Docket No. SA-533

Exhibit No. 2-HHH

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C.

Open NTSB Icing Recommendations to FAA

(45 Pages)

Recommendation Report

Friday, February 13, 2009

Log Number 2529A

Issue Date 8/15/1996 **ROSELAWN IN** **10/31/1994**

ON OCTOBER 31, 1994, ABOUT 1600 CENTRAL STANDARD TIME A SIMMONS AIRLINES AVIONS DE TRANSPORT REGIONAL ATR-72-210, OPERATING AS AMERICAN EAGLE FLIGHT 4184, CRASHED INTO A SOYBEAN FIELD 3 MILES SOUTH OF ROSELAWN, INDIANA. THE FLIGHT WAS ON AN INSTRUMENT FLIGHT RULES FLIGHT PLAN FROM INDIANAPOLIS, INDIANA, TO O'HARE INTERNATIONAL AIRPORT, CHICAGO, ILLINOIS, AND HAD BEEN PLACED IN A HOLDING PATTERN OVER ROSELAWN BECAUSE OF WEATHER DELAYS BEING EXPERIENCED AT O'HARE. THE AIRPLANE'S PRIMARY AND SECONDARY RADAR RETURNS DISAPPEARED FROM THE AIR TRAFFIC CONTROL RADAR SHORTLY AFTER THE FLIGHT WAS CLEARED TO CONTINUE THE HOLDING PATTERN AND TO DESCEND FROM 10,000 TO 8,000 FEET. WITNESSES OBSERVED THE AIRPLANE DESCEND OUT OF A LOW OVERCAST AND STRIKE THE GROUND IN A STEEP NOSE-DOWN ATTITUDE. ALL 64 PASSENGERS AND 4 CREWMEMBERS WERE KILLED IN THE ACCIDENT. THE SAFETY BOARD INVESTIGATED ONE SUCH EVENT THAT OCCURRED ON DECEMBER 22, 1988, AT MOSINEE, WISCONSIN.

Recommendation # A-96-051

Overall Status
OAA

Priority
CLASS II

THE NTSB RECOMMENDS THAT THE FAA: REVISE THE EXISTING AIRCRAFT ICING INTENSITY REPORTING CRITERIA (AS DEFINED IN THE AERONAUTICAL INFO MANUAL (AIM) AND OTHER FAA LITERATURE) BY INCLUDING NOMENCLATURE THAT IS RELATED TO SPECIFIC TYPES OF AIRCRAFT, AND THAT IS IN LOGICAL AGREEMENT WITH EXISTING FEDERAL AVIATION REGULATION (FARS).

FAA	Open - Acceptable Response

10/30/1996	Addressee	The FAA is developing an FAA In-flight Icing Plan which will address the recommendations and issues raised at the May 1996 International Conference on Aircraft In-flight Icing. One major issue identified at the conference was the need to harmonize icing terminology and criteria. This initiative will be addressed by a working group that will review, revise, develop the necessary advisory and guidance materials and handbook changes, and revise the appropriate regulations. This project will address the intent of this safety recommendation. The working group will be chaired by the FAA and will include representatives from appropriate FAA offices, the National Weather Service (NWS), the Aviation Weather Center in Kansas City, Missouri, and the William J. Hughes Technical Center in Atlantic City, New Jersey. I will keep the Board apprised of the FAA's progress on these safety recommendations.
6/27/1997	Addressee	THE FAA PUBLISHED ITS INFLIGHT AIRCRAFT ICING PLAN IN APRIL 1997. THE PLAN ADDDRESS RECOMMENDATIONS AND ISSUES RAISED AT THE MAY 1996 INTERNATIONAL CONFERENCE ON AIRCRAFT INFLIGHT ICING. THE PLAN DESCRIBES VARIOUS ACTIVITIES INCLUDING RULEMAKING, DEVELOPMENT OF AND REVISIONS TO ADVISORY MATERIALS, RESEARCH PROGRAMS, AND OTHER INITIATIVES TO ACHIEVE SAFETY WHEN OPERATING IN ICING CONDITIONS. THE MOST CURRENT INFO WAS USED IN THE DEVELOPMENT OF THE TASKS & SCHEDULES CONTAINED IN THE PLAN. HOWEVER, BECAUSE OF THE COMPLEX NATURE OF THE TASKS AND THE INTERRELATIONSHIPS BETWEEN TASKS, THE PLAN MAY NEED TO BE REVISED PERIODICALLY TO REFLECT CHANGES IN SCOPE OR SCHEDULE. THE INTENT OF THIS RECOMENDATION IS ADDRESSED IN THE PLAN. THE FAA WILL KEEP THE BOARD APPRISED OF THE FAA'S PROGRESS ON THIS RECOMMENDATION.
8/20/1997	NTSB	A-96-51 ASKED THE FAA TO REVISE THE EXISTING AIRCRAFT ICING INTENSITY REPORTING CRITERIA (AS DEFINED IN THE AERONAUTICAL INFO MANUAL (AIM) & OTHER FAA LITERATURE) BY INCLUDING NOMENCLATURE THAT IS RELATED TO SPECIFIC TYPES OF AIRCRAFT, & THAT IS IN LOGICAL AGREEMENT WITH EXISTING FEDERAL AVIATION REGULATIONS (FARS). PENDING COMPLETION & EVALUATION OF THE ACTIONS PLANNED THEREIN, THE BOARD CLASSIFIES A-96-51, -52, & -60 "OPEN--ACCEPTABLE RESPONSE."

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5/18/2000	Addressee	Letter Mail Controlled 05/22/2000 3:41:13 PM MC# 2000651 ON 6/27/97, THE FAA ADVISED THE BOARD THAT THE AIRCRAFT ICING PLAN ISSUED IN APRIL 1997 ADDRESSED RECOMMENDATIONS AND ISSUES RAISED AT THE MAY 1996 INTERNATIONAL CONFERENCE ON AIRCRAFT IN-FLIGHT ICING. THE ICING PLAN DESCRIBED VARIOUS ACTIVITIES INCLUDING RULEMAKING, DEVELOPMENT OF AND REVISIONS TO ADVISORY MATERIALS, RESEARCH PROGRAMS, AND OTHER INITIATIVES TO ACHIEVE SAFETY WHEN OPERATING IN ICING CONDITIONS. THE FAA FURTHER STATED THAT A WORKING GROUP WAS BEING FORMED TO REVIEW, REVISE, AND DEVELOP NECESSARY REGULATIONS AND GUIDANCE MATERIALS RELATED TO ICING. THE BOARD CLASSIFIED THESE RECOMMENDATIONS IN AN "OPEN ACCEPTABLE" STATUS PENDING COMPLETION AND EVALUATION OF THE ACTIONS IN THE ICING PLAN. THE FAA'S IN-FLIGHT ICING PLAN, FORMERLY KNOWN AS THE AIRCRAFT ICING PLAN, CONSISTS OF 14 TASKS. EACH TASK HAS A WORKING TEAM TO ADDRESS VARIOUS ISSUES RELATED TO ICING. TASK 1B TEAM HAS DEVELOPED A LIST OF NEW ICING TERMINOLOGY, WHICH WILL INCLUDE "ICING IN PRECIPITATION," AND A TABLE OF ICING EFFECTS ON AIRCRAFT. THE ICING TERMINOLOGY WILL BE INCORPORATED INTO ALL EXISTING AND FUTURE GUIDANCE AND RELEVANT DOCUMENTS. THE TABLE PROVIDES INFORMATION TO PILOTS IN THE FORM OF FOUR LEVELS OF EFFECTS WITH LEVEL FOUR HAVING THE MOST SEVERE EFFECT ON POWER, CLIMB, SPEED, CONTROL, AND STALL CHARACTERISTICS. THE FAA HAS INCLUDED IN ITS PROPOSAL OF NEW ICING TERMINOLOGY A REQUIREMENT THAT THE LEVEL OF EFFECTS BE INCLUDED IN THE PILOT'S ICING REPORT FORMAT SO THAT OTHER PILOTS CAN MAKE A REASONABLE JUDGEMENT REGARDING THE EFFECTS THAT THE REPORTED ICING MAY HAVE ON THEIR AIRCRAFT. IT IS KNOWN THROUGHOUT MUCH OF THE AVIATION COMMUNITY THAT ICE EFFECTS DIFFERENT TYPES OF AIRPLANES DIFFERENTLY. FOR EXAMPLE, AIRPLANES WITH THINNER AIRFOIL SHAPES ARE MORE EFFICIENT COLLECTORS OF ICE THAN AIRPLANES WITH THICKER AIRFOIL SHAPES. THE FAA IS ATTEMPTING TO BROADEN AND REINFORCE THIS KNOWLEDGE THROUGH THE PUBLICATION OF AN ADVISORY CIRCULAR (AC) ENTITLED, "PILOT GUIDE - FLIGHT IN ICING CONDITIONS." CURRENTLY, THE TECHNOLOGY TO FORECAST CLOUD LIQUID WATER CONTENT AND SUPERCOOLED LARGE DROPLETS SO THAT THEY CAN BE USED TO PREDICT THE PERFORMANCE EFFECTS ON AN AIRPLANE IS NOT AVAILABLE. IT IS ANTICIPATED THAT THE AC WILL BE PUBLISHED IN DECEMBER 2000. I WILL PROVIDE THE BOARD WITH A COPY OF THE AC AS SOON AS IT IS ISSUED. AS A RESULT OF THE IN-FLIGHT ICING CONFERENCE, THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA), IN COOPERATION WITH THE FAA, PRODUCED TWO VIDEOS ENTITLED "TAILPLANE ICING" AND "ICING FOR REGIONAL AND CORPORATE PILOTS." THE FAA HAS DISTRIBUTED COPIES OF THESE VIDEOS TO ALL REGIONAL AND FLIGHT STANDARDS DISTRICTS OFFICES AND HAS MADE THEM AVAILABLE TO THE PUBLIC. I HAVE ENCLOSED COPIES OF THE VIDEOS FOR THE BOARD'S INFORMATION. THE VIDEO ENTITLED "TAILPLANE ICING" IS AN EDUCATIONAL VIDEO THAT PROVIDES INFORMATION ABOUT ICE-CONTAMINATED HORIZONTAL STABILIZERS. THE VIDEO PRESENTS A PHYSICAL DESCRIPTION OF THE TAILPLANE ICING PROBLEM, SYMPTOMS OF ICE CONTAMINATION, AND SUGGESTED RECOVERY PROCEDURES. THE VIDEO ENTITLED "ICING FOR REGIONAL AND CORPORATE PILOTS" IS INTENDED FOR PILOTS OF TURBOPROP AIRCRAFT. THIS VIDEO DISCUSSES ICE PROTECTION SYSTEMS, HOW ICE ACCRETES ON THE AIRCRAFT, THE EFFECTS OF ICE ON BOTH THE PERFORMANCE DEGRADATION AND HANDLING QUALITIES, SUGGESTED RECOVERY TECHNIQUES FROM ROLL OR PITCH UPSET, AND THE HAZARDS OF SUPERCOOLED LIQUID DROPLETS. THE FAA IS CONTINUING TO WORK WITH NASA ON TWO ADDITIONAL VIDEOS DEALING WITH OTHER ASPECTS OF ICING. I WILL KEEP THE BOARD INFORMED OF THE FAA'S PROGRESS ON THESE RECOMMENDATIONS.
11/14/2000	NTSB	THE SAFETY BOARD IS PLEASED WITH THE FAA'S ACTIONS ON THESE RECOMMENDATIONS. PENDING REVIEW OF THE AC AND REVISIONS TO THE AIM AND OTHER RELEVANT DOCUMENTS, A-96-51 AND -52 ARE CLASSIFIED "OPEN--ACCEPTABLE RESPONSE."

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3/21/2001	Addressee	Letter Mail Controlled 03/26/2001 8:26:49 PM MC# 2010261 The Federal Aviation Administration (FAA) is continuing its efforts in response to these safety recommendations. One of the tasks in the FAA's In-Flight Icing Plan is to develop a list of new icing terminology, which will include "icing in precipitation," and a table of icing effects on aircraft. The icing terminology will be incorporated into all existing and future guidance and relevant documents. The table will provide information to pilots in the form of four levels of effects with level four having the most severe effect on power, climb, speed, control, and stall characteristics. The FAA has included in its proposal of new icing terminology a requirement that the level of effects be included in the pilot's icing report format so that other pilots can make a reasonable judgment regarding the effects that the reported icing may have on their aircraft. It is anticipated that the icing terminology will be approved by May 2001. The FAA will revise the Aeronautical Information Manual (AIM) once the terminology is approved. It is known throughout much of the aviation community that ice effects different types of airplanes differently. For example, airplanes with thinner airfoil shapes are more efficient collectors of ice than airplanes with thicker airfoil shapes. The FAA is attempting to broaden and reinforce this knowledge through the publication of an Advisory Circular (AC) entitled, "Pilot Guide - Flight In Icing Conditions." Currently, the technology to forecast cloud liquid water content and supercooled large droplets so that they can be used to predict the performance effects on an airplane is not available. It is anticipated that the AC would be published in May 2001. I will provide the Board with a copy of the AC as soon as it is issued.
6/5/2001	NTSB	The FAA is taking the actions recommended. Pending issuance of revisions to the AIM and issuance of the AC, Safety Recommendations A-96-51 and -52 remain classified Open--Acceptable Response."
8/29/2003	Addressee	Letter Mail Controlled 9/2/2003 2:47:32 PM MC# 2030440 The Federal Aviation Administration (FAA) is continuing its efforts in response to these safety recommendations. As part of the FAA's In-Flight Icing Plan the FAA revised Pilot Reports (PIREP) relating to airframe icing. The revised PIREP contains the aircraft type and a report of the level of icing effects experienced by the aircraft. Consequently, to complete the PIREP properly, the FAA is creating a "Level of Icing Effects" table that will provide information to pilots in the form of four levels of effects with level four having the most severe effect on power, climb, speed, control, and stall characteristics. The FAA is also developing a set of new icing terminology that will include "icing in precipitation," and the terminology will be incorporated into all existing and future guidance and relevant documents. The FAA plans to include the revised PIREP and new icing terminology in the next revision to the AIM, which will be published in February 2004. Additionally, the FAA and the National Aeronautics and Space Administration (NASA) are developing four additional videos dealing with icing effects for the aviation community. NASA has completed the video entitled "Icing for General Aviation Pilots," which is specific to general aviation. I have enclosed a copy of the video for the Board's information. The other three videos will be specific to large transport aircraft, helicopters, and supercooled large droplets. The FAA is providing technical assistance in the production of these videos, but the completion of these videos is dependent on NASA funding. As the videos become available, the FAA will distribute them through the FAA regional and flight standards district offices for distribution and use in air carrier flight training programs and general aviation training. I will keep the Board informed of the FAA's progress on these efforts to address these safety recommendations.
4/9/2004	NTSB	The Safety Board notes that the FAA has revised pilot reports (PIREP) related to airframe icing. The revised PIREP contains the aircraft type and a report of the level of icing effects experienced by the aircraft. To help complete the PIREP properly, the FAA is creating a "Level of Icing Effects" table that will provide information to pilots in the form of four levels of effects on power, climb, speed, control, and stall characteristics. The FAA is also developing a set of new icing terminology that will include "icing in precipitation," which will be incorporated into all existing and future guidance and other relevant documents. The FAA plans to include the revised PIREP and new icing terminology in the next revision to the AIM. Pending issuance of revisions to the AIM, Safety Recommendations A-96-51 and -52 remain classified "Open--Acceptable Response."

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2/8/2005	Addressee	Letter Mail Controlled 2/24/2005 1:47:17 PM MC# 2050078 The Federal Aviation Administration (FAA) is continuing its efforts in response to these safety recommendations. As part of the FAA's In-Flight Icing Plan, the FAA revised Pilot Reports (PIREP) relating to airframe icing. The revised PIREP contains the aircraft type and a report of the level of icing effects experienced by the aircraft. Consequently, to complete the PIREP properly, the FAA is creating a "Level of Icing Effects" table that will provide information to pilots in the form of four levels of effects with level four having the most severe effect on power, climb, speed, control, and stall characteristics. The FAA has developed a set of new icing terminology that includes "icing in precipitation," and the terminology will be incorporated into relevant existing and future guidance documents. The FAA has included the new icing terminology in the next revision to the AIM, which will be published in February 2005, and the revised PIREP format will be published in the August 2005 revision of the AIM. Additionally, the National Aeronautics and Space Administration (NASA), with technical assistance from the FAA, is developing videos dealing with icing effects for the aviation community. NASA has completed two videos-one entitled "Icing for General Aviation Pilots," which was provided in prcvious correspondence. NASA has completed its second video entitled "Supercooled Large Droplet Icins." I have enclosed a copy of the video for the Board's information. The remaining two videos will be specific to large transport aircraft and helicopters. As the videos become available, the FAA will distribute them through the FAA regional and flight standards district offices for distribution and use in air carrier flight training programs and general aviation training. I will keep the Board informed of the FAA's progress on these efforts to address these safety recommendations.
5/31/2005	NTSB	The Safety Board reviewed a copy of the February 17, 2005, revision to the AIM and notes that Section 7-1-22, "[Pilot Reports] PIREPs Relating to Airframe Icing," contains the same four-level icing severity rating scale (trace, light, moderate, and severe) but now indicates that a report to air traffic control of icing should include the aircraft type. The FAA has indicated that the August 2005 revision to the AIM will contain the final revisions to PIREP procedures for reporting icing. The Safety Board is concerned that the proposed revisions may not be able to fully address the issues raised in Safety Recommendation A-96-51. The letter that transmitted this recommendation to the FAA contained the following information: The investigation revealed that although the icing definitions in the Aeronautical Information Manual (AIM) provide some basis for assessing ice accumulation in PIREPs, they are subjective and of limited use to pilots of different aircraft types. For example, using these definitions, "light" icing for a B-727 could be "severe" icing for an ATR 72 or a Piper Malibu. The icing report provided by the captain of the A-320 Airbus that was holding at the HALIE intersection near Roselawn indicated that he observed about 1 inch of ice accumulate rapidly on his aircraft's icing probe. The captain provided a PIREP to air traffic control (ATC) and reported the icing as "light rime." After the accident, he stated that the anti-ice equipment on the airplane "handled the icing adequately," and that he believed the icing intensity to have been "light to moderate." The Safety Board is uncertain how the new system for icing PIREPs would have served on the night of the Roselawn accident to alert ATR-72 or Piper Malibu pilots that they would encounter severe icing based on a report of "light to moderate" from an A-320. Safety Board staff will schedule a SWAT (Safety With A Team) meeting to discuss this concern. Pending clarification of this concern and completion of revisions to procedures for PIREPs of airframe icing, Safety Recommendation A-96-51 remains classified "Open--Acceptable Response."

Recommendation Report

Friday, February 13, 2009

Recommendation # A-96-054

Overall Status
OUA

Priority
CLASS II

THE NTSB RECOMMENDS THAT THE FAA: REVISE THE ICING CRITERIA PUBLISHED IN 14 CODE OF FEDERAL REGULATIONS (CFR), PART 23 AND 25, IN LIGHT OF BOTH RECENT RESEARCH INTO AIRCRAFT ICE ACCRETION UNDER VARYING CONDITIONS OF LIQUID WATER CONTENT, DROP SIZE DISTRIBUTION, AND TEMPERATURE, AND RECENT DEVELOPMENT IN BOTH THE DESIGN AND USE OF AIRCRAFT. ALSO, EXPAND THE APPENDIX C ICING CERTIFICATION ENVELOP TO INCLUDE FREEZING DRIZZLE/FREEZING RAIN AND MIXED WATER/ICE CRYSTAL CONDITIONS, AS NECESSARY. A-96-54 SUPERSEDES RECOMMENDATIONS A-81-116 AND 118.

FAA	Open - Unacceptable Response

10/30/1996	Addressee	THE FAA WILL TASK AN AVIATION RULEMAKING AVISORY COMMITTEE (ARAC) WORKING GROUP TO DEVELOP CERTIFICATION CRITERIA FOR THE SAFE OPERATION OF AIRPLANE IN ICING CONDITIONS CONTAINING DROPLETS LARGER THAN CURRENT REQUIREMENT & IN MIXED-PHASE CONDITIONS CONTAINING SUPERCOOLED LIQUID WATER & ICE CRYSTALS IS SUCH CONDITIONS ARE DETERMINED TO BE MORE HAZARDOUS THAN THE LIQUID PHASE ICING ENVIRONMENT CONTAINING SUPERCOOLED WATER DROPLET. CURRENTLY THERE IS A LIMITED AMOUNT OF CLOUD PHYSICS DATA TO CHARACTERIZE SUPERCOOLED LARGE DROPLET ICING. THE FAA WILL SUPPORT A RESEARCH EFFORT (PENDING AVAILABILITY OF FUNDS) TO GATHER SUPERCOOLED LIQUID DROPLET DATA & TO INCREASE THE SUPERCOOLED LIQUID DROPLET CHARACTERIZATION DATA BASE. THE FAA WILL ALSO LEAD AN EFFORT TO COLLECT. CONSOLIDATE, & ANALYZE EXISTING SUPERCOOLED LIQUID DROPLET DATA. THE FAA WILL ALSO UNDERTAKE A STUDY (PENDING AVAILABILITY OF FUNDS) TO DETERMINE THE MAGNITUDE OF THE HAZARD POSED BY OPERATIONS IN MIXED-PHASE CONDITIONS. THE FAA WILL KEEP THE BOARD APPRISED OF THE FAA'S PROGRESS ON THIS RECOMMENDATION.
8/20/1997	NTSB	THE BOARD STRONGLY ENCOURAGES THE FAA TO MAKE EVERY EFFORT TO FUND THESE IMPORTANT IN-FLIGHT ICING RESEARCH PROJECTS. PENDING COMPLETION OF THESE ACTION ITEMS, THE BOARD CLASSIFIES A-96-54 "OPEN--ACCEPTABLE RESPONSE."
7/1/1998	Addressee	(Letter Mail Controlled 7/7/98 4:01:11 PM MC# 980846) THE FAA HAS TASKED THE AVIATION REGULATORY ADVISORY COMMITTEE (ARAC) TO FORM AN ICE PROTECTION HARMONIZATION WORKING GROUP. THE TERMS OF REFERENCE (TOR) DOCUMENT WAS APPROVED BY THE ARAC ON OCTOBER 1997 & PUBLISHED IN THE FEDERAL REGISTER ON 12/8/97. THE TOR DOCUMENT IDENTIFIES SEVERAL TASKS ASSIGNED TO THE ICE PROTECTION HARMONIZATION WORKING GROUP. ONE TASK IS TO " DEFINE AN ICING ENVIRONMENT THAT INCLUDES SUPERCOOLED LARGE DROPLETS (SLD), & DEVISE REQUIREMENTS TO ASSESS THE ABILITY OF AIRCRAFT TO SAFELY OPERATE EITHER FOR THE PERIOD OF TIME TO EXIT OR TO OPERATE WITHOUT RESTRICTION IN SLD ALOFT, IN SLD AT OR NEAR THE SURFACE, & IN MIXED PHASE CONDITIONS IF SUCH CONDITIONS ARE DETERMINED TO BE MORE HAZARDOUS THAN THE LIQUID PHASE ICING ENVIRONMENT CONTAINING SUPERCOOLED WATER DROPLETS. " DATA FROM THE RESEARCH ACTIVITIES LISTED BELOW WILL BE PROVIDED TO THE ICE PROTECTION HARMONIZATION WORKING GROUP IN SUPPORT OF THE TOR TASKS TO DEFINE AN ICING ENVIRONMENT. A RESEARCH EFFORT TO GATHER SLD DATA IN THE GREAT LAKE REGION WAS ACCOMPLISHED DURING THE WINTERS OF 1996-1998. THE DATA WILL BE ANALYZED & FORWARDED TO THE ARAC WORKING GROUP IN THE SECOND QUARTER OF FISCAL YEAR (FY) 1999. THE EFFORT TO COLLECT, CONSOLIDATE, & ANALYZE EXISTING SLD DATA IN UNDERWAY. THE FAA PLANS TO PROVIDE THE RESULT OF THIS EFFORT TO THE ARAC IN THE FIRST QUARTER OF FY 1999. THE FAA, COMPLETED A DRAFT REPORT, WHICH SURVEYS PUBLICLY AVAILABLE EVIDENCE BEARING ON THE POSSIBLE SAFETY HAZARDS POSED BY OPERATIONS IN MIXED-PHASE CONDITIONS. THE FAA PLANS TO PROVIDE ARAC WITH A FINAL REPORT IN THE THIRD QUARTER OF FY 1998.
11/9/1998	NTSB	A-96- 54 ASKED THE FAA TO REVISE THE ICING CRITERIA PUBLISHED IN 14 CODE OF FEDERAL REGULATIONS (CFR), PARTS 23 & 25, IN LIGHT OF BOTH RECENT RESEARCH INTO AIRCRAFT ICE ACCRETION UNDER VARYING CONDITIONS OF LIQUID WATER CONTENT (LWC), DROP SIZE DISTRIBUTION & TEMPERATURE, & RECENT DEVELOPMENTS IN BOTH THE DESIGN & USE OF AIRCRAFT. ALSO, EXPAND THE APPENDIX C ICING CERTIFICATION ENVELOPE TO INCLUDE FREEZING DRIZZLE/FREEZING RAIN & MIXED WATER/ICE CRYSTAL CONDITIONS, AS NECESSARY. PENDING THE COMPLETION OF THE ICE PROTECTION HARMONIZATION WORKING GROUP'S TASKS & SUBSEQUENT CHANGES TO APPROPRIATE REGULATIONS & ADVISORY MATERIAL A-96-54 IS CLASSIFIED "OPEN--ACCEPTABLE RESPONSE."

