Office of the Inspector General
Inspection Report

REPORT ON
FEDERAL AVIATION ADMINISTRATION
DEICING PROGRAM

Report Number: E5-FA-7-001
Date: October 2, 1996

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EXECUTIVE SUMMARY

The Office of Inspector General (OIG), Department of Transportation, conducted an inspection of the Federal Aviation Administration (FAA) Deicing Program. Following the March 1992 crash of USAir Flight 405 at La Guardia Airport in New York, New York, FAA amended Federal Aviation Regulation (FAR) Part 121.629, and developed the "Aircraft Ground Deicing and Anti-Icing Program," to prevent future icing-related accidents. This inspection was to determine how these changes improved air safety during icing conditions. As a part of the inspection, we contacted 179 officials from FAA Flight Standards Service, Air Traffic, and Airports divisions, as well as air carriers and airport operators.

The FAA amended regulation still makes the pilot responsible for determining the airworthiness of an aircraft before takeoff, just like the deicing regulation prior to 1992. However, under the amended regulation, the pilot now has additional guidance, training, and support to make critical decisions on aircraft deicing. FAA sees its Deicing Program as having improved safety because no icing-related accidents have occurred since amending the regulation. We concluded the amended regulation will not eliminate icing-related accidents and incidents. Specifically, we determined FAA:

- has not systematically analyzed air carrier deicing programs to ensure "best practices" are widely implemented,
- does not adequately analyze results of its deicing inspections to improve the safety of air carrier deicing operations,
- has shortfalls in its airport operator regulations and in its method of identifying which airports need special deicing program focus,
- has little impact on facilitating the construction of deicing facilities, and
- lacks technical, in-house icing expertise.

Given these findings, we recommend:

- FAA Flight Standards Service:

    1. review air carrier deicing programs to ensure "best practices" are adopted within air carrier deicing programs; and

    2. take appropriate steps to ensure Aviation Safety Inspectors analyze the results of deicing inspections and use the data to plan future inspections and seek changes to air carrier deicing programs based upon problems identified.

- FAA Assistant Administrator for Airports:

    3. develop and systematically apply criteria to identify which airports need special deicing program focus and require these airports to develop deicing plans;

    4. revise FAR Part 139 to address the responsibilities of airport operators in icing conditions, including developing and providing deicing plans to FAA; and

    5. aid airport operators in resolving Environmental Protection Agency issues to facilitate construction of deicing facilities.

- FAA Office of Aircraft Certification:

    6. establish an icing expert position with oversight authority.

In response to our draft report, FAA concurred with Recommendations 2, and 5; partially concurred with Recommendations 1 and 6, and did not concur with Recommendations 3 and 4. In its response to the partially concurred and nonconcurred recommendations, FAA saw no reason to develop and publish criteria to define "special emphasis" airports because the selection of airports has since been expanded to include all airports which might be subject to icing conditions. In addition, FAA did not agree to revise FAR Part 139 because deicing plans are outside the control and jurisdiction of the airport operator.

In reviewing the FAA response, we agree there is no reason to define "special emphasis" airports if the selection of airports has been expanded to include all airports which might be subject to icing conditions. However, we did not agree with the other FAA responses. Therefore, we request FAA: (1) re-evaluate the

obsolescence of regional deicing coordinators, (2) require selected airports to develop local deicing plans and provide a listing of these airports, and (3) reconsider revising FAR Part 139 to address the responsibilities of airport operators in icing conditions. In addition, on the recommendations FAA concurred with we request FAA: (1) provide air carriers and aviation safety inspectors (ASI) with "best practice" information on deicing procedures; (2) provide a more detailed explanation of how ASIs use surveillance data to perform followup inspections or change an air carriers approved program; and (3) provide a detailed listing of the enforcement actions taken in the 1993-94 winter season. We modified the report, as necessary, based on information provided by FAA in its reply to the draft report. The entire text of the FAA reply is included as appendix I.

TABLE OF CONTENTS

INTRODUCTION

BACKGROUND

Aircraft Accidents Attributed to Icing Conditions

Aircraft accidents raised public concern about the safety of aircraft during icing conditions. These accidents include the March 1992 crash of a USAir aircraft at La Guardia Airport in New York, New York, and the October 1994 crash of an American Eagle aircraft in Roselawn, Indiana.

Table 1 shows there have been a total of 6 aircraft accidents and 203 fatalities in the United States attributable to ice accumulation since 1982. The aircraft in three of the accidents received no deicing[1] or anti-icing[2] prior to takeoff. These accidents occurred because: (1) the flight crew[3] did not recognize conditions conducive to ice formation, (2) the aircraft was delayed on the ground after deicing, or (3) the visual pilot inspection from the flight deck did not detect ice contamination.

Table 1: Listing of Aircraft Accidents

No.	Date	Location	Icing Conditions	Fatalities
1.	January 1982	Washington, DC	Moderate Snow	78
2.	February 1985	Philadelphia, PA	* Ice, Snow Pellets, Freezing Rain	0
3.	November 1987	Denver, CO	* Moderate Snow, Fog	28
4.	February 1991	Cleveland, OH	* Light Snow	2
5.	March 1992	New York, NY	Moderate Wet Snow	27
6.	October 1994	Roselawn, IN	Freezing Rain	68
			Total	**203**

* Indicates Aircraft Not Deiced

As a result of these accidents and ensuing public concern, the Office of Inspector General (OIG) initiated this study to review the corrective action taken by the Federal Aviation Administration (FAA) to improve aircraft safety in icing conditions.

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1 **deicing**--the removal of accumulated frost, ice, or snow from an aircraft surface by the application of heated water or fluid (such as a glycol-based fluid).

2 **anti-icing**--the treatment of an aircraft surface with a fluid (such as a glycol-based fluid) to prevent the formation of frost, ice, or snow.

3 **flight crew**--the pilot and other air carrier personnel working on the flight deck of the aircraft.

Regulation Establishes "Clean Aircraft Concept"

Frost, snow, or ice on an aircraft can seriously degrade aircraft performance during takeoff. Even small amounts can alter flight characteristics and reduce controllability. According to an FAA training video, a layer of ice on an aircraft wing can reduce lift by 30 percent and increase drag as much as 40 percent. Federal Aviation Regulation (FAR) Part 121.629, "Operation in Icing Conditions," established the "clean aircraft concept" in 1950. This regulation prohibits takeoff of aircraft when frost, snow, or ice are adhering to wings, propellers, or control surfaces of the aircraft.

According to FAA Advisory Circular 120-58 dated September 30, 1992, and titled, "Pilot Guide: Large Aircraft Ground Deicing," the North American and European aviation communities commonly deice and, if necessary, anti-ice an aircraft before takeoff in order to obtain a "clean aircraft" free of snow and ice. Most commonly, this involves application of heated aqueous solutions of Freezing Point Depressant (FPD) fluids, such as ethylene glycol, to deice aircraft surfaces. This treatment is followed by anti-icing the surfaces using cold, rich FPD solutions that are thicker and have a lower freezing point. This anti-icing treatment provides a protective film to delay formation of snow and ice on the aircraft.

Attention Focuses on Ground Deicing

In the wake of the La Guardia accident, FAA sponsored an International Conference on Airplane Ground Deicing and Anti-icing (hereafter called the Conference) in May 1992. Over 800 representatives from airlines, aircraft manufacturers, airport operators, and Air Traffic Control (ATC) attended. Conference working groups made recommendations to FAA on ground deicing, including the following:

- use holdover time[4] as an operational guideline,
- train the pilot and ground crew[5] on the proper use of holdover times, and
- train air carrier personnel on deicing and on aircraft checks.

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[4] **holdover time**--estimated time deicing or anti-icing fluid will prevent the formation of frost or ice and the accumulation of snow on the protected surfaces of an aircraft. Holdover time begins when application of a deicing or anti-icing fluid commences and expires when the deicing or anti-icing fluid applied to the aircraft loses its effectiveness.

[5] **ground crew**--air carrier personnel who work on the aircraft (i.e., mechanics) but are not involved in its operation.

Responding to the conference recommendations and related recommendations from oversight agencies, FAA assigned deicing responsibilities to organizations listed in Table 2.

FAA amended FAR Part 121.629, "Aircraft Ground Deicing and Anti-Icing Program," on September 29, 1992. The amended regulation requires each air carrier operating under FAR Part 121,[6] "Certification and Operations: Domestic, Flag, and Supplemental Air Carriers and Commercial Operators of Large Aircraft," to follow an FAA-approved deicing program requiring (1) flight and ground crew deicing training, (2) establishment of operational holdover times, and (3) specific aircraft checks when holdover times expire. To oversee execution of these programs, FAA Flight Standards Service (AFS) focused surveillance activities on these air carrier deicing programs. In addition, the FAA Administrator requested airport operators work with air carriers and local ATC to develop local deicing plans identifying actions to maximize the effectiveness and efficiency of operations during deicing conditions.

FAA Air Traffic and Airports Organizations also made internal changes to improve air safety under icing conditions. Air Traffic trained its air traffic controllers and made operational changes to aggressively manage the flow of departure traffic within holdover times. In addition, FAA encouraged local ATCs to improve coordination with local airport managers and air carriers to facilitate effective airport operations under icing conditions. Finally, Airports prioritized funding for deicing facility improvements, with improvements worth $67 million in process as of August 1994.

Table 2: Deicing Responsibilities

Organization	Responsibilities
FAA	
Flight Standards Service	• Develop deicing regulations. • Approve air carrier deicing programs. • Conduct surveillance of air carriers.
Air Traffic	• Manage the flow of aircraft to minimize the time from deicing to takeoff. • Coordinate with air carriers and airport management during icing conditions.

[6] **FAR Part 121 air carrier**--a carrier operating large aircraft with a seating capacity of more than 30 passengers.

Airports	• Prioritize requests for Federal funds to ensure deicing projects receive top priority.
Airport Operators	• Develop local deicing plans. • Ensure snow-free runways. • Determine need for remote deicing facilities. • Determine environmental impact of deicing.
Air Carriers	• Develop air carrier deicing programs in accordance with FAR 121.629.

INSPECTION GOALS AND OBJECTIVES

The goal of this inspection is to determine how the FAA Deicing Program has improved air safety during icing conditions. In support of this goal, four objectives were identified:

1. Assess how FAA establishes, implements, and enforces regulations which promote the "clean aircraft concept" during icing conditions.

2. Assess FAA guidelines to minimize the time a deiced aircraft waits before takeoff.

3. Assess how FAA allocates airport improvement funds to ensure deicing projects receive priority.

4. Assess FAA efforts to identify and correct the deficiencies involving in-flight icing on the Avions de Transport Regional (ATR) aircraft.

INSPECTION SCOPE AND METHODOLOGY

We focused our review on the FAA Deicing Program for FAR Part 121 operators. Although this inspection dealt primarily with ground deicing issues, we did review the October 1994 crash of an ATR aircraft. Specifically, we examined FAA efforts to identify and correct the deficiencies involving in-flight icing leading to the October 1994 airplane crash. This review was conducted in

accordance with the President's Council on Integrity and Efficiency's Quality Standards for Inspections.

Interviews and Observations

As part of our inspection, we contacted 179 officials from FAA AFS, ATC, and Airports divisions, as well as air carriers and airport operators. Specifically, we interviewed (1) the FAA aviation safety inspectors responsible for overseeing air carrier deicing and (2) the ATC managers at special emphasis airports.[7] In addition, we interviewed airport operators at special emphasis airports. We also observed deicing activities at the Chicago O'Hare and Midway Airports, as well as the Dallas/Fort Worth International Airport. We conducted these observations on the tarmac with aviation safety inspectors (ASIs) and from within the terminal buildings.

Document Reviews

We reviewed various documents, including ATC regional assessments of the 1993-94 winter operation, a training videotape of deicing responsibilities for air traffic controllers, local deicing plans for special emphasis airports, air carrier deicing programs, the Program Tracking and Reporting Subsystem (PTRS) database, and the Aviation Safety Reporting System (ASRS) database. We reviewed these documents to determine how FAA Deicing Program was working.

Report Data

Our data collection occurred primarily between August 1994 and April 1995. Data for the 1993-94 winter deicing season was the most recent complete season information available at that time. We have updated the report where information was readily available. Based on continuing problems reported in the ASRS database, the FAA response to our draft report in May 1996, and our followup observations of deicing operations in 1996, the problems reported herein continue through the date of this report.

Prior Coverage

Studies by the General Accounting Office (GAO) address aspects of the amended deicing regulation. These studies, listed in appendix B, served as reference points for this inspection.

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[7] **special emphasis airports**-airports where deiced aircraft are most likely to encounter icing conditions while awaiting departure clearance.

FINDINGS AND RECOMMENDATIONS

The FAA Deicing Program enhanced air carrier deicing procedures and increased pilot awareness of the effects of icing conditions. FAA officials correctly assert that no ground icing-related accidents have occurred since FAA amended its deicing regulations; however, icing-related incidents (which can lead to an accident) have continued to occur (discussed on page 19). Our inspection concludes problems exist in the interpretation, implementation, inspection, and enforcement of FAA Deicing Program. In addition, FAA oversight falls short regarding airport operators, airports requiring special deicing program focus, construction of deicing facilities, and deicing expertise.

FINDING 1: AIR CARRIER DEICING PROGRAMS

FAA has not systematically analyzed air carrier deicing programs to ensure "best practices" are widely implemented. FAA amended regulations (FAR 121.629) require air carriers to have FAA-approved deicing programs. FAA required these deicing programs to cover key operational issues--crew training, holdover times, and aircraft checks--but did not otherwise standardize the air carrier programs. In response, air carriers produced programs that differ significantly. FAA has not systematically analyzed these air carrier programs to ensure "best practice" features of deicing programs are adopted by all air carriers because FAA did not define the responsibilities of the Regional Deicing Coordinators.

According to the National Transportation Safety Board (NTSB), the flight crew of USAir Flight 405 that crashed at La Guardia in 1992 lacked information necessary to decide whether the airplane was ice-free at takeoff. According to FAA, the intention of the amended regulation FAR 121.629 is to provide enhanced procedures for safe takeoffs during adverse weather conditions. Under the amended regulation, each air carrier deicing program must:

1. provide training to flight and ground crews,

2. require application of holdover times, and

3. require flight and ground crews to check the aircraft for ice.

FAA provided more detailed guidance on winter operations in over 45 documents including advisory circulars, technical bulletins, and manufacturers newsletters; however, it was left up to the air carriers to interpret and implement the information in an air carrier deicing program. Before approval, individual

ASIs reviewed the air carrier deicing programs to ensure the interpretation and implementation of the regulations were appropriate. Since the regulation lacked minimum standards beyond specifying general areas of coverage, ASIs had to use their judgment in reviewing the air carrier deicing programs. Further, no one within FAA systematically analyzed the similarities and differences among the air carrier deicing programs.

A representative from AFS stated approximately 90 of the 101 FAR Part 121 air carriers developed an FAA-approved deicing program by the November 1, 1992, deadline. Air carriers not having an FAA-approved deicing program either do not operate in cold weather climates, or they must conduct an outside-the-aircraft check within 5 minutes of takeoff. To assess the 90 FAA-approved programs, we reviewed a sample of 10 air carrier deicing programs (11 percent) to determine how they addressed the three requirements listed above.

Provide Training to Flight and Ground Crews

The amended regulation requires an air carrier deicing program to include initial and annual ground training, testing, and qualification for flight crew members, ground crew members, and all other personnel involved in the deicing process. Some air carriers developed new, stand-alone documents describing deicing training requirements, while others referred to established programs or procedures. Training covers various subjects such as the use of holdover times, aircraft deicing procedures, types and characteristics of deicing fluids, identification of aircraft surface contamination, and deicing checks. To train employees, air carriers use bulletins, operating manual revisions, training videotapes, self-grading exams, or other materials.

While all 10 programs include both initial and annual recurrent training for the flight and ground crews as required by regulation, they still vary substantially. Some air carrier programs provide only a general description of training, while others provide outlines of the training classes and sample exams which specify passing grades. Most programs do not specify the length of the deicing training, although one carrier allots 4 to 7 hours for initial flight crew training and 2 hours for recurrent training. To test flight and ground crews' understanding of the deicing training, the air carrier programs specify classroom (or home study) examinations, ranging from 10 to 40 questions, with minimum passing scores from 75 to 90 percent. Beyond standard classroom training, one air carrier requires flight crews to pass an annual flight simulator drill which covers ice detection, types of inspections, effectiveness of glycol, and other components in the deicing program.

