 pilots, and/or the design of the airplane and its deice and anti-icing systems. The Board is evaluating the certification and design of the Cessna 208 and its deice and anti-icing systems. In the interim, the Board has identified several operational issues that, if addressed promptly, should increase pilot awareness about operating in icing conditions and preclude Cessna 208 icing-related events during the 2004/05 icing season. These operational issues are addressed in this letter.

Background

One of the 15 icing-related events that resulted from in-flight ice accumulation occurred on November 4, 2003, when a Cessna 208B, N805TH, diverted to Bangor International Airport (BGR), Bangor, Maine, after encountering icing conditions in flight. The airplane hit the runway hard, causing the nose landing gear to collapse. The pilot⁸ (the sole occupant) was not injured. The airplane sustained minor damage when the propeller contacted the runway during the hard landing. The incident occurred during nighttime hours, and visual meteorological conditions (VMC) prevailed at the time. The nonscheduled cargo flight, which was conducted under the provisions of 14 *Code of Federal Regulations* (CFR) Part 135, departed Northern Maine Regional Airport (PQI), Presque Isle, Maine, with an intended destination of Manchester Airport, Manchester, New Hampshire.

During postincident interviews with Safety Board investigators, the pilot stated that the predeparture weather briefing had forecast rain and snow showers for his route of flight.⁹ The pilot stated that he departed PQI about 1830 and that, while in cruise flight between cloud layers at an altitude of 8,000 feet mean sea level (msl), he encountered snow and freezing rain. The pilot stated that he activated the airplane's deice and anti-icing systems when he saw ice accumulating on the left wing and the windshield. Despite this action, ice continued accumulating on the wings and windshield. When the pilot observed a 5-knot decrease in airspeed, he requested a descent to an altitude of 6,000 feet msl, where he hoped flying conditions would be better. However, the pilot reported that the icing conditions were worse at that altitude. The pilot stated that, although the windshield heated panel was activated, ice was

⁶ The icing certification envelopes, which define the parameters for safe operations in continuous maximum and intermittent maximum icing conditions, are found in Part 25, appendix C. The icing envelopes are based on the cloud's liquid water content, the mean effective diameter of the cloud droplets, the ambient air temperature, and the inter-relationship of these three variables. Manufacturers must demonstrate that an airplane is capable of safe operation in these icing conditions before the FAA will certificate that airplane for flight into known icing conditions.

⁷ The ice accumulation source and timing were not identified for 1 of the 26 events.

⁸ The pilot reported that he had flown in winter weather in the northeastern United States since 1984 and had accumulated 4,800 hours total flight time, including 2,800 hours in the Cessna 208B. He had attended a Cessna 208 cold-weather training program about 2 weeks before the incident occurred.

⁹ Records indicate that the weather briefing received by the pilot had forecast occasional moderate rime and mixed icing in precipitation and clouds up to 20,000 feet msl.

still accumulating on the windshield, and his forward visibility was limited to a small opening that was decreasing in size.

Because of the deteriorating conditions and accumulating ice, the pilot requested and received clearance to divert to BGR. The pilot stated that, as he descended in rain and sleet, the windshield became completely covered with ice and that he observed ice on the left wing aft of the deice boots. He further stated that the airplane's controls felt "sluggish." The pilot also stated that he did not extend the flaps for the landing and that he maintained a faster-than-normal airspeed during the approach to avoid a stall. In addition, the pilot stated that, because he had no forward visibility, he looked out the airplane's left window during the landing to judge the airplane's height above the runway. Postincident examination of the windshield anti-ice system revealed that it was capable of normal operation. Photographs taken before the airplane was moved off the runway showed ice on the deice boots and ice accumulations aft of the wing deice boots on the upper and lower surfaces of the wing (see figures 1 and 2).



Figure 1. Photograph of the left wing leading edge, showing ice accumulation aft of the deice boot.



Figure 2. Photograph of the right wing lower surface, showing ice accumulation aft of the leading edge deice boot.