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4/15/1999	Addressee	Letter Mail Controlled 4/21/99 4:25:45 PM MC# 990438 THE FAA TASKED THE AVIATION REGULATORY ADVISORY COMMITTEE (ARAC) TO FORM AN ICE PROTECTION HARMONIZATION WORKING GROUP. ONE TASK ASSIGNED TO THE WORKING GROUP WAS TO DEFINE AN ICING ENVIRONMENT THAT INCLUDES SUPERCOOLED LARGE DROPLETS (SLD), AND DEVISE REQUIREMENTS TO ASSESS THE ABILITY OF AIRCRAFT TO SAFELY OPERATE EITHER FOR THE PERIOD OF TIME TO EXIT OR TO OPERATE WITHOUT RESTRICTION IN SLD ALOFT, IN SLD AT OR NEAR THE SURFACE, AND IN MIXED PHASE CONDITIONS IF SUCH CONDITIONS ARE DETERMINED TO BE MORE HAZARDOUS THAN THE LIQUID PHASE ICING ENVIRONMENT CONTAINING SUPERCOOLED WATER DROPLETS. THE FOLLOWING IS A STATUS UPDATE ON THE RESEARCH ACTIVITIES RELATED TO THE ICE PROTECTION HARMONIZATION WORKING GROUP TASK: *AVAILABLE SLD DATA FROM THE GREAT LAKES REGION AND OTHER NORTH AMERICAN AREAS ARE BEING COLLECTED AND ANALYZED AT THE FAA WILLIAM J. HUGHES TECHNICAL CENTER. RESULTS TO DATE WERE PRESENTED TO THE ARAC WORKING GROUP IN FEBRUARY 1999. THE WORK IS STILL IN PRGRESS AND UPDATES WILL BE DELIVERED PERIODICALLY TO THE ARAC WORKING GROUP. THE DRAFT MIXED-PHASE REPORT WAS SUBMITTED TO THE ARAC WORKING GROUP IN SEPTEMBER 1998. THE FINAL REPORT WAS PUBLISHED IN DECEMBER 1998. IN DECEMBER 1998, THE FAA HELD A MIXED-PHASE AND GLACIATED ICING CONDITIONS WORKSHOP TO DISCUSS THE FOLLOWING SUBJECTS: ICE ACCRETION PROCESS IN MIXED-PHASE AND GLACIATED CONDITIONS; CHARACTERIZATION OF MIXED-PHASE AND GLACIATED CONDITIONS; AND METHODS OF SIMULATING MIXED-PHASE AND GLACIATED ICING CONDITIONS. THE PROCEEDINGS FROM THE DECEMBER 1998 WORKSHOP WILL BE GIVEN TO THE ICE PROTECTION HARMONIZATION WORKING GROUP FOR DISCUSSION REGARDING THE POSSIBILITY OF DEVELOPING CERTIFICATION CRITERIA FOR FLIGHT IN THESE CONDITIONS.
2/16/2000	NTSB	THE SAFETY BOARD URGES THE FAA TO EXPEDITE THE ARAC WORK AND WOULD APPRECIATE ANY SIGNIFICANT UPDATES REGARDING PROPOSED REVISIONS TO THE ICING CERTIFICATION CRITERIA IN 14 CFR, PARTS 23 AND 25. PENDING THESE ACTIONS, A-96-54 IS CLASSIFIED "OPEN--ACCEPTABLE RESPONSE."
10/16/2000	Addressee	Letter Mail Controlled 10/19/2000 3:19:55 PM MC# 2001561 The Ice Protection Harmonization Working Group (IPHWG) is continuing its efforts to define an icing environment that includes supercooled large droplets (SLD). The IPHWG began work on these tasks in February 1999. The IPHWG has received SLD data from the Federal Aviation Administration (FAA), National Aeronautics and Space Administration (NASA), Canada's Atmospheric Environment Service, and The Boeing Company. The FAA collected and consolidated SLD data from the atmosphere around the Great Lakes Region and existing SLD data and provided analyses of the SLD data to the IPHWG. The IPHWG will use these data to define an icing environment that includes SLD. The icing environment definition will support the development of a proposed icing regulation by the IPHWG. Presentations by the FAA's William J. Hughes Technical Center, NASA, Canada's Atmospheric Environment Service, and The Boeing Company on SLD analytical methods have been given to the IPHWG. The IPHWG has identified potential shortcomings of these analytical methods when applied to ice accretions, which form in SLD conditions. The IPHWG will consider potential shortcomings when determining an acceptable means to assess the ability of aircraft to operate safely in an icing environment either for the period of time to exit or to operate without restriction in SLD aloft and in SLD at or near the surface. The FAA provided a draft mixed?phase report to the IPHWG in September 1998. The final report was published in December 1998. Proceedings from the FAA?sponsored Mixed Phase and Glaciated Icing Conditions Workshop, which was held in December 1998, were published in July 1999 and subsequently provided to the IPHWG. The IPHWG will consider this information in determining the need for a rulemaking initiative to address mixed?phase conditions. The IPHWG anticipates having an adequate data set available define an atmosphere that includes SLD by February 2001. I will keep the Board informed of the FAA's progress on this safety recommendation.
3/26/2001	NTSB	The Safety Board is concerned about the pace at which the reported actions are being taken. In the 4 1/2 years since this recommendation was issued, the IPHWG (not the FAA) is only now moving to define an atmosphere that includes SLD. Considerable work remains to assess the ability of aircraft to operate safely in an icing environment and to determine the need for rulemaking to address mixed-phase conditions. Once the IPHWG issues its report and recommendations, more work remains for the FAA to implement any new regulations. The Safety Board urges the FAA to expedite this work. Pending issuance of the IPHWG's report and recommendations on an atmosphere that includes SLD, Safety Recommendation A-96-54 remains classified "Open--Acceptable Response."

8/22/2001	Addressee	Letter Mail Controlled 08/29/2001 3:49:24 PM MC# 2010693: The Aviation Rulemaking Advisory Committee's (ARAC) Ice Protection Harmonization Working Group is continuing its effort to define an icing environment that includes supercooled large droplets (SLD) and mixed phase conditions if they are more hazardous than the liquid phase. Sufficient data have been gathered to define the SLD environment for certification conditions. However, limited data available to the working group does not provide compelling evidence that mixed phase icing conditions are more hazardous than liquid phase icing environment. The FAA, in cooperation with the National Aeronautics and Space Administration, is supporting research on empirical data clarifying the effects of mixed phase icing conditions on thermal anti-icing energy requirements. Testing should occur in the spring 2002, and a report is expected by the end of 2002. This research is needed to determine whether rulemaking is needed to address mixed phase icing conditions. The original task to ARAC included airplanes certificated to 14 CFR Parts 23 and 25 standards. The task was revised in June 2000 to address 14 CFR Part 25 only. The FAA will promulgate similar 14 CFR Part 23 rules after completion of the 14 CFR Part 25 rulemaking. I will keep the Board informed of the FAA's progress on this safety recommendation.
1/27/2003	NTSB	Although the IPHWG appears to be making progress in responding to this recommendation, the Safety Board remains concerned about the slow pace of this work. The Board notes that the IPHWG's report is not scheduled for completion until sometime in 2003, about 6 1/2 years after the recommendation was issued, and then the FAA will still need to develop and issue any related regulatory amendments. The Board urges the FAA to act expeditiously on this recommendation. The Board would also appreciate the opportunity to review a draft copy of the contractor's report. Pending the revisions of 14 CFR Parts 23 and 25 and the expansion of the Appendix C design certification envelope, Safety Recommendation A-96-54 remains classified "Open--Acceptable Response."
5/19/2003	Addressee	Letter Mail Controlled 5/28/2003 2:42:21 PM MC# 2030262 In March 2002 the Aviation Rulemaking Advisory Committee (ARAC) approved a concept developed by the Ice Protection Harmonization Working Group for a 14 CFR Part 25 rule that includes regulatory requirements to demonstrate an airplane can safely operate in certain supercooled large droplets for an unrestricted time or can detect the supercooled large droplets environment and safely exit icing conditions. The Ice Protection Harmonization Working Group is continuing to develop its recommendations for a rule and the associated advisory material. Upon receipt of the recommendations, the Federal Aviation Administration (FAA) will determine the priority that should be assigned to this rulemaking project. In June 2002, research to clarify the effects of mixed phase icing conditions was completed. The report is expected during the second quarter of 2003. Upon receipt of the report, an evaluation will be made to determine if there is evidence that the mixed phase icing condition is more hazardous than the liquid phase icing environment.
9/15/2003	NTSB	Although the IPHWG appears to be making progress in responding to these recommendations, the Safety Board remains concerned about the slow pace of this work. The Board notes that the IPHWG's report is not scheduled for completion until more than 7 years after these recommendations were issued, after which the FAA will need more time to develop and issue any related regulatory amendments. The Board urges the FAA to give this rulemaking project a high priority. The Board would also appreciate the opportunity to review a draft copy of the report on mixed phase icing conditions. Pending the revisions of 14 CFR Parts 23 and 25 and the expansion of the Appendix C design certification envelope, Safety Recommendation A-96-54 remains classified "Open--Acceptable Response."
11/9/2004	NTSB	As part of its November 9, 2004 meeting addressing the Safety Board's Most Wanted List of safety improvements, the Board voted to reclassify this recommendation from "Open-Acceptable Response" to "Open-Unacceptable Response."

Recommendation Report

Friday, February 13, 2009

2/1/2005	Addressee	In its 2/1/2005 annual report to Congress, Regulatory Status of the National Transportation Safety Board's "Most Wanted" Recommendations to the Department of Transportation, the DOT wrote:The FAA's Aviation Rulemaking Advisory Committee's (ARAC's) Ice Protection Harmonization Working Group (IPHWG) approved a concept for a 14 CFR Part 25 rule that includes regulatory requirements to demonstrate an airplane can safely operate in super-cooled large droplets for an unrestricted time or can detect the super-cooled large droplets environment and safely exit icing conditions. The IPHWG is continuing to develop its recommendations for a rule and the associated advisory material. When the FAA receives the IPHWGs recommendations, the appropriate priority will be assigned to this rulemaking project. The FAA will promulgate similar 14 CFR Part 23 rules after completion of the 14 CFR Part 25 rulemaking. Additionally, research to clarify the effects of mixed phase icing conditions was completed, and a report issued in May 2003. The FAA is evaluating the report to determine whether the mixed phase icing condition is more hazardous than the liquid phase icing environment. An ARAC working group is examining engine icing events believed to have occurred in mixed-phase conditions to determine if there is a need to develop mixed-phase icing requirements for engine inlet (Part 25) and engines (Part 33).
10/26/2005	Addressee	Letter Mail Controlled 10/27/2005 2:12:40 PM MC# 2050501 Marion C. Blakey, Administrator, FAA, 10/26/05 The Aviation Rulemaking Advisory Committee's (ARAC) Ice Protection Harmonization Working Group is continuing to develop a revision to 14 CFR Part 25 that includes regulatory requirements to demonstrate an airplane can safely operate in certain supercooled large drop (SLD) conditions for an unrestricted time or can detect SLD and safely exit icing conditions. In 2002, the FAA sponsored research to clarify the effects of mixed-phase icing conditions. The results are documented in the final report entitled "Assessment of Effects of Mixed-Phase Icing Conditions on Thermal Ice Protection Systems" (DOT/FAA/AR-03/48), dated May 2003. The report is available at the FAA William J. Hughes Technical Center's full-text technical reports web page at actlibrary.tc.gov. The research examined unprotected airfoil surfaces, fully-evaporative systems, and running wet systems. The test results do not suggest that ice accretions on unprotected surfaces in mixed-phase clouds would be more hazardous that those in a pure liquid phase icing environment. For fully-evaporative thermal systems the power required in mixed-phase and glaciated conditions was lower than for purely liquid clouds. This may be attributed to ice particles bouncing from the surface and loss of water due to splashing. Also, the additional heat energy required for melting the adhering ice crystal is minor when compared with the much larger heat energy required for a fully-evaporative thermal ice protection system. For running-wet systems the local power density required at the stagnation areas was higher for mixed phase conditions. The additional local power density is required to melt ice crystals that adhere along the stagnation line of protected surfaces. However, the overall power required was virtually the same for all-liquid and mixed-phase conditions. Although the research raises some questions with regard to running wet systems, there is no history of airframe ice protection system problems in mixed-phase conditions. Therefore, the FAA does not find compelling evidence to include mixed-phase icing conditions in the certification requirements for airframe ice protections systems. An ARAC working group is, however, examining engine icing events believed to have occurred in mixed-phase conditions to determine if there is a need to develop mixed-phase icing requirements for engine inlets (14 CFR Part 25) and engines (14 CFR Part 33). I will keep the Board informed of the FAA's progress on this safety recommendation
3/1/2006	NTSB	In its 3/1/2006 annual report to Congress, Regulatory Status of the National Transportation Safety Board's "Most Wanted" Recommendations to the Department of Transportation, the DOT wrote: The FAA's Aviation Rulemaking Advisory Committee's (ARAC's) Ice Protection Harmonization Working Group (IPHWG) is developing 14 CFR Parts 25 and 33 rules that include regulatory requirements to demonstrate an airplane can safely operate in super-cooled large droplets for an unrestricted time or can detect the super-cooled large droplet environment and safely exit icing conditions. For Part 33 there will also be recommendations for mixed-phase icing rulemaking. The FAA anticipates receiving the ARAC recommendations in 2006. The FAA will promulgate similar 14 CFR Part 23 rules after completion ofthe 14 CFR Part 25 rulemaking.

5/10/2006	NTSB	The Safety Board appreciates the FAA's summary of the research results from its project to clarify the effects of mixed-phase icing conditions, as documented in the final report titled "Assessment of Effects of Mixed-Phase Icing Conditions on Thermal Ice Protection Systems" (DOT/FAA/AR-03/48), dated May 2003. The Safety Board notes that the FAA's Aviation Rulemaking Advisory Committee's (ARAC's) Ice Protection Harmonization Working Group (IPHWG) is continuing to develop a revision to Part 25 to require a demonstration that an airplane can safely operate in supercooled large drop (SLD) conditions for an unrestricted time or can detect SLD and safely exit icing conditions. Although the work of the IPHWG is responsive to this recommendation, it is proceeding at an unacceptably slow pace. There does not appear to have been any progress since the FAA previously informed the Board of the status of this recommendation on September 15, 2003. The Board notes that this recommendation is 9 1/2 years old, and the FAA has not yet received the recommendations from the IPHWG, let alone prepared regulatory analyses, issued the NPRM, analyzed comments, or completed the many other tasks involved in issuing new regulations. The Safety Board has previously advised the FAA that the pace of progress on this recommendation is not acceptable. The Board continues to investigate accidents where icing was a consideration, including current investigations of (1) a Cessna 560 which crashed while on approach to Montrose, Colorado, on February 16, 2005, killing eight people and (2) a Bombardier Challenger CL-600 which crashed during takeoff from Montrose, Colorado, on November 28, 2004, killing three people and seriously injuring three other people. In addition, the Board is participating in the investigation of a November 21, 2004, crash during takeoff of a Bombardier RJ200 in Baotou, China, resulting in 53 fatalities. Icing is being investigated as a significant factor that may have caused all three accidents. The Board notes that although this recommendation specifically asks for action for both Part 23 and Part 25 airplanes, the FAA's activities to date have been only for Part 25 airplanes. Pending development and issuance of regulatory requirements for both Part 23 and Part 25 airplanes to demonstrate that they can safely operate in SLD conditions for an unrestricted time or can detect the SLD environment and safely exit icing conditions, Safety Recommendation A-96-54 remains classified "Open-Unacceptable Response."

2/27/2007 NTSB

The Safety Board has previously identified concerns about inadequate flight test certification requirements. For example, it was revealed during the investigation for the October 31, 1994, accident involving American Eagle flight 4184 in which the airplane crashed during a rapid descent after an uncommanded roll excursion during icing conditions16 that SLD conditions can cause ice accretions that are more aerodynamically detrimental than those accretions that fall within the Part 25, Appendix C envelope.17 As a result, the Board issued Safety Recommendation A-96-54, which asked the FAA to do the following:

Revise the icing criteria published in 14 Code of Federal Regulations Parts 23 and 25, in light of both recent research into aircraft ice accretion under varying conditions of liquid water content, drop size distribution, and temperature, and recent developments in both the design and use of aircraft. Also, expand the Appendix C icing certification envelope to include freezing drizzle/freezing rain and mixed water/ice crystal conditions, as necessary.

Further, icing tunnel tests conducted as part of the Comair flight 3272 accident investigation indicated that the effects of ice accretion on airplane performance could vary widely depending on the size, distribution, and type of ice accumulated on the airplane's surfaces. However, the Board learned that manufacturers are not required to demonstrate an airplane's flight handling characteristics or stall margins using thin, rough ice that can accrete on protected surfaces before the activation of the deice boot system or between activation cycles. As a result of its findings, the Board issued Safety Recommendation A-98-92, which asked the FAA (in cooperation with the National Aeronautics and Space Administration and other interested aviation organizations) to do the following:

[C]onduct additional research to identify realistic ice accumulations, to include intercycle and residual ice accumulations and ice accumulations on unprotected surfaces aft of the deicing boots, and to determine the effects and criticality of such ice accumulations; further, the information developed through such research should be incorporated into aircraft certification requirements and pilot training programs at all levels.

The Safety Board also issued Safety Recommendation A-98-100, which asked the FAA to review the icing certification of all turbopropeller-driven airplanes currently certificated for operation in icing conditions, perform additional testing, and take action as required to ensure that these airplanes fulfill the requirements of the revised icing certification standards asked for in Safety Recommendation A-98-92.

The FAA indicated in a March 6, 2006, response to Safety Recommendation A-96-54 that the ARAC IPHWG is continuing to develop a revision to Part 25 to require a demonstration that an airplane can safely operate in SLD conditions for an unrestricted time or can detect SLD and safely exit icing conditions. However, the FAA has still not received the recommendations from the IPHWG, prepared regulatory analyses, issued the NPRM, analyzed comments, or completed the many other tasks involved in issuing new regulations.

The FAA indicated in an October 26, 2005, response to Safety Recommendation A-98-92 that it had completed and would shortly issue a draft revision to AC 20-73, which included the certification guidance on determining critical ice shapes, descriptions of intercycle and residual ice accretions, and the aerodynamic penalties associated with these ice shapes. Although the FAA issued AC 20-73A on August 16, 2006, it has still not provided the Safety Board with information regarding any new research conducted in response to this recommendation.

Regarding Safety Recommendation A-98-100, the FAA issued a notice of proposed rulemaking (NPRM) in November 2005, which proposed to expand 14 CFR Part 25 to include specific certification requirements for airplane performance or handling qualities for flight in icing conditions and to specify the ice accumulations that must be considered for each phase of flight. Further, the FAA proposed changes to AC 25-1X, which intended to provide guidance for implementing the regulations proposed in the NPRM.

In May 2006, the Safety Board expressed concern that, although it agreed with the proposed regulatory changes, the FAA had not applied the new standards to all in-service turbopropeller-driven aircraft. The FAA further indicated that no airplanes have an unsafe condition in icing environments despite a number of accidents in the 1990s that involved airplanes that had passed the certification standards. The Board stated that, to meet the intent of Safety Recommendation A-98-100, the FAA would need to formally evaluate (perhaps by conducting flight tests) all in-service turbopropeller-driven aircraft to ensure that these aircraft comply with all current icing certification criteria for new aircraft. The Board asked the FAA to provide a list of the aircraft that it had formally evaluated and a summary of the findings and resultant actions. To date, this information has not been received.
The circumstances of the Comair flight 3272, American Eagle 4184, and Pueblo accidents and the icing tunnel test data show that the ice shapes used during initial certification flight tests were not adequate because the tests did not account for thin, rough ice on the wing. The 1996 ice shapes

tests on the Cessna 560 were also inadequate because, although tests were conducted with ice shapes on the protected surfaces, tests were not conducted using thin, rough ice. Therefore, additional ice sizes, distribution patterns, and types need to be considered during flight testing to more adequately gauge an airplane's performance in icing conditions.

The Safety Board concludes that existing flight test certification requirements for flight into icing conditions do not test the effects of thin, rough ice on or aft of an airplane's protected surfaces, which can cause severe aerodynamic penalties. The circumstances of this accident clearly show that the actions requested in Safety Recommendations A-96-54 and A-98-92 are needed to improve the safety of all airplanes operating in icing conditions. Therefore, the Safety Board reiterates Safety Recommendations A-96-54 and A-98-92.

Recommendation # A-96-056

Overall Status
OUA

Priority
CLASS II

THE NTSB RECOMMENDS THAT THE FAA: REVISE THE ICING CERTIFICATION TESTING REGULATION TO ENSURE THAT AIRPLANES ARE PROPERLY TESTED FOR ALL CONDITIONS IN WHICH THEY ARE AUTHORIZED TO OPERATE, OR ARE OTHERWISE SHOWN TO BE CAPABLE OF SAFE FLIGHT INTO SUCH CONDITIONS. IF SAFE OPERATIONS CANNOT BE DEMONSTRATED BY THE MANUFACTURER, OPERATIONAL LIMITATION SHOULD BE IMPOSED TO PROHIBIT FLIGHT IN SUCH CONDITIONS & FLIGHTCREWS SHOULD BE PROVIDED WITH THE MEANS TO POSITIVELY DETERMINE WHEN THEY ARE IN ICING CONDITIONS THAT EXCEED THE LIMITS FOR AIRCRAFT CERTIFICATION.