ASIs were inconsistent in identifying problems with air carrier training programs. For example, ASIs disagreed over whether a light dusting of snow on the wing constitutes ice contamination requiring a deicing procedure. Specifically, FAR 121.629 prohibits aircraft from taking off with ice or snow "adhering" to the wings or other critical surfaces. Some ASIs and air carrier personnel interpreted this to mean any type of precipitation "covering" an aircraft, even if it is only a light dusting easily blown off at takeoff. Other ASIs and air carrier personnel interpreted "adhering" to mean snow had to stick to a wing before deicing was required. In addition, inconsistencies exist in how ASIs and air carriers apply holdover times and require flight crews to check aircraft for ice.

Require Application of Holdover Times

The amended regulation requires air carrier programs to use holdover times as an operational planning guideline for pilots, because time is a critical factor when weather requires deicing of an aircraft before takeoff. All 10 of the air carrier deicing programs provide a holdover chart similar to Table 3 below and identify holdover time as beginning when the final application of deicing fluid commences. In addition, all 10 of the air carrier deicing programs instruct employees to be conservative in determining holdover times.

According to a representative from an air carrier industry association who attended the 1992 Conference, air carriers believe in the use of holdover times. However, this air carrier representative said holdover time needs to be flexible because it depends on variables such as weather; unique aircraft characteristics; physical inspection of critical surfaces before takeoff; and different deicing equipment, fluids, and procedures. As demonstrated in Table 3, FAA agrees with a need for flexible holdover times. All the programs we reviewed address this flexibility.

Table 3: Holdover Times*

Outside Air Temperature		Deicing / Anti-icing Fluid/Water (% by Volume)	Approximate Holdover Times Anticipated Under Various Weather Conditions (hours:minutes)				
ºC	ºF		FROST	FREEZING FOG	SNOW	FREEZING RAIN	RAIN ON COLD SOAKED WING
0 and above	32 and above	100/0 75/25 50/50	12:00 6:00 4:00	1:15-3:00 0:50:2:00 0:35-1:30	0:25-1:00 0:20-0:45 0:15-0:30	0:08-0:20 0:04-0:10 0:02-0:05	0:24-1:00 0:18-0:45 0:12-0:30
below 0 to -7	below 32 to 19	100/0 75/25 50/50	8:00 5:00 3:00	0:35-1:30 0:25-1:00 0:20-0:45	0:20-0:45 0:15-0:30 0:05-0:15	0:08-0:20 0:04-0:10 0:01-0:03	**CAUTION! clear ice may require touch for confirmation**
below -7 to -14	below 19 to 7	100/0 75/25	8:00 5:00	0:35-1:30 0:25-1:00	0:20-0:45 0:15-0:30		
below -14 to -25	below 7 to -13	100/0	8:00	0:35-1:30	0:20-0:45		
below -25	below -13	100/0 if 7ºC (13ºF) Buffer is maintained	A buffer of at least 7ºC (13ºF) must be maintained for Type II used for anti-icing at Outside Air Temperature below -25ºC (-13ºF). Consider use of Type I fluids where Society of Automotive Engineers or International Standards Organization Type II cannot be used.				

* The above table appears in FAA Interim Final Rule and Advisory Circular 120-60.

Based on their inspection results since the air carrier deicing programs were introduced, ASIs identified deficiencies in air carrier application of holdover times. For example, one ASI stated flight crews needed more information on applying holdover timetables to specific weather conditions. Specifically, snow could be:

- **Heavy**--Snow very cohesive when compressed, containing lots of water (makes hard snowballs);
- **Moderate**--Snow has some moisture but does not turn to ice when compressed; or
- **Light**--Snow has little moisture content and low cohesion (poor snowball material--falls apart).

With this more specific information, holdover time ranges could be based upon the severity of the weather condition--heavy snowfall restricts aircraft holdover time to approximately 6 to 9 minutes, a moderate snowfall approximately 9 to 12 minutes, and a light snowfall approximately 12 to 15 minutes. This guidance is more sensitive and useful to the flight crew than the current practice of calculating holdover time between 6 and 15 minutes if it is snowing.

Another ASI identified timekeeping inconsistency in air carrier application of holdover times. The ASI stated the communication of holdover starting time is critical because important discrepancies may occur between the beginning holdover time quoted by a ground crew member using a wrist watch and the holdover time recorded by the pilot using an aircraft clock. Seven of the ten (70 percent) air carrier deicing programs addressed communication between the ground and flight crew. These programs commonly require the ground crew to communicate fluid type, percentage of glycol, and the start time of the final fluid application to the pilot. Two of the ten air carriers (20 percent) had a better approach to eliminate time discrepancies by requiring the ground crew to specify how many minutes have elapsed since the final fluid application. For example, one air carrier deicing program included the following information:

> When holdover time starts the ground crew would inform the pilot, "Captain, your deicing started at 10:30"; however, the air carrier determined providing a certain time was confusing because the time for one individual could be different from another. The air carrier decided to simplify the information and inform the pilot, "Captain, your holdover time started 2 minutes ago."

These examples illustrate how additional information can prevent flight crews from miscalculating holdover times.

Require Flight and Ground Crews to Check the Aircraft for Ice

The amended regulation requires air carrier programs to ensure flight and ground crews check the aircraft wings or other critical surfaces for ice before takeoff. The critical surfaces[8] to be checked are determined by either manufacturer data or air carrier operational experience.

FAA regulations permit these checks to be made from inside the airplane under most circumstances. For example, regulations require an air carrier to perform a pre-takeoff check[9] for ice from inside the airplane any time holdover time procedures are in use. However, if an aircraft exceeds its maximum holdover time, the current regulation gives air carriers three alternatives:

1. The aircraft can repeat the deicing process and establish a new holdover time.

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8 **critical surfaces**--include the leading edge and upper surface of the aircraft wing.

9 **pre-takeoff check**--is normally accomplished within the holdover time by the flight crew from the flight deck. This usually involves a flight crew member looking out of the window or a passenger window to ensure no ice has formed on the aircraft's wings.

2. The aircraft can takeoff if the air carrier has obtained approval for an alternate procedure,[10] or has new technology[11] capable of determining the aircraft is free of frost, ice, or snow.

3. Qualified air carrier personnel may perform a pre-takeoff contamination check.[12] ASIs may approve this check from inside the aircraft as part of an air carrier's deicing program; however, air carriers not having a deicing program must perform an outside-the-aircraft check.

Air carriers differ on whether to rely on the flight crew inside the aircraft to detect ice on the wings. According to one air carrier official, it is too difficult for a pilot inside the aircraft to see ice on the wings, especially at night. The official added this is especially critical when "clear ice"[13] develops on two types of aircraft, the MD-80 and the DC-9. In addition, the Airline Pilots Association (ALPA) is strongly against requiring pilots to look out windows to check whether there is ice formation on the wings. Both the air carrier official and ALPA state licensed, qualified mechanics should complete external deicing checks at the gate, deicing pad, or end of runway as appropriate. However, 9 of the 10 (90 percent) air carrier deicing programs we reviewed allow pilots to check for wing ice by looking out an aircraft window because it is quicker and easier than performing a physical inspection on an aircraft in line for takeoff. Based on our review of ASRS data (discussed later in this report), 73 percent of the deicing incidents, occurring after FAA amended FAR Part 121.629, indicate problems with aircraft ice checking procedures.

An air carrier determines, subject to ASI approval of the air carrier deicing program, whether to perform checks internally or externally based on numerous factors. For example, one air carrier performs its checks externally because it operates a large number of aircraft prone to "clear ice," and an external check is the only way to detect "clear ice." Our review of the 10 air carrier programs determined only 1 air carrier always requires an outside-the-aircraft inspection prior to takeoff. Five of the ten require an outside-the-aircraft check at the gate, deicing pad, or end of runway under certain circumstances, such as when holdover times are exceeded on certain types of aircraft. Lastly, four air carriers

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[10] **alternate procedure**--such as an outside-the-aircraft check to ensure ice has not developed.

[11] **new technology**--such as a deicing fluid that changes color when ice has formed.

[12] **pre-takeoff contamination check**--is accomplished within 5 minutes prior to beginning takeoff and must be accomplished from outside the aircraft unless otherwise approved by FAA.

[13] **clear ice**--ice which is difficult to see and in many instances cannot be detected other than by touch with the bare hand or by means of a special ice detector.

do not require an outside-the-aircraft check under any circumstances, even if holdover time has expired.

FAA maintains allowing a check from inside the aircraft is safe because, with the detailed guidance provided under the deicing programs, pilots will make better decisions. In its report "New Regulations for Deicing Aircraft Could Be Strengthened," dated November 1992, GAO disagreed noting obstructed views, distance, and poor lighting can make it difficult, if not impossible, to detect ice from inside an aircraft. Furthermore, FAA's Advisory Circular 120-58 recognizes that the only definitive method of detecting ice is to closely inspect an aircraft's exterior. Some air carriers stated an outside-the-aircraft check was unsafe with the engines running (particularly propeller drive aircraft). Further, an outside-the-aircraft check is impractical because most airports do not have a facility near the end of the runway to perform these checks.

Regional Deicing Coordinators Failed to Standardize Deicing Programs

FAA oversight of air carrier deicing programs is inconsistent because FAA failed to define Regional Deicing Coordinators responsibilities. FAA established Regional Deicing Coordinators to ensure ASIs in Flight Standards District Offices (FSDO) were aware of the amended regulation and to provide assistance to the air carriers in developing and implementing their deicing programs. In commenting on the amended regulation, NTSB agreed with FAA intent to establish a position in each regional office to serve as a reference and standardization point of contact for the deicing program. According to the four Regional Deicing Coordinators we interviewed, their responsibilities include distributing deicing information sent by the FAA Headquarters to FSDOs. In addition, according to an AFS official, the coordinator also collects all the air carrier deicing programs from the FSDOs (located within their region), reviews and seeks air carrier modifications when necessary for FAA approval to ensure the program meets the standard, subsequently submitting copies to the FAA Headquarters.

However, not all Regional Deicing Coordinators chose to review air carrier deicing programs. Of the four deicing coordinators we interviewed, two indicated they played a major role in ensuring air carriers correctly interpreted information (i.e., rules, regulations, and advisory circulars) in preparing their deicing programs. One Regional Deicing Coordinator stated his main function was to provide deicing information submitted by the FAA Headquarters to FSDOs, not to review air carrier deicing programs. Another Regional Deicing Coordinator indicated he just disseminated deicing information. As a result, Regional Deicing Coordinators were inconsistent in their review and approval of

air carrier deicing programs. By not defining the responsibilities of the Regional Deicing Coordinators, FAA did not ensure these individuals were consistent in their oversight.

Conclusion

To give pilots necessary information to make effective deicing decisions, FAA amended regulations to require air carriers to have FAA-approved deicing programs. FAA required these programs cover key operational issues--crew training, holdover times, and aircraft checks--but otherwise did not ensure "best practice" among the air carrier programs. Although the air carriers produced programs that differ significantly, FAA has not taken the opportunity to benefit overall safe winter operations by systematically analyzing these air carrier programs and sharing information among air carriers. As a result, safety is impacted because FAA did not ensure "best practices" were adopted within air carrier deicing programs.

RECOMMENDATION

We recommend FAA Flight Standards Service:

1. Review air carrier deicing programs to ensure "best practices" are adopted within air carrier deicing programs.

Agency Comments. FAA concurred with a need for the Flight Standards Service to review air carrier deicing programs, but FAA did not concur with a need to define the responsibilities of Regional Deicing Coordinators.

Review air carrier deicing programs--FAA policy requires ASIs to review each air carrier deicing program annually to incorporate "lessons learned." During the yearly reviews, ASIs ensure each air carrier program appropriately incorporates new information from recently published Flight Standards Information Bulletins (FSIB) related to icing programs. Air carriers may incorporate this information in different ways due to operational and environmental differences.

Define responsibilities of Regional Deicing Coordinators--This is unnecessary because coordinator duties are no longer required. The regional deicing coordinator was a temporary collateral duty assigned to a Flight Standards staff member in each region. Once all air carriers developed FAA-approved deicing programs, a regional deicing coordinator was no longer needed.

Evaluation of FAA Comments. Review air carrier deicing programs--We agree with the annual FAA review of air carrier deicing programs to incorporate "lessons learned." However, the inconsistencies identified in our report, such as training, applying holdover times, and checking the aircraft for ice, are where "lessons learned" have not been incorporated. While each air carrier has its own way of doing things, some air carriers ideas are better than others. Air carriers recognize this difference and would like to know what procedures FAA considers "best" so they can improve their deicing programs.

Define responsibilities of regional deicing coordinators--None of the four Regional Deicing Coordinators we contacted during the study indicated the position was temporary. After reviewing FAA comments, we contacted one coordinator who indicated he still serves as a focal point to handle such duties as answering questions about air carrier deicing plans and serving as liaison between FAA and air carriers.

We have considered FAA comments related to specific aspects of the report. Accordingly, we request FAA (1) provide air carriers and ASIs with "best practice" information on deicing procedures, and (2) re-evaluate the obsolescence of regional deicing coordinators. Please respond to OIG on the above two issues within 60 days from the date of this report.

FINDING 2: SURVEILLANCE OF AIR CARRIER DEICING ACTIVITY

FAA does not adequately analyze results of its deicing inspections to improve the safety of air carrier deicing operations. ASIs stepped up their surveillance activity to monitor air carrier compliance with their approved deicing programs. FAA can now identify how many deicing inspections it performed, but has done little analysis of what problems inspectors found and what corrective actions resulted. Without this information, FAA cannot measure inspection results and target future inspections. In addition, in 1993-94, FAA had not taken any enforcement action to ensure compliance with its deicing inspection program.

Increased Surveillance of Air Carrier Deicing Activity

FAA uses surveillance to: (1) determine air carrier ability to comply with regulations and meet its operating specifications, and (2) monitor the training and testing given to flight and ground crews. Table 4 shows surveillance is a sample process where ASIs observe a small percentage (i.e., less than 1 percent for deicing inspections) of air carrier operations.

Table 4: Deicing Surveillance of Air Carriers 1993-1994

Air Carrier	Carrier Group	Number Departures	Deicing Inspections
American Airlines	Major	875,059	354
America West Airlines	Major	182,579	61
Continental Airlines	Major	451,927	178
Delta Airlines	Major	945,630	256
Express One International	Large Regional	15,224	9
Federal Express Corp.	Major	238,244	62
North American Airlines	Medium Regional	233	1
Northwest Airlines	Major	510,683	302
Shuttle, Inc.	National	21,798	16
Southwest Airlines	Major	507,990	112
Tower Air	National	2,308	9
Trans World Airlines	Major	255,839	341
United Airlines	Major	698,437	348
United Parcel Service	Major	83,685	54
USAir	Major	852,102	247

The amount of surveillance activity needed to determine program compliance can vary. As shown in Table 4, a major air carrier with a large number of annual departures receives more surveillance inspections than small carriers with fewer flights. According to an AFS official, FAA conducts relatively few surveillance inspections on air carriers with good compliance records based on FAA surveillance results, while air carriers with bad records receive many surveillance

inspections. Further, FSDOs may emphasize different surveillance activities depending on the compliance records. For example, a FSDO may emphasize deicing equipment inspections if ASIs note equipment consistently malfunctions.

FAA Order 8400.10, Air Transportation Operations Inspector Handbook, provides policy, direction, and guidance to ASIs for evaluating and approving air carrier deicing programs. Deicing surveillance activities are diverse. According to FAA Order 8400.10, an ASI may:

- request a pilot, upon arrival at the gate, to produce and explain use of holdover tables;
- observe the application of deicing fluid from mobile deicing equipment at the gate;
- observe the flight crew actions and communications during an en route inspection[14] under icing conditions; or
- check air carrier training records to verify all crew and required personnel have had deicing training.

ASIs conduct some types of deicing surveillance only when icing conditions exist, such as observing the application of deicing fluid. Other deicing inspections may occur at any time, such as verifying all required personnel have had deicing training.

FAA increased its emphasis on deicing surveillance in its National Program Guidelines. According to an AFS official, ASIs reviewed deicing activities as part of surveillance before amending the regulation in 1992. Since 1992, however, ASIs perform specific inspections on deicing and record the results in FAA PTRS database--an information management and analysis system used to collect and analyze surveillance data. In addition, AFS annually issues National Program Guidelines establishing "required" and "planned" surveillance activity. Although FSDOs are not "required" to do a target number of deicing inspections because they depend upon weather, AFS designated deicing surveillance as an emphasized surveillance activity in its National Program Guidelines for both 1994 and 1995.