One of the 10 icing-related events that involved inadequate removal of ice accumulated while the airplane was on the ground occurred on October 10, 2001, when a Cessna 208B, N9530F, crashed shortly after takeoff from Dillingham Airport, Dillingham, Alaska. The pilot¹⁰ and nine passengers were killed, and the airplane was destroyed. The accident occurred during daylight hours, and VMC prevailed at the time. The flight was operated under the provisions of 14 CFR Part 135 with an intended destination of King Salmon Airport, King Salmon, Alaska.

The Safety Board's investigation revealed that the airplane was parked outside on the ramp on the night before the accident and was exposed to rain, snow, and below-freezing temperatures. Because of these conditions, ramp personnel deiced the accident airplane with a heated mixture of glycol and water. The ramp supervisor who conducted the deicing stated that he thought that the wings' upper surface was clear of ice but that he did not touch the wing to check for ice accumulation. Board investigators could not determine whether the pilot had checked the wing and horizontal stabilizer upper surfaces for ice accumulation after the airplane

¹⁰ Records showed that the pilot had accumulated about 3,100 hours total flight time, including 74 hours in the Cessna 208. He completed the initial Cessna 208 flight training in June 2001, and the Cessna 208 initial operating experience training in August 2001. The company confirmed that the pilot had completed cold weather operations training and viewed the Cessna 208 cold weather operations videotape produced by Cessna within the year preceding the accident. The pilot had been employed in the Alaskan aviation industry almost continually since 1993.

was deiced.¹¹ However, the airplane's high-wing configuration would have hindered the pilot's ability to see residual clear ice on the wing upper surface after the deicing procedures.

One witness, a pilot performing a preflight inspection of his airplane, stated that when he saw the airplane takeoff, he thought the airplane was "a little nose-up and a little sluggish...it seemed to wallow a bit." However, after watching the airplane climb out for about 3 to 5 seconds, the witness decided that the takeoff and climb appeared normal for a full airplane and returned to his preflight inspection. Another witness (a private pilot) was working in a nearby office building when he saw the airplane climb out from the airport. He stated that he saw the airplane's tail swing abruptly to the right and the wings roll to the left until they were perpendicular to the ground. The witness said the airplane appeared to "hang in the air" as it turned left, then the nose of the airplane dropped "directly down" and the airplane descended out of sight behind a hill. The airplane crashed into terrain about 0.7 mile northeast of the end of the departure runway. Information recorded by the engine data recorder¹² showed that the airplane's maximum altitude was about 600 feet above the ground. The Safety Board determined that the probable cause of this accident was an in-flight loss of control resulting from upper surface ice contamination that the pilot-in-command failed to detect during his preflight inspection of the airplane.

In-Flight Icing Operational Issues

The Safety Board's interviews with directors of operations and/or chief pilots for five Cessna 208 operators indicated that the Cessna 208 pilot's workload increases significantly when the airplane is operated in icing conditions. For example, because the Cessna 208 pneumatic boot deice system is not a "turn on and leave on" system, the pilot must constantly monitor and evaluate the ice accumulation. The Cessna 208 pilot operating handbook (POH) instructs pilots to wait until 1/4 to 3/4 inch of ice (depending on the type) has accumulated before activating the deice boots. However, when cockpit workload increases (for example, during the approach and landing phases of flight), the pilot may not be able to adequately monitor and evaluate the ice accumulation. Further, although the airplane is equipped with a light that illuminates the left wing inboard leading edge to assist the pilot in checking for ice accumulated in flight, the Cessna 208's high-wing makes it difficult for a pilot to determine whether ice is forming on the upper wing surface aft of the deice boots.¹³

The Cessna 208 POH contains guidance to pilots on operating the airplane in icing conditions and states that in-flight icing conditions that fall outside of the FAA's icing envelopes should be avoided. Because a pilot cannot directly determine whether icing conditions encountered in flight fall outside of the icing envelopes, the POH describes visual cues that might alert a pilot to the presence of icing conditions that should be avoided. These cues include

¹¹ The pilot-in-command (PIC) is responsible for ensuring that critical airplane surfaces are free of frost, ice, and snow before takeoff. Federal regulations (Section 135.227) state that no pilot may take off in an airplane that has frost, ice, or snow adhering to any propeller, wing, or stabilizing or control surface. Additionally, the Cessna 208 pilot operating handbook (POH) and aircraft flight manual (AFM) advise against taking off with any form of frost, ice, or snow on critical airplane surfaces, including the wings and horizontal stabilizers.