FAA	Open - Unacceptable Response

10/30/1996 Addressee

CURRENT REGULATIONS ENSURE THAT AIRPLANES ARE SAFE FOR OPERATION IN ICING CONDITIONS THROUGH A THOROUGH EVALUATION USING NUMERICAL ANALYSIS TECHNIQUES, SIMULATED ICING TESTS, DRY-AIR & ARTICIFICAL ICE SHAPE TESTING, & TESTING IN NATURAL ICING CONDITIONS DEFINED BY THE ENVELOPES IN APPENDIX C IN 14 CFR PART 25. THESES ARE THE ONLY ICING CONDITIONS IN WHICH THE AIRPLANES HAVE BEEN CERTIFIED FOR OPERATION & HAVE BEEN DEMONSTRATED TO BE SAFE BY COUNTLESS OPERATIONS . THEREFORE THE FAA DOES NOT BELIEVE THAT THE ICING CERTIFICATION REGULATIONS NEED TO BE CHANGED FOR OPERATION IN ICING CONDITIONS DEFINED BY APPENDIX C. THE FAA ACKNOWLEGES THAT AIRPLANES MANY ENCOUNTER ICING CONDITIONS NOT DEFINED IN APPENDIX C &, AS PREVIOUSLY MENTIONED IN A-96-54, THE FAA IS TAKING STEPS TO PROVIDE CERTIFICATION CRITERIA FOR THOSE CONDITIONS. THE FAA WILL TASK THE ARAC WITH PROJECT TO DEVELOP CERTIFICATION CRITERIA FOR SAFE OPERATION OF AIRPLANES IN SUPERCOOLED LIQUID WATER DROPLETS AT OR NEAR THE SURFACE & IN MIXED-PHASE CONDITIONS IF SUCH CONDITIONS ARE DETERMINED TO BE MORE HAZARDOUS THAN THE LIQUID PHASE ICING ENVIRONMENT CONTAINING SUPERCOOLED WATER DROPLETS. THE ARAC WILL ALSO BE TASKED TO CONSIDER DEVELOPMENT OR A REGULATION THAT REQUIRES THE INSTALLATION OF ICE DETECTERS, AERODYNAMIC PERFORMANCE MONITORS, OR ANOTHER ACCEPTABLE MEANS TO WARN FLIGHTCREWS OF ICE ACCUMULATION ON CRITICAL SURFACES REQUIRING CREW ACTION. THE FAA WILL INITIATE APPROPRIATE ACTIONS REQUIRING CERTAIN AIRCRAFT TO EXIT ICING CONDITIONS WHEN SPECIFIC VISUAL ICING CUES ARE OBSERVED. THE ACTIONS THAT FAA IS CONTEMPLATING WILL BE ACCEPTABLE TO THOSE AIRCRAFT WITH PNEUMATIC DEICING BOOTS & UNPOWERED AILERONS THAT WERE NOT COVERED BY THE ICING AD'S ISSUED ON 4/24/96. GIVEN THE ABSENCE OF ADVANCED TECHNOLOGY, THE FAA DOES NOT BELIEVE AN ADQUATE MEANS EXISTS THAT WOULD PROVIDE PILOTS WITH THE TOOLS TO DETERMINE POSITIVELY WHERE ICING CONDITIONS EXIST THAT EXCEED THE LIMITS OF THE AIRCRAFT CERTIFICATION. CONSEQUENTLY, THE FAA CANNOT STRICTLY COMPLY WITH THIS ASPECT OF THE RECOMMENDATION. HOWEVER, THE FAA BELIEVES THAT THE INTENT OF THIS RECOMMENDATION IS MET WITH CURRENT TESTING, THE ADDITIONAL SUPERCOOLED LARGE DROPLET TESTING, THE CURRENT AIRPLANE FLIGHT MANUAL GUIDANCE CONCERNING THE EXISTING ICING CONDITIONS, THE INFO ON THE IDENTIFICATION & THE PROPOSED ARAC TASKS.

8/20/1997	NTSB	THE BOARD CONCLUDED THAT SUCH DEVICES WOULD PROVIDE A RELIABLE MEANS FOR FLIGHTCREWS TO ASSESS IN-FLIGHT ICING CONDITIONS TO POSITIVELY DETERMINE WHEN THEY ARE FLYING IN INCING CONDITIONS THAT MAY BE BEYOND THE AIRPLANE'S CAPABILITIES OR EXCEED CERTIFICATION LIMITS. SUCH DEVICES WOULD ALSO HELP ELIMINATE MUCH OF THE UNCERTAINTY & INADEQUACIES ASSOCIATED WITH THE SUBJECTIVE VISUAL CUE "DETECT-&-EXIT" PHILOSOPHY USED IN THE FAA'S 18 ICING ADS. THE BOARD WILL CONTINUE TO MONITOR THE FAA'S PROGRESS ON THESE ISSUES. THEREFORE PENDING THE COMPLETION OF THE PLANNED FAA ACTIONS & THE FAA'S RECONSIDERATION OF THE ISSUE OF PROHIBITION OF FLIGHT IN ICING CONDITIONS OUTSIDE CERTIFICATION LIMITED BASED ON THE USE OF ICE DETECTION DEVICES FOR "DETECT-& EXIT" CAPABILITY, A-96-56 IS CLASSIFIED "OPEN--ACCEPTABLE RESPONSE."
4/15/1999	Addressee	Letter Mail Controlled 4/21/99 4:25:45 PM MC# 990438 THE FAA'S LETTER DATED 10/30/96, RESPONDED TO THE PORTION OF THE RECOMMENDATION THAT ASKED THAT OPERATIONAL LIMITATIONS BE IMPOSED TO PROHIBIT FLIGHT IN SUCH CONDITIONS. THE FAA ASSUMED THAT THIS MEANT THAT THE AIRPLANE MUST NEVER BE EXPOSED TO ICING CONDITIONS FOR WHICH IT HAS NOT BEEN CERTIFICATED. IN OTHER WORDS, THERE WOULD HAVE TO BE A MEANS TO ASSESS WHETHER THE ICING CONDITIONS THAT THE AIRPLANE HAD NOT YET ENCOUNTERED EXCEEDS THE ICING CONDITIONS FOR WHICH THE AIRPLANE HAD BEEN CERTIFICATED. THE FAA'S OCTOBER 1996 LETTER DISCUSSED THE INADEQUACY OF TECHNOLOGY TO ACCOMPLISH REMOTE DETECTION AND ACCURATE ASSESSMENT OF THE ICING CONDITIONS. AFTER REVIEWING THE BOARD'S LETTER DATED 8/20/97, IT WAS CLEAR THE BOARD'S INTENT WAS TO RECOMMEND RULEMAKING FOR A "DETECT-AND-EXIT" PHILOSOPHY. IN OTHER WORDS, THE FLIGHTCREW WILL ENTER ICING CONDITIONS THEN DETERMINE IF THEY MAY REMAIN IN THE CONDITION OR EXIT THE CONDITION. THE FAA'S TASKING STATEMENT FOR THE ARAC ICE PROTECTION HARMONIZATION WORKING GROUP ADEQUATELY ADDRESSES THE "DETECT-AND-EXIT" PHILOSOPHY. THE TASKING STATEMENT STATES, IN PART, THAT THE WORKING GROUP SHALL "CONSIDER THE NEED FOR A REGULATION THAT REQUIRES INSTALLATION OF ICE DETECTORS, AERODYNAMIC PERFORMANCE MONITORS, OR OTHER ACCEPTABLE MEANS TO WARN CREWS OF ICE ACCUMULATION ON CRITICAL SURFACES AND REQUIRE CREW ACTION (REGARDLESS OF WHETHER THE ICING CONDITIONS ARE INSIDE OR OUTSIDE APPENDIX C OF 14 CFR PART 25)." THE ICE PROTECTION HARMONIZATION WORKING GROUP HELD ITS FIRST MEETING IN FEBRUARY 1998. AFTER A THOROUGH REVIEW OF THE ICING-RELATED ACCIDENT AND INCIDENT HISTORY, THE WORKING GROUP HAS DETERMINED THAT, FOR CERTAIN AIRPLANE TYPES, THERE IS A NEED FOR SUCH AN OPERATIONS REGULATION. THE WORKING GROUP ANTICIPATES PRODUCING A PROPOSED OPERATIONS RULE FOR ARAC APPROVAL IN FALL 1999. THE FAA'S OCTOBER 1996 LETTER IDENTIFIED TWO INTERIM ACITONS WHILE WAITING FOR THE ARAC PROCESS TO BE COMPLETED. THE FOLLOWING IS AN UPDATED STATUS OF THOSE INTERIM ACTIONS: ISSUED AIRWORTHINESS DIRECTIVE (AD) 98-04-38 ON 2/6/98, WHICH IS SIMILAR TO THE 18 ICING-RELATED AD'S ISSUED ON 4/24/96. AD 98-04-38 REFERENCES 23 OTHER SIMILAR AD'S THAT WERE ISSUED SIMULTANEOUSLY. BOTH SETS OF AD'S REQUIRE CERTAIN AIRCRAFT TO EXIT ICING CONDITIONS WHEN SPECIFIC VISUAL ICING CUES ARE OBSERVED. THE FIRST SET OF 18 AD'S FOCUSED ON AIRCRAFT USED IN REVENUE PASSENGER CARRYING AIRCRAFT. THE SECOND SET OF 23 AD'S ADDRESSED ALL 14 CFR PART 25 AIRPLANES AND MANY 14 CFR PART 23 AIRPLANES WITH NON-POWERED ROLL CONTROLS AND PNEUMATIC DEICING BOOTS. A COPY OF AD 98-04-38 IS ENCLOSED FOR THE BOARD'S INFORMATION. ON 7/23/97, FAA DISTRIBUTED A MEMORANDUM TO ALL AIRCRAFT CERTIFICATION OFFICES IDENTIFYING THE POTENTIAL FOR AN UNSAFE CONDITION OF ROLL UPSET DUE TO ICING INVOLVING SUPERCOOLED LARGE DROPLETS. THE AIRCRAFT CERTIFICATION OFFICES WERE INSTRUCTED TO EVALUATE NEW TYPE CERTIFICATES ON 14 CFR PARTS 23 AND 25 AIRCRAFT EQUIPPED WITH PNEUMATIC DEICING BOOTS AND NON-POWERED ROLL CONTROL SYSTEMS. THE EVALUATION SHOULD ALSO BE APPLIED TO SIMILARLY EQUIPPED AIRCRAFT IF THE AMENDED OR SUPPLEMENTAL TYPE CERTIFICATE PROGRAMS INVOLVE ICING APPROVAL, INSTALLATION OF, OR SIGNIFICANT MODIFICATIONS TO, THE WING ICE PROTECTION SYSTEMS. A COPY OF THE MEMORANDUM IS ALSO ENCLOSED FOR THE BOARD'S INFORMATION.

Recommendation Report

Friday, February 13, 2009

2/16/2000	NTSB	THE SAFETY BOARD EXPECTED THE FAA TO ENSURE THAT ALL AIRCRAFT ARE PROPERLY CERTIFIED FOR ALL ICING CONDITIONS IN WHICH THEY ARE AUTHORIZED TO OPERATE (INCLUDING THE WARM BOUNDARIES OF THE FAR 25 APPENDIX C ENVELOPE WHERE WORST-CASE ICE SHAPES, RUNBACK ICING, AND ICE SHEDDING/SLIDING CAN OCCUR) TO PROHIBIT FLIGHT IN ALL UNCERTIFIED ICING CONDITIONS AND TO IMPLEMENT THE BEST MEANS OF PILOT IDENTIFICATION OF UNCERTIFIED ICING CONDITIONS. THE SAFETY BOARD'S INTENTION WAS FOR THE FAA TO EXAMINE ALL OPTIONS FOR PREVENTING FLIGHT IN ICING CONDITIONS THAT EXCEED CERTIFICATION LIMITS. THE BOARD RECOGNIZES THAT REMOTE SENSING OF ICING LEVELS IS NOT POSSIBLE WITH PRESENT OR FUTURE TECHNOLOGY; THEREFORE, THE BOARD BELIEVES THAT A "DETECT AND EXIT" PHILOSOPHY IS NECESSARY. THE SAFETY BOARD'S 8/20/97, LETTER REGARDING THIS RECOMMENDATION FURTHER CLARIFIED ITS INTENT BY STATING THAT THE ON BOARD ICE DETECTION DEVICES RECOMMENDED IN A-96-69 SHOULD, IF AND WHEN THEY BECOME AVAILABLE, BE USED TO AUGMENT THE VISUAL CUES CURRENTLY USED ON SOME AIRCRAFT FOR PILOT IDENTIFICATION OF UNCERTIFIED ICING CONDITIONS. THE FAA AND ARAC RESPONSE TO THE OPERATIONAL LIMITATIONS PORTION OF THIS RECOMMENDATION APPEARS TO HAVE FOCUSED ONLY ON TURBOPROPS WITH DEICE BOOTS AND UNPOWERED ROLL CONTROL SYSTEMS; HOWEVER, THIS RECOMMENDATION APPLIES TO ALL AIRCRAFT, NOT JUST TURBOPROPS WITH DEICE BOOTS AND UNPOWERED ROLL CONTROL SYSTEMS. ALTHOUGH HISTORICAL INCIDENT AND ACCIDENT DATA MAY NOT SHOW THAT OTHER TYPES OF AIRCRAFT HAVE HAD PROBLEMS OPERATING IN UNCERTIFIED ICING CONDITIONS, THAT RECORD ALONE DOES NOT PROVIDE AN ADEQUATE BASIS TO EXCLUDE THEM FROM OPERATIONAL LIMITATIONS. THE BOARD IS CONCERNED THAT THE LACK OF OPERATIONAL LIMITATIONS FOR AIRCRAFT NOT AFFECTED BY THE FAA AD'S ESSENTIALLY AUTHORIZES THEIR FLIGHT IN UNCERTIFIED ICING CONDITIONS (SUCH AS FREEZING DRIZZLE AND FREEZING RAIN). THE FAA'S RESPONSES TO DATE HAVE ALSO NOT MENTIONED ANY PLANS TO ADDRESS THE ISSUE OF INADEQUATE CERTIFICATION FOR THE WARM BOUNDARIES OF THE APPENDIX C ICING ENVELOPE (FOR EXAMPLE, THE TYPICAL LACK OF CERTIFICATION FLIGHT TEST DATA POINTS NEAR OR ALONG THOSE BOUNDARIES). ACCORDINGLY, THE SAFETY BOARD BELIEVES THE FAA SHOULD REVISIT ITS PLANS TO ADDRESS THE FULL SCOPE OF THIS RECOMMENDATION. WITH OVER 3 YEARS HAVING ELAPSED SINCE THIS RECOMMENDATION WAS ISSUED, THE BOARD URGES THE FAA TO ACT ON THIS RECOMMENDATION AS RAPIDLY AS POSSIBLE. PENDING THE FAA'S ISSUANCE OF APPROPRIATE REGULATORY AND/OR ADVISORY MATERIAL CHANGES, A-96-56 IS CLASSIFIED AS "OPEN--ACCEPTABLE RESPONSE."

10/16/2000 Addressee Letter Mail Controlled 10/19/2000 3:19:55 PM MC# 2001561 The FAA has outlined a number of actions taken or initiated in previous letters to the Board on this safety recommendation. However, on February 16, 2000, the Board stated that the FAA and ARAC response to the operational limitations portion of this safety recommendation appears to have focused on turboprops with deice boots and unpowered roll control systems. The Board emphasized that this portion of the safety recommendation applies to all aircraft. The Board also stated that the FAA's previous responses did not mention any plans to address inadequate certification for the warm boundaries of the Appendix C icing envelope. The Board asked that the FAA revisit its plans to address the full scope of this safety recommendation. The Board classified this safety recommendation in an "open acceptable" status pending further response. Regarding the Board's first concern, the airworthiness directives (AD) discussed in the FAA's letters to the Board dated October 30, 1996, and April 15, 1999, address airplanes equipped with deicing boots and unpowered roll control. This group of airplanes was addressed as a priority because the flightcrew of an airplane having an unpowered roll control system must rely solely on physical strength to counteract roll control anomalies. A roll control anomaly that occurs on an airplane having a powered roll control system is offset by the flightcrew with powered assistance. Federal Aviation Regulations require that the FAA make a finding of an unsafe condition before an AD may be issued. The FAA is unaware of a justification that would allow it to make this finding for all airplanes. Therefore, the FAA does not plan on issuing AD's against airplanes that are not equipped with unpowered roll controls and pneumatic deicing boots. I would like to add that in response to Safety Recommendation A-96-54, the FAA is taking actions to expand the certification atmospheric icing conditions through the ARAC process. The resulting icing conditions will be applicable to all airplanes. The FAA does not agree that the lack of operational limitations for airplanes not affected by the AD's authorizes flight in uncertified icing conditions like freezing drizzle and freezing rain. The AD's provide the flightcrew with recognition cues and procedures for exiting from severe icing conditions. The emphasis of the AD's is on severe icing??not freezing drizzle and freezing rain. The Aeronautical Information Manual (AIM) defines severe icing as follows: "The rate of accumulation is such that the deicing/anti?icing equipment fails to reduce or control the hazard. Immediate flight diversion is necessary." The absence of an AD does not negate the information contained in the AIM. With regard to the ARAC effort, the FAA tasked the ARAC to consider the need for a regulation that requires installation of ice detectors, aerodynamic performance monitors, or other acceptable means to warn flightcrews of ice accumulation on critical surfaces and require crew action. The ARAC has identified the need for such a device for certain airplanes, and the FAA is drafting a rule. It is anticipated that the draft rule will be completed by the end of this year. While the ARAC IPHWG has found the need for such a device only on certain airplanes, the FAA believes it is premature to draw conclusions on what the FAA might do. The ARAC has yet to provide any recommendations to the FAA, and working group positions are not necessarily ARAC positions. The FAA also does not agree that detecting and exiting from all conditions, which are not defined by the icing envelope of Appendix C, is warranted. The envelopes are defined by many parameters, including liquid water content, mean effective drop diameter, horizontal extent, temperature, and altitude. Exceeding one of the parameters does not automatically constitute an unsafe condition that must be exited. The FAA believes that it is more important to understand when the airplane is in icing conditions that could result in the inability of the aircraft to operate safely. For example, the mean effective droplet diameter may be within the limits defined by Appendix C, but the droplet distribution could contain large droplets that can impinge behind the protected surfaces. Even though the mean effective droplet diameter is within the limits of Appendix C, there could be ice accretions that can result in the inability of the airplane to operate safely. Requiring an airplane to exit icing conditions simply based on the mean effective drop diameter would not be appropriate. For this reason, the FAA tasked ARAC to consider the need for a regulation that requires the installation of ice detectors, aerodynamic performance monitors, or other acceptable means to warn flightcrews of ice accumulation on critical surfaces and to require flightcrew action, regardless of whether the icing conditions are inside or outside of Appendix C limits. The Board's second concern is that the FAA has not addressed inadequate certification for the warm boundaries of the Appendix C icing envelope. In response, warm icing boundaries are included in the icing cloud envelopes of 14 CFR Part 25, Appendix C, and are addressed during certification. As discussed in the FAA's letter to the Board dated October 30, 1996, the current icing certification regulations ensure that airplanes are safe for operation in icing conditions. This is accomplished through a thorough evaluation using analysis techniques, simulated icing conditions testing methods including icing wind tunnels and icing tankers, dry?air and artificial ice shape flight testing, and flight testing in natural icing conditions within the icing cloud envelopes of 14 CFR Part 25, Appendix C. For ice protected surfaces, 14 CFR 25.1419 requires that the airplane or its components be flight tested in the various operational configurations, in measured natural atmospheric icing conditions and, as found necessary, by other means (i.e., laboratory dry air or simulated icing test and dry air flight test) to verify ice protection analyses and icing anomalies and to demonstrate that the ice protection system and its components are effective. The ability to conduct flight testing in natural atmospheric icing conditions at the boundaries of the icing cloud envelopes of 14 CFR Part 25, Appendix C, is highly unlikely due to the low probability of experiencing an icing condition that is characterized by all the Appendix C envelope parameters and the variable character of natural icing clouds. Therefore, methods such as icing wind tunnel tests and ice accretion analyses (analyses and computer codes) are used to determine critical

		ice accretions within Appendix C limitations, including the boundary icing conditions of Appendix C. For unprotected control surfaces, the critical ice shapes resulting from a continuous exposure to icing conditions are determined based on a continuous exposure to icing conditions for approximately 45 minutes. Extensive flight testing in dry air with these critical ice accretion shapes attached to the airplane is performed to ensure that the airplane can safely operate in icing conditions. The use of dry-air flight testing with artificial critical ice accretion shapes allows airplane performance and handling characteristics to be evaluated in stable dry-air conditions with the ice shape remaining constant (i.e., no change of ice accretion due to erosion, shedding, sublimation, etc., as can occur with natural ice shapes). Upon review of its previous responses, the FAA realizes that it has not mentioned the work accomplished by the ARAC Flight Test Harmonization Working Group (FTHWG). The FTHWG has completed the technical content of proposed 14 CFR Part 25 regulations and advisory material for evaluating airplane performance and handling characteristics in the icing conditions of Appendix C. A notice of proposed rulemaking (NPRM) is scheduled for publication in May 2001. The FAA strives to improve the certification process as evidenced by the FAA Inflight Aircraft Icing Plan. In accordance with the Icing Plan, the FAA released Advisory Circular (AC) 25.1419?1, revised AC 23.1419?2A, and updated the FAA Electronic Aircraft Icing Handbook to include information on the calculation of median volumetric diameter and liquid water content. The FAA is also working on validation standards for analytical and empirical tools used in icing certifications. What is most relevant to this safety recommendation is the FAA's plan to produce certification guidance material on determining critical ice shapes used in certification. The guidance will provide a basis for determining the most adverse shapes for relevant aerodynamic characteristics and evaluating whether or not the certification ice shapes are appropriately chosen so that the aerodynamic impact will be the most severe. Progress on this activity is provided to the Board in response to Safety Recommendation A?98?92. The FAA believes that these interim actions, along with the work being accomplished by ARAC, fully address the issues raised by the Board and in this safety recommendation. I will continue to keep the Board informed of the FAA's progress on this safety recommendation.
3/26/2001	NTSB	Pending the FAA’s issuance of a requirement for installation of ice detectors, aerodynamic performance monitors, or other acceptable means to warn flight crews of ice accumulation on critical surfaces and a requirement for the crew to take action, issuance of 14 CFR Part 25 regulations and advisory material for evaluating airplane performance and handling characteristics in the icing conditions of Appendix C, and the expansion of the certification atmospheric icing conditions applicable to all airplanes, Safety Recommendation A-96-56 remains classified “Open--Acceptable Response.”
8/22/2001	Addressee	Letter Mail Controlled 08/29/2001 3:49:24 PM MC# 2010693: The ARAC is considering a proposed revision to 14 CFR Part 121 and advisory material. The proposed rule is applicable to airplanes operated under 14 CFR Part 121 with takeoff weights less than 60,000 pounds. The proposed rule addresses when to activate the ice protection system and when the flightcrew should exit icing conditions. The latter aspect is limited to airplanes with unpowered roll controls. The ARAC is also considering a similar certification standard for transport- category airplanes under 14 CFR Part 25. The original task to ARAC included airplanes certificated to 14 CFR Parts 23 and 25 standards. The task was revised in June 2000 to address 14 CFR Part 25 only. The FAA will promulgate similar 14 CFR Part 23 rules after completion of the 14 CFR Part 25 rulemaking. I will keep the Board informed of the FAA's progress on this safety recommendation.
1/27/2003	NTSB	Although the FAA, through its referral of this work to the ARAC, is responding to these recommendations, the Safety Board remains concerned that in the 6 years since these recommendations were issued, the work has not been completed. The Board would like the FAA to provide a schedule for completion of the recommended actions. Pending receipt and review of a schedule and completion of the recommended actions, Safety Recommendations A-96-56 and -58 remain classified "Open--Acceptable Response."