[14] **en route inspection**--a test or examination of an airplane and flight crew while in flight. The objective of an en route inspection is to determine flight crew competency and evaluate operation of an air carrier.

Little Analysis of Inspection Results and No Enforcement Action

Based on our ASI interviews, we found little sharing of inspector deicing findings in the PTRS database among FSDOs. ASIs are often critical of PTRS in general. One ASI indicated PTRS is excellent if used correctly, but the database often contains misleading information because of a breakdown in training or communication. Another ASI stated PTRS data is not useful for trend analysis for small carriers because it is such a low statistical sample.

PTRS data reveal some problems with air carrier deicing programs, but this information is difficult to extract because of the size of the database and inconsistencies in data entry. By the end of a given year, the PTRS database contains over one million records. Each record has one of six results codes shown in Table 5.

Table 5: PTRS Deicing Inspections 1993-94 Winter Season

Results Code	Frequency
"A"--Assisted	74
"E"--Enforcement	0
"F"--Followup	35
"I"--Information	1,741
"S"--Satisfactory	1,383
"T"--Terminated	5
Total	**3,238**

The PTRS entries with "I" result codes include narrative information in a comment data field. In some cases, this information highlighted problems with air carrier deicing programs. For example, ASIs found:

- incorrect type of fluid used to deice the aircraft,
- improper labeling and type of fluid on or in the truck,
- no quality control personnel to ensure the aircraft was properly deiced,
- lack of procedures on how to annotate holdover times on the log form, and
- failure to document the time deicing began and ended.

Based on its PTRS database, FAA can identify that its ASIs conducted 3,238 deicing inspections in the 1993-94 winter season. However, FAA could not provide us information on the frequencies of problems ASIs found with air carrier deicing activities and on FAA success in correcting these problems. FAA

PTRS analysis is limited because the database only allows retrieval of information by the results code, not by the narrative information.

To estimate how often the ASI inspections found deicing problems, we randomly selected 10 ASI comments from each of four FAA regions with severe winters from the 1993-94 PTRS database. Based on our sample, 9 of the 40 entries (23 percent) highlighted a problem warranting attention from the ASI. Of the nine entries, three highlighted problems with air carrier adherence to regulations and procedures, one cited miscommunication between the air carrier and ATC, one cited problems with deicing fluid dispensing equipment, and four cited problems with either holdover times or completion of the 5-minute pre-takeoff check.

Table 5 shows ASIs did not take any enforcement actions against air carriers as a result of the 3,238 deicing inspections FAA conducted in the 1993-94 winter season. ASIs explained the purpose of their surveillance was to work with the air carriers to correct deicing program deficiencies. If ASIs identified a deficiency, the ASIs discussed the problem with the air carrier and gave the air carrier time to correct the deficiency. The ASI would then use the PTRS results code "F"--Followup--to perform a future inspection to ensure the air carrier corrected the deficiency.

One ASI we interviewed did identify a single deicing enforcement action not recorded in PTRS. According to enforcement action documentation, an ASI observed an aircraft takeoff from the Chicago Midway Airport in February 1994 in near "blizzard conditions" with ice and slush accumulation on the fuselage and wing surfaces in violation of the amended regulation. Unable to stop the takeoff, the ASI recorded the incident and turned the information over to the Great Lakes Flight Standards Division for enforcement action against the air carrier and the pilot. In response to our draft report, FAA adequately explained its enforcement actions.

Aviation Safety Reporting System (ASRS) Indicates Deicing Incidents Still Occur

Regardless of ASI inspection emphasis, the ASRS data indicate deicing incidents still occur. ASRS is a database of aviation incident reports maintained by Battelle Memorial Institute under contract with The National Aeronautics and Space Administration. ASRS contains over 46,000 aviation reports submitted voluntarily by pilots, air traffic controllers, and other individuals over an 8-year period. FAA validated use of ASRS data in a July 1994 FAA report entitled "Boeing 757 Wake Turbulence." In this report, FAA concluded the ASRS

reports provide FAA with an additional means to investigate and address emerging safety issues.

An Ohio State University study identified and analyzed 52 ASRS reports on air carrier ground deicing/anti-icing extracted from the ASRS data from 1986 through 1993. This study identified such problems as: (1) failure of deicing crews to follow prescribed procedures, (2) inadequate procedures for deicing and/or post-deicing checks, (3) poor communications between deice and flight crews, (4) improperly prepared deicing fluids, (5) lack of reliable equipment, and (6) inadequate staffing to conduct deicing.

In order to update this study and examine early results of the FAA revised Deicing Program, we reviewed the ASRS reports for a period of three winters after FAA amended the deicing regulation, 1992-93, 1993-94, and partial 1994-95. Our review identified 34 reported incidents relating to improper deicing which potentially compromised aircraft safety. We categorized the incidents in Table 6 according to requirements in the FAA amended regulation.

Table 6: OIG Review of ASRS Deicing Incidents

		INCIDENTS	PERCENTAGE
1.	Training for Flight and Ground Crews	3	9%
2.	Application of Holdover Times	6	18%
3.	Flight and Ground Crews Checking the Aircraft for Ice	25	73%
	Total	**34**	**100%**

On the basis of our review, 3 of the 34 incidents (9 percent) indicate problems with deicing training for ground and flight crews (a potential area for "best practice" review under recommendation 1). In one incident, for example, an aircraft was on the runway for takeoff when the flight attendants notified the pilot a passenger had noticed the left wing of the aircraft had not been deiced. Six of the thirty-four incidents (18 percent) indicate problems with the application of holdover times. For example, the deicing crew did not advise the flight crew prior to starting the deicing procedure in one incident. Therefore, the flight crew could not accurately measure the elapsed time from deicing to takeoff. Twenty-five of the thirty-four incidents (73 percent) indicate problems with aircraft ice checking procedures. For example, a pilot did not perform a pre-takeoff contamination check of the wings despite being questioned by the co-pilot.

The following are summaries of four deicing incidents reported in ASRS since FAA revised its deicing program:

- In January 1994, an aircraft returned to a Nashville airport after takeoff because an engine ingested ice causing engine damage. The incident occurred because ground deicing did not remove all the ice, and the flight crew could not see the ice from inside the cabin during the pre-takeoff check. A visual inspection by the ground crew also failed to detect the ice, finally discovered when a ground crew member touched the wing after the aircraft returned to the airport.

- In February 1994, an aircraft had to return to a Seattle airport after ice ingestion damaged an engine. Proper deicing procedures were not followed.

- In March 1994, a pilot at a Pittsburgh airport began taxiing the aircraft without authorization from ATC. Concerned about exceeding holdover time, the pilot did not have 3 minutes to spare waiting for authorization when the ground control frequency was saturated.

- In April 1994, a flight crew at a Detroit airport forgot to do a final check of the wings for ice before takeoff.

As previously noted, although our review was for the 1993-94 winter season, problems continued to occur in the 1994-95 winter season. For example:

- In December 1994, an aircraft had to divert to the Seattle airport after ice ingestion damaged an engine. Proper deicing procedures were not followed.

- In January 1995, a passenger observed ice on a portion of a wing shortly after takeoff from a Chicago airport. Air carrier deicing procedures failed to identify the ice prior to takeoff.

- In February 1995, a pilot of an aircraft at a Chicago airport observed the post-deicing inspection was deficient because the ground crew did not inspect the top of the wings.

Physical Layout of Airport Can Restrict Surveillance

Ideally, an ASI will observe the entire deicing process from initiation of spraying the aircraft with deicing fluid to takeoff. However, many factors prevent this ideal inspection, including an airport layout and the ASI timing. For example, an ASI cannot always view the final takeoff of an aircraft to determine whether its critical surfaces were contamination-free. At O'Hare Airport, ASIs are unable to

drive their vehicles to the ends of runways to view aircraft queued for takeoff because no access roads exist other than active taxiways or runways. As a result, an ASI may experience difficulty in verifying whether the aircraft was within its holdover time at takeoff and contamination-free. In addition, the time an ASI arrives at a deicing operation will determine the extent of the observations. If an ASI arrives after the aircraft has pulled away from the gate, the ASI cannot converse with the pilot to verify ability to compute a proper holdover time.

Results of Surveillance Entered into Database

Individual ASIs at the FSDOs we visited claim to perform trend analysis, but they did not have a set interval or specific procedure for doing so. Four of the five (80 percent) FSDOs we visited do not utilize PTRS to look for trends. Only the ASIs at the Kansas City FSDO systematically review the PTRS comments.

The Kansas City FSDO utilizes PTRS to track and graph data on the major Kansas City air carrier from surveillance performed by other ASIs across the country. Using key word searches, the Kansas City FSDO generates weekly and monthly reports presenting the results of its searches. The Principal ASIs (including operations, maintenance, and avionics) review the results for the major air carrier. If an ASI reviewing the data finds an abnormally high rate of unsatisfactory comments in a particular area, the ASI first contacts the ASI who initially input the information. If the reporting ASI verifies the problem area, the reviewing ASI then contacts the air carrier to resolve the problem. ASIs benefit because they can focus future inspections on identifiable problem areas, or they can discuss the problems with the air carrier and request corrective action.

FAA hopes to correct some of its database and trend analysis deficiencies with the Safety Performance Analysis System (SPAS),[15] designed to revamp PTRS. According to an ASI involved in the development of SPAS, SPAS will provide analytical and graphic trend information allowing ASIs to compare air carrier compliance. SPAS will also identify air carriers presenting a greater safety risk and warranting further FAA surveillance. For SPAS to be effective, FAA must ensure (1) the underlying data used for trends is correct and (2) ASIs perform trend analysis at regular intervals. FAA has begun SPAS installation and expects it to begin deployment to all ASIs in September 1997. Training and deployment will continue through 1998 and 1999.

[15] GAO has reviewed SPAS and determined FAA has done a credible job analyzing and defining the requirements of SPAS. However, if the data quality is poor, the system's input into safety decisions will not be reliable and will not effectively support FAA's inspection and certification system.

Conclusion

To monitor air carrier compliance with their FAA-approved deicing programs, the FAA inspectors stepped up their surveillance activity. However, inspectors do little analysis or sharing of information on problems found and corrective actions taken. In addition, FAA is not taking action against air carriers who violate the amended regulation. Finally, FAA has an inadequate automated system for recording and tracking findings from deicing inspections and ASRS reports.

RECOMMENDATIONS

We recommend FAA Flight Standards Service:

2. Take appropriate steps to ensure ASIs analyze the results of deicing inspections and use the data to plan future inspections and seek changes to air carrier deicing programs based upon problems identified.

Agency Comments. FAA concurred with these recommendations and indicated a 3-day conference for principal operating inspectors was held in July 1992 to train them on the new deicing regulations. In addition, the Air Transportation Operations Inspector Handbook change, 8400.10 CHG 9, was issued on November 2, 1994, providing standard procedures for performing deicing inspections and techniques for recognizing contamination on the airplane. The primary purpose of these inspections is to ensure that approved procedures outlined in the air carrier program are adequate to ensure aircraft are free of contamination prior to takeoff and that approved procedures are satisfactorily accomplished. National program guidelines annually set numerical guidelines for scheduling deicing surveillance for the next winter season. These inspections provide the basis for followup surveillance or changes to an air carrier approved program.

FAA claimed that Table 5, as presented in the draft report, is misleading. FAA advised it took a number of enforcement actions in the 1993-94 winter season which included warning letters, letters of correction, warning notices, and civil penalties.

Evaluation of FAA Comments. The action taken by FAA is not fully responsive to Recommendation 2. Our review was conducted after aviation safety inspectors attended the 3-day training conference. With the exception of the Kansas City FSDO, aviation safety inspectors are not analyzing the results of

deicing inspections. The inspectors are not able to plan future inspections or seek necessary changes to air carrier deicing programs.

The data in Table 5 is based on PTRS data provided by FAA which included all deicing inspections for the period of November 30, 1992, through April 12, 1994. The lack of enforcement actions was confirmed by 37 of the 38 ASIs we interviewed. On May 23, 1996, we requested a listing of enforcement actions from FAA. At the time, FAA was unable to comply with our request because of additional work load requirements resulting from the ValuJet accident in May 1996. On September 30, 1996, FAA provided a listing of enforcement actions to the OIG. However, this listing lacked sufficient detail for OIG analysis.

We request FAA reconsider and provide OIG within 60 days from the date of this report: (1) a copy of the directions to ASIs to use surveillance data to perform followup inspections or to change an air carrier approved program, and a list of followup inspections completed and FAA-directed changes to air carrier programs; and (2) a detailed listing of the enforcement actions taken in the 1993-94 and 1994-95 winter seasons.

FINDING 3: DEICING COOPERATION AT AIRPORTS

FAA has shortfalls in its airport operator regulations and in its method of selecting special emphasis airports. FAA asked for local airport deicing plans at 29 selected airports, but only 5 airports submitted these plans to FAA. FAA abandoned this initiative when airport operators replied (1) there was no regulation requiring a deicing plan; or (2) the local airport lacked icing conditions, or traffic density, to make a deicing plan useful. FAA should mandate airport operators, in cooperation with the air carriers and ATC, submit to FAA local deicing plans for airports with heavy traffic and harsh winters.

FAA Recognized a Need for Improved Local Airport Coordination

At the May 1992 Deicing Conference, the FAA Administrator stated the Air Traffic System would play a vital role in developing a deicing program to "coordinate the efforts of airport operators, users, and ATC." Soliciting Conference recommendations for more efficient Air Traffic procedures, the Administrator requested help in stopping the kind of delay reported in a January 1992 Air Traffic Bulletin. In this incident, a pilot had his airplane deiced at the gate; waited 35 minutes on the runway in freezing rain, snow, and drizzle: and then spent another hour going back to the gate for a second deicing.

In order to formalize the communication and coordination, the FAA Administrator made a special request to airport operators at 29 airports with heavy traffic and ideal conditions for snow, ice, and frost (refer to appendix C). He requested these airport operators facilitate meetings among themselves, airport users, and the local ATC to assess the impact of deicing activities on airport operations. As necessary, airport operators would then develop local deicing plans to identify actions by the various parties to maximize the effectiveness and efficiency of operations during deicing conditions. The Administrator requested local plans because each airport is unique due to weather, location, runway configuration, type of operation, and volume. The Administrator also requested group participation because he wanted to focus on a team concept, rather than an individual approach, to deicing plans.

FAA suggested local airport deicing plans could:

1. establish airport ground flow strategies to shorten taxi routes and minimize holdover time for deiced aircraft,

2. establish a triggering mechanism to activate the deicing plan and notify all participants,

3. provide a procedure for repeat aircraft deicing when necessary,

4. establish departure rates for each runway used during icing conditions and balance departure rates with arrival rates,

5. exempt departing flights from air traffic metering and separation programs which could delay departures of deiced aircraft,

6. provide for and communicate departure slot allocations to air carriers, and

7. describe types of deicing fluid and their holdover times.

Air Traffic Control Manages the Time a Deiced Aircraft Waits for Departure

To aggressively manage the time a deiced aircraft waits for departure, ATC (1) balances aircraft arrivals and departures and (2) systematically assigns departure times so pilots can take off within holdover times. When the local airport deicing plan is in effect, ATC takes steps to ensure aircraft arrivals do not dominate airport capacity, squeezing out airport departures slowed by aircraft deicing activities and runways closed for snow and ice removal. According to an ATC manager, airport operators normally favor arriving aircraft over departing aircraft. This emphasis stems from the old notion "a plane on the ground can't hurt you while a plane in the air can." Under the local airport deicing plan developed by the airport operator, operational emphasis shifts to getting departing aircraft off before holdover times expire.

In order to train its air traffic controllers on how to effectively participate on the local deicing plan team, Air Traffic produced a video tape for distribution to air traffic controllers at the 29 special emphasis airports. FAA produced this video tape to remind air traffic controllers to manage aggressively the time a deiced aircraft waits for departure.

FAA Did Not Receive Local Airport Deicing Plans

FAA could only provide us with local deicing plans for 5 of the 29 special emphasis airports (refer to appendix D). FAA explained most of the 29 special emphasis airports either did not provide deicing plans to FAA or had yet to complete the plans. FAA was reluctant to pursue these missing local airport deicing plans because it could not require airports to produce the plans without

modifying FAR Part 139, "Certification and Operations: Land Airports Serving Certain Air Carriers." According to one FAA official, "airports don't work for the FAA," and there was "no need to introduce a change" to FAR Part 139 requiring the airport operator to develop local deicing plans. Although Part 139 regulates airport operations in such areas as maintenance of paved areas, maintenance of safety areas, airport emergency procedures, and ground vehicle limitations, FAA did not amend FAR Part 139 to require the airport operators to develop local deicing plans. FAA inaction is troubling, given the Administrator's emphasis on improving ground traffic delays at airports in order to eliminate the expiration of holdover times.