¹² The airplane was not equipped with flight data or cockpit voice recorders and was not required by Federal regulations to be so equipped.

¹³ Research has shown that ice formations on the wing upper surfaces is more detrimental to lift than ice formations on the wing lower surfaces.

heavy ice accumulation on the windshield and ice formation aft of the curved section of the windshield or aft of the protected surfaces of the wing struts.

Additionally, the POH contains the following warnings:

Pilots are advised to be prepared to divert the flight promptly if hazardous ice accumulations occur....Whenever icing conditions are encountered, immediate action should be taken to leave these conditions.

An accumulation of one inch of ice on the leading edges can cause a large (up to 500 fpm [foot per minute]) loss in rate of climb, a cruise speed reduction of up to 40 KIAS [knots indicated airspeed], as well as a significant buffet and stall speed increase (up to 20 knots). Even after cycling the deicing boots, the ice accumulation remaining on the unprotected areas of the airplane can cause large performance losses.

The POH also warns that the stall warning horn may not function if 1 inch of ice has accumulated and that “there may be little or no pre-stall buffet with heavy ice loads on the wing leading edges.”

In addition to the POH guidance on operating the Cessna 208 in icing conditions, in 1995 Cessna developed and began offering a Safety Awareness Program for its Cessna 208 operators. This program addresses cold weather-specific ground operation and considerations (including parking, storing, towing, preheating, and using deice and anti-icing equipment and materials),¹⁴ flight operation considerations, airplane systems considerations, engine considerations, maintenance practices, and fuel anti-ice additives.¹⁵ Specifically, the program emphasizes the importance of promptly exiting certain icing conditions because of progressive performance degradation if ice remains after repeated activation of the deice boots. It also instructs that, if needed, pilots should use maximum continuous engine power to exit icing conditions and counter degrading airspeeds. During interviews, several operators reported that Cessna 208 pilots should make prompt decisions about exiting even moderate icing conditions when encountered; if continued exposure to moderate or severe icing conditions occurs, pilots should expect to lose altitude while maintaining an airspeed just above a stall.

Cessna representatives indicated that Cessna’s Safety Awareness Program was intended to be a refresher course for Cessna 208 pilots. Cessna initially offered this program every other

¹⁴ The program’s reference to deice and anti-icing equipment and materials included on-airplane as well as ground applications, such as deicing fluids, their use, and holdover times.

¹⁵ In addition, each pilot who attends the Cessna 208 Safety Awareness Program is provided with the following resources: Cessna’s cold weather operations video, a Cessna 208 Safety Awareness Program compact disc (CD), National Aeronautics and Space Administration’s (NASA) “Icing for Regional and Corporate Pilots” video, NASA’s “Icing for General Aviation Pilots” digital video disc, and NASA’s “A Pilot’s Guide to In-Flight Icing” CD.

year; however, after an increase in icing-related accidents was noted during a year in which it did not offer the program (1997/98), Cessna offered it more frequently.¹⁶

The Safety Board's assessment indicated that Cessna's Safety Awareness Program, as well as similar Cessna 208 cold weather operations programs offered by Flight Safety International and the Pan Am International Flight Academy, appear to address most pertinent cold weather operation issues. However, the Board is concerned that these training programs might not place sufficient emphasis on recognizing unacceptable ice accumulations on the Cessna 208 (such as ice accumulations aft of the deice boots) and escaping icing conditions promptly. Further, only a portion of the Cessna 208 pilot population have access to these programs.¹⁷ For example, the Board's Cessna 208 series icing assessment identified only 5 of the PICs who were involved in the 26 in-flight and ground icing-related events who had attended one of these (Cessna's, Flight Safety International, or Pan Am) training programs.¹⁸ The events involving these 5 PICs occurred between December 1999 and November 2003.