5/19/2003	Addressee	Letter Mail Controlled 5/28/2003 2:42:21 PM MC# 2030262 The FAA has initiated several projects to address this safety recommendation. The following is a status update of these projects: 14 CFR Part 121 Operations in Icing: In September 2002, the ARAC voted to forward to the FAA a proposed revision to 14 CFR Part 121 and advisory material to the FAA. The proposed rule is applicable to airplanes with takeoff weights less than 60,000 pounds, and addresses when to activate the ice protection system and when the flightcrew should exit icing conditions. The latter aspect is limited to airplanes with unpowered roll controls. The proposed rule would require a visual or aural alert or substantiated visual cues that enable the flightcrew to determine that the airplane is in large droplet conditions conducive to ice accumulation aft of the airframe's protected areas. The proposed rule would also require the pilot in command to immediately exit the conditions in which ice accretion is occurring after determining the airplane is in the large droplet conditions. The FAA is processing a 14 CFR Part 25 proposed rule that addresses when to activate the ice protection system for all 14 CFR Part 25 airplanes. In both 14 CFR Parts 121 and 25 rule, it is proposed that the activation of the ice protection system be based on one of the following: · a primary ice detector; · visual cues and an advisory ice detector; or · visible moisture and a temperature conducive to airframe icing. 14: CFR Part 25 Perfiormance and Handling in Icing: The ARAC drafted recommended changes to 14 CFR Part 25 requirements and related advisory material to introduce new requirements to evaluate airplane performance and handling characteristics of transport-category airplanes for flight in icing conditions of 14 CFR Part 25, Appendix C. The FAA will publish a notice of proposed rulemaking based on these recommendations by June 2004. The recommendations include a proposed regulatory amendment containing a flight test maneuver to evaluate airplanes for susceptibility to ice-contaminated tailplane stall. The advisory material provides detailed flight test guidance, including consideration of critical ice accretions that may be accumulated during extensive exposure to icing conditions, and evaluated in the most critical landing configurations. Expansion of Certification Icing Conditions: As discussed in our response to Safety Recommendation A-96-54, the ARAC approved a concept developed by the Ice Protection Harmonization Working Group in May 2002 for a 14 CFR Part 25 rule that includes regulatory requirements to demonstrate an airplane can safely operate in certain supercooled large droplets for an unrestricted time or can detect the supercooled large droplets environment and safely exit icing conditions. The Ice Protection Harmonization Working Group is continuing to develop its recommendations for a rule and the associated advisory material. Upon receipt of the recommendations, the FAA will determine the priority that should be assigned to this rulemaking project, In June 2002, research to clarify the effects of mixed phase icing conditions was completed. The report is expected during the second quarter of 2003. Upon receipt of the report, an evaluation will be made to determine if there is evidence that the mixed phase icing condition is more hazardous than the liquid phase icing environment. I will keep the Board informed of the FAA's progress on this safety recommendation.
9/15/2003	NTSB	The Safety Board notes that the FAA intends to publish a notice of proposed rulemaking by June 2004 that will include a flight test maneuver to evaluate airplanes for susceptibility to ice-contaminated tailplane stall. Advisory material will provide detailed flight test guidance, including consideration of critical ice accretions that may be accumulated during extensive exposure to icing conditions and evaluated in the most critical landing configurations. Pending issuance of revisions to Part 121 and Part 25, Safety Recommendation A-96-56 remains classified "Open--Acceptable Response."
11/9/2004	NTSB	As part of its November 9, 2004 meeting addressing the Safety Board's Most Wanted List of safety improvements, the Board voted to reclassify this recommendation from "Open-Acceptable Response" to "Open-Unacceptable Response."
2/1/2005	Addressee	In its 2/1/2005 annual report to Congress, Regulatory Status of the National Transportation Safety Board's "Most Wanted" Recommendations to the Department of Transportation, the DOT wrote:In September 2002, the ARAC gave the FAA a proposed revision to 14 CFR Part 121, applicable to airplanes with takeoff weights less than 60,000 pounds, that addresses when to activate the ice protection system and when the flight crew should exit icing conditions. The proposed rule would require visual or aural alert or substantiated visual cues that enable the flight crew to determine that the airplane is in large-droplet conditions. The FAA is also working on a revision to 14 CFR Part 25 that addresses when to activate the ice protection system. The ARAC is continuing to develop a Part 25 rule that includes regulatory requirements to demonstrate an airplane can safely operate in certain super- cooled large drop (SLD) conditions for an unrestricted time or can detect SLD and enable the flight crew to exit icing conditions. The FAA will promulgate similar 14 CFR Part 23 rules after completion ofthe 14 CFR Part 25 rulemaking.

10/26/2005	Addressee	Letter Mail Controlled 10/27/2005 2:12:40 PM MC# 2050501 Marion C. Blakey, Administrator, FAA, 10/26/05 The following is a status update on projects the FAA initiated to address this safety recommendation: Part 121 Operations in Icing and Part 25 Activation of Ice Protection: In January 2003, the ARAC forwarded to the FAA a proposed revision to 14 CFR Part 121 and advisory material. applicable to certain airplanes, for activation of the ice protection system and exiting icing conditions. The FAA is processing a proposed change to 14 CFR Part 25 that addresses when to activate the ice protection system for all Part 25 airplanes. The FAA's progress on these rulemaking projects is reported in our response to Safety Recommendation A-98-91. Part 25 Performance and Handling in Icing: The FAA had anticipated publishing the proposed rulemaking and advisory material for evaluating airplane performance and handling characteristics in icing conditions of Appendix C in June 2004. The FAA now anticipates publication by October 2005. The FAA's progress on this rulemaking project is reported in response to Safety Recommendation A-91-87. Expansion of Certification Icing Conditions: The ARAC's Ice Protection Harmonization Working Group is continuing to develop a revision to 14 CFR Part 25 that includes regulatory requirements to demonstrate that an airplane can safely operate in certain SLD conditions or can detect SLD and safely exit icing conditions. The FAA's progress on this rulemaking project is reported in response to Safety Recommendation A-96-54. I will keep the Board informed of the FAA's progress on this safety recommendation.
3/1/2006	Addressee	In its 3/1/2006 annual report to Congress, Regulatory Status of the National Transportation Safety Board's "Most Wanted" Recommendations to the Department of Transportation, the DOT wrote: There are five rulemaking activities that address this safety recommendation: A proposed revision to 14 CFR Part 121, applicable to airplanes with takeoff weights less than 60,000 pounds, that addresses when to activate the ice protection system and when the flight crew should exit icing conditions. A proposed revision to 14 CFR Part 25 that addresses when to activate the ice protection system. The next step for these two rules is for the FAA to prepare a regulatory evaluation. Due to the higher priority of other safety related rulemaking activities, the regulatory evaluations have been delayed. A proposed revision to 14 CFR Part 25 for evaluating airplane performance and handling characteristics in the icing conditions of Appendix C. The NPRM and AC were published in the Federal Register on November 4,2005. ARAC is developing Part 25 and Part 33 rules that include regulatory requirements to demonstrate an airplane can safely operate in certain super-cooled large drop (SLD) conditions for an unrestricted time or can detect SLD and enable the flight crew to exit icing conditions. For Part 33 there will also be recommendations for mixed-phase icing rulemaking. The FAA anticipates receiving the ARAC recommendations in 2006. The FAA will promulgate similar 14 CFR Part 23 rules after completion of the 14 CFR Part 25 rulemaking.
5/10/2006	NTSB	The FAA provided an update of several activities in progress in response to this recommendation: 1.Part 121 Operations in Icing and Part 25 Activation of Ice Protection: In January 2003, the ARAC proposed revisions to Part 121 for activation of the ice protection system and exiting icing conditions. The FAA is also processing a proposed change to Part 25 that addresses when to activate the ice protection system. 2.Part 25 Performance and Handling in Icing: This is addressed by the FAA's November 4, 2005, NPRM. 3.Expansion of Certification Icing Conditions: The IPHWG is continuing to develop Part 25 revisions that include a demonstration that an airplane can safely operate in SLD conditions or can detect SLD and safely exit icing conditions. These three projects are responsive to this recommendation, but the interminable delays are not acceptable. Issuance of the NPRM is progress, but the Board notes that it is only an NPRM, and full implementation of the regulatory change may be several years away. The FAA has made no progress on the other two items. The Board also notes that for the first item, the ARAC recommended regulatory revisions 3 years ago, but the FAA has not taken any further action since then. Pending the FAA's completing the recommended actions, Safety Recommendation A-96-56 remains classified "Open-Unacceptable Response."

Recommendation Report

Friday, February 13, 2009

Recommendation # A-96-058

Overall Status
OAA

Priority
CLASS II

NTSB RECOMMENDS THAT THE FAA: DEVELOP AN ICING CERTIFICATION TEST PROCEDURE SIMILAR TO THE TAILPLANE ICING PUSHOVER TEST TO DETERMINE THE SUSCEPTIBILITY OF AIRPLANES TO AILERON HINGE MOMENT REVERSALS IN THE CLEAN & ICED-WING CONDITIONS. REVISE 14 CFR PART 23 & 25 ICING CERTIFICATION REQUIREMENTS TO INCLUDE SUCH A TEST.

FAA	Open - Acceptable Response

10/30/1996	Addressee	THE FAA WILL TASK ARAC TO DEVELOP CERTIFICATION CRITERIA FOR THE SAFE OPERATION OF AIRPLANES IN SUPERCOOLED LIQUID DROPLETS ALOFT, NEAR THE SURFACE & IN MIXED-PHASE CONDITIONS IF THOSE CONDITIONS ARE DETERMINED TO BE MORE HAZARDOUS THEN THE LIQUID PHASE ENVIRONMENT. THE ARAC WILL ALSO DEVELOP THE REQUIREMENTS THAT WILL ALLOW AN AIRPLANE SAFETY EXIT THOSE CONDITIONS & WILL DETERMINE THE TYPE(S) OF TESTS NECESSARY TO DETERMINE THE SUSCEPTIBILITY OF AIRPLANES TO AILERON HINGE MOMENT REVERSALS IN ICING CONDITIONS.
8/20/1997	NTSB	A-96-58 ASKED THE FAA TO DEVELOP AN ICING CERTIFICATION TEST PROCEDURE SIMILAR TO THE TAILPANE ICING PUSHOVER TEST TO DETERMINE THE SUSCEPTIBILITY OF AIRPLANE TO AILERON HINGE MOMENT REVERSAL IN THE CLEAN & ICE-WIND CONDITIONS & TO REVISE 14 CFR PARTS 23 & 25 ICING CERTIFICATION REQUIREMENTS TO INCLUDE SUCH A TEST. PENDING COMPLETION OF THE ARAC WORK & FINAL ACTION BY THE FAA, THE BOARD CLASSIFIES A-96-58 "OPEN--ACCEPTABLE RESPONSE."
7/1/1998	Addressee	(Letter Mail Controlled 7/7/98 4:01:11 PM MC# 980846) THE FAA'S POSITION AS STATED IN ITS LETTER DATED 10/30/96, IS THAT A WING TEST REQUIREMENT FOR A "CLEAN," UNCONTAMINATED WING IS NOT NECESSARY. FOR THE ICED-WING CONDITION, THE FAA HAS TASKED THE ARAC TO DEFINE AN ICING ENVIRONMENT THAT INCLUDES SLD, & TO DEVISE REQUIREMENTS TO ASSESS THE ABILITY OF AIRCRAFT TO OPERATE SAFELY EITHER FOR THE PERIOD OF TIME TO EXIT OR TO OPERATE WITHOUT RESTRICTION IN SLD ALOF, IN SLD AT OR NEAR THE SURFACE, & IN MIXED PHASE CONDITIONS IF SUCH CONDITIONS ARE DETERMINED TO BE MORE HAZARDOUS THAN THE LIQUID PHASE ICING ENVIRONMENT CONTAINING SUPERCOOLED WATER DROPLETS. THE TOR DOCUMENT WAS APPROVED BY THE ARAC IN OCTOBER 1997 & PUBLISHED IN THE FEDERAL REGISTER ON 12/8/97. THE ARAC WILL ASSESS THE NEED FOR A SPECIFIC TEST (SIMILAR TO THE TAILPLANE ICING PUSHOVER TEST) TO DETERMINE THE SUSCEPTIBILITY OF AIRPLANES TO AILERON HINGE MOMENT REVERSALS WHEN THE SAFE EXIT REQUIREMENTS ARE DEVELOPED.
11/9/1998	NTSB	A-96-58 ASKED THE FAA TO DEVELOP AN ICING CERTIFICATION TEST PROCEDURE SIMILAR TO THE TAILPLANE ICING PUSHOVER TEST TO DETERMINE THE SUSCEPTIBILITY OF AIRPLANES TO AILERON HINGE MOMENT REVERSALS IN THE CLEAN & ICED-WING CONDITIONS & TO REVISE 14 CFR PARTS 23 & 25 ICING CERTIFICATION REQUIREMENTS TO INCLUDE SUCH A TEST. PENDING THE ARAC'S ASSESSMENT & CHANGES TO THE APPROPRIATE REGULATIONS, A-96-58 IS CLASSIFIED "OPEN--ACCEPTABLE RESPONSE."
4/15/1999	Addressee	Letter Mail Controlled 4/21/99 4:25:45 PM MC# 990438 ON 10/30/96, THE FAA TOLD THE BOARD THAT A WING TEST REQUIREMENT FOR A "CLEAN", UNCONTAMINATED WING WAS NOT NECESSARY. THE FAA STATED THAT THE ARAC WILL ASSESS THE NEED FOR A SPECIFIC TEST (SIMILAR TO THE TAILPLANE ICING PUSHOVER TEST) TO DETERMINE THE SUSCEPTIBILITY OF AIRPLANES TO AILERON HINGE MOMENT REVERSALS WHEN THE SAFE EXIT REQUIREMENTS ARE DEVELOPED BY THE ICE PROTECTION HARMONIZATION WORKING GROUP. THE WORKING GROUP MET FOR THE FIRST TIME IN FEBRUARY 1998 AND HAS DEVELOPED A WORK PLAN AND SCHEDULE TO ADDRESS THE TASKS ASSIGNED TO THE GROUP. THE WORK PLAN IDENTIFIES THE TASK OF DEFINING AN ATMOSPHERIC CHARACTERIZATION THAT INCLUDES SLD. THIS TASK BEGAN IN FEBRUARY 1999. FOLLOWING DEFINITION OF THE ENVIRONMENT THE WORKING GROUP WILL DEVELOP A MEANS TO ASSESS THE ABILITY OF AIRCRAFT TO SAFELY OPERATE IN OR SAFELY EXIT THE NEWLY DEFINED CONDITIONS.

Recommendation Report

Friday, February 13, 2009

2/16/2000	NTSB	ON 10/30/96, THE FAA STATED THAT IT HAD DETERMINED THAT A WING TEST REQUIREMENT FOR A "CLEAN," UNCONTAMINATED WING WAS NOT NECESSARY. THE BOARD CONCURRED WITH THAT POSITION IN ITS 11/9/98, LETTER. THE FAA NOW REPORTS THAT THE ARAC WILL ASSESS THE NEED FOR A SPECIFIC TEST (SIMILAR TO THE TAILPLANE ICING PUSHOVER TEST) TO DETERMINE THE SUSCEPTIBILITY OF AIRPLANES TO AILERON HINGE MOMENT REVERSALS WHEN THE SAFE EXIT REQUIREMENTS ARE DEVELOPED BY THE ICE PROTECTION HARMONIZATION WORKING GROUP. THE SAFETY BOARD ENCOURAGES THE FAA TO AGGRESSIVELY PURSUE THESE ISSUES. PENDING DEVELOPMENT OF THE PROPOSED FLIGHT TEST IN THE ICED WING CONDITION AND APPROPRIATE REGULATORY ACTION, A-96-58 IS CLASSIFIED "OPEN--ACCEPTABLE RESPONSE."
10/16/2000	Addressee	Letter Mail Controlled 10/19/2000 3:19:55 PM MC# 2001561 As stated in response to Safety Recommendation A?96?54, the IPHWG is continuing to define atmospheric characterization that includes SLD. An acceptable means of compliance to assess the ability of the aircraft to operate safely in or exit safely from the newly defined conditions will be developed. The IPHWG anticipates having an adequate data set available to define an atmosphere that includes SLD by February 2001. I will keep the Board informed of the FAA's progress on this safety recommendation.
3/26/2001	NTSB	The Safety Board urges the FAA to move expeditiously to implement the action recommended. Pending the development and requirement of an icing certification test procedure similar to the tailplane icing pushover test to determine the susceptibility of airplanes to aileron hinge moment reversals in the clean and iced-wing conditions, Safety Recommendation A-96-58 remains classified "Open--Acceptable Response."
8/22/2001	Addressee	Letter Mail Controlled 08/29/2001 3:49:24 PM MC# 2010693: The ARAC will address its task to recommend to the FAA an acceptable means of compliance to assess the ability of the aircraft to operate safely in or exit safely from the atmospheric conditions developed. The recommendation will assist the FAA in responding to Safety Recommendation A-96-54. The original task to ARAC included airplanes certificated to 14 CFR Parts 23 and 25 standards. The task was revised in June 2000 to address 14 CFR Part 25 only. The FAA will promulgate similar 14 CFR Part 23 rules after completion of the 14 CFR Part 25 rulemaking. I will keep the Board informed of the FAA's progress on this safety recommendation.
1/27/2003	NTSB	Although the FAA, through its referral of this work to the ARAC, is responding to these recommendations, the Safety Board remains concerned that in the 6 years since these recommendations were issued, the work has not been completed. The Board would like the FAA to provide a schedule for completion of the recommended actions. Pending receipt and review of a schedule and completion of the recommended actions, Safety Recommendations A-96-56 and -58 remain classified "Open--Acceptable Response."
5/19/2003	Addressee	Letter Mail Controlled 5/28/2003 2:42:21 PM MC# 2030262 The development of a means of compliance will occur simultaneously with the development of the rule that addresses safe operations in supercooled large droplets. A status of the proposed rule is outlined in response to Safety Recommendation A-96-54. I will keep the Board informed of the FAA's progress on this safety recommendation.
9/15/2003	NTSB	Although the IPHWG appears to be making progress in responding to these recommendations, the Safety Board remains concerned about the slow pace of this work. The Board notes that the IPHWG's report is not scheduled for completion until more than 7 years after these recommendations were issued, after which the FAA will need more time to develop and issue any related regulatory amendments. The Board urges the FAA to give this rulemaking project a high priority. The Board would also appreciate the opportunity to review a draft copy of the report on mixed phase icing conditions. Pending the revisions of 14 CFR Parts 23 and 25 and the expansion of the Appendix C design certification envelope, Safety Recommendation A-96-54 remains classified "Open--Acceptable Response." In response to Safety Recommendation A-96-58, the FAA stated that development of a means of compliance will occur simultaneously with the development of the rule that addresses safe operations in supercooled large droplets. Pending revision of 14 CFR Parts 23 and 25 to include a test to determine the susceptibility of airplanes to aileron hinge moment reversals in the clean and iced-wing conditions, Safety Recommendation A-96-58 remains classified "Open--Acceptable Response."

10/26/2005	Addressee	Letter Mail Controlled 10/27/2005 2:12:40 PM MC# 2050501 Marion C. Blakey, Administrator, FAA, 10/26/05 An ARAC working group is developing 14 CFR Part 25 advisory material to establish a means of compliance to substantiate that an airplane can be safely operated in certain SLD for an unrestricted time or can detect SLD and safely exit icing conditions. The working group is considering whether the substantiation should include a specific test procedure to evaluate uncommanded motion of the aileron. The need to include such a test for 14 CFR Part 23 will be assessed when a 14 CFR Part 23 SLD rule is developed in response to Safety Recommendation A-96-54. In the interim, a proposed method that has been used on new airplanes and used to screen existing airplanes with reversible lateral controls and pneumatic deicing boots is in AC 23.1419-2C dated July 21, 2004.
5/10/2006	NTSB	The FAA indicated that an ARAC working group is developing advisory material for Part 25 to establish a means of compliance whereby an airplane can be safely operated in SLD conditions for an unrestricted time, or can detect SLD and safely exit icing conditions. The working group is considering whether to include a specific test procedure to evaluate uncommanded motion of the aileron. The FAA further indicated that the need to include such a test in Part 23 will be assessed when a Part 23 SLD rule is developed. However, in the interim, the FAA noted that AC 23.1419-2C contains a method that has been used for new airplanes and for existing airplanes with reversible lateral controls and pneumatic deicing boots. The Safety Board remains concerned with the very slow progress on this recommendation. This recommendation is 9 1/2 years old, and it has been over 11 years since the accident (Roselawn, Indiana) that prompted its issuance. In that accident, the Safety Board determined that the probable cause was the loss of control, attributed to a sudden and unexpected aileron hinge moment reversal that occurred after a ridge of ice accreted beyond the deice boots. This recommendation was issued to ensure that the FAA would evaluate the risk of airplanes being subject to this problem. However, the ARAC is still considering whether to include a specific test procedure to evaluate uncommanded motion of the aileron. The Board believes that regardless of the complex issues associated with an SLD rule, the FAA should not have delayed evaluation of aileron hinge moment reversals. The Board notes that an evaluation method was developed and published in 2004, in AC 23.1419-2C, and that the FAA has used this method on new airplanes and to screen existing airplanes. Although the final action on this recommendation has been delayed as long as action on the other icing recommendations, the FAA's interim actions in (1) publishing an evaluation method in the AC, and (2) using it for new and existing aircraft are positive steps towards implementing the recommendation. Pending the FAA's completing the recommended action, Safety Recommendation A-96-58 remains classified "Open-Acceptable Response." Safety Recommendations A-98-91, -92, -96, -100, and -101 were issued to the FAA as a result of the Safety Board's investigation of the January 9, 1997, accident involving Comair flight 3272, an Embraer EMB-120. The airplane crashed during a rapid descent after an uncommanded roll excursion in icing conditions near Monroe, Michigan.

Recommendation Report

Friday, February 13, 2009

Recommendation # A-96-060

Overall Status
OAAR

Priority
CLASS II

THE NTSB RECOMMENDS THAT THE FAA: REVISE 14 CFR PARTS 91.527 AND 135.227 TO ENSURE THAT THE REGULATIONS ARE COMPATIBLE WITH THE PUBLISHED DEFINITION OF SEVERE ICING, AND TO ELIMINATE THE IMPLIED AUTHORIZATION OF FLIGHT INTO SEVERE ICING CONDITIONS FOR AIRCRAFT CERTIFIED FOR FLIGHT IN SUCH CONDITIONS.

FAA	Open Acceptable Alternate Response

10/30/1996	Addressee	The FAA is developing an FAA In-flight Icing Plan which will address the recommendations and issues raised at the May 1996 International Conference on Aircraft In-flight Icing. One major issue identified at the conference was the need to harmonize icing terminology and criteria. This initiative will be addressed by a working group that will review, revise, develop the necessary advisory and guidance materials and handbook changes, and revise the appropriate regulations. This project will address the intent of this safety recommendation. The working group will be chaired by the FAA and will include representatives from appropriate FAA offices, the National Weather Service (NWS), the Aviation Weather Center in Kansas City, Missouri, and the William J. Hughes Technical Center in Atlantic City, New Jersey. I will keep the Board apprised of the FAA's progress on these safety recommendations.
6/27/1997	Addressee	THE FAA PUBLISHED ITS INFLIGHT AIRCRAFT ICING PLAN IN APRIL 1997. THE PLAN ADDDRESSES RECOMMENDATIONS & ISSUES RAISED AT THE MAY 1996 INTERNATIONAL CONFERENCE ON AIRCRAFT INFLIGHT ICING. THE PLAN DESCRIBES VARIOUS ACTIVITIES INCLUDING RULEMAKING, DEVELOPMENT OF & REVISIONS TO ADVISORY MATERIALS, RESEARCH PROGRAMS, & OTHER INITIATIVES TO ACHIEVE SAFETY WHEN OPERATING IN ICING CONDITIONS. THE MOST CURRENT INFO WAS USED IN THE DEVELOPMENT OF THE TASKS & SCHEDULES CONTAINED IN THE PLAN. HOWEVER, BECAUSE OF THE COMPLEX NATURE OF THE TASKS & THE INTERRELATIONSHIPS BETWEEN TASKS, THE PLAN MAY NEED TO BE REVISED PERIODICALLY TO REFLECT CHANGES IN SCOPE OR SCHEDULE. THE INTENT OF THIS RECOMENDATION IS ADDRESSED IN THE PLAN. THE FAA WILL KEEP THE BOARD APPRISED OF THE FAA'S PROGRESS ON THIS RECOMMENDATION.
8/20/1997	NTSB	A-96-60 ASKED THE FAA TO REVISE 14 CFR 91.527 & 135.227 TO ENSURE THAT THE REGULATIONS ARE COMPATIBLE WITH THE PUBLISHED DEFINITION OF SEVERE ICING, & TO ELIMINATE THE IMPLIED AUTHORIZATION OF FLIGHT INTO SEVERE ICING CONDITIONS FOR AIRCRAFT CERTIFIED FOR FLIGHT IN SUCH ICING CONDITION. PENDING COMPLETION & EVALUATION OF THE ACTIONS PLANNED THEREIN, THE BOARD CLASSIFIES A-96-51,-52, & -60 "OPEN--ACCEPTABLE RESPONSE."
3/16/2000	NTSB	ON 3/16/00 THE SAFETY BOARD REQUESTED AN UPDATE ON THE STATUS OF THIS RECOMMENDATION.