Some air carriers also stated FAA was too easy on the airports. According to these air carriers, FAA burdened the air carriers with deicing responsibilities, but let airport operators escape any responsibilities for deicing despite their prominent role to ensure snow-free runways.

Some Airports Still Developed Plans With Varying Success

In spite of FAA reluctance to press for local airport deicing plans not mandated by the regulations, some airports still developed them. For example, we discovered five plans FAA did not possess. Furthermore, several airports not designated special emphasis by FAA have also formulated local deicing plans. These airports developed plans because local air carriers wanted a coordinated response to icing conditions.

Based on our review of the 10 special emphasis airport plans listed in appendix D (5 from FAA plus 5 we obtained independently through on-site visits), only 1 of the 10 airport plans addressed all 7 points suggested by FAA. Because of each airport's uniqueness in weather conditions; the number of arrivals and departures; communication between operators, carriers and ATC; and the design of the airport, the other nine airports concluded it was not necessary to address all seven points to ensure aircraft safety during deicing conditions.

Through our review of the plans and interviews with plan participants, we found some airports have excellent communication systems enabling the air carriers, ATC, and the airport operator to communicate the triggering of the deicing plan, slot times for aircraft, and runway conditions. For instance, ATC at the Chicago O'Hare Airport reported their new "blast phone concept" is an invaluable tool in linking the tower and airport users with updated information on airport conditions, arrival rates, and the snow removal plan. Similarly, the New York La Guardia Airport utilizes a computer program to limit takeoff slots during icing conditions.

Plans at other airports, however, fall short in promoting cooperation and communication. At one airport, for example, air carriers report the airport operator distanced itself from the deicing plan and shifted the entire responsibility to the air carriers. The airport operator has refused to cooperate with and provide guidance to the air carriers and ATC, stating it had no responsibility in the deicing plan because FAA did not mandate local deicing plans by amending FAR Part 139. This airport operator has provided no deicing assistance beyond clearing runways and communicating runway conditions. In a second example, an air carrier reports deicing plans have not really alleviated delays and aircraft queues at the nation's busiest airports.

With regard to traffic control, ATC in one region reported airlines were not adhering to allocated slots as agreed in the deicing plan. This breakdown in the plan resulted in more airplanes taxiing for departure than ATC could accommodate. A second region reported, based on continued long lines for takeoff and gridlock, the need for improved in-house metering and flight reductions during deicing conditions.

Reason for Designating Some Airports as "Special Emphasis" is Unclear

FAA chose the special emphasis airports based on a list compiled by the Air Transportation Association (ATA). FAA accepted this list without conducting original research of relevant traffic and weather statistics for all national airports. As a result, FAA either excluded airports that could benefit from local deicing plans or mistakenly included some airports not requiring special emphasis.

FAA did not adequately consider weather and traffic statistics in selecting special emphasis airports. The ATA list identified 29 airports as high activity airports where aircraft are likely to encounter icing conditions while waiting for departure clearance. However, we found several of these special emphasis airports rarely encounter deicing conditions during the winter season. For example, Atlanta and Dallas/Fort Worth only encounter one or two icing events a year. Furthermore, the FAA personnel at several regions we visited expressed doubt the airports in their region actually warranted the designation of special emphasis because of a lack of either traffic or freezing precipitation. At one airport, aircraft very rarely experience delays and queues for takeoff in either normal or icing weather. A local FAA official commented, while the plan was good to have in case of future traffic expansion, the plan has merely added "another layer of bureaucracy."

In order to determine whether FAA adequately selected the special emphasis airports based on traffic and weather characteristics, we compared weather and air traffic statistics for the 29 special emphasis airports to 23 other airports with

similar traffic densities. Our analysis indicated 7 airports besides the 29 special emphasis airports experienced comparable levels of traffic and icing weather (refer to appendix E). For example, the Milwaukee General Mitchell International Airport has icing and traffic statistics that meet or exceed corresponding statistics at the Chicago Midway Airport in five of the six categories listed in Table 7:

Table 7: Comparison of Weather Between Milwaukee and Chicago

Statistic	Milwaukee General Mitchell	Chicago Midway
Aircraft Departures	41,538	40,898
Percent Enplanements[16]	0.45%	0.64%
Average Inches of Snow	49	39
Average Days With Snow	75	62
Average Days Below 32° Fahrenheit	141	132
Average Days With Freezing Rain	8 to 12	8 to 12

In addition, General Mitchell International Airport may handle even more air traffic due to diversions from Chicago O'Hare International Airport; however, Midway Airport is a special emphasis airport and General Mitchell is not.

Conclusion

FAA acknowledged the dangers of ice accumulation on aircraft waiting for departure in icing weather. To promote cooperation among the air carriers, the airport operator, and ATC, FAA asked for local airport deicing plans at 29 special emphasis airports. However, FAA did not adequately consider weather and traffic statistics in selecting special emphasis airports. When only five airports developed these plans, FAA abandoned this initiative. FAA should mandate airport operators develop local deicing plans, in cooperation with the air carriers and ATC, at airports with heavy traffic and harsh winters.

[16] **percent enplanements**--is the percent of paying passengers boarding airplanes at a specific airport during a given time period, with percentages totaling 100 percent for enplanements at all US airports.

RECOMMENDATIONS

We recommend the FAA Assistant Administrator for Airports:

3. Develop and systematically apply criteria to identify which airports need special deicing program focus and require these airports to develop local deicing plans.

4. Revise FAR Part 139 to address the responsibilities of airport operators in icing conditions, including developing and providing deicing plans to FAA.

Agency Comments. FAA did not concur with Recommendations 3 and 4. In the FAA view, OIG based these recommendations on erroneous information that FAA requested airport operators at 29 "special emphasis" airports to develop and submit local airport deicing plans to FAA, later abandoning this initiative when airport operators failed to respond. In fact, FAA encouraged, but did not require, airport operators, air carriers, and air traffic control facilities to work together to develop and implement local deicing plans.

With Recommendation 3 to develop and publish criteria for "special emphasis" airports, FAA and the industry initially selected 29 high activity airports where aircraft were most likely to encounter icing conditions while awaiting departure. This initial selection did not represent a formal categorization of airports or an agency intention to place a long-term "special emphasis" on particular airports. This initial selection was subsequently expanded to include all certificated airports with local air traffic control facilities and which might be subjected to icing conditions and departure delays.

FAA did not concur with Recommendation 4 to revise FAR Part 139 to require airport operators at selected airports to develop and provide local deicing plans to FAA. Because the primary focus of the local deicing plans would involve specific activities and coordination procedures between the air carriers and local air traffic control facilities--procedures outside the control and jurisdiction of the airport operator--FAA does not consider it appropriate to require the airport operator to develop and implement such a plan. Such a regulatory imposition would be at variance with FAR Part 139, in that all requirements in Part 139, including the development and implementation of various operational plans, are the direct and sole responsibility of the airport operator.

Evaluation of FAA Comments. The OIG recommendation was based on reported information written and distributed by FAA. Specifically, on January 11, 1992, FAA issued FSIB Flight Standards Information Bulletin for Airworthiness number 93-07 and Flight Standards Information Bulletin for Air Transportation number 93-03 entitled "Revised Air Carrier Deicing/Anti-Icing Surveillance and reporting Requirements." This bulletin indicated "The Assistant Administrator for Airports has identified and directed 29 airports to develop a local deicing plan." FAA contends its selection of 29 airports was informal and has since been expanded, so there is no need for criteria and definition. We agree that establishing criteria for "special emphasis" airports has little value if there is no reason for special emphasis, such as a requirement for a local deicing plan. However, we are still of the opinion FAA should require operators at selected airports to produce, in conjunction with local operators and air traffic control, local airport deicing plans at airports subject to icing conditions and departure delays. Further, we ask FAA to provide a listing of the selected airports and respond within 60 days in accordance with DOT Order 8000.1C.

FAA permitted airport operators to avoid any formal responsibility for deicing despite their prominent role to ensure snow-free runways. We found some airports have local plans providing excellent communication systems enabling the air carriers, ATC, and the airport operator to communicate the triggering of the deicing plan, slot times for aircraft, and runway conditions. However, other airports fall short in promoting cooperation and communication. We agree with FAA that local airport deicing plans are a good idea that can enhance aviation safety during icing conditions. If airport operators--recognized by FAA as a "focal point" to promote close coordination among the airport, air carriers, and air traffic control personnel--decline to participate in producing local deicing plans in response to FAA encouragement, FAA needs to require such participation by revising FAR Part 139 or some other means. We ask FAA to reconsider its response to Recommendation 4 and respond within 60 days from the date of this report.

FINDING 4: CONSTRUCTION OF DEICING FACILITIES

FAA has little impact on facilitating the construction of deicing facilities. More deicing facilities near the ends of runways would reduce time from aircraft deicing to takeoff. Although FAA prioritized funding to build more deicing facilities, few of these new facilities are under construction, due, in part, to the Environmental Protection Agency (EPA) restrictions on wider use of deicing fluids. To harmonize safety and environmental concerns, FAA and EPA need to coordinate on this issue.

An aircraft deicing facility removes frost, snow, or ice from the surface of the aircraft. Deicing frequently occurs while aircraft are parked at the terminal gates, but airports also locate deicing facilities along taxiways leading to runways or near the ends of runways. The benefits of a such a remote deicing facility are to:

1. minimize aircraft taxiing time between deicing treatment and takeoff, thereby reducing the potential for an expired holdover time; and

2. eliminate any disincentives for a second deicing when holdover time expires.

FAA Recognized the Benefit of Remote Deicing

High-level FAA officials support the need to upgrade airport deicing facilities. In a July 1992 press release, FAA notified airport operators that deicing projects would receive priority for Airport Improvement Program (AIP)[17] funding. In addition, at an August 1994 Deicing Conference, FAA Deputy Administrator announced requests for AIP funds to enhance deicing capabilities at airports will receive top priority. Furthermore, the Secretary of Transportation, after a January 1995 airline safety summit, supported construction of new deicing facilities at major airports.

Based on our interviews, 7 of 10 (70 percent) air carriers advocate remote deicing facilities to improve aircraft safety. Because use of remote deicing facilities reduces the taxi times from deicing until takeoff, there are fewer expired holdover times. In addition, remote

[17] **AIP**--funds authorized by the Airport and Airway Improvement Act of 1982 to assist in the development of a nationwide system of public-use airports adequate to meet the current projected growth of civil aviation. Funds come from the Airport and Airway Trust Fund.

facilities eliminate the need for an aircraft to lose its place in a takeoff line and taxi back to the gate area for a second deicing when its holdover time expires.

Airports Are Not Building Remote Deicing Facilities

According to an airport official, the FAA has approved over $67 million in deicing facility projects currently in progress. About $59 million is approved for special emphasis airports and $8 million for non-special emphasis airports.

Based on our interviews, 10 of 13 (77 percent) ASIs, 7 of 10 (70 percent) air carriers, and 2 of 3 (67 percent) airport operators expressing an opinion advocate remote deicing facilities to improve aircraft safety, with only a few individuals we interviewed opposed to the concept. Despite FAA financial support for the construction of remote deicing facilities, airports have not fully utilized the AIP funds to build them for several reasons:

- Many special emphasis airports already utilize some form of remote deicing facility (refer to appendix F).

- Many airports are currently considering building deicing fluid reclamation systems.

- Not all airports have traffic density and weather conditions to warrant remote deicing facilities.

- Physical layout of an airport can make construction of additional remote deicing facilities difficult or impossible.

- Danger of ice ingestion by a rear engine on certain types of taxiing aircraft, like the MD-80, makes gate deicing preferable.

Furthermore, ASIs, air carriers, and airport operators opposing remote deicing facilities state ground collisions between deicing equipment and aircraft are more likely with remote deicing facilities than with gate deicing. Currently, most major airlines own their own deicing equipment and deice their own aircraft. If an airport constructs remote deicing facilities, it creates the risk of multiple deicing trucks from various air carriers interfering with, and possibly colliding with, aircraft queued for takeoff.

An alternative is common air carrier use of one general deicing contractor hired by the airport operator, or one air carrier could provide the deicing service to all other carriers. However, liability is a major concern. Air carriers hesitate to assume the responsibility for a contractor who might fail to properly deice an aircraft and consequently cause an accident. Also, various parties question whether air carriers could ever agree on a single contractor to provide all deicing services at an airport. For example, air carriers at one airport have already expressed their displeasure with a proposed remote deicing facility serviced by a single deicing contractor.

Environmental Concerns Impact the Construction of Deicing Facilities

In deciding whether to construct remote deicing facilities, an airport must consider how it will dispose of deicing fluid Currently, EPA restricts the spillage and deposit of deicing fluids into general water systems. This makes the airport operator and air carrier responsible for complying with both the EPA and FAA regulations.

FAA and EPA failed to work together for the common goals of safer aviation and a better environment. As a result, FAA has not been involved in working with airport operators to resolve environmental issues. One air carrier stated FAA did not fully consider all the environmental repercussions of its amended regulation. For example, EPA initially stated it would not enforce certain regulations concerning deicing fluid for the sake of aviation safety. However, when air carriers began using deicing fluid in greater amounts because of FAA amended regulation, EPA grew alarmed at the possible runoff danger to water sources. Air carriers and airport operators were caught in the middle with no guidance from FAA on how to handle this situation. In another example, EPA issued a cease and desist order to an air carrier deicing operation because storm water toxicity levels were exceeding the EPA limit. The air carrier believes EPA and FAA could have avoided the situation by better communication and coordination of efforts to satisfy their respective goals.

Conclusion

To reduce time from aircraft deicing to takeoff, FAA prioritized use of the AIP funds to construct more deicing facilities near the ends of runways. Few of these new facilities are under construction, due in part to the EPA restrictions on wider use of deicing fluids and lack of support among the airport operators. To harmonize safety and environmental concerns, FAA and EPA need to coordinate on this issue.

RECOMMENDATION

We recommend the FAA Assistant Administrator for Airports:

5. Aid airport operators in resolving EPA issues to facilitate construction of more deicing facilities.

Agency Comments. FAA concurred with this recommendation. However, FAA was not aware of any air carriers who received a "Cease and Desist Order" because they have exceeded EPA-established glycol toxicity levels.

FAA emphasized the following activities the Office of Airport Safety and Standards (AAS) has undertaken to assist the EPA in its efforts to control storm water runoff from deicing/anti-icing facilities.

AAS has cooperated with EPA throughout EPA development of the National Pollution Discharge Elimination System (NPDES) storm water permit regulations.

In an attempt to resolve issues between FAA and EPA regarding many aspects of airport operations, including deicing/anti-icing activities, AAS has provided comments to EPA on its proposed NPDES regulations and permits.

In addition to EPA regulations and multi-sector permit, airport operators must comply with 39 different sets of NPDES permit requirements, since EPA has authorized 39 states to issue general NPDES storm water permits (EPA issues those permits in the 11 states not yet having that authority).

FAA states these efforts show the Associate Administrator for Airports is taking an active role in assisting those operators to resolve environmental issues related to deicing/anti-icing facilities. AAS remains available to provide that assistance upon an operators request.

Evaluation of FAA Comments. Many airport operators and air carriers are not aware of the assistance AAS can provide. Accordingly, we request FAA inform airport operators and air carriers on the active role AAS can take in solving environmental issues related to deicing/anti-icing facilities.

FINDING 5: AIRCRAFT DESIGN UNDER ICING CONDITIONS

The lack of FAA deicing expertise and its outdated icing certification standards hampered its ability to focus on dangerous ice formations on flying aircraft. Dangerous ice can form on aircraft wings in flight as well as on the wings of aircraft on the ground. Use of glycol-based fluids, holdover times, and checks outside the aircraft do not apply to in-flight icing problems. In the case of the ATR aircraft, FAA was slow to act until after the October 1994 fatal crash near Roselawn, Indiana. In retrospect, FAA dated certification standards for commuter aircraft and its reliance on manufacturer testing and analysis prevented earlier focus on the problem.

Methods for Protection Against Icing In Flight

To prevent in-flight buildup of ice on wings and other critical surfaces, manufacturers design aircraft systems to remove ice from airplane surfaces; and pilots are trained to fly out of icing conditions. Commercial aircraft are commonly equipped with deicing boots to break away ice, or the airplanes are designed with holes in the wings to allow heat or liquid to slide away the ice. The ATR aircraft uses rubber boots which rapidly inflate and deflate, causing any ice formation to crack and fall off. Deicing systems are located on the leading edge (the front part) of the wings, tail, and intake of the engines.