Cold weather operations training programs developed by Cessna 208 operators provide another way for pilots to receive the necessary cold weather operation information. However, the Safety Board's Cessna 208 series icing assessment indicated that the effectiveness of operator-developed training programs varied widely. This assessment is supported by the results of the FAA's 2001/02 evaluation of the Cessna 208.¹⁹ During interviews with 22 qualified Cessna 208 pilots who worked for different operators in different parts of Alaska, FAA inspectors found that many pilots demonstrated inadequate knowledge of Cessna 208 operations in icing conditions. For example, 6 of the 22 pilots interviewed did not know the Cessna 208's maximum gross takeoff weight for operations in icing conditions. Also, 6 of the 22 pilots interviewed were not aware that the Cessna 208 POH warns pilots not to operate into or out of airports where freezing rain or drizzle are reported, and several pilots were unfamiliar with ground deicing procedures and materials.

The Safety Board concludes that, because of the differences in the effectiveness of training programs, Cessna 208 pilots and operators are not consistently provided with pertinent cold weather operation information, which may result in pilots being unprepared for operations into icing conditions. Therefore, the Safety Board believes that the FAA should require all pilots and operators of Cessna 208 series airplanes equipped for flight into known icing conditions to undergo seasonal training for ground deicing and flight into icing conditions on an annual basis. This seasonal training should be timed to precede the operator's cold weather operations and

¹⁶ According to Cessna, the Safety Awareness Program cold weather training is currently offered annually in 19 locations in the United States, including 5 in Alaska.

¹⁷ When an operator purchases a Cessna 208, the purchase price includes airplane-specific training at Flight Safety International for one pilot and one mechanic. (Initial training for other pilots and mechanics and subsequent recurrent training may be purchased by operators.) According to Flight Safety International personnel, these training courses address cold weather operations regardless of the time of year and/or location in which they are offered.

¹⁸ It is possible that other PICs had attended similar training; however, there was no indication of such training.

¹⁹ As a result of the Dillingham, Alaska, accident in 2001, the FAA's Alaskan Region System Safety Analysis Branch conducted a safety evaluation of the Cessna 208. For more information, see the FAA's "Cessna 208 De-icing Evaluation Interim Report," dated June 28, 2002, and revised September 3, 2002. Although still titled an "interim" report, the FAA has since indicated that its September 2002 report is the final product resulting from the evaluation.

should specifically address (1) the limitations of the Cessna 208 in icing situations; (2) the Cessna 208 deice and anti-icing systems and controls and their use; (3) pilot actions during cold weather ground operations, with emphasis on the need for careful visual and tactile examination of wing and horizontal stabilizer upper surfaces during the preflight inspection to ensure that they are free of ice before takeoff; (4) pilot actions during cold weather flight operations, with emphasis on the timely recognition of potentially dangerous accumulations of ice and the importance of having an appropriate strategy for escaping the icing conditions and acting on that strategy promptly; (5) the hazards of performance degradation caused by ice that remains after activation of the deice boots; and (6) Cessna 208 POH icing-related limitations, warnings, and notes.

Additionally, the Safety Board believes that the FAA should require Cessna Aircraft Company, working with Cessna 208 operators, to develop effective operational strategies (for example, cold weather preflight strategies in remote locations, viable methods of collecting icing-related weather information before and during flight, ice detection and monitoring cues, optimal use of anti-ice and deice systems, minimum airspeeds for all phases of flight, proper use of flaps and engine power in icing conditions, and development of ice accumulation limitations and exit strategies for pilots in icing conditions) and related guidance materials to minimize the chance of Cessna 208 ground and in-flight icing accidents or incidents; the FAA should then verify that these strategies are incorporated into Cessna 208 operator manuals and training programs in a timely manner.

On-Ground Icing Operational Issues

During the FAA's 2002 safety evaluation of the Cessna 208, FAA inspectors reviewed the operations specifications, training manuals, operations manuals, policies and procedures, deicing manuals, and aircraft flight manuals (AFM) for nine Cessna 208 operators. Inspectors also interviewed directors of operations, chief pilots, mechanics and other ground personnel, and 22 qualified Cessna 208 line pilots. The results indicated "a general lack of or inadequate procedures for deicing [airplanes on the ground]" and that many operators' systems and procedures for ground deicing were "found to be deficient." The evaluation also noted the following:

These systems contained inadequate, incomplete, or contradictory guidance and procedures for deicing Cessna 208 aircraft. Several operators' manuals contained operational procedures that were contrary to limitations found in the Cessna 208 Pilot Operating Handbook....Identified system deficiencies combined with poorly trained pilots increase the likelihood of the Cessna 208 aircraft being improperly deiced.

Additionally, when asked if they could take off in the Cessna 208 with polished frost, snow, or ice on the wings or stabilizer surfaces, 8 of the 22 pilots interviewed thought such an operation was approved or were unsure. Further, several operators' manuals endorsed this

operation. Although this operation is generally permitted by Federal regulations, it is prohibited by the Cessna 208 POH.²⁰

The original Cessna 208 POH advised pilots to "...ensure that all wing, strut, tail control, propeller, and windshield surfaces ...are free of ice, snow, and frost accumulations...prior to takeoff." In 1996, when Cessna observed that Cessna 208 pilots continued to take off with ice and/or frost on the airplane's surfaces, the company issued a "Known Icing Equipment" supplement, which cautioned that during such a takeoff "aircraft performance will be degraded to a point where a safe takeoff and climbout may not be possible." The Cessna 208 AFM contains similar icing-related cautions. However, as recently as March 2002, a Cessna 208 crashed because the pilot did not remove ice and/or frost from the airplane's wing and horizontal stabilizer surfaces before takeoff.

One possible explanation for these continued occurrences is that the airplane's high-wing design makes thorough visual inspection of the wing's upper surfaces more physically challenging than a similar inspection on an airplane with a low-wing design. Further, some types of ice and/or frost can be difficult to detect visually, especially at night. A combination of a visual and a physical (tactile) inspection of the Cessna 208 wing and horizontal stabilizer leading edges and upper surfaces would provide more positive assurance that those surfaces were free of ice accumulations before takeoff.²¹

The Safety Board concludes that, in certain environmental conditions and with certain ice accretions, a visual inspection alone may not be sufficient to detect ice on the Cessna 208 wing and horizontal stabilizer surfaces, and a tactile examination of those surfaces would ensure that they were uncontaminated. Therefore, the Safety Board believes that the FAA should require all pilots and operators of Cessna 208 series airplanes to conduct a visual and tactile examination of the wing and horizontal stabilizer leading edges and upper surfaces to ensure that those surfaces are free of ice and/or frost contamination before any flight from a location at which the temperatures are conducive to frost or ground icing.

The Safety Board notes that the FAA's 2001/2002 Cessna 208 evaluation report also stated the following:

FAA systems did not detect that operator training and qualification programs were not meeting the initial and recurrent training requirements of FAR [Federal Aviation Administration] Part 135. In addition, normal FAA surveillance did not detect that Cessna 208 pilots were not properly trained for operations in ground icing conditions.

The FAA's evaluation report recommended that its certificate management teams should "revisit" and "retarget" its surveillance practices for Cessna 208 operators to ensure that deficiencies in

²⁰ Research has shown that almost imperceptible amounts of ice on an airplane's wing upper surface during takeoff can result in significant performance degradation. See National Transportation Safety Board. 1993. *Takeoff Stall in Icing Conditions, USAir Flight 405, LaGuardia Airport, Flushing, New York, March 22, 1992*. Aircraft Accident Report NTSB/AAR-93/02. Washington, DC.

²¹ The Safety Board notes that, as a result of McDonnell Douglas DC-9 events involving ice or frost that accumulated on the ground, in 1993 the FAA issued an airworthiness directive requiring flight crews to verify that a "visual check and a physical (hands-on) check of the leading edge and upper wing surfaces have been accomplished, and that the wing is clear of ice/frost/snow accumulation" before takeoff.

those operators' icing-related training programs, personnel monitoring, and manuals and guidance are identified and corrected. According to the FAA's Alaskan Region System Safety Analysis Branch, the FAA has taken no action on its recommendation. Accordingly, the Safety Board concludes that the FAA's surveillance practices may not be adequate to ensure that Cessna 208 operators are adhering to effective cold weather operational strategies and guidance materials intended to prevent icing-related Cessna 208 accidents and incidents. Therefore, the Safety Board believes that the FAA should evaluate its current procedures for surveillance of operators of Cessna 208 series airplanes equipped for flight into known icing conditions to determine whether the surveillance effectively ensures that these operators are in compliance with Federal deicing requirements and, if necessary, modify the surveillance procedures to ensure such compliance.

The Safety Board notes that because the 2004/05 cold weather season is approaching and Cessna 208 pilots may already be encountering icing conditions in some operating environments, it is important that these recommendations are acted on promptly. Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration expeditiously do the following:

Require all pilots and operators of Cessna 208 series airplanes equipped for flight into known icing conditions to undergo seasonal training for ground deicing and flight into icing conditions on an annual basis. This seasonal training should be timed to precede the operator's cold weather operations and should specifically address (1) the limitations of the Cessna 208 in icing situations; (2) the Cessna 208 deice and anti-icing systems and controls and their use; (3) pilot actions during cold weather ground operations, with emphasis on the need for careful visual and tactile examination of wing and horizontal stabilizer upper surfaces during the preflight inspection to ensure that they are free of ice before takeoff; (4) pilot actions during cold weather flight operations, with emphasis on the timely recognition of potentially dangerous accumulations of ice and the importance of having an appropriate strategy for escaping the icing conditions and acting on that strategy promptly; (5) the hazards of performance degradation caused by ice that remains after activation of the deice boots; and (6) Cessna 208 Pilot Operating Handbook icing-related limitations, warnings, and notes. (A-04-64)

Require Cessna Aircraft Company, working with Cessna 208 operators, to develop effective operational strategies (for example, cold weather preflight strategies in remote locations, viable methods of collecting icing-related weather information before and during flight, ice detection and monitoring cues, optimal use of anti-ice and deice systems, minimum airspeeds for all phases of flight, proper use of flaps and engine power in icing conditions, and development of ice accumulation limitations and exit strategies for pilots in icing conditions) and related guidance materials to minimize the chance of Cessna 208 ground and in-flight icing accidents or incidents; the FAA should then verify that these strategies and guidance materials are incorporated into Cessna 208 operator manuals and training programs in a timely manner. (A-04-65)

Require all pilots and operators of Cessna 208 series airplanes to conduct a visual and tactile examination of the wing and horizontal stabilizer leading edges and upper surfaces to ensure that those surfaces are free of ice and/or snow contamination before any flight from a location at which the temperatures are conducive to frost or ground icing. (A-04-66)

Evaluate its current procedures for surveillance of operators of Cessna 208 series airplanes equipped for flight into known icing conditions to determine whether the surveillance effectively ensures that these operators are in compliance with Federal deicing requirements and, if necessary, modify the surveillance procedures to ensure such compliance. (A-04-67)

Chairman ENGLEMAN CONNERS, Vice Chairman ROSENKER, and Members HEALING and HERSMAN concurred with these recommendations. Member CARMODY did not participate.

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Chairman