Recommendation Report

Friday, February 13, 2009

5/18/2000	Addressee	ON 6/27/97, THE FAA ADVISED THE BOARD THAT THE AIRCRAFT ICING PLAN ISSUED IN APRIL 1997 ADDRESSED RECOMMENDATIONS AND ISSUES RAISED AT THE MAY 1996 INTERNATIONAL CONFERENCE ON AIRCRAFT IN-FLIGHT ICING. THE ICING PLAN DESCRIBED VARIOUS ACTIVITIES INCLUDING RULEMAKING, DEVELOPMENT OF AND REVISIONS TO ADVISORY MATERIALS, RESEARCH PROGRAMS, AND OTHER INITIATIVES TO ACHIEVE SAFETY WHEN OPERATING IN ICING CONDITIONS. THE FAA FURTHER STATED THAT A WORKING GROUP WAS BEING FORMED TO REVIEW, REVISE, AND DEVELOP NECESSARY REGULATIONS AND GUIDANCE MATERIALS RELATED TO ICING. THE FAA'S IN-FLIGHT ICING PLAN, FORMERLY KNOWN AS THE AIRCRAFT ICING PLAN, CONSISTS OF 14 TASKS. EACH TASK HAS A WORKING TEAM TO ADDRESS VARIOUS ISSUES RELATED TO ICING. TASK 1B TEAM HAS DEVELOPED A LIST OF NEW ICING TERMINOLOGY, WHICH WILL INCLUDE "ICING IN PRECIPITATION," AND A TABLE OF ICING EFFECTS ON AIRCRAFT. THE ICING TERMINOLOGY WILL BE INCORPORATED INTO ALL EXISTING AND FUTURE GUIDANCE AND RELEVANT DOCUMENTS. THE TABLE PROVIDES INFORMATION TO PILOTS IN THE FORM OF FOUR LEVELS OF EFFECTS WITH LEVEL FOUR HAVING THE MOST SEVERE EFFECT ON POWER, CLIMB, SPEED, CONTROL, AND STALL CHARACTERISTICS. THE FAA HAS INCLUDED IN ITS PROPOSAL OF NEW ICING TERMINOLOGY A REQUIREMENT THAT THE LEVEL OF EFFECTS BE INCLUDED IN THE PILOT'S ICING REPORT FORMAT SO THAT OTHER PILOTS CAN MAKE A REASONABLE JUDGEMENT REGARDING THE EFFECTS THAT THE REPORTED ICING MAY HAVE ON THEIR AIRCRAFT. THE FAA IS EVALUATING THE FEASIBILITY OF AMENDING 14 CFR 91.527 AND 135.227 TO FORBID FLIGHT INTO SEVERE ICING CONDITIONS. I WILL INFORM THE BOARD OF THE FAA'S DECISION ON THIS RECOMMENDATION AS SOON AS ITS EVALUATION IS COMPLETED.
11/14/2000	NTSB	THE SAFETY BOARD IS CONCERNED THAT, AFTER MORE THAN 3 YEARS SINCE THE ISSUANCE OF THIS RECOMMENDATION, THE FAA HAS NOT YET MADE THE NECESSARY REVISIONS. THE BOARD NOTES THAT THE CITED REGULATIONS AND THE PUBLISHED ICING TERMINOLOGY ARE INCOMPATIBLE. NEVERTHELESS, THE BOARD RECOGNIZES THAT COMPLETION OF THE NEW ICING TERMINOLOGY, AS DISCUSSED IN RESPONSE TO A-96-51 AND -52, WILL ENABLE THE FAA TO DETERMINE AN APPROPRIATE COURSE OF ACTION FOR THIS RECOMMENDATION. PENDING REVISION OF 14 CFR PARTS 91.527 AND 135.227, A-96-60 IS CLASSIFIED "OPEN--ACCEPTABLE RESPONSE."
3/21/2001	Addressee	Letter Mail Controlled 03/26/2001 8:26:49 PM MC# 2010261 In May 2000, the FAA informed the Board that it was evaluating the feasibility of amending 14 CFR 91.527 and 135.227 to forbid flight into severe icing conditions. The FAA is now concerned that the apparent incompatibility of 14 CFR 91.527 and 135.227 may be because of the difference in the way the term "severe icing" is understood. The FAA considers severe icing to be airplane-specific; however, weather forecasters do not have the technical capability at this time to forecast severe icing conditions for specific aircraft. Consequently, the FAA will ask the In-Flight Icing Steering Committee to address this issue. It is anticipated that the FAA will have a course of action established to address this safety recommendation by spring 2001.
6/5/2001	NTSB	The Safety Board is concerned that this problem was not discovered until 4 1/2 years after the recommendation was issued. Nevertheless, pending completion of the recommended action, Safety Recommendation A-96-60 remains classified "Open--Acceptable Response."
8/29/2003	Addressee	Letter Mail Controlled 9/2/2003 2:47:32 PM MC# 2030440 In May 2000, the FAA informed the Board that it was evaluating the feasibility of amending 14 CFR 91.527 and 135.227 to forbid flight into severe icing conditions. The FAA was concerned that the apparent incompatibility of 14 CFR 91.527 and 135.227 may be because of the difference in the way the term "severe icing" is understood. The FAA considers severe icing to be airplane-specific; however, weather forecasters do not have the technical capability at this time to forecast severe icing conditions for specific aircraft. For example, airplanes with thinner airfoil shapes are more efficient collectors of ice than airplanes with thicker airfoil shapes. To broaden and reinforce this knowledge, the FAA published Advisory Circular (AC) 91-74, Pilot Guide - Flight In Icing Conditions. The AC provides pilots with a convenient reference on the principal factors related to flight in icing conditions and informs them of the location of additional information in related publications. I have enclosed a copy of the AC for the Boards information. The FAA had planned to ask the In-Flight Icing Steering Committee to address the difference in the way the term "severe icing" was understood, but subsequently determined that this request was not within the scope of the committee. As an alternate solution, the FAA issued Notice N8400.33, Air Carrier Transportation - Flight Into Known or Forecast Severe Icing Condition. The notice clarifies the definition of severe icing and clearly states that when encountering severe icing, immediate flight diversion is necessary. I have enclosed a copy of the notice for the Board's information. I believe that the FAA has satisfactorily responded to this safety recommendation, and I look forward to your response. SWAT Meeting, 2/24/04 Minutes attached.

4/9/2004 NTSB

Previously, the FAA informed the Safety Board that it was concerned that the apparent incompatibility of 14 Code of Federal Regulations 91.527 and 135.227 may result from the difference in the way "severe icing" is understood. The FAA considers severe icing to be airplane-specific; however, weather forecasters do not have the technical capability to forecast severe icing conditions for specific aircraft. To address this gap, the FAA published Advisory Circular (AC) 91-74, "Pilot Guide-Flight In Icing Conditions," which provides pilots with a reference on factors related to flight in icing conditions. The FAA had planned to ask its In-Flight Icing Steering Committee to address the difference in the way the term "severe icing" was understood, but it subsequently determined that this request was not within the scope of the committee. Instead, on October 30, 2002, the FAA issued Notice N8400.33, "Air Carrier Transportation-Flight Into Known or Forecast Severe Icing Condition," which clarifies the definition of severe icing and states that when a pilot encounters severe icing, immediate flight diversion is necessary.

Although Notice N8400.33 met the intent of this recommendation in an acceptable alternate manner, the Safety Board notes that it did so only for air carrier operations (i.e., those operated under Parts 135 and 121); it did not address aircraft operated under Part 91, although the recommendation specifically asked for changes to Part 91. The Board further notes that the notice was cancelled on October 30, 2003. In addition, the Board notes that AC 91-74, Appendix B, "Regulatory Issues Related to Icing," Paragraph 1, "Part 91 Icing Regulations," Section (c), "Severe Icing" contains an implied authorization of flight into severe icing conditions for aircraft certified for flight in such conditions. That section states the following:

c. Severe Icing. No pilot may fly an airplane into known or forecast severe icing conditions unless:
(1) The airplane has ice protection provisions that meet the requirements in section 34 of SFAR 23.
(2) The airplane has ice protection provisions that meet the requirements for transport category airplane type certification.

On February 24, 2004, staff from the FAA and the Safety Board met to discuss issues related to currently open recommendations, including Safety Recommendation A-96-60. At that meeting, the Board discussed its concern with the continued implied authorization in AC 91-74 for flight into severe icing conditions. Potential revisions to the AC's language that would address the Board's concerns in this recommendation in an acceptable alternate manner were also discussed. The Board believes that appropriate changes to the AC will address our concern that Notice N8400.33 has expired and applies only to Part 135 operations. Accordingly, pending revisions to the AC that address the implied authorization in Parts 91and 135 for flight into severe icing conditions, Safety Recommendation A-96-60 is classified "Open--Acceptable Alternate Response."

Recommendation Report

Friday, February 13, 2009

Log Number 2630A
Issue Date 11/30/1998 **MONROE MI** **1/9/1997**

On January 9, 1997, an Empresa Brasileira de Aeronautica, S/A (Embraer) EMB-120RT, operated by COMAIR Airlines, Inc., crashed during a rapid descent after an uncommanded roll excursion near Monroe, Michigan. The flight was a scheduled, domestic passenger flight from the Cincinnati/Northern Kentucky International Airport, Covington, Kentucky, to Detroit Metropolitan/Wayne County Airport, Detroit, Michigan. The flight departed Covington with 2 flightcrew, 1 flight attendant, and 26 passengers on board. There were no survivors. The airplane was destroyed by ground impact forces and a postaccident fire. IMC prevailed at the time of the accident, and the flight was operating on an IFR flight plan.The probable cause of this accident was the FAA's failure to establish adequate aircraft certification standardds for flight in icing conditions.

Recommendation # A-98-089

Overall Status **Priority**
OAA

THE NTSB RECOMMENDS THAT THE FAA: REQUIRE PRINCIPAL OPERATION INSPECTORS (POIS) TO DISCUSS THE INFORMATION CONTAINED IN AIRPLANE FLIGHT MANUAL REVISIONS AND/OR MANUFACTURERS' OPERATIONAL BULLETINS WITH AFFECTED AIR CARRIER OPERATORS AND, IF THE POI DETERMINES THAT THE INFORMATION CONTAINED IN THOSE PUBLICATIONS IS IMPORTANT INFORMATION FOR FLIGHT OPERATIONS, TO ENCOURAGE THE AFFECTED AIR CARRIER OPERATORS TO SHARE THAT INFORMATION WITH THE PILOTS WHO ARE OPERATING THOSE AIRPLANES.

FAA	Open - Acceptable Response

9/16/1999	Addressee	Letter Mail Controlled 9/22/99 9:22:50 AM MC# 991064 THE FAA AGREES WITH THE INTENT OF THIS RECOMMENDATION AND ON 5/28/99, ISSUED JOINT FLIGHT STANDARDS HANDBOOK BULLETIN FOR AIR TRANSPORTATION (HBAT), AIRWORTHINESS (HBAW), AND GENERAL AVIATION (HBGA). THE BULLETIN DIRECTS PRINCIPAL OPERATIONS INSPECTORS TO ENCOURAGE THEIR OPERATORS TO HAVE A RELIABLE DELIVERY SYSTEM IN PLACE FOR AIRPLANE FLIGHT MANUAL (AFM) AND ROTORCRAFT FLIGHT MANUAL (RFM) REVISIONS. THE DELIVERY SYSTEM SHOULD ENSURE THAT THE OPERATOR RECEIVES FLIGHT MANUAL REVISIONS WITHIN 30 CALENDAR DAYS OF FAA APPROVAL. EACH OPERATOR WILL BE ENCOURAGED TO DEVELOP AN ACTION PLAN AND NOTIFY ITS RESPECTIVE POI IN WRITING WITHIN 15 CALENDAR DAYS OF RECEIPT WHEN A NEW AFM/RFM REVISION HAS BEEN RECEIVED. I HAVE ENCLOSED A COPY OF THE BULLETIN FOR THE BOARD'S INFORMATION. TO ADDRESS ISSUES CONCERNING MANUALS AND CURRENCY OF AIRPLANE OPERATING INFORMATION, WORKING GROUP V WAS ESTABLISHED AT THE FAA'S IN-FLIGHT OPERATIONS IN ICING CONDITIONS CONFERENCE IN FEBRUARY 1999. THE PARTICIPANTS ON THE WORK GROUP CONSISTED OF REPRESENTATIVES FROM THE FAA, SAFETY BOARD, MANUFACTURERS, OPERATORS, AND INDUSTRY GROUPS. REGARDING THE ISSUE OF OPERATORS REVIEWING AIRCRAFT MANUFACTURERS' OPERATIONS BULLETINS WITH THE POSSIBILITY OF INCORPORATING THAT INFORMATION INTO VARIOUS COMPANY MANUALS AND TRAINING PROGRAMS, THE WORKING GROUP PARTICIPANTS REACHED CONSENSUS ON THE FOLLOWING POINTS: (1) OPERATORS NEED A SOLE SOURCE OF INFORMATION FROM WHICH TO IMPLEMENT OPERATING PROCEDURES RECOMMENDED BY AIRCRAFT MANUFACTURERS. THE PARTICIPANTS AGREED THAT THE CURRENT AFM REVISION PROCESS WOULD BE THE SOLE SOURCE OF CHANGES IN COMPANY FLIGHT MANUALS AND TRAINING PROGRAMS. (2) OPERATIONAL PROCEDURES RECOMMENDED IN AN AIRCRAFT MANUFACTURER'S OPERATIONS BULLETIN, ALTHOUGH DEEMED DESIRABLE, MAY CONFLICT WITH OPERATIONAL PROCEDURES CONTAINED IN AN APPROVED AFM OR COMPANY FLIGHT MANUAL CURRENTLY IN USE BY THE OPERATOR. BASED ON THE ABOVE, THE FAA ESTABLISHED SAFETY POLICY IN THE JOINT FLIGHT STANDARDS HANDBOOK BULLETIN FOR AIR TRANSPORTATION (HBAT), AIRWORTHINESS (HBAW), AND GENERAL AVIATION (HBGA), FLIGHT STANDARDS POLICY - COMPANY OPERATING MANUALS AND COMPANY TRAINING PROGRAM REVISIONS FOR COMPLIANCE WITH CURRENT AIRPLANE OR ROTORCRAFT FLIGHT MANUAL REVISIONS. THE BULLETIN, DATED 5/28/99, ESTABLISHES THE FOLLOWING SAFETY POLICY: (1) AIRCRAFT OPERATING PROCEDURES CONTAINED IN AIRCRAFT MANUFACTURERS' OPERATIONS BULLETINS ARE FOR INFORMATION ONLY. (2) OPERATORS SHALL NOT CHANGE EXISTING APPROVED AIRCRAFT MANUFACTURERS' RECOMMENDED OPERATING PROCEDURES IN THE COMPANY FLIGHT MANUALS BASED SOLELY ON INFORMATION CONTAINED IN THE AIRCRAFT MANUFACTURERS' OPERATIONS BULLETINS, UNLESS THE CHANGE IS COORDINATED THROUGH THE POI. POI'S WILL COORDINATE APPROVAL OF ANY PROPOSED CHANGES THROUGH THE AIRCRAFT EVALUATION GROUP AND AIRCRAFT CERTIFICATION OFFICE. THIS COORDINATED PROCESS, WHICH INVOLVES COLLECTIVE EXPERTISE OF THE OPERATOR, THE POI, AND THE SUBJECT MATTER EXPERTS IN THE AIRCRAFT IN THE AIRCRAFT EVALUATION GROUP AND THE AIRCRAFT CERTIFICATION OFFICE, ENSURES A UNIFORM IMPLEMENTATION WITHIN THE INDUSTRY OF NEW OPERATIONAL PROCEDURES RECOMMENDED IN AN AIRCRAFT MANUFACTURER'S OPERATIONS BULLETIN. THE FAA POLICY WITH RESPECT TO AIRCRAFT MANUFACTURER OPERATIONS BULLETINS MAKES IT CLEAR TO MANUFACTURERS THAT RECOMMENDED OPERATING PROCEDURES IN OPEERATIONS BULLETINS MUST BE INCORPORATED INTO THE APPROPRIATE AFM/RFM THROUGH THE REVISION PROCESS. IN ADDITION TO THE ABOVE ACTIONS, THE JOINT FLIGHT STANDARDS HANDBOOK BULLETIN FOR AIR TRANSPORTATION (HBAT), AIRWORTHINESS (HBAW), AND GENERAL AVIATION (HBGA), FLIGHT STANDARDS POLICY - COMPANY OPERATING MANUALS AND COMPANY TRAINING PROGRAM REVISIONS FOR COMPLIANCE ESTABLISHES THE FOLLOWING FAA POLICY: (1) INFORMATION CONTAINED IN APPROVED SECTIONS OF THE AFM/RFM PERTAINING TO OPERATING LIMITATIONS, OPERATING PROCEDURES, PERFORMANCE INFORMATION, LOADING INFORMATION, AND OTHER INFORMATION NECESSARY FOR SAFE OPERATIONS MUST BE INCORPORATED IN THE OPERATOR'S COMPANY FLIGHT MANUAL AND IN ITS TRAINING PROGRAM. (2) EACH OPERATOR SHALL ENSURE THAT ITS AFM/RFM, COMPANY FLIGHT MANUAL, AND TRAINING PROGRAM ARE KEPT CURRENT. THE ACTIONS THAT HAVE BEEN OUTLINED, ADDRESS THE FULL INTENT OF THIS SAFETY RECOMMENDATION. IT IS THE OPERATOR'S RESPONSIBILITY TO ENSURE RECEIPT OF AFM AND RFM REVISIONS, EVALUATE AND INCORPORATE THE INFORMATION INTO COMPANY MANUALS AND TRAINING PROGRAMS, DISSEMINATE INFORMATION TO FLIGHTCREWS, AND FURNISH CURRENT COPIES OF AFM AND RFM REVISIONS TO THE POI UPON REQUEST. THE POI'S RESPONSIBILITY IS TO ASSESS IF THE PROCEDURES CONSIDERED BY THE OPERATOR ARE IN COMPLIANCE WITH INFORMATION REQUIRED IN THE AFM OPERATING LIMITATIONS, OPERATING PROCEDURES, PERFORMANCE INFORMATION, AND LOADING INFORMATION SECTIONS. IF

		THE PROCEDURES ARE IN COMPLIANCE, THE POI WILL EITHER APPROVE OR ACCEPT THEM AS APPLICABLE. IF THEY ARE NOT IN COMPLIANCE, THE POI WILL NOT APPROVE THE PROCEDURES. I HAVE ENCLOSED A COPY OF THE BULLETIN FOR THE BOARD'S INFORMATION, AND I CONSIDER THE FAA'S ACTION TO BE COMPLETED ON THIS SAFETY RECOMMENDATION.
4/11/2000	NTSB	THE SAFETY BOARD BELIEVES THAT IT IS NOT THE OPERATOR'S DUTY TO PROVIDE POI'S WITH THE APPROPRIATE DOCUMENTS FOR AFM REVISIONS, RATHER THE POI'S SHOULD BE UP-TO-DATE ON THEIR ASSIGNED CARRIERS' AIRCRAFT, WHICH INCLUDES HAVING THE MOST CURRENT UPDATES OF APPLICABLE MANUALS AND INSTRUCTIONS. RELYING ON OPERATORS TO PROVIDE POI'S WITH SUCH DOCUMENTATION INTERFERES WITH THE OFFICIAL PERFORMANCE OF THEIR DUTIES AS REGULATORY OFFICIALS. ALTHOUGH THE SAFETY BOARD AGREES THAT IT IS A POI'S DUTY TO EVALUATE OPERATORS' COMPLIANCE WITH FAA REGULATIONS, THE BOARD ALSO BELIEVES THAT POI'S SHOULD HAVE A SYSTEM OF EVALUATION STANDARDS THAT DOES NOT RELY ON OPERATORS' INITIATIVE. THE SAFETY BOARD IS ENCOURAGED BY THE CREATION OF A USER-FRIENDLY DATABASE AND ITS USE BY POI'S IN THEIR SURVEILLANCE ACTIVITIES AND OTHER FLIGHT STANDARDS PERSONNEL IN THE PERFORMANCE OF THEIR DUTIES. IT IS THE SAFETY BOARD'S UNDERSTANDING OF HBAT 99-16A, HBAW 99-14A, AND HBGA 99-20A THAT FAA PERSONNEL WILL INDEPENDENTLY BE RESPONSIBLE FOR UPDATING THIS DATABASE AND WILL NOT RELY ON CARRIERS TO SUBMIT THIS INFORMATION. THE BULLETIN DESCRIBES THE USE OF THE DATABASE AND THE MEASURES THAT THE FAA PLANS TO DEVELOP TO ASSIST IN MONITORING IMPLEMENTATION OF AFM REVISIONS AND MANUFACTURER'S OPERATIONAL BULLETINS. HOWEVER, SEVERAL ITEMS OF CONCERN REMAIN; THEREFORE, WE REQUEST THAT THE FAA CLARIFY THE FOLLOWING MATTERS: (1) WILL THE DATABASE INCLUDE MANUFACTURERS' OPERATIONAL BULLETINS AS WELL AS AFM'S? RETENTION OF OPERATIONAL BULLETINS IN THE DATABASE IS INCLUDED UNDER THE HEADING "PURPOSE AND RECORDS" IN THE DATABASE SECTIONS OF HBAT 99-16A, HBAW 99-14A, AND HBGA 99-20A. HOWEVER, IN SECTION 4B, "DATABASE USE DURING SURVEILLANCE," INSPECTORS ARE INSTRUCTED TO USE THE DATABASE FOR SURVEILLANCE AND COMPARE THE DATABASE TO "OPERATOR'S AFM(S), MANUAL(S), AND TRAINING PROGRAM(S)." MANUFACTURERS' OPERATIONAL BULLETINS ARE NOT INCLUDED IN THIS LIST. (2) HBAT 99-16A, HBAW 99-14A, AND HBGA 99-20A, AS WRITTEN, DESCRIBE THE INCLUSION OF INFORMATION AND ITS USE DURING SURVEILLANCE. HOWEVER, THERE IS NO SYSTEM TO MAKE FLIGHT STANDARDS PERSONNEL, INCLUDING POI'S, AWARE OF NEW REVISIONS TO THE AFM'S OR MANUFACTURERS' OPERATIONAL BULLETINS. WAITING UNTIL THE NEXT SURVEILLANCE ROUND TO MAKE FLIGHT STANDARDS PERSONNEL AWARE OF SUCH CHANGES MAY CREATE AN EXCESSIVE PERIOD OF TIME BEFORE THE POI ENSURES THE OPERATOR'S COMPLIANCE WITH THESE REVISIONS. (3) THE DATABASE WILL CONTAIN ONLY THE NUMBER, DATE, AND NAME OF THE DOCUMENT CORRESPONDING TO EACH AFM REVISION AND EACH OPERATIONAL BULLETIN LISTED. THE DATABASE WILL NOT INCLUDE FULL TEXT INFORMATION REFLECTING THE CONTENT. THEREFORE, WHEN THE POI OR OTHER FLIGHT STANDARDS PERSONNEL USE THE DATABASE, THEY WILL BE REQUIRED TO OBTAIN COPIES OF THESE DOCUMENTS. A-98-103 SPECIFICALLY MENTIONS "INCLUDING THE BACKGROUND AND JUSTIFICATION FOR THE REVISION." EXISTING COMPUTER TECHNOLOGY SHOULD ALLOW FOR AT LEAST AN ABSTRACT, INCLUDING THE BACKGROUND AND JUSTIFICATION OF THE DOCUMENT, TO BE PLACED IN THE DATABASE. PENDING CLARIFICATION FROM THE FAA THAT MANUFACTURERS' OPERATIONAL BULLETINS IN THE DATABASE WILL BE INCLUDED IN OVERSIGHT ACTIVITIES BY THE POI, THE DEVELOPMENT OF A SYSTEM WITHIN THE FAA TO ALERT POI'S AND OTHER FLIGHT STANDARDS PERSONNEL WHEN NEW INFORMATION IS POSTED TO THE DATABASE, AND REVISION OF THE DATABASE TO INCLUDE AN ABSTRACT INCLUDING BACKGROUND AND JUSTIFICATION OF THE REVISIONS TO THE AFM'S AND OPERATIONAL BULLETINS, A-98-89 AND A-98-103 ARE CLASSIFIED AS "OPEN--ACCEPTABLE RESPONSE."
2/24/2004	NTSB	In a SWAT meeting, the FAA indicated that it shares the Board’s concern about POIs having access to the latest information and changes to airplane flight manuals and manufacturer’s operational bulletins. The FAA believes that some sort of regulation to require manufacturers to provide this information to the FAA for use by POIs may be needed. The FAA will consider how this might be achieved and provide an update to the Board on planned actions.