In addition to aircraft systems designed to remove ice, the dispatcher, ATC, and pilot should all work together to keep aircraft out of freezing rain conditions. If an airplane gets into severe icing conditions, the pilot is instructed to quickly fly out of the bad weather, often by changing altitude. Pilots for commuter airlines cannot always evade severe weather because they normally operate short flights at altitudes lower than 22,000 feet.

ATR Certified for Icing Conditions

The ATR aircraft is type certified for operation in the U.S. under FAR Part 21.29, "Issue of Type Certificate: Import Products," and the applicable bilateral airworthiness agreement. Under a reciprocal certification arrangement, the French aviation authority Direction Generale De L'Aviation Civile (DGAC) tested and certified the French and Italian-manufactured ATR on behalf of the FAA. In this process, DGAC determined the ATR aircraft exceeded the FAA certification standard for icing conditions. However, according to an FAA certification official, DGAC regularly accepts manufacturer test results at face value without independent verification. In this case, FAA accepted the ATR test

results at face value from DGAC, which accepted test results at face value from ATR.

Even if FAA had examined the ATR icing standard data firsthand, GAO has questioned FAA expertise. In a 1993 report, GAO noted the FAA personnel who certify aircraft "are falling farther behind in understanding the principles and effects of ice on aircraft designs." GAO also questioned whether the FAA engineers have the training to understand sophisticated aircraft. Upon the retirement of its sole icing expert in 1989, FAA created an advisory committee to assume the icing expert responsibilities. The advisory committee includes headquarters personnel and one person from each of the four directorates. All members of the committee have many areas of responsibility beyond icing expertise. Even some members of this committee believe there would be better continuity if FAA had one expert on icing.

FAA is using deicing standards based on data from the 1940s. The FAA standard presumes the most common icing conditions are tiny droplets no larger than 50 microns in diameter. The certification standard does not include larger droplets (i.e., 200 microns in diameter) sometimes found in a freezing drizzle. According to the leader of FAA Certification Review Team (discussed later in this report), Doppler radar reported the freezing rain conditions at the time of the ATR crash consisted of droplets ranging from 100-400 microns in diameter. Freezing rain and drizzle of this size are so rare that FAA has never included the larger droplets in its certification regulations. FAA has relied strictly on the pilot, in cooperation with the dispatcher and ATC, to avoid these icing conditions. According to FAA, this joint effort has worked well for the last 40 or 50 years.

When accurate weather forecasts are not available, warning of icing conditions depends on pilot reports. According to an ALPA official, the flight deck tape from the Roselawn crash indicates the pilots were not aware of the ice build-up. On July 9, 1996, NTSB issued its report on the probable cause of the Roselawn crash. NTSB indicated FAA contributed to the accident by failing to ensure the hazards of flying in freezing rain and other conditions were adequately addressed in its aircraft icing certification requirements, operational requirements, and published information about aircraft icing. NTSB made 35 recommendations with 31 (22 new and 9 restated) directed to FAA. The recommendations included revising icing certification requirements, improving meteorological information to pilots, improving training, and improving guidance regarding operation in known or reported icing conditions.

FAA Failed to Heed Warnings

The ATR aircraft has a history of icing problems. In a November 7, 1994, letter to FAA, NTSB indicated its awareness of icing problems on ATR-42 airplanes over the past 6 years. Pilots reported icing problems almost immediately after the ATR-42 began flying in the fall of 1986. On December 18, 1986, violent tilting and a stall of an ATR-42 resulted in FAA issuing an emergency order barring flights in icing conditions. FAA lifted the ban 4 days later when the ATR officials persuaded FAA the incident resulted from pilot error.

Following an October 15, 1987, crash of an ATR-42 in Milan, Italy, British scientists concluded ice could build up behind the deicing boots. The scientists attributed the crash to severe icing conditions not covered by the existing American and European standards. The manufacturer criticized the British tests as unscientific. Subsequently, the manufacturer conducted additional flight tests, which failed to demonstrate any icing effect on aircraft stability.

In April 1989, FAA banned autopilot use in icing conditions after an ATR-42 pilot reported shaking and a violent roll as he was approaching a runway in Mosinee, Wisconsin. FAA concluded ice building up unevenly on the wings could cause the plane to tilt to one side. To win FAA approval for its new ATR-72, the manufacturer conducted additional testing which showed the ATR aircraft could perform safely in icing conditions.

Despite the manufacturer claims, ALPA, the largest U.S. pilots' union, questioned the ATR-42 history and FAA failure to require manufacturers to design planes to cope with freezing rain and drizzle. Ignoring the union complaint, FAA lifted the ban on the use of the autopilot following its evaluation of the effectiveness of the ATR-42 in freezing rain. Only after the October 1994 crash did the NTSB officials look more closely at the flight data recorders, finding striking similarities between the Roselawn crash and prior ATR incidents and crashes.

According to a report published in The New York Times in February 1995, the Director of the NTSB Office of Aviation Safety concedes both FAA and NTSB missed clues indicating operational problems in icing conditions. On November 4, 1994, FAA issued an FSIB to the operators of ATR-42 and ATR-72 aircraft advising operation changes. However, just a week after the accident, NTSB stated this measure was still inadequate and recommended FAA (1) conduct a special certification review and (2) ban the aircraft from flying in icing weather. On December 6, 1994, the union representing ASIs informed FAA management

its members would not conduct in-flight inspections of ATRs flying in icing conditions because the aircraft were not safe.

FAA Forms Certification Review Team

In response to the NTSB recommendation, FAA established a special Certification Review Team in November 1994 comprised of six FAA representatives and four DGAC representatives. The specialists started their review at the ATR facility in Toulouse, France on November 30, 1994, reviewing the certification history and the aerodynamics of the aircraft. The team also observed ATR tests and found some evidence indicating ice could cause a problem with control. On December 9, 1994, based on preliminary tests conducted in France, FAA issued an airworthiness directive[18] (AD) banning the planes from flying in icing weather.

In December 1994, in additional testing designed by the Certification Review Team in cooperation with NTSB, the National Aeronautics and Space Administration, and the U.S. Air Force, an ATR airplane flew behind an Air Force tanker releasing a heavy spray of water (super cooled water droplets of different diameters.) The tanker sprayed the water droplets to determine icing characteristics of various-sized droplets. The ATR airplane did not experience any problems when the spray of droplets ranged in size from 40-50 microns. However, with the spray of larger droplets (150-200 microns) well outside of the certification requirements (15-50 microns), ice formed on the wings behind the inflatable boots.

FAA issued a telegraphic AD[19] on January 12, 1995, allowing the ATR aircraft to fly in all but the worst icing weather. The AD also restricted use of the autopilot in icing conditions.

On March 2, 1995, Transportation News Digest reported ATR has staunchly defended the safety of its aircraft design, suggesting pilot error may have caused the crash. ATR insists the aircraft met all

[18] **AD**--the only means for FAA to force manufacturers and air carriers to make fixes or to perform inspections. ADs are issued for critical problems that have a high risk of reoccurrence.

[19] **telegraphic AD**--expedited form of an AD, where the public comment period is modified to avoid delaying AD issuance. In this instance, FAA has determined the suspected problem poses an immediate hazard to flight and therefore requires prompt corrective action.

American standards, and the pilot was at fault for not changing the altitude of the aircraft. ATR suggests the pilots were distracted when they violated the sterile flight deck rule by allowing a flight attendant onto the flight deck during a critical phase of flight.

We heard mixed opinions on ATR safety from two FAA officials we contacted. The leader of the Certification Review Team stated the ATR aircraft gets substantial lift from its small, highly efficient wing, making it more susceptible to ice contamination than most other aircraft. However, he stated the ATR is not uniquely dangerous to operate in icing conditions because the ATR pilots have more tools for identifying severe icing than most other pilots. For example, the pilot can look for the "side window cue" (icing on the side window) to signal the airplane has crossed over the threshold into severe icing. Although the ATR aircraft is sensitive to icing, he states the ATR has an extra margin of safety since the Roselawn accident. The ATR performance in icing conditions has been rigorously studied, and pilots know what to expect. In contrast, an ASI familiar with the ATR airplane considers the airplane that crashed at Roselawn a "Jekyll and Hyde"--capable of comfortably carrying many passengers at low operating cost under normal conditions, but dangerous to fly in icing conditions.

On March 4, 1995, the Certification Review Team conducted a second test using an Air Force tanker to spray a trailing ATR to demonstrate the effectiveness of a larger deicing boot developed by ATR. On the basis of this test, FAA concluded the improved deicing boot was successful in removing ice formed by the 200-micron droplets. FAA, therefore, mandated installation of the larger boots, completed by ATR in May 1995.

FAA Expands Its Icing Oversight

According to the FAA Associate Administrator for Regulation and Certification, FAA plans to determine the effect of icing on other commuter aircraft. On June 21-22, 1995, FAA met with the General Aviation Manufacturing Association to discuss the manufacturers data on how their airplanes perform in icing weather. FAA required manufacturers of similar type airplanes to check their airplanes, identify any deficiencies, and identify actions to fix any identified problems by October 1995. As a result, FAA published 17 Notices of Proposed Rulemaking in the January 25, 1996, Federal Register.

FAA held an International Conference on Aircraft Inflight Icing on May 6-8, 1996, in Springfield, Virginia, to evaluate whether icing certification rules can be updated using computer analysis of more detailed weather data. For example, FAA is evaluating whether larger droplets should be included in the

certification standard. FAA Technical Center in New Jersey is heavily involved in this project. According to the FAA Associate Administrator, changing the icing certification rules is a long-term process because operators, manufacturers, and special interest groups (i.e., Aerospace Industries of America) must all be given an opportunity to raise their concerns about rule changes.

Conclusion

An unusual ice formation on the aircraft wing contributed to the loss of control which preceded the October 1994 crash of an ATR model 72. Although the ATR aircraft exceeded the FAA certification standard for icing conditions based on data from the 1940's, the FAA standard did not consider the larger droplets encountered by this aircraft. Because FAA lacks a designated icing expert, the FAA advisory committee on icing will review the icing certification rules to evaluate whether they can be updated using computer analysis of more detailed weather data.

RECOMMENDATION

We recommend The FAA Office of Aircraft Certification:

6. Establish an icing expert position with oversight authority.

Agency Comments. FAA partly concurred with this recommendation. They concurred with the hiring of an icing expert position, but did not concur with OIG recommendation that the icing expert position have oversight authority for certification. FAA believes it can improve the effectiveness of the National Resource Specialist (NRS) in the certification process with better management oversight, not with the use of rigid requirements.

Responsibility for compliance with applicable regulations lies with the applicant. FAA establishes the certification basis and reviews and approves test plans prior to testing. Further, FAA witnesses critical tests, including certain ground and laboratory tests, and reviews the test results upon the conclusion of testing. In the cases of airplanes manufactured in a foreign country, the foreign authority makes all findings of compliance to Part 25 in accordance with the guidance provided by FAA. FAA grants a type certificate only when it is satisfied that all certification requirements have been met.

The icing certification program for the ATR-42 was thorough and was in compliance with FAA requirements. DGAC imposed additional testing

requirements for the ATR-72 to show compliance with appendix C of FAR/JAR 25 icing requirements.

The bulk of the experimental data forming the basis of appendix C of Part 25 (the icing certification standards) was generated in the 1940's and 1950's and reevaluated in studies conducted in the 1980's and 1990's. The icing envelopes contained in appendix C have withstood the test of time and they provide an accurate representation of the most frequent natural icing environment.

Although FAA has identified a critical need for an NRS in-flight environmental icing, it has not been successful in recruiting applicants with the highly specialized skills necessary for this position. In the interim, it has created a six-person Icing Advisory Committee comprised of senior engineers and scientists to perform the functions of the icing expert. The team members have substantial experience in icing-related matters and have done an excellent job in performing the duties associated with the icing expert position.

Evaluation of FAA Comments. We agree the Aircraft Certification Icing Steering Group has provided a positive interim means of providing icing-related guidance. However, the steering group members cannot devote full time to icing-related isues as they must perform the duties associated with their positions. The steering group only meets formally two times a year. It would be far more advantageous to have one subject area expert who could devote full attention to icing problems.

The establishment of an icing expert position with oversight authority would improve the certification process by directly addressing icing issues during the certification process. Adding this position is not a rigid requirement but an overall enhancement to the certification process.

On February 12, 1996, FAA issued a position vacancy announcement (No. AWA-AIR-96-100-91) for a "Chief Scientific and Technical Advisor Flight Environmental Icing, ST-861." The individual chosen for this position "Serves as a recognized national and international expert and consultant with a high level of technical knowledge and professional expertise in the field of aircraft ice protection as it applies and relates to certification requirements, policy, and research to improve overall aviation safety level." The issuance of this position vacancy announcement is fully responsive to our recommendation.

APPENDIX A

ACTIVITIES VISITED OR CONTACTED

AIR CARRIERS
American Airlines, Dallas, TX
Delta Airlines, New York, NY
Express One International, Dallas, TX
Kitty Hawk, Dallas, TX
North American Airlines, New York, NY
Northwest Airlines, Minneapolis, MN
Southwest Airlines, Dallas, TX
Tower Air, New York, NY
Trans World Airlines, Kansas City, MO
USAir Shuttle, New York, NY

AIRPORT MANAGERS
Airport Operations, Dallas-Fort Worth, TX
City of Chicago, Chicago, IL
Aviation Department, Kansas City, MO
Department of Public Works Airport Division, Milwaukee, WI
Port Authority--John F. Kennedy Airport, New York, NY
Port Authority--La Guardia Airport, New York, NY

ASSOCIATIONS
Aerospace Industries Association of America, Washington, DC
Airline Employees Association, Bedford Park, IL
Air Transport Association of America, Washington, DC
Airline Operational Control Society, Sewickly, PA
Alaska Air Carriers Association, Anchorage, AK
Allied Pilots Association, Arlington, TX
Airline Pilots Association, Herndon, VA
Association of Flight Attendants, Washington, DC
Association of Professional Flight Attendants, Euliss, TX
Aviation Consumer Action Project, Washington, DC
Aviation Development Council, New York, NY
Aviation Insurance Association, Kirkland, WA
Aviation Safety Institute, Worthington, OH
Flight Safety Foundation, Arlington, VA
Independent Pilots Association, Louisville, KY
National Air Carrier Association, Washington, DC
National Air Transportation Association, Inc., Alexandria, VA
National Association of Flight Instructors, Dublin, OH
National Avionics Society, Inc., Lafayette, CO
Southwest Airlines Pilots Association, Dallas, TX

FEDERAL AVIATION ADMINISTRATION

Headquarters, Washington, DC

Aircraft Certification Service
Air Traffic System Management
Associate Administrator for Regulation and Certification
Flight Standards Service
Office of Air Traffic Program Management
Office of Air Traffic System Effectiveness
Office of Airport Safety and Standards
Office of Integrated Safety Analysis

Regional Offices

Alaskan Region, Anchorage, AK
Airports Division

Central Region, Kansas City, MO
Airports Division
Air Traffic Division
Flight Standards Division

Eastern Region, Jamiaca, New York, NY
Airports Division
Air Traffic Division
Flight Standards Division

Great Lakes Region, Des Plaines, IL
Airports Division
Air Traffic Division
Flight Standards Division

New England Region, Burlington, MA
Airports Division

Northwest Mountain Region, Renton, WA
Airports Division

Southern Region, College Park. GA
Airports Division

Southwest Region, Fort Worth, TX
Airports Division
Air Traffic Division
Flight Standards Division

Air Traffic Control
Dallas-Fort Worth International Airport, Dallas-Fort Worth, TX
Dulles International Airport, Washington, DC
General Mitchell International Airport, Milwaukee, WI
John F. Kennedy International Airport, New York, NY
Kansas City International Airport, Kansas City, MO
La Guardia Airport, New York, NY
Midway Airport, Chicago, IL
National Airport, Washington, DC
O'Hare International Airport, Chicago, IL

Flight Standards District Office
Flight Standards District Office, Schiller Park, IL
Flight Standards District Office, Dallas-Fort Worth, TX
Flight Standards District Office, Kansas City, MO
Flight Standards District Office, Milwaukee, WI
Flight Standards District Office, Garden City, NY
Flight Standards District Office, Washington, DC

Transport Airplane Directorate
Aircraft Certification Office, Renton, WA

APPENDIX B

PRIOR COVERAGE

For a description of the FAA response to these reports, see appendix I.

OIG

FAA Responsiveness to Suspected Aircraft Maintenance and Design Problems (No. E5-FA-4-009, dated April 15, 1994). OIG reviewed the Transport Airplane Directorate ability to identify and respond to suspected aircraft maintenance and design problems. We found the responsiveness to be hampered by inadequate oversight because: (1) no formal system exists to ensure aircraft problems do not fall into a "black hole" and (2) no adequate documentation, tracking, and report archival and research mechanism exists to enable FAA to recall incidents, other than by engineers' memories.

Report on the 1988 FAA Reorganization "Straightlining" (No. E5-FA-3-002, dated June 9, 1993.) At the request of the Chairman of the House Aviation Subcommittee, we evaluated the effectiveness by which FAA communicates and oversees policy execution since the 1988 management restructuring (known as "Straightlining"). We determined "Straightlining" (1) improved communication and management accountability within straightlined organizations; (2) reduced communication between straightlined organizations and between straightlined and non-straightlined organizations; and (3) generally improved the consistency by which policy is applied within FAA, with the exception of the aircraft inspection program.

General Accounting Office

New Regulations for Deicing Aircraft Could Be Strengthened(GAO/RCED-93-52, dated November 1992). At the request of the Ranking Minority Member, Subcommittee on Transportation and Related Agencies, Senate Committee on Appropriations asked GAO to: (1) determine FAA progress in developing new deicing regulations, (2) describe the manner in which the new regulations address safety concerns, and (3) identify any areas needing improvement. GAO determined FAA regulations are a positive step toward ensuring safe ground operations for aircraft during icing condition. However, additional actions could further ensure safety.

New FAA Approach Needed to Meet Challenges of Advanced Technology (GAO/RCED-93-155, dated September 1993). At the request of the Chairman of the House Aviation Subcommittee, GAO evaluated if the FAA staff are effectively involved in the certification process and provided the assistance and training to be competent. GAO determined FAA has not ensured its staff is effectively involved in the certification process or provided its staff the assistance and training needed to ensure competence in new technologies.

APPENDIX C

SPECIAL EMPHASIS AIRPORTS

No.	State	Airport Name	1993 Aircraft Depart-ures	1993 Percentage Enplane-ments	Inches of Snow	Days with Snow	Days Below 32°	Days With Freezing Rain
1	Alaska	Anchorage	36,909	0.30	70	99	194	NA
2	Georgia	William B. Hartsfield Atlanta	272,889	4.76	2	4	49	2 to 4
3	Maryland	Baltimore-Washington	61,599	0.84	21	23	97	4 to 8
4	Massachusetts	General Edward L. Logan	157,959	2.18	40.2	NA	98	4 to 8
5	North Carolina	Charlotte-Douglas	125,266	1.67	6	5	65	2 to 4
6	Illinois	Chicago Midway	40,898	0.64	39	62	132	8 to 12
7	Illinois	Chicago-O'Hare	384,362	6.22	39	62	132	8 to 12
8	Kentucky	Cincinnati-Northern Kentucky I	78,361	1.09	23	47	107	4 to 8
9	Ohio	Cleveland-Hopkins	64,907	0.83	55	95	123	4 to 8
10	Texas	Dallas-Ft. Worth	356,770	5.26	3	4	40	4 to 8
11	Colorado	Stapleton	183,464	3.06	63	75	155	4 to 8
12	Michigan	Detroit Metropolitan Wayne County	145,579	2.35	41	77	136	8 to 12
13	Indiana	Indianapolis	58,409	0.58	25	46	119	8 to 12
14	Missouri	Kansas City	60,347	0.81	21	34	110	8 to 12
15	Tennessee	Memphis	89,988	0.69	5	NA	56	2 to 4
16	Minnesota	Minneapolis-St. Paul	136,748	2.22	52	80	156	> 12
17	Tennessee	Nashville	65,306	0.81	11	14	76	2 to 4
18	New Jersey	Newark	140,542	2.34	27	NA	86	4 to 8
19	New York	John F. Kennedy	82,460	1.76	24	28	73	4 to 8
20	New York	La Guardia	135,996	1.99	24	28	73	4 to 8
21	Pennsylvania	Philadelphia	115,595	1.56	22	27	94	4 to 8
22	Pennsylvania	Pittsburgh	131,443	1.79	43	82	121	8 to 12
23	Oregon	Portland	89,821	0.89	7	NA	42	2 to 4
24	North Carolina	Raleigh-Durham	61,605	0.90	8	2	77	2 to 4
25	Missouri	Lambert-St. Louis	189,020	2.11	20	28	100	8 to 12
26	Utah	Salt Lake City	89,388	1.53	63	74	128	4 to 8
27	Washington	Seattle-Tacoma	143,465	1.92	13	14	38	2 to 4
28	D.C.	Washington Dulles	45,164	0.86	18	18	71	4 to 8
29	D.C.	Washington National	97,173	1.53	18	18	71	4 to 8
		Minimum:	**36,909**	**0.30**	**2**	**2**	**38**	**2**
		Maximum:	**384,362**	**6.22**	**70**	**99**	**194**	**>12**

- Data on the 1993 aircraft departures and percentage of enplanements were taken from Airport Activity Statistics of Certificated Route Air Carriers for the 12 months ending December 31, 1993.

- Weather data (i.e., inches of snow, days with snow, days below 32°, and days with freezing rain) were taken from The 1995 USA Today Weather Almanac.

APPENDIX D

LOCAL DEICING PLANS

This appendix summarizes our review of 10 local airport deicing plans. FAA Headquarters provided us with 5 of the 10 plans; however, FAA Headquarters did not possess the Chicago-O'Hare, Chicago-Midway, Dallas-Ft. Worth, Lambert-St. Louis, and Washington-Dulles plans. We acquired these five plans through site visits to the airports. We reviewed these plans to see how they address the major local airport coordination issues identified by FAA. Table 8 shows the comparison of the local deicing plans.

Table 8: Comparison of Local Deicing Plans[20] (Continued on Next Page)

Airport	Triggering Mechanism	Ground Flow Strategies	Repeat Aircraft Deicing	Balance Departure and Arrival Rates	Exempt Flights From Metering & Separation Programs	Departure Slot Allocations	Deicing Fluid and Holdover Time Description
Anchorage	Air carrier operating under holdover time restriction	YES Detailed instructions depending on runway availability	YES Two special movement areas for secondary deicing	NO Gate Hold Procedures implemented by ATC	NO	NO	NO
Chicago Midway	No Trigger	YES Special provisions for remote deicing and aircraft requiring physical examination of wings	YES	YES Departure restrictions unnecessary. Arrival rates can potentially be altered	YES	NO	NO
Chicago-O'Hare	Airport Operator	YES. Detailed instructions on metering aircraft to runways	YES	YES	YES	YES Hourly predetermined number of departures for air carriers	YES
Dallas-Ft. Worth	Air carriers anticipating a need for deicing	YES Detailed instructions on directing aircraft to secondary deicing sites	YES Designated areas for inspections & secondary deicing	YES	NO	YES Hourly predetermined number of departures for air carriers	NO
John F. Kennedy	Mutual decision by air carriers, ATC, and airport operator	NO	YES Two secondary deicing stations	YES	YES	YES Allocation system operated by air carriers on a rotational basis	NO

[20] **local deicing plans**--descriptions reflect contents of the local deicing plans and may not reflect actual airport operations.

Table 8: Comparison of Local Deicing Plans (Continued from Prior Page)

Airport	Triggering Mechanism	Ground Flow Strategies	Repeat Aircraft Deicing	Balance Departure and Arrival Rates	Exempt Flights From Metering & Separation Programs	Departure Slot Allocations	Deicing Fluid and Holdover Time Description
Kansas City	Any air carrier informs airport operator of deicing	NO	NO	NO Gate Hold Procedures	NO	NO	NO
La Guardia	Air carrier-operated Deicing Desk	YES Detailed taxi directions depending on runway availability	YES	YES	NO	YES Allocation system operated by air carriers on a rotational basis	NO
Lambert-St. Louis	First air carrier initiating deicing operations	NO	NO	NO	NO	YES Operated by TWA	NO
Washington Dulles	United Airlines Departure Control Desk	NO	YES Two designated secondary deicing areas	YES	YES	YES Operated by United Airlines	NO
Washington National	Airport operator, ATC, or USAir	NO	NO	YES	NO	YES Determined by Deice Control Center	NO

APPENDIX E

NON-SPECIAL EMPHASIS AIRPORTS

No.	State	Airport Name	1993 Aircraft Departures	1993 Percentage Enplane-ments	Inches of Snow	Days with Snow	Days Below 32°	Days With Freezing Rain
1	New Mexico	Albuquerque	39,433	0.57	11	18	114	1 to 2
2	New York	Greater Buffalo	28,936	0.31	90	129	131	8 to 12
3	Ohio	Port Columbus	41,008	0.51	28	56	118	4 to 8
4	Texas	Dallas Love Field	45,870	0.68	3	4	40	4 to 8
5	Connecticut	Bradley	36,628	0.46	46	50	135	4 to 8
6	Hawaii	Honolulu	83,307	1.81	0	0	0	NA
7	Texas	William P. Hobby	59,729	0.87	0	0	21	< 1
8	Texas	Houston	116,601	1.86	0	0	21	< 1
9	Nevada	McCarran	104,489	2.16	1	1	37	< 1
10	California	Los Angeles	192,145	3.94	0	0	0	< 1
11	Florida	Miami	119,708	2.16	0	0	0	< 1
12	Wisconsin	General Mitchell	41,538	0.45	49	75	141	8 to 12
13	Louisiana	New Orleans	46,284	0.70	0	0	13	< 1
14	Oklahoma	Will Rogers World Airport	27,531	0.33	10	15	79	8 to 12
15	Florida	Orlando	94,823	1.86	0	0	3	< 1
16	Arizona	Phoenix-Sky Harbor	148,478	2.41	0	0	10	< 1
17	California	Sacramento Metropolitan	36,620	0.54	0	0	21	< 1
18	Texas	San Antonio	40,208	0.59	1	0	23	1 to 2
19	California	San Diego Lindbergh Field	68,889	1.22	0	0	0	< 1
20	California	San Francisco	151,966	2.99	0	NA	0	< 1
21	Florida	Tampa	60,601	0.98	0	0	3	< 1
22	Arizona	Tucson	17,595	0.27	2	1	18	< 1
23	Oklahoma	Tulsa Airport	27,173	0.31	10	14	78	8 to 12

- The highlighted airports (numbers 2, 3, 4, 5, 12, 14, and 23) are the seven airports experiencing comparable levels of traffic and icing weather to the 29 special emphasis airports.

- Data on the 1993 aircraft departures and percentage of enplanements were taken from Airport Activity Statistics of Certificated Route Air Carriers for the 12 months ending December 31, 1993.

- Weather data (i.e., inches of snow, days with snow, days below 32°, and days with freezing rain) were taken from The 1995 USA Today Weather Almanac.

APPENDIX F

DEICING FACILITY CONSTRUCTION

FAA provided the Fiscal Years 1993 and 1994 funding figures for the special emphasis airports listed in Table 9. The deicing facility figures reflect total AIP funds granted to these airports for deicing facility construction.

Table 9: Special Emphasis Airports Deicing Facility Construction

No.	Airport	Fiscal Year 1993	Fiscal Year 1994	Total	Total Deicing Facilities	Deicing Locations[21]	Future Plans[22]
1.	Anchorage	7,253,048	7,109,531	14,362,579	0	gates & secondary	no
2.	Atlanta - William B. Hartsfield	17,768,128	24,139,301	41,907,429	0	gates & secondary	no
3.	Baltimore-Washington	6,279,027	5,963,138	12,242,165	3,869,268	gates & secondary	yes
4.	Boston - General Edward L Logan	16,303,500	17,220,358	33,523,858	0	gates & secondary	no
5.	Charlotte-Douglas	15,546,340	17,787,555	33,333,895	0	gates & secondary	no
6.	Chicago Midway	5,208,775	3,046,800	8,255,575	0	gates	no
7.	Chicago-O'Hare	33,299,480	38,369,654	71,669,134	52,000,000	gates & secondary	yes
8.	Cleveland-Hopkins	4,605,368	4,348,738	8,954,106	0	gates	no
9.	Cincinnati-Northern Kentucky	13,950,000	17,249,975	31,199,975	0	gates	no
10.	Dallas-Ft. Worth	39,129,891	57,029,056	96,158,947	0	gates & secondary	no
11.	Denver (New Airport)	47,882,441	38,021,038	85,903,479	0	secondary	no
	Denver Stapleton (defunct)	0	0	0	0	gates	no
12.	Detroit Metropolitan Wayne Co.	22,317,369	26,706,483	49,023,852	0	gates & secondary	no
13.	Indianapolis	21,021,899	6,488,849	27,510,748	0	gates & secondary	no
14.	Kansas City	6,712,530	28,016,562	34,729,092	0[23]	gates	no
15.	Memphis	11,284,175	16,898,187	28,182,362	0	secondary	yes
16.	Minneapolis-St. Paul	18,949,313	13,285,888	32,235,201	0	gates & secondary	no
17.	Nashville	16,851,250	10,649,473	27,500,723	0	gate & secondary	no
18.	John F. Kennedy	10,057,288	9,319,628	19,376,916	0	gates & secondary	no
19.	La Guardia	9,415,000	24,624,287	34,039,287	0	gates & secondary	no
20.	Newark	8,793,489	9,911,680	18,705,169	0	gates & secondary	no
21.	Philadelphia	14,186,038	14,092,395	28,278,433	0	gates & secondary	no
22.	Pittsburgh	14,101,862	22,864,093	36,965,955	0	gates & secondary	no
23.	Portland	5,298,140	5,168,192	10,466,332	0	gates	yes
24.	Raleigh-Durham	4,968,307	4,725,575	9,693,882	0	gates & secondary	no
25.	Salt Lake City	31,658,165	26,964,216	58,622,381	0	gates & secondary	yes
26.	Seattle-Tacoma	18,247,224	6,839,926	25,087,150	0	gates	yes
27.	Lambert-St. Louis	13,709,801	14,425,000	28,134,801	3,155,800	gates & secondary	yes
28.	Washington Dulles	16,734,582	9,378,290	26,112,872	0	gates & secondary	no
29.	Washington National	13,600,000	7,231,399	20,831,399	0	gates & secondary	no
	Total	$440,111,254	$456,626,435	$896,737,689	**$59,025,068**		

[21] **deicing locations--**"gates" indicates deicing only takes place at the passenger boarding area. "Secondary" indicates some form of deicing takes place away from the passenger boarding area;. These secondary locations may be a taxiway, an end of a runway, or a fully-operating deicing pad with a fluid reclamation system and automatic aircraft sprayers.

[22] **future plans--**future plans range from construction of fluid reclamation systems to construction of fully operational deicing pads.

[23] **Kansas City--**declined a $3,010,359 AIP grant to construct a deicing facility because traffic density did not warrant construction.

The airports listed in Table 10 are not special emphasis airports. The values indicate the total amount of both AIP and Passenger Facility Charge[24] funds designated for deicing facilities.

Table 10: Non-Special Emphasis Airports Deicing Facility Construction

No.	City/State	Airport	Total Deicing Facilities
1.	Buffalo, NY	Greater Buffalo	$0
2.	Cheyenne, WY	Cheyenne	$251,737
3.	Colorado Springs, CO	City of Colorado Springs	$17,103
4.	Columbus, OH	Port Columbus	$0
5.	Dallas, TX	Dallas Love Field	$0
6.	Dayton, OH	James M Cox Dayton	$728,835
7.	Huntington, WV	Tri-State/Milton J Ferguson	$30,000
8.	Lexington, KY	Blue Grass	$215,563
9.	Lincoln, NE	Lincoln Municipal	$900,000
10.	Lubbock, TX	Lubbock	$123,952
11.	Milwaukee, WI	General Mitchell	$0
12.	Oklahoma City, OK	Will Rogers World	$0
13.	Parkersburg, WV	Wood County/Gill Robb Wilson	$125,000
14.	Providence, RI	Theodore Francis Green State	$1,494,678
15.	Rhinelander, WI	Rhinelander-Oneida County	$5,650
16.	Spokane, WA	Spokane	$2,500,000
17.	Tulsa, OK	Tulsa	$0
18.	Windsor Locks, CT	Bradley	$2,000,000
		Total	**$8,392,518**

[24] **passenger facility charge**-a charge imposed on passengers enplaned at a commercial service airport. These funds may be used to finance approved projects at the airport.