Recommendation Report

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3/9/2000	NTSB	THE SAFETY BOARD NOTES THAT ALTHOUGH THE FAA'S PROPOSED ACTIONS HOLD SIGNIFICANT POTENTIAL TO ACCOMPLISH THE INTENT OF THIS RECOMMENDATION FOR NEWLY CERTIFICATED AIRCRAFT, THE CONCEPTS PROPOSED FOR CURRENT IN-SERVICE AIRCRAFT DO NOT. THE BOARD DOES NOT CONSIDER THE SETTING OF OPERATING SPEEDS AN ADEQUATE SUBSTITUTE FOR RELIABLE STALL WARNINGS IN ICING CONDITIONS. THE BOARD STRONGLY URGES THE FAA TO REVIEW ITS PROPOSED ACTIONS AND CONSIDER REGULATORY ACTION THAT RESULTS IN THE NECESSARY CHANGE TO STALL WARNING SYSTEMS FOR CURRENT IN-SERVICE AIRCRAFT. PENDING SUCH A REVIEW, A-98-96 IS CLASSIFIED "OPEN--UNACCEPTABLE RESPONSE."
9/25/2000	Addressee	Letter Mail Controlled 10/02/2000 3:16:36 PM MC# 2001437 For future airplane designs, the FAA is continuing to develop 14 CFR Part 25 regulatory requirements for airplane performance and handling characteristics in icing conditions. For currently certificated 14 CFR Part 25 airplanes, the FAA had requested that manufacturers of transport-category aircraft review their Airplane Flight Manuals to ensure that appropriate operating speeds in icing conditions are provided. The FAA has reviewed the information received from manufacturers and additional input from aircraft certification specialists. As a result of this review, the FAA is considering a rulemaking project to develop regulatory requirements that would, in part, require stall warning to be provided by a cockpit warning system at speeds appropriate for operations with ice accretions. These regulatory requirements would be applied retroactively. I will keep the Board informed of the FAA's progress on this safety recommendation
3/12/2001	NTSB	The Safety Board notes that the FAA is taking the actions recommended and that the information for currently certified airplanes on appropriate operating speeds in icing conditions will be used to develop stall warning systems for operations in icing conditions. Pending the development of regulatory requirements for a stall warning system that provides a warning before the onset of a stall in icing conditions, for newly certificated and currently operating aircraft, Safety Recommendation A-98-96 is classified Open--Acceptable Response.
9/21/2001	Addressee	Letter Mail Controlled 10/22/2001 11:44:27 AM MC# 2010866 For future airplane designs, the FAA is continuing to develop 14 CFR Part 25 regulatory requirements for airplane performance and handling characteristics in icing conditions. For currently certificated 14 CFR Part 25 airplanes, the FAA is developing a rulemaking project that would, in part, require stall warning to be provided by a cockpit warning system at speeds appropriate for operations with ice accretions. These regulatory requirements would be applied retroactively. I will keep the Board informed of the FAA's progress on this safety recommendation.
7/11/2002	NTSB	The Safety Board is pleased that the FAA is taking action for both new and current designs. Pending issuance of the changes to Title 14 CFR Part 25, Safety Recommendation A-98-96 remains classified "Open--Acceptable Response."

Recommendation Report

Friday, February 13, 2009

10/26/2005	Addressee	Letter Mail Controlled 10/27/2005 2:12:40 PM MC# 2050501 Marion C. Blakey, Administrator, FAA, 10/26/05 The FAA is continuing its plans to adopt new 14 CFR Part 25 regulatory requirements that would require adequate stall warning margin to be shown with the most critical ice accretion for airplanes approved to fly in icing conditions. Except for the short time before icing conditions are recognized and the ice protection system activated, this stall warning must be provided by the same means as for non-icing conditions. Although neither the current nor the proposed new 14 CFR Part 25 requirements mandate use of an aural warning or stick shaker, all recently certificated transport-category airplanes have used either a stick shaker or an aural warning to warn the pilot of an impending stall. The FAA does not anticipate any future airplane designs without a cockpit warning of an impending stall. The proposed stall warning requirements for icing conditions are part of the NPRM referenced in response to Safety Recommendation A-91-87. It is anticipated that the NPRM will be published for public comment by October 2005. In the meantime, the FAA is working with applicants to ensure that new airplane designs have adequate stall warning in icing conditions. After further review, considering the actions that the FAA and industry have taken and are intending to take in the future to improve flight safety in icing conditions, the FAA has determined that requiring all airplanes currently in service to be modified to provide a stall warning in advance of a stall in icing conditions would impose a cost burden that is not commensurate with the potential safety benefits. In some cases, the stall warning system would need significant hardware modifications, including external modifications to the airplane (i.e., changing from wing-mounted angle-of-attack vanes to fuselage mounted vanes). In other cases, significant software and avionics systems and equipment changes would be needed. These changes would result in considerable costs to design, test, certify, and implement throughout the fleet. The FAA will, however, take appropriate action on those airplane designs already in service if an unsafe condition is identified. For example, we have been working closely with Embraer to improve the critical ice shapes for evaluating stall warning and operating speed margins for the Embraer EMB-120. This work has recently concluded and Embraer has produced a service bulletin to modify stall warning computers to provide adequate stall warning margin and revise the airplane flight manual to provide increased operating speeds for icing conditions. The FAA plans to issue an AD to mandate incorporation of this service bulletin. A recent review of operating speed information provided to flightcrews indicates that the operating speeds now being provided to flightcrews contain additional maneuvering and stall margins for icing conditions where necessary. On August 9, 2004, the FAA provided a comprehensive summary of this review in response to Safety Recommendation A-98-94 at the "Safety With A Team" meeting. The FAA looks forward to hearing the Board's position on the comprehensive summary.

5/10/2006 NTSB

This recommendation was issued because aerodynamic changes due to icing can raise the stall speed and lower the angle of attack that leads to a stall, and these events may lead to little or no margin between the warning and the start of a stall. For example, in the Comair accident that prompted this recommendation, the autopilot disengaged and the roll upset began before the stick shaker (i.e., the stall warning) activated. Had the pilots been warned of an impending stall before the roll upset started, they might have been able to avoid the accident. The FAA's November 4, 2005, NPRM on icing considerations in aircraft certification proposes to require for newly certificated aircraft to have an adequate stall warning margin with the most critical ice accretion for airplanes approved to fly in icing conditions. The FAA indicated that until this NPRM becomes a final rule, it is working to ensure that new airplane designs have adequate stall warning margins in icing conditions.

In its September 21, 2001, letter to the Safety Board, the FAA stated that it was pursuing regulatory development projects for both new and currently operating aircraft to address this recommendation, and that the new rules would be applied retroactively. The FAA now indicates that after further review, it has determined that requiring all airplanes currently in service to be modified to provide a stall warning in advance of a stall in icing conditions would impose a cost burden not commensurate with the potential safety benefits. However, the FAA states that it will take appropriate action on those airplane designs already in service if an unsafe condition is identified. The FAA gave the EMB-120 as an example. Embraer recently produced a service bulletin to modify stall warning computers to provide an adequate stall warning margin and to revise the airplane flight manual to provide increased operating speeds for icing conditions. The FAA stated that it plans to issue an AD to mandate compliance with this service bulletin.

The Safety Board submitted detailed technical comments to the docket for the NPRM. The NPRM appears to address the intent of this recommendation for newly type-certificated aircraft, and the FAA has indicated that until the NPRM becomes a final rule, it will ensure that new airplane designs have adequate stall warning margins in icing conditions. The Board is disappointed that the FAA does not believe that an inadequate stall warning margin in icing conditions is an unsafe condition that needs to be identified and rectified. The FAA indicated that when a problem with an in-service airplane is identified, it will take appropriate action, as with the EMB-120. This is not an acceptable response to this recommendation. The Safety Board does not believe that the FAA should wait for an accident or serious incident to identify an aircraft with an insufficient stall warning margin in icing conditions.

The problem of inadequate stall warning margins in icing conditions remains a problem with in-service airplanes. The Board is currently investigating the February 15, 2005, crash of a Cessna Citation 560 aircraft while on approach to Pueblo Memorial Airport, Pueblo, Colorado. This accident was fatal to 8 people, and the aircraft was destroyed. Although the Board's investigation is continuing, it has revealed that icing was an important consideration in this accident, and that the airplane stalled in icing conditions before the stall warning activated.

The Safety Board notes that if the FAA has conducted analyses of the stall warning margins in icing conditions for in-service aircraft, and identified those aircraft in need of revision, this may be the basis for an acceptable alternate response to the recommendation. However, delaying action until there is an accident or serious incident is not acceptable. Pending issuance of the final rule associated with the November 4, 2005, NPRM, with a requirement that airplanes be equipped with stall warning/protection systems that provide a cockpit warning before the onset of stall when the airplane is operating in icing conditions, and a similar requirement for currently certificated aircraft (or an acceptable alternative), Safety Recommendation A-98-96 is classified "Open-Unacceptable Response."

Recommendation Report

Friday, February 13, 2009

Recommendation # A-98-102

Overall Status
OAA

Priority

THE NTSB RECOMMENDS THAT THE FAA: REQUIRE AIR CARRIERS TO ADOPT THE OPERATING PROCEDURE CONTAINED IN THE MANUFACTURER'S AIRPLANE FLIGHT MANUAL AND SUBSEQUENT APPROVED REVISIONS OR PROVIDE WRITTEN JUSTIFICATION THAT AN EQUIVALENT SAFETY LEVEL RESULTS FROM AN ALTERNATIVE PROCEDURE.

FAA	Open - Acceptable Response

9/16/1999	Addressee	Letter Mail Controlled 9/22/99 9:22:50 AM MC# 991064 THE FAA AGREES WITH THE INTENT OF THIS RECOMMENDATION AND ON 5/28/99, ISSUED JOINT FLIGHT STANDARDS HANDBOOK BULLETIN FOR AIR TRANSPORTATION (HBAT), AIRWORTHINESS (HBAW), AND GENERAL AVIATION (HBGA), FLIGHT STANDARDS POLICY - COMPANY OPERATING MANUALS AND COMPANY TRAINING PROGRAM REVISIONS FOR COMPLIANCE. THE BULLETIN DIRECTS PRINCIPAL OPERATIONS INSPECTORS (POI) TO ENCOURAGE THEIR OPERATORS TO HAVE A RELIABLE DELIVERY SYSTEM IN PLACE FOR AIRPLANE FLIGHT MANUAL (AFM) AND ROTORCRAFT FLIGHT MANUAL (RFM) REVISIONS. THE DELIVERY SYSTEM SHOULD ENSURE THAT THE OPERATOR RECEIVES FLIGHT MANUAL REVISIONS WITHIN 30 CALENDAR DAYS OF FAA APPROVAL. EACH OPERATOR WILL BE ENCOURAGED TO DEVELOP AN ACTION PLAN AND NOTIFY ITS RESPECTIVE POI IN WRITING WITHIN 15 CALENDAR DAYS OF RECEIPT WHEN A NEW AFM/RFM REVISION HAS BEEN RECEIVED. I HAVE ENCLOSED A COPY OF THE BULLETIN FOR THE BOARD'S INFORMATION. IN PREVIOUS CORRESPONDENCE, THE FAA STATED THAT IT AGREES WITH THIS SAFETY RECOMMENDATION AND WILL CONSIDER REGULATORY ACTION TO ADDRESS ITS INTENT. CLEARLY, THE BULLETIN ESTABLISHES THE GUIDANCE AND THE SAFETY POLICY NECESSARY TO ADDRESS THIS SAFETY RECOMMENDATION. PRESENTLY, THE EXISTING REGULATIONS DO NOT ALLOW THE FAA TO COMPEL AN OPERATOR TO COMPLY WITH AN AIRCRAFT MANUFACTURER'S RECOMMENDED OPERATING PROCEDURES (REGULATIONS ONLY MAKE THOSE ELEMENTS IN THE OPERATING LIMITATIONS SECTION OF THE AFM/RFM MANDATORY). CONSEQUENTLY, THE FAA IS CONSIDERING A REGULATORY CHANGE THAT WILL REQUIRE THE SAFETY POLICY CONTAINED IN THE BULLETIN TO BE MANDATORY. THE ISSUE CONCERNING THE INCORPORATION OF AIRCRAFT MANUFACTURER'S RECOMMENDED OPERATING PROCEDURES INTO COMPANY FLIGHT MANUALS WAS ADDRESSED BY WORKING GROUP V AT THE FAA'S IN-FLIGHT OPERATIONS IN ICING CONDITIONS CONFERENCE IN FEBRUARY 1999. THE WORKING GROUP V PARTICIPANTS AGREED THAT CURRENT POLICY AND RULES ON THIS ISSUE NEEDED IMPROVEMENT. THE WORKING GROUP V PARTICIPANTS AGREED THAT THE POLICY OUTLINED IN JOINT FLIGHT STANDARDS HANDBOOK BULLETIN FOR AIR TRANSPORTATION (HBAT), AIRWORTHINESS (HBAW), AND GENERAL AVIATION (HBGA), FLIGHT STANDARDS POLICY - COMPANY OPERATING MANUALS AND COMPANY TRAINING PROGRAM REVISIONS FOR COMPLIANCE AND THE FAA'S ELECTRONIC DATA BASE, REFERENCED IN RESPONSE TO A-98-103, PROVIDE EFFECTIVE MEASURES TO ADDRESS THE CURRENT PROBLEMS. THE FOLLOWING RECOMMENDATIONS WERE MADE AND ADOPTED BY WORKING GROUP V: (1) AFM/RFM REVISIONS SHOULD BE THE ONLY SOURCE OF INFORMATION USED BY OPERATORS TO MAKE CHANGES IN THEIR COMPANY FLIGHT MANUAL, AIRCRAFT OPERATING PROCEDURES, AND TRAINING PROGRAMS BECAUSE THE AFM/RFM REVISIONS HAVE BEEN REVIEWED AND APPROVED BY THE FAA. (2) OTHER SOURCES OF INFORMATION, LIKE THE AIRCRAFT MANUFACTURERS' OPERATIONS BULLETINS, SHOULD BE USED BY THE FAA TO DETERMINE WHICH PROCEDURAL CHANGES ARE INCORPORATED IN AN AFM/RFM REVISION. THE AFM/RFM REVISION WOULD THEN BE REQUIRED TO BE ADOPTED BY ALL OPERATORS UNLESS AN EQUIVALENT LEVEL OF SAFETY RESULTS FROM AN ALTERNATIVE COURSE OF ACTION SPECIFIED BY THE OPERATOR AND APPROVED BY THE FAA BEFORE IMPLEMENTATION. THE FAA BELIEVES THAT THE SAFETY POLICY OUTLINED IN THE BULLETIN ADDRESSES THE FULL INTENT OF THIS SAFETY RECOMMENDATION. I WILL KEEP THE BOARD INFORMED OF THE FAA'S PROGRESS ON THE REGULATORY CHANGE TO MAKE THE POLICY CONTAINED IN THE BULLETIN MANDATORY.
4/11/2000	NTSB	THE SAFETY BOARD NOTES THAT ALTHOUGH THE INTERIM ACTION OF ISSUING THE BULLETIN IS NOT REGULATORY IN NATURE, IT IS A POSITIVE STEP IN MEETING THE GOALS OF THIS RECOMMENDATION. PENDING COMPLETION OF THE REGULATORY PROCESS, A-98-102 IS CLASSIFIED "OPEN--ACCEPTABLE RESPONSE."

Recommendation Report

Friday, February 13, 2009

7/7/2000	Addressee	Letter Mail Controlled 07/12/2000 9:46:00 AM MC# 2000878 THE FAA AGREES WITH THE INTENT OF THIS RECOMMENDATION AND ON 5/28/99, ISSUED JOINT FLIGHT STANDARDS HANDBOOK BULLETIN FOR AIR TRANSPORTATION (HBAT), AIRWORTHINESS (HBAW), AND GENERAL AVIATION (HBGA), FLIGHT STANDARDS POLICY - COMPANY OPERATING MANUALS AND COMPANY TRAINING PROGRAM REVISIONS FOR COMPLIANCE. THE BULLETIN DIRECTS POI'S TO ENCOURAGE THEIR OPERATORS TO HAVE A RELIABLE DELIVERY SYSTEM IN PLACE FOR AIRPLANE FLIGHT MANUAL AND ROTORCRAFT FLIGHT MANUAL REVISIONS. THE DELIVERY SYSTEM SHOULD ENSURE THAT THE OPERATOR RECEIVES FLIGHT MANUAL REVISIONS WITHIN 30 CALENDAR DAYS OF FAA APPROVAL. A COPY OF THE BULLETIN WAS PROVIDED TO THE BOARD ON 9/16/99. THE FAA HAS INITIATED A NOTICE OF PROPOSED RULEMAKING (NPRM) PROPOSING TO REVISE 14 CFR PART 121, SUBPARTS N & O. THE FAA WILL INCLUDE THE POLICY CONTAINED IN THE BULLETIN IN THE NPRM. IT IS ANTICIPATED THAT THE NPRM WILL BE PUBLISHED IN THE FEDERAL REGISTER FOR COMMENT BY FEBRUARY 2001. I WILL PROVIDE THE BOARD WITH A COPY OF THE NPRM AS SOON AS IT IS PUBLISHED.
1/12/2001	NTSB	THE SAFETY BOARD BELIEVES THE FAA IS TAKING THE ACTION RECOMMENDED. PENDING ISSUANCE OF THE NPRM AND IMPLEMENTATION OF THE PROPOSED REGULATION, A-98-102 REMAINS CLASSIFIED "OPEN--ACCEPTABLE RESPONSE."
8/2/2001	Addressee	Letter Mail Controlled 08/10/2001 1:11:47 PM MC# 2010634: The safety policy outlined in Joint Flight Standards HBAT, HBAW, and HBGA, "Flight Standards Policy - Company Operating Manuals and Company Training Program Revisions For Compliance" addresses the full intent of this safety recommendation. The FAA is continuing its effort to develop a notice of proposed rulemaking (NPRM) proposing to make the policy contained in the bulletin mandatory. I will keep the Board informed of the FAA's progress on this regulatory effort.
10/23/2001	NTSB	This safety recommendation was addressed by NTSB AAR-1/02. On November 30, 1998, Safety Recommendation A-98-102 was issued because air carriers had the prerogative not to adopt certain manufacturer procedures without clear written justification. Safety Recommendation A-98-102 asked the FAA to "require air carriers to adopt the operating procedures contained in the manufacturer's airplane flight manual and subsequent approved revisions or provide written justification that an equivalent safety level results from an alternate procedure." In response to this recommendation, the FAA issued, in May 1999, the Joint Flight Standards HBAT, Airworthiness, and General Aviation, Flight Standards Policy—Company Operating Manuals and Company Training Program Revisions for Compliance. The handbook bulletin directed that POIs encourage their operators to (1) have a reliable delivery system in place for flight manual revisions, which ensures that the operators receive the revisions within 30 calendar days of approval, and (2) develop an action plan to notify, in writing, respective POIs of new flight manual revisions within 15 days after receipt. In addition, on July 7, 2000, the FAA stated that it had initiated an NPRM proposing to revise 14 CFR Part 121, Subparts N and O, to reflect the policy included in the May 1999 Joint Flight Standards HBAT, Airworthiness, and General Aviation, Flight Standards Policy—Company Operating Manuals and Company Training Program Revisions for Compliance. On January 12, 2001, the Safety Board acknowledged the FAA's actions and stated that, pending the issuance of the NPRM and implementation of the proposed regulation, Safety Recommendation A-98-102 was classified "Open--Acceptable Response." On August 2, 2001, the FAA stated that it was continuing to develop the NPRM. At the public hearing on this accident, the POI for American indicated that a carrier might choose not to make a manufacturer's suggested change because of the way that the carrier has configured the particular airplane. However, it is critical that the carrier provide written justification to the FAA regarding the reasons for not making a change or for implementing an alternative procedure in case the manufacturer's performance data do not support the carrier's justification. It is also critical that the carrier make its POI and respective aircrew program manager (APM) aware of any manufacturer's recommended procedure that is not being adopted or is being altered. The Safety Board recognizes that American, since the time of the accident, has revised its DC-9 Operating Manual to include spoiler deployment and autobrake procedures similar to Boeing's. The Board further recognizes that the FAA has taken positive steps toward implementing the intent of this recommendation. However, this accident highlights the need for timely action to ensure that pilots are operating airplanes according to procedures that reflect the manufacturer's safest operating practices. Therefore, the Safety Board reiterates Safety Recommendation A-98-102.

Recommendation Report

Friday, February 13, 2009

1/3/2002	NTSB	The FAA states its belief that the safety policy outlined in Joint Flight Standards Handbook Bulletins for Air Transportation (HBAT), Airworthiness (HBAW), and General Aviation (HBGA), "Flight Standards Policy-Company Operating Manuals and Company Training Program Revisions For Compliance," addresses the full intent of this safety recommendation. The FAA reports that it is continuing its effort to develop a notice of proposed rulemaking (NPRM) proposing to make the policy contained in the bulletin mandatory. Pending a requirement to make the policy in the bulletin mandatory, Safety Recommendation A-98-102 remains classified "Open--Acceptable Response."
2/11/2003	Addressee	"FAA Staff advised via telephone that the NPRM package with changes to 14 CFR subparts N and O is in internal FAA coordination at this time. The document is 1000 pages and they expect to have it submitted to OST in May 2003."
10/17/2005	NTSB	Because there has been no formal correspondence on these recommendations for a considerable period of time, the Board would appreciate an update on recent FAA activities in response to these safety recommendations, including when the FAA expects the recommended actions to be completed. These seven open safety recommendations are dependent, according to the FAA, on the proposed, but as yet unpublished, revisions to Part 121, subparts N and O. Through correspondence with the FAA on these recommendations, we have seen the proposed date for the FAA's publication of a notice of proposed rulemaking (NPRM) related to revisions to Part 121 subparts N and O, repeatedly delayed. The NPRM was first promised in July 1998, then December 2000, then February 2001; and an NPRM has yet to be published. All of these recommendations are more than 7 years old, and one is 12 years old. The Board anticipates that a considerable period of time will be taken to collect and analyze comments from the public following publication of the NPRM and that, consequently, a final rule will not be issued until several years after the NPRM is published. The Board urges the FAA to issue this NPRM soon. The Board also requests that the FAA advise us on the most current schedule for issuing this NPRM and for implementation of the final rule. We would appreciate receiving this information before we reevaluate the status of these recommendations.