APPENDIX G

ACRONYMS

AAS	Airport Safety and Standards
AD	Airworthiness Directive
AFS	Flight Standards Service
AIP	Airport Improvement Program
ALPA	Airline Pilots Association
ASI	Aviation Safety Inspector
ASRS	Aviation Safety Reporting System
ATA	Air Transport Association
ATC	Air Traffic Control
ATR	Avions de Transport Regional
DGAC	Direction Generale de L'Aviation Civile
DOT	Department of Transportation
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FPD	Freezing Point Depressant
FSDO	Flight Standards District Office
FSIB	Flight Standards Information Bulletin
GAO	General Accounting Office
NPDES	National Pollution Discharge Elimination System
NRS	National Resource Specialist
NTSB	National Transportation Safety Board
OIG	Office of Inspector General
PTRS	Program Tracking and Reporting Subsystem
SPAS	Safety Performance Analysis System

APPENDIX H

INSPECTION TEAM MEMBERS

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APPENDIX I

FAA COMMENTS ON DRAFT REPORT

U.S. Department
of Transportation
Federal Aviation Administration

Memorandum

Subject: **INFORMATION:** Response to Office of Inspector General (OIG) Draft Report, Evaluation of FAA's Deicing Program

Date: MAY 21 1996

From: Administrator

Reply to Attn. of: A Williams: 267-9000

To: Assistant Inspector for Inspections and Evaluations

As requested in your December 5, 1995, memorandum, we have reviewed and attached our comments to the subject OIG draft report. In addition to stating corrective actions taken or planned to be taken to close each recommendation, we have also commented on several of your findings. Recommendation 6 does not contain an estimated completion date, since recommended action would only be taken when necessary and appropriate under specific circumstances.

David R. Hinson

Attachment

Federal Aviation Administration (FAA) Position on Findings and Recommendations Contained in the Office of Inspector General (OIG) Draft Report on the Evaluation of the Federal Aviation Administration's Deicing Program

Finding 1: Air Carrier Deicing Programs

Comments: I am pleased to see that all 10 deicing programs reviewed by the evaluation team contained the required elements of initial and recurrent training and application of holdover times and procedures to inspect the aircraft visually. I believe it should be clearly stated in the report that all the programs were found to be in compliance with the regulations.

Although it is not clearly stated, it appears the team has concluded that the FAA should have issued a rule directing operators to implement deicing programs in a specific way to avoid inconsistencies among programs. The FAA chose, instead, to establish a performance standard and to allow operators to fashion their own programs to meet the standard. The report should acknowledge that the use of a performance standard, rather than a rule directing behavior, is highly recommended by the National Performance Review Report and other studies. It would be useful if the team could explain why it concludes that a performance standard, which will allow operators to establish the most effective and efficient program for their operations, but which may result in inconsistencies among programs, is an inappropriate regulatory scheme in this instance.

The team states that aviation safety inspectors (ASI) identified deficiencies in operator programs and assisted in the correction of the deficiencies and improvement of the programs. Because it is inevitable that some operators will experience difficulty implementing a new program, it was the FAA's intent to work in a partnership with the operators to ensure that the most effective programs were implemented. The report should indicate that the ASI's were implementing agency policy, when they worked with the operators to evaluate deicing programs, to help identify deficiencies and to correct any deficiencies that were discovered.

The team concludes that safety was impacted because "FAA did not consistently approve how air carriers interpret and implement the deicing regulation. " This statement is inconsistent with the fact that all the programs evaluated by the team met the regulatory requirements. FAA consistently approved programs which contained the elements set forth in the regulation. FAA then worked closely with operators to ensure that, when implemented, the approved programs provided the enhanced level of safety necessary for operation in icing conditions.

Recommendation 1 FAA's Flight Standards Service reviews air carrier deicing programs to ensure consistent interpretation and implementation of FAA's deicing regulations and defines responsibilities of regional deicing coordinators.

Response: Partially concur. FAA policy requires that ASI's review **each** carrier's icing program annually to incorporate lessons learned. Since the rule was issued in 1992, the

FAA has issued a number of Flight Standards Information Bulletins (FSIB) related to icing programs. Other guidance materials included Advisory Circular (AC) 120-59 dated 9/30/92, "Pilot Guide Large Aircraft Ground Deicing;" AC 135-17 dated 12/14/92, "Pilot Guide Small Aircraft Ground Deicing;" AC 120-60 dated 5/19/94, "Ground Deicing and Anti-Icing Program;" and AC 135-16 dated 12/12/94, "Ground Deicing and Anti-Icing Training and Checking. "

During the yearly reviews, ASI's ensure that this information is incorporated appropriately into each operator's program. This yearly review ensures that operators are interpreting and implementing their programs in a manner consistent with the regulations. As indicated above, operators may implement the rules in ways that are different from one another due to the nature of their operation and the environment within which they operate. In all cases, however, the program that is implemented will be consistent with the regulatory requirement,

The regional deicing coordinator was a collateral duty assigned to a Flight Standards staff member in each region. The purpose of these duties was to communicate and coordinate the implementation of the amended deicing rules. This duty was never intended to be permanent. The rule was issued and implemented in the 1992-1993 winter season and all carriers have developed policies and procedures that comply with the rule, Any further guidance is in the form of FSIB'S. Therefore, there is no need to define the responsibilities of the coordinators, since these duties are no longer required.

Finding 2: Surveillance of Air Carrier DeicingAuthoritv

Comments: We are pleased that the data reviewed by the evaluation team demonstrates that ASI's have increased their emphasis on surveillance of deicing programs. FAA emphasized gaining compliance by working with the air carriers during the formal conferences that were held to train principal operating instructors, This increased surveillance was performed to allow ASI's to identify shortcomings in deicing programs and to work with operators to make corrections. The report confirms that ASI's worked to correct deficiencies. For example, on page 8 (of the drafti report), the team indicates that ASI's worked with instructors to correct training deficiencies or to clarify inaccurate information. On page 10, the team found that ASI'S corrected deficiencies in operators' holdover programs. We suggest that the report also note that the effort to work in partnership with aviation operators is consistent with the initiatives of Secretary Peña and the FAA to reach our shared goal of zero accidents.

Recommendation 2 FAA's Flight Standards Service take appropriate steps to ensure ASI's are consistent in analyzing the results of deicing inspections, planning future inspections, and seeking changes to air carrier deicing programs.

Response: Concur. A 3-day conference for principal operating inspectors was held in July 1992 to train them on the new deicing regulation. In addition, an Air Transportation Operation Inspector's Handbook change, 8400.10 CHG 9, was issued on November 2, 1994, providing standard procedures for performing deicing inspections and

techniques for recognizing contamination on the airplane. The primary purpose of these inspections is to ensure that approved procedures outlined in the air carrier's program are adequate to ensure aircraft are free of contamination prior to takeoff and that approved procedures are satisfactorily accomplished. National program guidelines annually set numerical guidelines for scheduling deicing surveillance for the next winter season. These inspections provide the basis for followup surveillance or changes to an air carrier's approved program.

Recommendation 3. FAA's Flight Standards Service: (1) investigates what enforcement action, if any, was taken against the air carrier that violated the amended regulation, and (2) corrects any deficiencies identified in the enforcement process.

Response: Concur. We can confirm that the February 25, 1994, deicing enforcement action referred to in the draft report was opened in the Program Tracking and Reporting Subsystem (PTRS) on March 4, 1994. FAA sought a 90-day suspension against the pilot in command (PIC) for a Kiwi flight departing Chicago Midway. A National Transportation Safety Board (NTSB) law judge heard the case on May 9, 1995, and ruled in favor of the PIC dismissing FAA's order of suspension. Subsequently, an appeal was filed by the FAA with the full NTSB and that appeal is still pending. There do not appear to be any deficiencies in the enforcement program related to this case. Table 5, as presented in the draft report is misleading. FAA took a number of enforcement actions in the 1993-94 winter season which included warning letters, letters of correction, warning notices, and civil penalties.

Finding 3: Deicing Coorperation at Airports

Recommendation 4: FAA's Associate Administrator for Airports develop and publish criteria to define which airports are "special emphasis. "

Response: Nonconcur. Finding 3 and recommendations 4 and 5 are based on erroneous information disseminated by the various sources and reported as fact by the OIG investigator. Specifically, contrary to the OIG assertion, FAA did not request airport operators at 29 "special emphasis" airports to develop local airport deicing plans and to submit such plans to the FAA, nor did the FAA abandon the initiative it undertook due to lack of responsiveness by airport operators.

The responsibility for conducting adequate aircraft deicing operations rests solely with the aircraft operators and pilots. FAA and the industry have long recognized the impact on safety of ice accumulation on aircraft while awaiting departure after initial deicing has taken place. At the May 1992 Deicing Conference, it was agreed that to minimize this problem, cooperation and close coordination among the air carriers, the airport operators, and the local air traffic control facilities was essential. To promote this closer coordination, the FAA Associate Administrator for Airports communicated in writing to 29 selected airport operators requesting that each of them serve as a focal point in arranging a meeting with the air carriers and air traffic control personnel for the purpose of assessing "the impacts of the air carriers' deicing activities on airport operations and

identify actions that can be taken by air carriers, the control tower, and the airport operator to maximize the effectiveness and efficiency of operations during these periods. ” The development of mutually agreed-upon airport deicing plans by representatives of each of these entities acting in concert was subsequently encouraged, but was not specifically requested. Consequently, there was never any intention by FAA to require and to review any formal plans that might be developed as a result of this initiative.

The 29 high activity airports were initially selected by FAA and the industry as those in which aircraft were most likely to encounter icing conditions while awaiting departure. This request was not limited to these 29 airports, but was subsequently expanded to include all certificated airports that had local air traffic control facilities and which might be subject to icing conditions and departure delays.

Given these facts, FAA takes strong exception to the statement by the OIG that it abandoned this initiative due to the negative responses received by airport operators. Quite the contrary, we consider this initiative to have been highly successful. The responses that we received from airport operators in response to this request were all very positive and, with few exceptions, resulted in greater coordination at the local level and, in many cases, the establishment of permanent deicing coordination teams and formalized procedures.

OIG recommendations 4 and 5 would have FAA define those airports considered “special emphasis” and amend Federal Aviation Regulations (FAR) Part 139 to address the responsibilities of airport operators in icing conditions, including developing and providing deicing plans to FAA.

As noted previously, FAA encouraged airport operators, air carriers, and air traffic control facilities to work together to develop and implement local deicing plans. These plans would address the coordination procedures and activities necessary to reduce the ground time of departing aircraft after deicing had taken place. In most cases, the primary focus of these plans would involve specific activities and coordination procedures between the individual tenant air carriers and local air traffic control facilities. These are outside the control and jurisdiction of the airport operator and beyond their ability to ensure their implementation. Hence, we do not consider it appropriate or useful to impose upon the airport operator the development and implementation of such a plan. Such a regulatory imposition would be at variance with FAR Part 139 in that all requirements in this regulation, including the development and implementation of various operational plans, are the direct and sole responsibility of the airport operator. This includes an existing requirement for the development and implementation of a snow and ice control plan designed to ensure that runways, taxiway routes, and other aircraft operational areas are properly maintained during snow and icing conditions. Finally, we are unaware of any major problems that have occurred with aircraft deicing activities that can be attributed to lack of the airport operator’s cooperation with the tenant air carriers and the local air traffic control facilities.

With regard to recommendation 4, the initial selection of 29 airports did not represent a formal categorization of airports or an agency intention to place a long-term "special emphasis" on particular airports. In light of the FAA's nonconcurrence with the recommendations for rulemaking to require airport operators to prepare local deicing plans, a "special emphasis" list of airports is unnecessary.

For these reasons, we believe that recommendations 4 and 5 as proposed by the OIG are both inappropriate and unnecessary.

Recommendation 5: FAA's Associate Administrator for Airports revised FAR Part 139 to address the responsibilities of airport operators in icing conditions, including developing and providing deicing plans to FAA.

Response: See response to recommendation 4.

Finding 4: Construction of Deicing Facilities

Recommendation 6: FAA's Associate Administrator for Airports aid airport operators in resolving Environmental Protection Agency (EPA) issues to facilitate construction of more deicing facilities.

Reponse: Concur. Although we agree with the recommendation, we are not aware of any environmental problems related to deicing/anti-icing facilities. In addition, we do not know of any air carriers who have received a Cease and Desist Order because they have exceeded EPA-established glycol toxicity levels. Since we are very interested in problems airport operators and air carriers experience regarding such facilities, we would appreciate any information the OIG can provide on this subject,

We would also like to emphasize the following activities that the Office of Airport Safety and Standards (AAS) has undertaken to assist the EPA in its efforts to control storm water runoff from deicing/anti-icing facilities.

1. AAS has cooperated with EPA throughout EPA's development of the National Pollution Discharge Elimination System (NPDES) storm water permit regulations. Members of this office's environmental and safety staffs have met with EPA personnel responsible for writing these regulations and those portions of the multi-sector permit addressing airport-related storm water issues. After speaking with this office, EPA emphasized that it did not intend to compromise aircraft safety in any way by writing regulations or permit conditions that would limit the amount of glycol-based deicing/anti-icing agents used to prepare aircraft for safe flight.

2. In an attempt to resolve issues between FAA and EPA regarding many aspects of airport operations, including deicing/anti-icing activities, AAS has provided comments to EPA on its proposed NPDES regulations and permits. Our comments pointed out differences and concerns regarding airport operations and the NPDES storm water regulations and permits.

3. In addition to EPA's regulations and multi-sector permit, airport operators must comply with 39 different sets of NPDES permit requirements, since EPA has authorized 39 states to issue general NPDES storm water permits (EPA issues those permits in the 11 states not yet having that authority). As a result, the decentralized issuance of these permits makes resolution of storm water issues related to deicing/anti-icing impacts more complicated, since we are not dealing solely with one agency, i.e., EPA. Nevertheless, we emphasize that the Office of Airports environmental specialists throughout the country are available to assist any airport sponsor who requests FAA assistance in resolving issues with EPA or any state regarding the contractions or operation of deicing/anti-icing facilities.

We also emphasize the following FAA airport programs that are available to aid airport sponsors in resolving environmental issues related to constructing and operating deicing/anti-icing facilities.

1. Before providing funds from the Airport Improvement Program (AIP) to build deicing/anti-icing facilities or approving changes to an airport layout plan (ALP) to include those facilities, the FAA requires the airport sponsor to prepare an environmental assessment (EA) to comply with the National Environmental Policy Act (NEPA). These documents assess construction and operation impacts expected to result from these facilities, and accepts those EA's if they meet the criteria published in FAA Order 5050.4A. EA's meeting these criteria are used to determine the level of environmental impact these facilities are expected to cause. For facilities not significantly affecting the environment, we issue Findings of No Significant Impact (FONSI), which may contain mitigative measures to minimize expected deicing/anti-icing related water quality impacts. For facilities significantly affecting the environment, we would prepare an environment impact statement (EIS) under NEPA. In all cases, FAA airport specialists would, if an airport operator requests, assist the airport operator in resolving water quality impacts that the EPA or a state agency requires in a water quality certificate (WQC) or an NPDES permit issued under sections 401 and 402, respectively, of the Federal Water Pollution Control Act.

2. Measures to mitigate deicing/anti-icing related water quality impacts that are identified in an FONSI or an EIS or that are required by WQC or NPDES permit would be eligible for AIP finds. The Airport and Airway Safety, Capacity, Noise Improvement, and Intermodal Transportation Act of 1992 (49 U.S.C. 47102) authorizes the Associate Administrator for Airports to assist airport operators implement such measures financially. This financial assistance often enhances an airport operator's ability to meet state or EPA concerns and resolve deicing/anti-icing related issues that these parties may have.

3. The FAA's Passenger Facility Charge (PFC) program allows airport operators to use money collected under the PFC program to finance FAA-approved capital investment projects that would improve airplane passenger safety and convenience. Some of these projects include PFC-financed deicing/anti-icing facilities. Per 49 U.S.C. 47102,

mitigation measures identified in NPDES permits or WQC's are eligible for PFC funds if the project is also included in an AIP grant. In addition, water quality mitigation measures required by FONSI'S or EIS's are eligible for money collected under the PFC program, whether or not this office issues an AIP grant for the deicing/anti-icing facility. In both cases, the Director of Airport Safety and Standards (AAS-1) must approve an airport operator's request to collect a PFC and any related proposed facilities and mitigation measures.

We believe that the above efforts, in conjunction with other requests that we receive from airport operators, show that the Associate Administrator for Airports takes, and is willing to take, an active role in assisting these operators resolve environmental issues related to deicing/anti-icing facilities. AAS-1 remains available to provide that assistance and welcomes any airport operator's request to do so.

Finding 5: Aircraft Design Under Icing Conditions

Comments: We are disturbed that the team seems to rely upon newspaper articles as the source of data for its review of the certification of the ATR aircraft. That would suggest that the conclusions drawn in the report may reflect any bias or misunderstandings on the part of the news reporter--bias or misunderstanding of which the team would not be aware. Aircraft certification is a complex, technical undertaking. Any conclusions about the certification of the ATR based purely on reading press accounts are unlikely to withstand scrutiny by the scientific community--and may, in fact, lack sound scientific basis. To assist in a more complete understanding of the certification process and the certification of the ATR, we provide the following information. We request that it be incorporated in this section of the report:

In any certification program, responsibility for compliance with applicable regulations lies with the applicant. The FAA establishes the certification basis and reviews and approves test plans prior to testing. The FAA witnesses critical tests, including certain ground and laboratory tests, and reviews the test results upon the conclusion of testing.

In the case of airplanes manufactured in a foreign country--like the Aerospatiale ATR-42 and ATR-72--the Bilateral Airworthiness Agreement (BAA) between the United States and the responsible foreign authority governs the actions of each party. The FAA establishes the certification basis and instructs the foreign authority in matters of policy and procedures regarding the showing of compliance with FAR Part 25. The foreign authority makes all findings of compliance to FAR Part 25 in accordance with the guidance provided by the FAA. The FAA grants a type certificate only when it is satisfied that all requirements of the certification basis have been met. These roles and responsibilities are reversed when a U. S. manufactured airplane is certificated in a foreign country.

In the specific case of Aerospatiale and the Direction Generale de l'Aviation Civile (DGAC), the icing certification program for the ATR42 was thorough, and compliance with FAA requirements was satisfactorily shown. For the ATR-72, the DGAC imposed

additional testing requirements to show compliance with appendix C of FAR/JAR 25 icing requirements. These additional requirements were known as "Special Condition B-6, " and contained requirements and explanatory material relating to handling characteristics and airplane performance with ice accumulated on certain unprotected surfaces. The requirements of Special Condition B-6 have been adopted by the FAA and other airworthiness authorities in the certification programs of several later airplane makes and models.

Since 1986, when the ATR-42 entered service, the ATR fleet has accumulated approximately 4 million flight hours. In that time, there have been eight serious roll anomalies on the ATR-42 and 72. In each case, the FAA investigated the incident thoroughly and, based on the evidence available at that time, took prudent action. Five airworthiness directives (AD) were written to address unsafe conditions that were discovered during our investigations.

- Telegraphic AD T86-25-52 was written on December 19, 1986, following roll control problems on two ATR-42's approaching Detroit, MI. This AD initially prohibited flight into icing conditions. Later, after changes to the operation of the deicing system and the stall warning system, including a new speed schedule to be flown in icing conditions, the flight restriction was removed.

- On October 15, 1987, an ATR-42 crashed near Crezzo, Italy, following an encounter with severe icing. The FAA dispatched two specialists to Toulouse, France, to review the ATR icing certification procedures and data. The FAA determined that this accident was caused by a slow-speed stall which occurred while the airplane was attempting to climb in severe icing conditions. The flight crew allowed the airplane to slow below the required speed during the attempted climb.

- Telegraphic AD T87-25-51 was written on December 4, 1987, following a roll control problem on an ATR-42 near Traverse City, MI. This AD required the installation of a drain hole on the autopilot roll actuator to prevent water from collecting, freezing, and binding the actuator, which was determined to have caused the roll problem.

- On April 7, 1989, the FAA issued AD 89-09-05, which prohibited the use of the autopilot in icing conditions. This AD was prompted by a reported roll control problem on an ATR-42 on approach to Mosinee, WI. The FAA determined during its investigation that the autopilot masked an asymmetric ice buildup, and the airplane rolled when the autopilot disconnected. This AD was later superseded by a new AD which removed the autopilot restriction following the installation of vortex generators to improve roll control of the airplane. Vortex generators were required as part of the basic type design on the ATR-72.

- On October 31, 1989, the FAA issued AD 89-24-07, which required the installation of an anti-icing advisory system on the ATR-42. This AD was not in response to any particular incident, but was designed to address the problem of flight crews being unaware of significant ice buildup when operating in icing conditions, including

freezing rain. The new anti-icing advisory system included: (1) an electronic ice detector; (2) a stick shaker system; (3) changes in stall angle of attack; and (4) changes to the Airplane Flight Manual to reflect higher minimum speeds when operating in icing conditions. These changes were made proactively to improve protection against loss of control when operating in icing conditions, including freezing rain. Similar design features were incorporated into the basic type design of the ATR-72.

Following the tragic accident near Roselawn, Indiana, numerous changes to the ATR fleet have been made. Clear and unmistakable icing cues, which signal that the airplane has entered freezing drizzle, have been identified. Flight manual procedures have been developed to guide the crew in safely exiting those extreme conditions. New, enlarged deicing boots, which have been shown to shed the ice which may have formed behind the original deicing boots, and which is believed to have contributed to the Roselawn accident, have been FAA approved and installed on all ATR-42 and ATR-72 airplanes.

Finally, the FAA created a special certification review team following the Roselawn accident. This team was made up of 10 certification specialists and pilots, with 6 from the FAA, and 4 from the DGAC. This team spent 6 months reviewing the original certification data for both the ATR-42 and ATR-72, in addition to the extensive wind tunnel and flight test data generated by Aerospatiale after the accident. The team concluded that the ATR-42 and ATR-72 series airplanes were certificated properly in accordance with the FAA and DGAC certification bases, as defined in 14 CFR parts 21 and 25 and JAR 25, including the icing requirements contained in appendix C of FAR/JAR 25, under the provisions of the BAA between the United States and France. The team also concluded that the Roselawn accident conditions included supercooled drizzle droplets (freezing drizzle) outside the requirements of FAR/JAR 25 and appendix C. This extensive review found no discrepancies and verified that the airplane was certificated properly on FAA's behalf by the DGAC under the BAA.

As the report indicates, the bulk of the experimental data forming the basis of appendix C of part 25 (the icing certification standards for all large and small airplanes) was generated in the 1940's and 1950's. However, the team neglected to report that it was re-evaluated in studies conducted in the 1980's and 1990's. Reliance on newspaper accounts, which have failed to report these reevaluations, may have caused the team to be unaware of this fact.

The development of new techniques, and the power of the microprocessor, has only served to enhance our ability to measure cloud physics with greater accuracy and repeatability. In each new certification program, the manufacturer predicts ice shapes and airfoil performance for its airplane from standard texts and computer codes, and then validates these calculations in the wind tunnel and during natural icing flight tests. The applicant must show compliance to a set of well-developed rules and requirements. The icing envelopes contained in appendix C have withstood the test of time, and provide an accurate representation of the most frequent natural icing environment occurring as defined.

It should be noted that the adverse effects of large droplet ice accumulations (supercooled large droplets, more commonly known as freezing rain or freezing drizzle) were not well understood within the aviation industry prior to the Roselawn accident. Investigations by the FAA, the National Transportation Safety Board (NTSB), and academia since the accident have provided the first real understanding of the phenomenon and its effects on airfoils.

With this new information regarding the effects of the relatively rare phenomena referred to as freezing rain and freezing drizzle, the FAA is investigating whether these phenomena should be addressed in the certification requirements of appendix C. This investigation is ongoing, and will involve the aviation industry and numerous foreign airworthiness authorities.

Recommendation 7: FAA's Office of Aircraft Certification establish an icing expert position with oversight authority.

Response: Partially concur. In coordination with industry, the FAA has identified 10 National Resource Specialist (NRS) disciplines, including flight environmental icing, which are critically needed to maintain U.S. leadership in rapidly advancing aerospace technology. However, in the past, we have not been successful in attracting applicants with the highly specialized skills necessary for these positions. Similar positions in industry offer substantially higher salaries plus bonuses. To posture the agency to attract applicants with superior qualifications, we are working to establish executive level NRS positions. Plans are to begin filling new positions in 1996, assuming the funds are available. Personnel Reform should enhance our ability to recruit qualified applicants.

As noted in the report, FAA created an Icing Advisory Committee following the retirement of the FAA Icing NRS. This six-person team is made up of representatives from the four directorates, the FAA Technical Center, and Washington headquarters. This team has been very active in many icing activities, including the ground deicing conference in 1992, the investigation into the tailplane stall phenomenon, the investigation of effects of large droplets on airplane performance, and several conferences with foreign authorities regarding appendix C of FAR Part 25. The team also advises FAA on the scope of its research and development programs for future technologies, including new ice detection systems and experimental ice protection schemes. The team members are all senior engineers and scientists with long experience in icing-related matters. The aviation industry has benefited greatly from their combined expertise.

The FAA, however, does not concur with the OIG's recommendation that the icing expert position should have oversight authority for certification. The FAA has a structured approach to the certification process that allows it the flexibility to tailor its participation, including the NRS's, to each certification project. The FAA believes it can improve the effectiveness of the NRS's in the certification process with better management oversight, not with the use of rigid requirements.

APPENDIX B - PRIOR COVERAGE - We would note that of the four audits mentioned by the OIG, only the General Accounting Office (GAO) report (November 1992) addressed deicing. Since the OIG/GAO recommendations are stated for each report, we would request that you include a summary of the agency's response. As written, this summary leaves the false impression that the agency took no action in response to these recommendations. Of the 13 recommendations, only 3 remain open and those 3 are in the rulemaking process.

E5-FA-4-009 - FAA Responsiveness to Suspected Aircraft Maintenance and Design Problems - (April 15, 1994) - It should be noted that when the OIG issued this evaluation, it recognized that the Transport Airplane Directorate (TAD) had adequate systems in place for tracking the resolution of Airworthiness Directives (AD), FAR Section 21.3 reports, incidents and accidents, and NTSB safety recommendations.

(1) TAD develop and implement a formal tracking system to ensure adequate accountability and timely resolution of reported aircraft maintenance and design problems.

FAA did not concur because the Aircraft Certification offices, within the TAD, have in place systems for processes which meet the intent. OIG noted its intent was to recommend FAA expand the current tracking systems. A copy of the plan was provided to OIG in July 1995.

(2) TAD develop and implement standard procedures for documenting research of suspected aircraft problems.

After further clarification from the OIG, FAA agreed to develop and publish by April 1995 guidelines and procedures for engineers to follow in documenting research of suspected aircraft problems. FAA did not agree that a study which focuses on the research phase of airworthiness problems is warranted. A copy of the plan was provided to OIG in July 1995.

(3) FAA correct SDR program deficiencies and/or invest in an alternate source(s) to facilitate trend analysis of aircraft problems, and

(4) FAA develop trend analysis guidelines and communicate these guidelines to TAD. The guidelines should address the use of Service Difficulty Reporting (SDR) (and/or alternate systems) in conducting trend analysis of suspected aircraft problems.

The above two recommendations are essentially the same as a recommendation made by GAO in RCED-91-24, "Changes Needed in FAA's SDR Program, " dated March 1991. FAA requested that ARAC review the SDR program and to propose changes to those areas of the program needing improvement. The final rule is expected to be issued by September 1996.

E5-FA-3-002 Report on the 1988 FAA Reorganization "Straightlining" (June 9, 1993) OIG found that the 1988 reorganization of the FAA:

(1) improved communication and management accountability within straightlined organizations (no recommendation);

(1) reduced communication between straightlined organizations and between straightlined and non-straightlined organizations, and recommended that FAA develop and implement procedures for identifying and coordinating issues that cut across organizational lines. These procedures, to include specific guidelines, will apply to both straightlined and non-straightlined managers in headquarters and the regions. FAA agreed that communication can always be improved, but the OIG failed to acknowledge adequately the many examples of how organizations are currently working on issues that cut across organizational lines. Developing written procedures and guidelines for identifying and coordinating issues will not add much value; and

(3) generally improved the consistency by which policy is applied within the FAA, with the major exception of the aircraft inspection program. FAA has previously addressed this same issue in OIG/R6-FA-2-084 and identified specific commitments to remedy the situation. The report further stated that the FAA, the OIG, and the Assistant Secretary for Administration are working together to develop actions that would improve the consistency and effectiveness of the aircraft inspection program.

New Regulations for Deicing Aircraft Could be Strengthened (November 1992) - GAO's report noted that following the USAir Flight 405 accident, the FAA acted quickly to issue new regulations governing airlines' ground operations during icing conditions. GAO also found that FAA achieved a significant accomplishment by issuing, within 6 months, interim final regulations to govern airlines' ground operations more strictly during icing conditions. These new regulations require more thorough procedures for inspecting aircraft and removing ice before takeoff. In addition, the new regulations detail the information and training that airlines should provide their personnel to ensure safety during icing conditions. GAO maintains that the new regulations could be further improved by requiring external inspections after deicing/anti-icing holdover time expires, requiring compliance by commuter airlines, and verifying airline deicing/anti-icing training. GAO recommended FAA:

1. Amend the interim final regulations to require that if the holdover time has expired, the critical surfaces for all aircraft be closely inspected from outside or deiced.

The FAA noted that the rule provides three alternatives when a holdover time has expired. The interim final rule states the pre-takeoff contamination check must be accomplished from outside the aircraft unless that air carrier's FAA-approved program specifies otherwise. FAA believes that additional training for personnel associated with the ground deicing process and pre-takeoff contamination check procedures provide an acceptable method of determining if an airplane's critical surfaces are free of frost, ice, and snow.

2. Strengthen existing regulations governing commuter airlines to ensure that their aircraft are free of ice on take off.

FAA agreed to evaluate the need to strengthen existing regulations governing commuter airlines. If FAA's analysis shows that rulemaking is appropriate, actions will be taken to initiate the rulemaking process. FAA anticipates the final rule will be published by September 1996.

3. Develop a method to determine whether airline pilots and ground personnel have received and understood the initial training material explaining their responsibilities and develop more specific guidelines for monitoring the implementation of the regulations this winter,

FAA (concurrent with the effective date of the interim final rule) established a special surveillance plan for this first winter season. As of January 15, 1993, over 1,300 surveillance reports have been completed with over 1,800 comments. These surveillance activities have been entered into Program Tracking Review System (PTRS). Based on this surveillance. FAA believes the intent of this recommendation was met.

GAO/RCED 93155 New FAA Approach Needed to Meet Challenge of Advanced Technology -~ (September 1993) The Department's April 1994 response included a statement that noted "Overall the designee system works well and is a necessary and appropriate element of FAA's certification program. It is a sound approach to providing needed services to the aviation community in a timely way, and allows FAA to leverage its staffing many times over. " Also, it should be noted that the three recommendations GAO made have been successfully closed.

1. To ensure that FAA staff members are effectively involved in the certification process and competent in new and complex technologies, GAO recommended that the Secretary of Transportation direct the FAA Administrator to define a minimum effective role for FAA in the certification process by identifying critical activities requiring the agency's involvement or oversight, establishing guidance on the necessary level and quality of the oversight of designated engineering representatives (DER), and developing measures through which staff members' performance and effectiveness can be evaluated.

FAA concurred and noted that overall the designee system works well and is a necessary and appropriate element of FAA's certification program. It is a sound approach to providing needed services to the aviation community in a timely way, and allows FAA to leverage its staffing many times over. **We are pleased that the GAO did not identify any safety problems associated with the current level of DER supervision and monitoring.** Nonetheless, in the interest of continuous improvement, we plan to reevaluate our current guidance regarding the quality of DER oversight. We plan to complete this evaluation by the end of FY 1994. The evaluation was completed and a copy of the final report was provided to GAO. This action was closed.

2. GAO recommended that the Secretary of Transportation direct the FAA Administrator to: (1) formally examine the need to hire national resource specialists (NRS) in areas of technological advancement over the last 14 years, and (2) require NRS's involvement early in the certification process and at other key junctures.

FAA agreed to reexamine its need to hire additional NRS's. However, FAA did not agree with GAO's recommendation for mandating NRS involvement in the certification process. This action was closed.

3. To ensure that FAA staff receive the technical training needed, GAO recommended that the Secretary of Transportation direct the FAA Administrator to establish specific training requirements for each certification discipline, ensure that each staff member meets those requirements, and keep the training as current as possible by identifying the training in new technologies that is available at universities, private industry, and other Government agencies.

The FAA's Aircraft Certification Service agreed to developed a strategic plan for technical training. The plan was published in December 1993 and a copy provided to GAO. This action was closed.