Recommendation Report

Friday, February 13, 2009

Log Number 2630B

Issue Date 11/30/1998 **MONROE MI** **1/9/1997**

INFOMATION FROM THE CVR INDICATES THAT THE FLIGHTCREW ACTIVATED THE ANTI-ICE EQUIPMENT FOR THE WINDSHIELD, PROPELLERS, PITOT PROBES, ANGLE-OF ATTACK VANES, SIDESLIP ANGLE VANE, AND TOTAL AIR TEMPERATURE PROBES. THERE IS NO EVIDENCE FROM THE CVR, FDR, PERFORMANCE OF THE AIRCRAFT, OR AIRCRAFT WRECKAGE TO DETERMINE IF THE FLIGHTCREW ACTIVATED THE DE-ICING BOOTS. THESE FACTS AND THE AIRPLANE'S DEGRADED AERODYNAMIC PERFORMANCE STRONGLY SUGGEST THAT ICE HAD ACCUMULATED ON AIRFRAME, BUT MAY NOT HAVE SEEN OR RECOGNIZED AS A HAZARD BY THE FLIGHT CREW OF COMAIR 3272. THERE WERE SEVEN ACCIDENTS INVOLVING AIRCRAFT EMBRAER EMB- 120: (1) 1/9/97, EMBRAER EMB-120, MONROE, MICHIGAN, (2) IN APRIL OF 1995, EMBRAER EMB -120, TALLAHASSEE, FLORIDA, (3) 10/16/94, EMBRAER EMB-120, ELKO, NEVADA, (4) 4/29/93, EMBRAER EMB -120, PINE BLUFF, ARKANSAS, (5) 11/22/91, EMBRAER EMB - 120, CLERMONT-FERRAND, FRANCE, (6) IN SEPTEMBER, 1991, EMBRAER EMB -120, FORT SMITH, ARKANSAS, AND (7) 6/28/89, EMBRAER EMB- 120, KLAMATH FALLS, OREGON.

Recommendation # A-98-108

Overall Status
OAA

Priority

THE NTSB RECOMMENDS THAT THE NASA: WITH THE FAA AND OTHER INTERESTED AVIATION ORGANIZATIONS, CONDUCT ADDITIONAL RESEARCH TO IDENTIFY REALISTIC ICE ACCUMULATIONS,TO INCLUDE INTERCYCLE AND RESIDUAL ICE ACCUMULATIONS AND ICE ACCUMULATIONS ON UNPROTECTED SURFACES AFT OF THE DEICING BOOTS, AND TO DETERMINE THE EFFECTS AND CRITICALITY OF SUCH ICE ACCUMULATIONS; FURTHER, THE INFORMATION DEVELOPED THROUGH SUCH RESEARCH SHOULD BE INCORPORATED INTO AIRCRAFT CERTIFICATION REQUIREMENTS AND PILOT TRAINING PROGRAMS AT ALL LEVELS.

NASA	Open - Acceptable Response

1/13/1999	Addressee	Letter Mail Controlled 02/19/1999 10:02:22 AM MC# 990021 NASA IS WELL POSITIONED TO FULFILL A-98-107 AND -108. NASA, THE FAA, AND OTHER AVIATION ORGANIZATIONS WILL WORK TOGETHER TO DEVELOP AND IMPLEMENT A PLAN TO AGGRESSIVELY PURSUE AN INDUSTRY-WIDE TRAINING PROGRAM ON THE HAZARDS OF ICING. ADDITIONALLY, NASA WILL WORK WITH THESE SAME ORGANIZATIONS TO INCREASE UNDERSTANDING OF THE ADVERSE EFFECTS OF ICE ACCUMULATIONS ON AIRCRAFT. NASA AND THE FAA ARE PARTNERS IN THE JOINT SAFETY WORKING GROUP (SWG) SPECIFICALLY TO ADDRESS ISSUES IN RESEARCH AND DEVELOPMENT IN AVIATION SAFETY. THE SWG COORDINATES EFFORTS FOR BOTH AGENCIES IN THIS FIELD, AND THAT COORDINATION, ESSENTIAL TO THE FUNCTIONING OF NASA'S AVIATION SAFETY PROGRAM OFFICE, WILL PROVIDE THE FOCUS FOR RESPONDING TO THE RECOMMENDATIONS. THE FAA'S FLIGHT STANDARDS AND AIRCRAFT CERTIFICATION SERVICES HAVE TAKEN THE LEAD IN A WEATHER-ACCIDENT PREVENTION TRAINING EFFORT BY SETTING UP A WORKSHOP ON IN-FLIGHT OPERATIONS AND ICING CONDITIONS. NASA'S AVIATION SAFETY PROGRAM OFFICE WILL PARTICIPATE IN THAT WORKSHOP. NASA WILL WORK WITH THE FAA AND OTHER INTERESTED AVIATION ORGANIZATIONS TO DEVELOP EDUCATIONAL MATERIALS THAT WILL FOCUS ON THE HAZARDS, TECHNOLOGY, AND OPERATIONAL PROCEDURES ASSOCIATED WITH CONDUCTING FLIGHT OPERATIONS DURING ICING CONDITIONS. AN IMPORTANT PART OF NASA'S INVESTMENT IN AVIATION SAFETY RESEARCH IS WEATHER-RELATED. NASA WILL EXAMINE ITS RESEARCH PLANS TO ENSURE THAT AN UNDERSTANDING OF THE EFFECTS AND CRITICALITY OF ICE ACCUMULATIONS IS AGGRESSIVELY PURSUED. KNOWLEDGE GAINED FROM THIS RESEARCH WILL BE PROVIDED TO THE FAA FOR INCORPORATING IN AIRCRAFT CERTIFICATION REQUIREMENTS AND PILOT TRAINING PROGRAMS. NASA WILL WORK CLOSELY WITH THE FAA ACROSS MANY DIFFERENT ORGANIZATIONAL LEVELS TO ADDRESS THE PROBLEMS OF AIRCRAFT SAFETY, SUCH AS ICING. AFTER COLLABORATION WITH THE FAA, WE WILL PROVIDE YOUR STAFF WITH A MORE DETAILED APPROACH TO SATISFY A-98-107 AND -108.
3/12/1999	NTSB	A-98-108 ASKED NASA, ALONG WITH THE FAA AND OTHER INTERESTED AVIATION ORGANIZATIONS, TO CONDUCT ADDITIONAL RESEARCH TO IDENTIFY REALISTIC ICE ACCUMULATIONS, INCLUDING INTERCYCLE AND RESIDUAL ICE ACCUMULATIONS AND ICE ACCUMULATIONS ON UNPROTECTED SURFACES AFT OF THE DEICING BOOTS, AND DETERMINE THE EFFECTS AND CRITICALITY OF SUCH ICE ACCUMULATIONS; FURTHER, THE INFORMATION DEVELOPED THROUGH SUCH RESEARCH SHOULD BE INCORPORATED INTO AIRCRAFT CERTIFICATION REQUIREMENTS AND PILOT TRAINING AT ALL LEVELS. PENDING MORE DETAILED INFORMATION ON NASA'S EDUCATION MATERIALS AND RESEARCH REGARDING ICING CONDITIONS, A-98-107 AND -108 ARE CLASSIFIED "OPEN--ACCEPTABLE RESPONSE."

Recommendation Report

Friday, February 13, 2009

7/26/2000	NTSB	THE BOARD'S RECORDS INDICATE THAT THE MOST RECENT CORRESPONDENCE FROM NASA CONCERNING THESE RECOMMENDATIONS WAS DATED 1/13/99. THE SAFETY BOARD WOULD APPRECIATE LEARNING OF ANY FURTHER ACTIONS NASA HAS TAKEN OR INTENDS TO TAKE TO ADDRESS A-88-19, A-96-14, A-98-107, AND A-98-108.
10/19/2000	Addressee	Letter Mail Controlled 11/01/2000 8:13:05 AM MC# 2001575 ·NASA is working as a technical advisor to the FAA, the principal investigator for this recommendation, on a Residual Ice/Intercycle Ice project that was initiated in FY1999. · The work is a collaborative effort between both agencies, with representation from an ice protection manufacturer and two airframe manufacturers. At NASA, the work is conducted by the Icing Research group at our Glenn Research Center and is supported by their subject matter experts and facilities that incorporate results from the Icing Research Tunnel and the Icing Research Aircraft. · In FY2000, two tests have been conducted in an icing wind tunnel to examine the residual ice characteristics, and a follow-on test will be conducted in FY2001 in a NASA dry-air tunnel test will catalogue the aerodynamic effects. · This work will eventually provide the basis for a better understanding of residual ice and small ice accumulations and be included in training materials. · The work supporting A?98?108 is led by and predominantly funded by the FAA. NASA has supplied some funding, but principally provides test materials and subject matter experts.
3/12/2001	NTSB	NASA reports that it is working with the FAA on a Residual Ice/Intercycle Ice research project that was initiated in Fiscal Year (FY) 1999. In FY 2000, two tests were conducted in an icing wind tunnel to examine residual ice characteristics. NASA reports that, in FY 2001, a follow-on test will be conducted in a NASA dry?air wind tunnel to catalogue the aerodynamic effects. Pending completion of the wind tunnel tests and analysis of the aerodynamic effects of residual ice and small ice accumulations, Safety Recommendation A-98-108 remains classified “Open—Acceptable Response.”
12/10/2003	NTSB	The Safety Board's records indicate that the most recent correspondence from NASA concerning these recommendations was dated October 19, 2000. In this correspondence, NASA indicated that, regarding Safety Recommendation A-98-107, it had produced two training videos on icing and was planning to produce another, as well as a computer-based training module, for general aviation pilots. Regarding Safety Recommendation A-98-108, NASA indicated that it intended to conduct additional testing in a dry-air tunnel in fiscal year 2001. NASA stated that this testing was in support of the FAA and would eventually provide a better understanding of residual ice and small ice accumulations for incorporation in training materials. Based on NASA's plans, Safety Recommendations A-98-107 and -108 were classified "Open--Acceptable Response," pending NASA's development of the additional training materials and completion and analysis of the additional testing. The Safety Board would appreciate receiving an update from NASA regarding actions taken to address Safety Recommendations A-96-14, A-98-107, and A-98-108.
3/3/2004	Addressee	Letter Mail Controlled 3/15/2004 9:38:45 AM MC# 2040117 NASA lists this recommendation jointly with A-98-107, but all action described is in response to -107. There is no mention of research in response to the recommendation. "The information provided to Mr. Marcus should be sufficient to satisfy the recommendations listed. Please advise us if more information is required."
8/19/2004	NTSB	NASA's letter did not include any new information on actions taken in response to this safety recommendation. A companion recommendation, A-98-92, was issued to the FAA. Safety Recommendation A-98-92, along with several other recommendations concerning the reduction of dangers to aircraft flying in icing conditions, is on the Safety Board's Most Wanted list. The Board considers research on freezing rain and large water droplets and the modifications to aircraft design and operating procedures resulting from that research to be a critical need in the efforts to reduce aviation transportation accidents due to icing conditions and to save lives. The Safety Board urges NASA, in conjunction with the FAA, to continue and, if possible, expedite research in this area. The Board would appreciate an update on this research before our November 2004 Board meeting, when the icing-related recommendations on the Most Wanted list will be reviewed. Pending that updated information, Safety Recommendation A-98-108 remains classified "Open--Acceptable Response."

Recommendation Report

Thursday, April 02, 2009

Log Number 2924
Issue Date 12/15/2004

From 1987 to 2003, 26 icing-related accidents and incidents involving Cessna 208 series airplanes occurred, resulting in at least 36 fatalities. 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, the atmospheric conditions often encountered during cold weather
ground and flight operations, airplane dispatch considerations, and Cessna 208 pilot experience and training information.

Recommendation # A-04-067

Overall Status
OAA

Priority

The National Transportation Safety Board recommends that the Federal Aviation Administration expeditiously do the following: 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.

FAA	Open - Acceptable Response

3/17/2005 Addressee

Letter Mail Controlled 3/28/2005 2:05:07 PM MC# 2050133: The FAA will notify inspectors and operators of Cessna 208 airplanes of the relatively high rate of icing-related accidents and incidents involving these airplanes. Further, pending development of revised limitations and procedures for the Cessna 208 in icing
conditions, inspectors and operators will be encouraged to be particularly diligent in observing existing regulations regarding icing, including deicing requirements. Operators will be encouraged to do more, namely, to implement voluntarily additional ground deicing procedures known to be effective such as those contained in the current versions of Advisory Circular (AC) 20-117, AC 120-58, AC 120-60, and AC 135-17.

9/13/2005 NTSB

The Safety Board notes that the FAA has indicated that it will notify FAA inspectors and Cessna 208 operators of the high rate of icing-related accidents and incidents involving Cessna 208s. In addition, pending development of revised limitations and procedures for the Cessna 208 in icing conditions, the FAA will encourage inspectors and operators to be particularly diligent in observing existing regulations regarding icing, including deicing requirements.

The Safety Board's December 15, 2004, letter references a 2001/2002 safety evaluation study of the Cessna 208 conducted by the FAA's Alaskan Region System Safety Analysis Branch. That report 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 Regulation] 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 report recommended that its certificate management teams should "revisit" and "retarget" surveillance practices for Cessna 208 operators to ensure that deficiencies in those operators' icing-related training programs, personnel monitoring, and manuals and guidance are identified and corrected. At the time this recommendation was issued, the FAA had not taken this action.

Although acknowledging that notifying FAA inspectors to be vigilant of icing considerations with Cessna 208 operators is a step in the right direction, the Safety Board questions whether this action is fully responsive to the recommendation. The evaluation report completed by the Alaskan Region found that FAA systems did not detect deficiencies in operator training and qualification programs or problems with training for icing operations. Further, it is not clear that the FAA's proposed action is responsive to the recommendation in the Alaska Region's report that certificate management teams revisit and retarget Cessna 208 operators.

The Safety Board asks the FAA to explain how notifying inspectors of the problems of icing in Cessna 208 operations and encouraging diligence in observing existing icing regulations addresses the need for certificate management teams to "revisit" and "retarget" operators who fly Cessna 208 aircraft in icing conditions. Pending consideration of the Board's comments, Safety Recommendation A-04-67 is classified "Open--Acceptable Response."

Recommendation Report

Thursday, April 02, 2009

7/11/2008	Addressee	Letter Mail Controlled 7/22/2008 2:37:42 PM MC# 2080429: Robert A. Sturgell, Acting Administrator, FAA, 7/11/08 In response to Safety Recommendations A-04-64 and A-04-67, concerning annual cold weather operations training specific to pilots of Cessna 208 series aircraft, as well as the Federal Aviation Administration surveillance of such training programs, the FAA has taken the following actions: ·In addition to the annual recurrent icing training required by 14 Code of Federal Regulations section 135.35 1, on November 1, 2006, the FAA issued Safety Alert for Operators (SAFO) 06016 (enclosure l), to operators of Cessna CE-208 and CE-208B airplanes discussing the need for increased awareness of the dangers associated with in-flight icing. The SAFO emphasized the importance of following aircraft specific limitations and procedures established for flight into icing conditions; ·On May 17, 2007, the FAA published Airworthiness Directive (AD) 2007-10-15 (enclosure 2), requiring Cessna 208 series operators to incorporate S1 supplemental revision 10 dated February 20, 2007, into the applicable section of the Airplane Flight Manual and Pilot's Operating Handbook. This AD incorporates significant improvements to flight safety, including annual documented "type specific" pilot ground training before flights into icing conditions. Cessna Aircraft Company developed an annual training course specifically to address winter operations and icing issues related to the Cessna 208 series aircraft. The Cessna 208 icing training is available on-line to registered users at no cost, and users can access it at the following web address: http://www.cessnalearnina.com; and ·On November 30, 2007, the FAA published SAFO 07009 (enclosure 3), Cessna CE-208 and CE-208B Specific Pilot Training Requirements for Flight into Icing Conditions, outlining the annual specific Cessna 208 pilot training requirements. The FAA plans to issue a policy for principal operations inspectors with oversight responsibility of carriers operating Cessna 208 series airplanes, requiring them to validate that operators have incorporated the training requirements specified in AD 2007-10-15 into the operators' approved training program. Once we issue this policy we will forward a copy to the Board. We anticipate issuing this policy within 120 days.
1/29/2009	NTSB	The FAA indicated that it plans to issue a policy for its principal operations inspectors (POIs) with oversight responsibility for Cessna 208 operators, requiring the POIs to confirm that the operators have incorporated the training requirements specified in AD 2007-10-15 into the operators' approved training program. Pending issuance of the policy and appropriate action by FAA POIs in response, Safety Recommendation A-04-67 remains classified Open Acceptable Response.

Recommendation Report

Thursday, April 02, 2009

Log Number 2952
Issue Date 7/10/2006 **San Luis Obispo CA** **1/2/2006**

On January 2, 2006, about 1439 Pacific standard time, American Eagle flight 3008, a Saab-Scania AB SF340B+, N390AE, departed from San Luis County Regional Airport (SBP), San Luis Obispo, California, destined for Los Angeles International Airport (LAX), Los Angeles, California. The airplane encountered icing conditions during the en route climb and departed controlled flight at an altitude of about 11,500 feet mean sea level (msl) and descended to an altitude of about 6,500 feet msl. The pilots recovered control of the airplane and continued to their scheduled destination, where they landed about 1540 without further incident. American Eagle Airlines, Inc., operated the scheduled domestic passenger flight under the provisions of 14 Code of Federal Regulations (CFR) Part 121. The 2 flight crewmembers, 1 flight attendant, and 25 passengers were not injured, and the airplane did not sustain any damage. Instrument meteorological conditions (IMC) prevailed, and the flight was operating on an instrument flight rules flight plan.

Recommendation # A-06-049

Overall Status
OAA

Priority

The National Transportation Safety Board recommends that the Federal Aviation Administration: Require the installation of modified stall protection logic in Saab SF340 series airplanes certified for flight into known icing conditions.

FAA	Open - Acceptable Response

10/3/2006	Addressee	Letter Mail Controlled 10/10/2006 2:27:31 PM MC# 2060500: The FAA agrees the Saab SF340 series airplanes may benefit from improved stall warning in icing conditions. We are discussing this issue with EASA and Saab to determine the most effective method to address the stall warning system of the SF340 during icing conditions. We will provide a status update by November 17, 2006.
4/3/2007	NTSB	As with Safety Recommendation A-06-48, the FAA stated that it was discussing with EASA and Saab what actions would be taken in response to these recommendations, and the FAA was to provide a status update November 17, 2006. Again, the Safety Board has learned that it is taking longer than the FAA anticipated to obtain consensus on the issues addressed by Safety Recommendations A-06-48 through -50. Although the FAA believed that it would be able to provide an update by March 2007, the FAA now believes it will not be able to supply this information until July 2007. Without additional information, the Safety Board is unable to evaluate whether the actions that will be taken in conjunction with EASA and Saab will be responsive to these recommendations. Pending receipt of an updated status regarding what actions will be taken, Safety Recommendations A-06-49 and -50 remain classified Open Await Response.
8/11/2008	Addressee	Letter Mail Controlled 8/22/2008 8:16:27 AM MC# 2080508: Robert A. Sturgell, Acting Administrator, FAA, 8/11/08 In our last response, dated October 6, 2006, we agreed with the Board that the Saab SF340 series airplanes may benefit from improved stall warning in icing conditions. We also stated we were discussing this issue with EASA and Saab to determine the most effective method to address the stall warning system of the Saab SF340 during icing conditions. Based on our initial review of ice accretion used to certify the Saab SF340 for flight in icing conditions, we were concerned these ice accretions did not represent the most critical ice accretion that may occur in the environmental conditions defined in Appendix C to 14 CFR part 25. As a result, we requested Saab provide additional icing certification test data in order to evaluate the stall characteristics of the Saab SF340 during the most critical ice accretion defined in Appendix C to 14 CFR part 25. We have received this data and are working closely with Saab to determine appropriate stall warning and protection logic. We plan to provide the next update in February 2009.

2/4/2009	NTSB	After the FAA reviewed the ice accretion data used to certify the Saab SF340 for flight in icing conditions, the FAA was concerned that these ice accretions did not represent the most critical ice accretions defined in Appendix C of 14 Code of Federal Regulations Part 25. As a result, the FAA requested that Saab provide additional icing certification test data in order to evaluate the stall characteristics of the Saab SF340 during the most critical ice accretion defined in Appendix C. The FAA is currently reviewing this data with Saab to determine appropriate stall warning and protection logic. The actions described by the FAA are responsive to this recommendation; however, the Safety Board has several questions. Are the additional data that Saab supplied flight test data or something else? The FAA indicated that the data being supplied by Saab are based on ice accretions and conditions defined in Appendix C, and the Board notes that Appendix C does not address supercooled large droplet (SLD) conditions. Did the FAA request, and did Saab provide, any data concerning SLD conditions? Although the Board would appreciate receiving answers to these questions, the Board is encouraged that the FAA is evaluating modification to the stall protection logic in Saab 340 series aircraft. Therefore, pending modification of the stall protection logic in Saab SF340 aircraft certified for flight into known icing conditions, Safety Recommendation A-06-49 is classified Open Acceptable Response.

Recommendation # A-06-051

Overall Status

OAR

Priority

The National Transportation Safety Board recommends that the Federal Aviation Administration: 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.

FAA	Open - Await Response

10/3/2006	Addressee	Letter Mail Controlled 10/10/2006 2:27:31 PM MC# 2060500: This recommendation is similar to a previous NTSB Safety Recommendation A-98-97, which the FAA did not accept because it was determined that the benefits of workload reduction outweighed the risks of using autopilots during icing conditions. The FAA recognizes this recommendation differs slightly from safety recommendation A-98-97 and is considering A-06-51 in light of that difference. We will provide a status update by February 9, 2007.
4/3/2007	NTSB	The FAA's letter noted that this recommendation is very similar to Safety Recommendation A-98-97, which was classified Closed Unacceptable Action on January 12, 2001, because the FAA believed that the benefits of workload reduction outweighed the risks of using the autopilot during icing conditions. Recognizing the FAA's concerns about the benefits of workload reduction, the Safety Board included in Safety Recommendation A-06-51 the phrase except during intermittent periods of high workload. The FAA indicated that it was considering the recommendation and planned to provide a status update by February 9, 2007. However, the FAA now indicates that it will not be able to supply this update until July 2007. Although the Safety Board is encouraged that the FAA is considering the recommended action, Safety Recommendation A-06-51 remains classified Open Await Response pending receipt of additional information regarding how the FAA plans to meet the intent of the recommendation.

Total Number of Recommendations for Recommendation Report: 3

Selection for Report:

Recommendation Report

Friday, February 13, 2009

Log Number 2975
Issue Date 2/27/2007 **Pueblo CO** **2/16/2005**

On February 16, 2005, about 0913 mountain standard time,1 a Cessna Citation 560, N500AT, operated by Martinair, Inc., for Circuit City Stores, Inc.,2 crashed about 4 nautical miles east of Pueblo Memorial Airport (PUB), Pueblo, Colorado, while on an instrument landing system (ILS) approach to runway 26R. The two pilots and six passengers on board were killed, and the airplane was destroyed by impact forces and postcrash fire. The flight was operating under the provisions of 14 Code of Federal Regulations (CFR) Part 91 on an instrument flight rules flight plan. Instrument meteorological conditions (IMC) prevailed at the time of the accident.

Recommendation # A-07-012

Overall Status
OAA

Priority
CLASS II

The National Transportation Safety Board recommends that the Federal Aviation Administration:Require that operational training in the Cessna 560 airplane emphasize the airplane flight manual requirements that pilots increase the airspeed and operate the deice boots during approaches when ice is present on the wings.

FAA	Open - Acceptable Response

5/17/2007	Addressee	Letter Mail Controlled 5/31/2007 8:48:32 AM MC# 2070240: Marion C. Blakey, Administrator, FAA, 5/17/07 The Federal Aviation Administration agrees with the Board and is proposing the following to respond to this recommendation. Short Term Actions The FAA will complete the following actions within the next 12 months: ·Initiate an expedited request for changes to the Instrument Airplane and Airline Transport Pilot/Aircraft Type Rating Practical Test Standards (PTS) to place emphasis on knowledge of the hazards of flight in icing conditions in all phases of flight; and ·Issue a Notice to inspectors requiring them to advise all part 135 Principle Operations inspectors, part 91 K Program Managers, part 141 Pilot Schools, and part 142 Training Centers requiring Cessna Citation CE-560 operators to amend their ground and simulator curriculum to reflect the criticality of the proper operation of pneumatic boots (as stated in Advisory Circular (AC) 91-74) and stress the importance of increasing approach speed (Airplane Flight Manual (AFM) increasing approach speed (AFM increases to Vapp & Vref) when residual ice is present or can be expected during the approach and landing. -The Notice will have inspectors require examiners to test pilots knowledge of CE-560 operating procedures in icing conditions in both initial and recurrent training and require demonstration of this knowledge during practical tests and/or proficiency checks; and -The Notice will have inspectors require flight examiners to stress the critical importance of adherence to the disciplines of crew resource management (CRM) while operating in the heavy workload environments such as in-flight icing. Additional action under consideration: ·Consider revising the Cessna Citation 560 AFM procedures regarding the activation of the airframe ice protection system.
9/10/2008	NTSB	The FAA informed the Safety Board that it will initiate action to change the Instrument Airplane and Airline Transport Pilot/Aircraft Type Rating Practical Test Standards (PTS) to place emphasis on knowledge of the hazards of in-flight icing. The FAA will also issue a notice to inspectors requiring them to advise all Part 135 operators, Part 91 Subpart K Program Managers, Part 141 Pilot Schools, and Part 142 Training Centers to require Cessna C-560 operators to amend their ground and simulator curriculum (1) to emphasize the importance of the proper operation of pneumatic boots and (2) to stress the importance of increasing approach speed as directed in the airplane flight manual (AFM) when residual ice is present or can be expected during approach and landing. The notice will direct inspectors to require examiners to test pilots' knowledge of C-560 operating procedures in icing conditions in both initial and recurrent training and to require demonstration of this knowledge during practical tests and/or proficiency checks. Pending revision of the PTS and issuance of the notice, Safety Recommendation A-07-12 is classified Open Acceptable Response.

Recommendation Report

Friday, February 13, 2009

Recommendation # A-07-013

Overall Status
OAA

Priority
CLASS II

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:Require that all pilot training programs be modified to contain modules that teach and emphasize monitoring skills and workload management and include opportunities to practice and demonstrate proficiency in these areas.

FAA	Open - Acceptable Response

5/17/2007	Addressee	Letter Mail Controlled 5/31/2007 8:48:32 AM MC# 2070240: Marion C. Blakey, Administrator, FAA, 5/17/07 The FAA believes that training in CRM is adequately addressed for Title 14 Code of Federal Regulation (14 CFR) part 91 operations through the provisions of 14 CFR part 61 (61,55(b)(2)(iii), 61.58(d)) and the PTS (FAA-S-8081-5E). Both 14 CFR part 61 and the PTS specifically address the requirement for CRM in airman certification and checking. Some examples of the current requirements that FAA has that address this recommendation are: ·14 CFR 61.155 (c)(13), Aeronautical knowledge test for ATP, requires CRM training; ·The ATP & Aircraft Type Rating PTS addresses Aeronautical Decision Making (ADM) and CRM and states in part ...the examiner must evaluate the applicant's ability throughout the practical test to use good aeronautical decison making procedures in order to evaluate risks. The examiner must accomplish this requirement by developing scenarios that incorporate as many TASKS as possible to evaluate the applicant's risk management in making safe aeronautical decisions; ·14 CFR 61.58, Pilot-in-command proficiency check: Operation of aircraft requiring more than one pilot flight crewmember. Section 61.58 requires the practical test to be administered to PTS Type Rating standards (see above); 14 CFR 61.55, Second -in-command qualifications: Section 61.55 (b)(2)(iii) requires CRM training within the previous 12 months; ·14 CFR part 61 subpart E -Private Pilot requirements and 14 CFR part 6 1 subpart F -commercial pilots requirements identify the need to demonstrate knowledge of ADM (aeronautical decision making and judgment); and ·Private Pilot PTS and commercial pilot PTS requires knowledge of and testing of ADM and CRM. The FAA will consider identifying in its work program a list of required inspections that would reemphasize to the regional and flight standards district office (FSDO) managers the need to validate the training that is already required and to verify its effectiveness.
9/10/2008	NTSB	The FAA stated that monitoring skills and workload management are part of crew resource management (CRM) and that current CRM regulations adequately address these issues. The FAA indicated that it will consider identifying in its work program a list of required inspections, reemphasizing to the regional and flight standards district office managers the need to validate the training that is already required and to verify its effectiveness. Although current CRM regulations cover the issues addressed in this recommendation, the Safety Board has investigated a number of accidents and incidents, such as the Pueblo accident, where improved monitoring and workload management skills might have interrupted the chain of events that led to the accident, and thus prevented its occurrence. The FAA's proposal to identify a list of required inspections as described above is responsive to the recommendation provided that the list includes a strong emphasis on monitoring and workload management components of the CRM program. Pending the development of a list that includes monitoring and workload management components and its incorporation into FAA work programs for regional and flight standards district offices, Safety Recommendation A-07-13 is classified Open Acceptable Response.

Recommendation Report

Friday, February 13, 2009

Recommendation # A-07-014

Overall Status
OAA

Priority
CLASS II

The National Transportation Safety Board recommends that the Federal Aviation Administration:Require manufacturers and operators of pneumatic deice boot-equipped airplanes to revise the guidance contained in their manuals and training programs to emphasize that leading edge deice boots should be activated as soon as the airplane enters icing conditions. (A-07-14) (This safety recommendation supersedes Safety Recommendation A-98-91 and is classified Open Unacceptable Response.

FAA	Open - Acceptable Response

5/17/2007	Addressee	Letter Mail Controlled 5/31/2007 8:48:32 AM MC# 2070240: Marion C. Blakey, Administrator, FAA, 5/17/07 This safety recommendation supersedes A-98-91. The recommendation is the same as A-98-91 except that it was limited to turbopropeller-driven airplanes in which ice bridging is not a concern, and this recommendation expands the applicability to all pneumatic deice boot-equipped airplanes. In our previous responses to A-98-91, we provided the Board with details on proposed Parts 25 and 121 rule changes that address the activation of airframe ice protection systems. The proposed rules will not distinguish the type of powerplant and therefore these rulemaking activities remain relevant to this new recommendation. We previously reported to the Board in our October 26, 2005 letter that the regulatory evaluations on these rule changes had been delayed due to the higher priority of other safety-related rulemaking activities. In March 2006, the FAA raised the priority of the Part 25 Activation of Ice Protection rulemaking. The notice of proposed rulemaking for the Part 25 Activation of Ice Protection was published on April 26, 2007 and a copy is enclosed. The proposed Part 25 rule would require, after the initial activation of the ice protection system, that: ·The ice protection system operate continuously, or; ·The airplane be equipped with a system that automatically cycles the ice protection system, or; ·An ice detection system be provided to alert the flightcrew each time the ice protection system must be cycled. As we stated in our October 26, 2005 letter the FAA is considering an icing regulation change to Part 23 that will address the method and timing of boot activation, in addition to other icing related issues that affect Part 23 airplanes. In the interim, manufacturers of Part 23 airplanes have been following the guidance in Advisory Circular 23.1419-2C, which recommends that deicing boots be operated at the first sign of icing and in an appropriate continuous mode. The recommendations apply to all airplanes with pneumatic deicing boots. The FAA believes this action should not be taken on airplanes without modern boots due to the potential for ice bridging. Modern boots are defined as those that use small diameter tubes (up to 1.75 inches), operated at nominal pressures of at least 15 psig by excess bleed air from a turbine engine, and rapid inflation and deflation.
9/10/2008	NTSB	On April 26, 2007, the FAA published a notice of proposed rulemaking (NPRM) for the activation of the ice protection system (IPS) in Part 25 airplanes. The NPRM proposes to require IPS activation as soon as the airplane enters icing conditions. The NPRM also proposes that after the initial IPS activation, (1) the IPS operate continuously, (2) the airplane be equipped with a system that automatically cycles the IPS, or (3) an ice detection system be provided to alert the flightcrew each time the IPS must be cycled. For several years, the FAA has been considering a change to the Part 23 regulations concerning icing issues, including the method and timing of the IPS activation. The FAA indicated that in the interim, manufacturers of Part 23 airplanes have complied with Advisory Circular (AC) 23.1419-2C, which recommends that deicing boots be operated at the first sign of icing and in an appropriate continuous mode. The Safety Board is encouraged by the issuance of the NPRM, and on July 23, 2007, provided comments to the Docket for this rulemaking. The NPRM proposes actions for Part 25 airplanes that are responsive to Safety Recommendations A-07-14 and -15. Although the Board is concerned that the FAA has not yet initiated any rulemaking for Part 23 airplanes, AC 23.1419-2C addresses the regulatory changes recommended. Pending timely issuance of the final rule for the NPRM, and issuance of regulations for Part 23 airplanes, Safety Recommendations A-07-14 and -15 are classified Open Acceptable Response.

Recommendation Report

Friday, February 13, 2009

Recommendation # A-07-015

Overall Status
OAA

Priority
CLASS II

The National Transportation Safety Board recommends that the Federal Aviation Administration:Require that all pneumatic deice boot-equipped airplanes certified to fly in known icing conditions have a mode incorporated in the deice boot system that will automatically continue to cycle the deice boots once the system has been activated.

FAA	Open - Acceptable Response

5/17/2007 Addressee

Letter Mail Controlled 5/31/2007 8:48:32 AM MC# 2070240: Marion C. Blakey, Administrator, FAA, 5/17/07 This safety recommendation supersedes A-98-91. The recommendation is the same as A-98-91 except that it was limited to turbopropeller-driven airplanes in which ice bridging is not a concern, and this recommendation expands the applicability to all pneumatic deice boot-equipped airplanes.
In our previous responses to A-98-91, we provided the Board with details on proposed Parts 25 and 121 rule changes that address the activation of airframe ice protection systems. The proposed rules will not distinguish the type of powerplant and therefore these rulemaking activities remain relevant to this new recommendation. We previously reported to the Board in our October 26, 2005 letter that the regulatory evaluations on these rule changes had been delayed due to the higher priority of other safety-related rulemaking activities. In March 2006, the FAA raised the priority of the Part 25 Activation of Ice Protection rulemaking. The notice of proposed rulemaking for the Part 25 Activation of Ice Protection was published on April 26, 2007 and a copy is enclosed. The proposed Part 25 rule would require, after the initial activation of the ice protection system, that:
·The ice protection system operate continuously, or;
·The airplane be equipped with a system that automatically cycles the ice protection system, or;
·An ice detection system be provided to alert the flightcrew each time the ice protection system must be cycled.
As we stated in our October 26, 2005 letter the FAA is considering an icing regulation change to Part 23 that will address the method and timing of boot activation, in addition to other icing related issues that affect Part 23 airplanes. In the interim, manufacturers of Part 23 airplanes have been following the guidance in Advisory Circular 23.1419-2C, which recommends that deicing boots be operated at the first sign of icing and in an appropriate continuous mode.
The recommendations apply to all airplanes with pneumatic deicing boots. The FAA believes this action should not be taken on airplanes without modern boots due to the potential for ice bridging. Modern boots are defined as those that use small diameter tubes (up to 1.75 inches), operated at nominal pressures of at least 15 psig by excess bleed air from a turbine engine, and rapid inflation and deflation.

9/10/2008 NTSB

On April 26, 2007, the FAA published a notice of proposed rulemaking (NPRM) for the activation of the ice protection system (IPS) in Part 25 airplanes. The NPRM proposes to require IPS activation as soon as the airplane enters icing conditions. The NPRM also proposes that after the initial IPS activation, (1) the IPS operate continuously, (2) the airplane be equipped with a system that automatically cycles the IPS, or (3) an ice detection system be provided to alert the flightcrew each time the IPS must be cycled.

For several years, the FAA has been considering a change to the Part 23 regulations concerning icing issues, including the method and timing of the IPS activation. The FAA indicated that in the interim, manufacturers of Part 23 airplanes have complied with Advisory Circular (AC) 23.1419-2C, which recommends that deicing boots be operated at the first sign of icing and in an appropriate continuous mode.

The Safety Board is encouraged by the issuance of the NPRM, and on July 23, 2007, provided comments to the Docket for this rulemaking. The NPRM proposes actions for Part 25 airplanes that are responsive to Safety Recommendations A-07-14 and -15. Although the Board is concerned that the FAA has not yet initiated any rulemaking for Part 23 airplanes, AC 23.1419-2C addresses the regulatory changes recommended. Pending timely issuance of the final rule for the NPRM, and issuance of regulations for Part 23 airplanes, Safety Recommendations A-07-14 and -15 are classified Open Acceptable Response.

Recommendation Report

Friday, February 13, 2009

Recommendation # A-07-016

Overall Status
OUA

Priority
CLASS II

The National Transportation Safety Board recommends that the Federal Aviation Administration:When the revised icing certification standards (recommended in Safety Recommendations A-96-54 and A-98-92) and criteria are complete, review the icing certification of pneumatic deice boot-equipped airplanes that are currently certificated for operation in icing conditions and perform additional testing and take action as required to ensure that these airplanes fulfill the requirements of the revised icing certification standards. (A-07-16) (This safety recommendation supersedes Safety Recommendation A-98-100 and is classified Open Unacceptable Response.

FAA	Open - Unacceptable Response

5/17/2007	Addressee	Letter Mail Controlled 5/31/2007 8:48:32 AM MC# 2070240: Marion C. Blakey, Administrator, FAA, 5/17/07 This safety recommendation supersedes A-98-100. In response to safety recommendation A-98-100, we have taken certain actions for the safe operation of turbopropeller-driven airplanes in icing conditions. We are aware of the lessons learned from two major accidents, the ATR-72 accident in Roselawn, Indiana and the EMB-120 accident in Monroe, Michigan, which occurred in 1994 and 1998, respectively. We issued airworthiness directives (AD) against existing aircraft of designs similar to the accident airplanes (see enclosure). In addition, after a general review of icing accidents and incidents the FAA began a rulemaking project to amend the 14 CFR part 121 operating rules to improve the safety of the fleet. The proposed part 121 rule, in addition to those described in our October 2005 response to the Board, improves ice protection activation means and requires less subjective means of determining when the flightcrew should exit icing conditions. This rule is applicable to all booted airplanes. We believe these ADs and the planned part 121 rule will incorporate the lessons learned from both the Roselawn and Monroe accidents for existing turbopropeller-driven airplanes in service. As a result of the issuance of A-07-16, we have reexamined our position and find that our actions are appropriate for both turbopropeller and turbojet-driven airplanes, because many of the FAA actions were applicable to both types of airplanes. The FAA will take additional action for specific airplane models if we find evidence that an unsafe condition exists or is likely to develop in any in-service airplane type.
9/10/2008	NTSB	This safety recommendation supersedes Safety Recommendation A-98-100 by including all pneumatic deice boot equipped airplanes that are currently certificated for operation in icing conditions rather than only turbo-propeller aircraft equipped with pneumatic deice boots. The FAA stated that in response to Safety Recommendation A-98-100, it issued airworthiness directives (ADs) for existing aircraft similar in design to the ATR-72 airplane involved in the October 31, 1994, icing accident over Roselawn, Indiana, and an EMB-120 involved in the January 9, 1997, icing accident over Monroe, Michigan. In addition, the FAA is planning to revise the regulations in Part 121 (1) to address when the ice protection system should be activated and (2) to provide a less subjective means of determining when to exit icing conditions. The FAA believes that its actions are appropriate for both turbopropeller and turbojet airplanes. The FAA's October 26, 2005, response to Safety Recommendation A-98-100 indicated that the FAA believed the icing certification regulations and advisory material were sufficient to determine whether additional actions were needed to correct unsafe conditions on airplanes certificated at that time. The FAA further stated that it had determined that no unsafe conditions existed that warranted actions beyond those that had already been completed or were in the process of being completed. On May 10, 2006, the Board responded to the FAA that it agreed that suitable information was available to determine whether additional action was required. However, the Board did not agree that the FAA had applied the new information to all appropriate airplanes in service. The FAA found that there were no airplanes for which an unsafe condition existed, and the Board was concerned that the FAA had based its conclusion primarily on the absence of accidents or serious incidents. To meet the intent of Safety Recommendation A-98-100 (and now A-07-16), the FAA will need to formally evaluate (perhaps by conducting flight tests on) all existing pneumatic deice boot-equipped airplanes that are currently certificated for operation in icing conditions to ensure that these aircraft comply with all current icing certification criteria for new aircraft. In the May 10, 2006, letter, the Board asked the FAA to supply a list of those aircraft that it had formally evaluated and a summary of the findings and resultant actions. Pending receipt of such a list, Safety Recommendation A-98-100 was classified Open Unacceptable Response. The FAA has not supplied such a list of aircraft evaluated and resultant actions. Pending our receipt and review of a list of those aircraft that the FAA has formally evaluated and a summary of the findings and resultant actions, Safety Recommendation A-07-16 remains classified Open Unacceptable Response.

Recommendation Report

Friday, February 13, 2009

Recommendation # A-07-017

Overall Status
OAA

Priority
CLASS II

The National Transportation Safety Board recommends that the Federal Aviation Administration:Require modification of the Cessna 560 airplane's stall warning system to provide a stall warning margin that takes into account the size, type, and distribution of ice, including thin, rough ice on or aft of the protected surfaces.

FAA	Open - Acceptable Response

5/17/2007 Addressee

Letter Mail Controlled 5/31/2007 8:48:32 AM MC# 2070240: FAA Comment. Since December 2006, Cessna and the Wichita ACO have been aggressively working to gain a better understanding of the factors that may have contributed to the subject accident. The following factors have been identified:

Stall warning system operation with ice accretions, including freezing drizzle; Maintenance actions associated with the stall warning system; Deice boot replacement and associated stall strip maintenance actions; Adequacy of current Flight Manual; and Stall warning system design review.

Below you will find an action plan with associated status and schedule to address each of the identified factors.

Stall warning system operation with ice accretions:

On December 12, 2006, Cessna was notified of the need to conduct additional evaluations of the Model 560 with simulated ice shapes. This included the possibility of testing ice shapes for conditions outside of the current certification standards for supercooled large droplets. Cessna and the FAA are currently evaluating the following:

a. The adequacy of stall warning with artificial ice shapes representative of critical Appendix C icing conditions. This consists of shapes not tested during the '96/'98 investigation such as thin rough ice (sandpaper) and runback at near freezing temperatures; b. Stall characteristics with artificial ice shapes of item (a); and c. Additionally, we are re-examining the definition of the original ice shapes utilized during '96/'98 evaluations to verify their adequacy.

The FAA asked Cessna to:

a. Evaluate the adequacy of stall warning with artificial ice shapes representative of freezing drizzle icing conditions; b. Evaluate stall characteristics with artificial ice shapes of item (a); and c. Evaluate potential runback ice forming behind the protected wing leading edge in freezing drizzle.

The ongoing flight tests with the Appendix C simulated ice accretions are nearly complete. Results from the latest flight tests appear consistent with those from the '96/'98 evaluations. The data reviewed thus far indicate adequate stall warning margin for a properly biased system. The data also show that if the stall warning system fails to bias, results are consistent with the accident investigation findings. A cursory examination was conducted on the 1996 ice shapes, but a more detailed analysis will be required.

Once these critical Appendix C flight evaluations are completed and the data have been reviewed, Cessna and the FAA will discuss the need to examine icing conditions associated with freezing drizzle. Freezing drizzle is outside the required certification icing envelopes, but it may have been a factor in the subject accident. It is estimated Appendix C flight evaluations will be complete by the middle of November 2007.

Field and maintenance manual evaluations of stall warning system:

In addition to the flight evaluations for stall warning and handling characteristics above, Cessna and the FAA are evaluating a sample of representative in-service aircraft. The target sample size is 10 - 15 aircraft. This evaluation will examine the adequacy of maintenance/inspection procedures associated with inspection and/or adjustment of the angle of attacWstal1 warning system. It will also provide data, via flight tests, on in-service stall warning system performance. Two aircraft have been evaluated thus far and the FAA and Cessna are working to obtain additional aircraft to complete the evaluation. The maintenance procedure review is estimated to be complete by the end of July 2007 and it is estimated the aircraft survey task will be complete by December 2007.

9/10/2008	NTSB	On August 9, 2007, staff from the Safety Board met with staff from the FAA and Cessna at the FAA's Aircraft Certification Office in Wichita, Kansas, to discuss activities in response to this recommendation. The FAA and Cessna conducted an extensive evaluation that found that with the Appendix C icing conditions, the Cessna C-560 had an adequate stall warning margin. The evaluation then used test evaluation conditions for supercooled large droplet (SLD) icing developed by the aviation rulemaking advisory committee's ice protection harmonization working group to perform additional tests with ice shape conditions not currently specified in Part 23 or Part 25. Much of this work consisted of putting 40-grit sandpaper on the leading edge of the airfoil and then performing flight tests to evaluate the stall warning margin. Again, an adequate stall warning margin was found even in these flight tests simulating SLD conditions. Given that the FAA/Cessna investigation could not find icing conditions with a lack of stall warning margin similar to the conditions found in the February 16, 2005, accident that prompted this recommendation, other possible causes of the lack of stall warning margin were investigated. If the airplane's angle of attack (AOA) sensor is off calibration, the stall warning system will not be reliable. Cessna reviewed a number of in-service Cessna C-560 aircraft and found that all had AOA sensors out of calibration, and in every case, the out-of-calibration AOA had resulted in a stall warning's being issued at a lower speed than it should have, thus reducing the stall warning margin. In some cases the AOA sensor problem had resulted in the stall warning speed's being off as much as 7 knots, a significant error. Therefore, the FAA believes that the problem is with the AOA sensor, not with the stall warning speed margin in icing conditions. On November 15, 2007, the FAA issued AD 2007?23-13, which requires installing new minimum airspeed placards on C-560 aircraft to notify the flightcrew of the proper airspeeds for operating in both normal and icing conditions. The AD also requires revising the AFM to provide limitations and procedures for operating in icing conditions; for operating with anti-ice systems turned on, regardless of icing conditions; and for recognizing and recovering from an inadvertent stall. The FAA issued this AD to prevent an inadvertent stall due to the inadequate stall warning margin provided by an improperly adjusted stall warning system, which could result in loss of controllability of the airplane. Cessna is also examining the problem with the AOA sensor and is developing a service bulletin to alert C-560 operators of the need to check the AOA sensor's calibration and reset it if needed. The service bulletin may also include a continuing airworthiness requirement to periodically check the AOA sensor. The FAA plans to issue an AD to mandate this service bulletin when it is issued. The Safety Board considered the testing of SLD conditions performed with the C?560. The Board believes this was comprehensive work, and this testing may form the basis for certification tests to evaluate airplane handling in SLD conditions for future aircraft designs. However, the Board does not believe that this testing considered all of the SLD conditions of concern. Before concluding that the airplane has an adequate stall warning margin in SLD conditions, the Board believes that the FAA and Cessna need to consider additional icing conditions and additional locations of ice accumulation in SLD conditions. The details of the additional testing needed are technically complex and are best discussed in face-to-face meetings of the FAA and the Board's technical staff. Although the Safety Board does not believe the FAA is yet able to conclude that the C-560 airplane has an adequate stall warning margin in icing conditions, the Board is pleased to learn that the FAA and Cessna have identified the problem with the AOA sensor and are taking actions to resolve this issue. Pending a meeting of FAA and Safety Board technical staff to discuss additional SLD testing conditions needing evaluation and, if necessary, revisions to the stall warning margin in icing conditions based on the results of this additional testing, Safety Recommendation A-07-17 is classified Open Acceptable Response.

Total Number of Recommendations for Recommendation Report: 17

Selection for Report: