Ground Deice/Anti-Ice Manual

2016-2017 Winter Season

U.S. Department
of Transportation
**Federal Aviation
Administration**

Northwest Mountain Region
Colorado, Idaho, Montana,
Oregon, Utah, Washington,
Wyoming

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October 3, 2016

Robert McIver, Director of Operations
Corporate Air
P.O. Box 81050
Billings, Montana 59108-1050

Dear Mr. McIver:

The Corporate Air Ground De-Icing/Anti-Icing manual, Revision 13, dated October 1, 2016, is approved effective October 3, 2016.

Feel free to contact me at (406) 449-5270, extension 56, if you have any questions. Our office is open from 7:30 a.m. to 4:00 p.m., Monday through Friday.

Sincerely,

Christopher Farnell
Principal Operations Inspector

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Highlight of Changes
Ground Deicing/Anti-icing Manual
Revision 13

- All pages, added page numbers to the bottom of the page for better administrative control and referencing.
- Pages i through vii…. Renamed section Front Matter. Contains general administrative polices. No editorial changes.
- Renamed section General Provisions and numbered all pages of the section with the number 1.xx
- Some repagination due to document cleanup. No content change until noted a solid line sidebar on the page and in this Highlight of Changes
- Page 1.12…. Added some updated information about Type I Fluids from FAA Notice 8900.3784 with an effective date of 8/3/16
- Page 1.13…. Added additional information regarding Type IV Fluid holdover time when applied heated and a note on the two-step deicing/anti-icing using Type IV Fluid exclusively for the deicing/anti-icing procedure
- Page 1.20…. Paragraphs 6.5 and 6.6 removed. The information obtained is no longer applicable. FedEx the deice/anti-ice provider post the freezing point information at their stations for the pilots to review.
- Page 1.24…. Removed reference to Part 121 operations in paragraph 9.3(7)(i).
- Page 1.25…. Added 9.4(a) Pilot Assessment of Precipitation Intensity procedures.
- Page 1.34…. Removed paragraph 13.0, A Summary of the Sequence of Events When Ground Deicing Procedures are in Effect. This subject is covered by the One-Step or Two-Step Procedure work cards in this document and carried on board the aircraft.
- Page 1.39…. Added Crewmember assessment of precipitation intensity.
- Page A-1…. Notes Appendices A & B have been removed
- Page C-6…. 2016-2017 Snowfall Intensity table
- Page C-7…. 2016-2017 Holdover table Type I fluid aluminum surface aircraft
- Page C-8…. Updated notes to the chart on previous page
- Page C-9…. 2016-2017 Holdover table Type I and Type IV fluids in active frost
- Page C-10…. Updated notes to the chart on previous page
- Page C-11…. Updated Holderover table for generic Type IV fluids

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- Page C-12…. Updated notes to the chart on previous page
- Page C-13…. Updated holdover table for Type IV Cyrotech Polar-Guard Advance
- Page C-12…. Updated notes to the chart on previous page
- Page C-13…. 2016-2017 Holdover table for Type IV Cryotech Polar-Guard Advance
- Page C14…. Updated notes to the chart on previous page
- Page C-15…. 2016-2017 guidelines for applications of of SAE Type I fluids
- Page C-17…. Reorganized/reformatted One-Step Deicing Checklist
- Page C-18…. Continuation of the One-Step Deicing Checklist
- Page C-19…. 2016-2017 Type I and Type IV fluids Aerodynamic Acceptance tables
- Page C-20…. Reorganized/reformatted Two Step Deice/Anti-ice Checklist
- Page C-21…. Continuation of the Two Step Deice/Anti-ice Checklist
- Pages D-1 thru D-2…. Excerpts from FAA NOTICE N8900.374
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1.0 General Provisions

GROUND DEICING MANUAL OVERVIEW
(135.21, 135.23, 135.227, 121.629)

a) Applicability
   1) This Manual Describes the policies, procedures, and responsibilities of personnel associated with Corporate Air's ground deicing program for the company's continuing authorization under Operations Specification A023.

b) Authority and Responsibility
   1) The person holding the authority and responsibility for the setup and changing of the processes/procedures for the Ground Deicing Manual is specified in the Part 135 GOM.

c) Manual Distribution
   1) Distribution of the Ground Deicing Manual is specified in the Part 135 GOM.

d) Impact Assessment, Interfaces and Consistency Among Manuals
   1) These processes are specified in the Part 135 GOM.

e) Discrepancies
   1) Advise the person holding the authority and responsibility to change the processes/procedures of this manual so corrections can be made.
   2) Guidance, policies, and procedures in this manual are not intended to be contrary to any provisions of the Federal Aviation Regulations or the limitations/provisions of the Aircraft Flight Manual. In the event a conflict arises, the Federal Aviation Regulations/Aircraft Flight Manual will be used as the primary source of guidance. If the holder of this manual perceives such a conflict, immediately contact the Chief Pilot for clarification.
   3) Through the bulletin process, short-term corrections to discrepancies can be made when such errors are discovered.

f) Portions of This Document Required Onboard the Aircraft
   1) The following portions are required to be carried on the aircraft.
      i) The appropriate aircraft type appendix.
      ii) The chart specifying Snowfall Intensities As A Function Of Prevailing Visibilities.
      iii) Table of Qualified Deicing/Anti-icing Fluids for the each type fluid Corporate Air uses for ground deicing/anti-icing.
      iv) FAA Guidelines For The Application Of SAE Type I Fluid Mixture Minimum Concentrations As A Function Of Outside Air Temperature
      v) Holdover Tables appropriate for the types of deicing/anti-icing fluid.

Part 121 and Part 135 of the Federal Aviation Regulations specifies that no aircraft may take off with frost, ice, or snow adhering to the aircraft.

This program will provide the PIC with adequate procedures to determine whether the aircraft is free of frozen contaminants.

The ground deicing program and alternative procedures specified in this manual are:

Part 121.629(c) program. This program is required for issuance of Operations Specification A023 and should be used at CPR, GFK, GTF, BZN and SLC. This program is applicable for ground deicing of Corporate Air Part 135 aircraft at the listed locations depending on the capabilities of the deice vendor and compliance with this program. In the event that any of the required elements of this program, i.e. trained personnel, operable deicing equipment, deicing/anti-icing fluid availability, etc. cannot be met, Part 135.227(b)(1)(2), should be used. The Part 121.629(c) program allows the use of the appropriate Holdover Tables.

Operations in lieu of an approved deicing/anti-icing program. Part 135.227(b)(1)(2), alternative ground deice procedures approved by the Administrator, should be used by Corporate Air aircraft operated under Part 135 at all locations other than CPR, GFK, GTF, BZN and SLC. The Tactile Check within 5 minutes of takeoff is required under this program.

1.0 General Provisions Applicable to All Aircraft

1.1 General

a) Federal Aviation Regulations 121.629 (a), (b), (c) states the following:
   1) No person may dispatch or release an aircraft, continue to operate an aircraft en route, or land an aircraft when in the opinion of the pilot in command icing conditions are expected or met that might adversely affect the safety of the flight.
   2) No person may take off an aircraft when frost, ice, or snow is adhering to the wings, control surfaces, propellers, engine inlets, or other critical surfaces of the aircraft, or when the takeoff would not be in compliance with paragraph (3) of this section. Takeoffs with frost under the wing in the area of the fuel tanks may be authorized by the Administrator.
   3) No person may dispatch, release, or take off an aircraft anytime conditions are such that frost, ice, or snow may reasonably be expected to adhere to the aircraft, unless the certificate holder has an approved ground deicing/anti-icing program in its operations specifications and unless the dispatch, release, and takeoff comply with that program.

b) The program specified in this manual will allow Corporate Air to operate under the provisions of paragraph (a) (3). The program will contain the procedures for the following:
   1) A management plan to exercise proper operational control when conditions are such that frost, ice, snow, or slush may reasonably be expected to adhere to an aircraft.
   2) Specify who is responsible for deciding when ground deicing/anti-icing procedures are in effect.
   3) Specify who is responsible for the implementation of ground deicing/anti-icing procedures, including adequate personnel and equipment.
   4) This manual will include a description of the deicing/anti-icing program for flight crewmembers, flight following personnel, ground operations personnel, and management personnel when conducting operations under ground icing conditions.
   5) Procedures for coordination with ATC and appropriate airport authorities.
   6) Deicing/anti-icing application procedures.
   7) Use of Holdover Tables.

c) All provisions of this program have been developed in compliance with FAR 121.629, AC 120-60 (most current at time of writing), AC 120-58, most current FAA notice regarding ground deicing and authorize operations under Operations Specifications A023.

d) Corporate Air does not operate any aircraft with composite aerodynamic structural components. The location of the C-208 pod does not require special consideration during the deicing/anti-icing procedure.

2.0 Definitions (Advisory Circular 120-60B and/or the annual FAA Approved Deicing Program Notice Updates)

Anti-icing – A procedure used to provide protection against the formation of frost or ice and accumulation of snow or slush on clean surfaces of the aircraft for a limited period of time (holdover time). Anti-icing fluids are normally applied unheated on clean aircraft surfaces, but may be applied heated, and include:

a) SAE Type I fluid.
b) Concentrates or mixtures of water and SAE Type I fluid.
c) Concentrates or mixtures of water and SAE Type II fluid.
d) Concentrates of SAE Type III fluid.
e) Concentrates or mixtures of water and SAE Type IV fluid.

Deicing – A procedure used to remove frost, ice, slush, or snow from the aircraft in order to provide clean surfaces. The procedure can be accomplished using fluids, infrared energy, mechanical means, or by heating the aircraft. Deicing fluid is usually applied heated to assure maximum deicing efficiency and includes:

a) Heated water.
b) SAE Type I fluid.
c) Heated concentrates or mixtures of water and SAE Type I fluid.
d) Heated concentrates or mixtures of water and SAE Type II fluid.
e) Heated concentrates or mixtures of water and SAE Type III fluid.
f) Heated concentrates or mixtures of water and SAE Type IV fluid.

Frozen Contaminants – As used in this AC, frozen contaminants include light freezing rain, freezing drizzle, frost, ice, ice pellets, snow, snow grains, and slush.

Holdover Time (HOT) – An estimated time deicing or anti-icing fluid will prevent the formation of frost or snow or ice and the accumulation of snow on the protected surfaces of an aircraft. Holdover time begins when the final application of deicing/anti-icing fluid commences, and expires when the deicing/anti-icing fluid applied to the aircraft loses its effectiveness

Pretakeoff Check – A check of the aircraft's wings or representative surfaces for frozen contaminants. This check is conducted within the aircraft's Holdover Time (HOT) and may be made by observing the representative surfaces from the flight deck, cabin, or outside the aircraft, depending on the type of aircraft and the operator's FAA-approved program. (If these representative surfaces are free of contamination, then it is logical that all other critical surfaces on the aircraft are also free of contamination.)

Pretakeoff Contamination Check – A check conducted after the aircraft's HOT has been exceeded to ensure the aircraft's wings, control surfaces, and other critical surfaces are free of all frozen contaminants. This check must be completed within five minutes before beginning takeoff and from outside the aircraft, unless the certificate holder's FAA-approved program specifies otherwise.**Post Deicing Check** – A check, after deicing application, to ensure all aircraft surfaces are free of frozen contaminants.

Other Definitions:

Active Frost – Active frost is a condition that exists when frost is forming. During active frost conditions, frost will form on an unprotected surface or re-form on a surface protected with deicing/anti-icing fluid.

Cold Weather Preflight Inspection – A cold weather preflight inspection must be completed as part of the normal exterior preflight whenever one of the following conditions exists:

a) Ground Deicing Conditions are in effect.
b) A temperature of 5°C or less with a dew point of 3°C or less.
c) When frost is visible on other non-aircraft surfaces in the area.

Critical Aircraft Surfaces – The surfaces of the aircraft the manufacturer has determined that must be free of frozen contamination in order for the aircraft to safely takeoff. These critical surfaces must be checked closely during the preflight flight inspection when ground icing conditions are in effect. These surfaces must also be checked during the post deicing/anti-icing procedure.

Freezing Fog – It is best confirmed by observation. If there is accumulation in the deicing area, then the condition is active, and there is a tendency for freezing fog accumulation to increase with increasing wind speed.

Freezing Precipitation – Snow, sleet, light freezing rain, drizzle, or hail, which could adhere to aircraft surfaces.

Frost – A crystallized deposit, opaque in color, formed from water vapor on surfaces that are at or below 0°C (32°F). If there is frost on any object in the deicing area (including the aircraft), and the OAT and dew point are 3°C apart and narrowing, there is likely to be active frost. Weather forecasts and METARs usually do not provide information on frost conditions.

Frozen Contaminants – As used in this AC, frozen contaminants include light freezing rain, freezing rain, freezing drizzle, frost, ice, ice pellets, snow, snow grains, and slush.

Ground Deicing Conditions – A set of predetermined conditions using the variables such as temperature, dew point, visibility and precipitation to determine if conditions exist that most likely will cause ice formation on the aircraft while it is on the ground.

Hoarfrost – Is usually a uniform white deposit of fine crystalline texture as indicated above with frost, and is thin enough to allow one to visually distinguish aircraft paint surface features underneath it, such as paint lines, markings, and lettering.

Ice Pellets – (abbrev. IP) Same as Sleet; defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. Heavy sleet is a relatively rare event defined as an accumulation of ice pellets covering the ground to a depth of $^{1}/_{2}$" or more.

Inflight Ice Accumulation – Inflight ice accumulation could result in a ground deicing situation when flights are scheduled for short turnaround times; that is, for 30 minutes or less, and when ambient temperatures on the ground are at or below freezing. Three types of ice you may encounter:

a) Clear Ice – Is generally the formation of a layer of ice that is relatively transparent and smooth. Factors that favor clear icing are large drop size commonly found in cumuliform clouds and exposure to supercooled water drops as found in cumuliform clouds with significant vertical development of freezing rain. Clear ice generally forms in the 0°C temperature range. Clear ice characteristically will dissipate by sublimation much more slowly than Rime Ice. This is the most dangerous type of ice since it's clear, hard to see, and can change the shape of the air foil. If for any reason clear icing is suspected, then a tactile inspection is required.
b) Rime Ice – Is the formation of a white or milky and opaque granular deposit of ice formed by rapidly freezing of small water droplets as they impact the aircraft structure. Rime Ice usually forms in the -15°C to -20°C temperature range.
c) Mixed Ice – Mixed Ice is a mixture of clear ice and rime ice. It has the bad characteristics of both types of ice and can form rapidly. Ice particles become imbedded in clear ice, building a very rough accumulation. Mixed icing commonly occurs between -10°C to -15°C.

Inspection of Critical Aircraft Surfaces – A check of the critical aircraft surfaces is done by ground deicing personnel after the deicing procedure to ensure that the critical aircraft surfaces are free from frost, snow, or ice. This check may be done during the deicing procedure if no precipitation is falling.

Light Freezing Rain – Water condensed from atmospheric vapor falling to earth in supercooled drops, forming ice on objects.

Rain or High Humidity on Cold Soaked Wing – Water forming ice or frost on the wing surface when the temperature of the aircraft wing surface is at or below 0°C (32°F). This ice or frost may freeze over the entire wing surface and on the wings' leading edges

Rain or High Humidity on Cold Soaked Fuel Tanks – Water forming ice or frost may form on the wing surface when the temperature of the aircraft wing surface in the vicinity of the wing fuel tanks is at or below 0°C (32°F) due to cold soaked fuel. Certain aircraft are susceptible to the formation of frost or ice on wing upper surfaces when cold soaked fuel is in the main wing fuel tanks, and the aircraft is exposed to conditions of high humidity, rain, drizzle, or fog at ambient temperatures well above freezing.

Representative Surfaces – Certain aircraft surfaces that the flight crew can readily observe to determine whether or not ice, frost, or snow is accumulating or forming on that surface and, by using it as a representative surface, can make a reasoned judgment whether or not ice, frost, or snow is adhering to other aircraft surfaces.

Sensitive Area – Areas on the aircraft that direct application of deicing/anti-icing fluid is prohibited. Sensitive areas may be critical areas requiring deicing/anti-icing; however, direct application of fluid is not allowed.

Snow – Precipitation in the form of small ice crystals or flakes, which may accumulate on, or adhere to, aircraft surfaces. Snowfall intensities as a function of visibility are determined by "The Estimation of Snowfall Rate Using Visibility," Rasmussen, et al, Journal of Meteorology, October 1999.

Underwing Frost – Takeoff with frost under the wing in the area of the fuel tanks (caused by cold soaked fuel) is prohibited, and under wing frost must be removed from the aircraft to adhere to the clean aircraft concept

3.0 Abbreviations

- ADF – Aircraft Deicing Fluid
- (C) – Control (Safety Attribute)
- CRE – Chronological Record of Events
- °C – Degrees Celsius
- DO – Director of Flight Operations
- DT – Director of Training
- °F – Degrees Fahrenheit
- FAA – Federal Aviation Administration
- FAR – Federal Aviation Regulation
- FF – Flight Following
- FO – First Officer
- FOA – Flight Operations Assistant
- FP – Freeze Point
- FPD – Freezing Point Depressant
- HOT – Holdover Time
- OAT – Outside Air Temperature
- PIC – Pilot-in-Command
- POI – Principal Operations Inspector
- RON – Remain Overnight (aircraft or crew)
- SAE – Society of Automotive Engineers

4.0 Duties and Responsibilities 121.629 (c), (1)(iv), 121.629 (c), (4)

4.1 Director of Operations

a) Has overall responsibility for the program.
b) Responsible for the monitoring and initiating policies and procedures in this program.
c) Is authorized to revise this program.
d) Coordinate deicing activities with control tower and airport managers.
e) Complete agreements with Control Tower and airport managers.
f) Complete agreements with airport managers regarding airplane secondary deicing/anti-icing locations and pre-takeoff checking locations.
g) Monitor this program for any changes that need to be made.
h) Responsible for approving contract companies to perform deicing duties per the procedures in this manual.
i) Ensure that Corporate Air contract personnel are properly trained and that sufficient records are kept of this training and future training scheduled.
j) Ensure Flight Followers are trained and performing their duties.
k) The qualifications for the Director of Operations are specified in the Part 135 GOM.
l) In the absence of the Director of Operations, the Chief Pilot will perform those duties.

4.2 Chief Pilot

a) Responsible that flight crewmembers are trained and performing their duties per this manual.
b) Advise the Director of Operations when revisions to the program are necessary.
c) Monitor the crew's performance in the field regarding adherence to the procedures of this program.

4.3 Director of Training and Standards

a) Train and qualify crewmembers, Flight Followers, and contract vendors in this program.
b) Maintain the training records of each individual, including contract vendors.
c) Forward to the manager of Flight Following, the Director of Operations, and Chief Pilot copies of individuals trained and qualified under this program.
d) Ensure appropriate personnel are requalified on a yearly basis with regards to recurrent training under this program.
e) Advise the Director of Operations when revisions to this program are necessary.

4.4 Flight Followers

a) For flights to cities that Corporate Air does not routinely serve, determine the deice capabilities and fluid types available from the vendors at these airports.
b) Monitor forecast and actual weather conditions to advise flight crewmembers when ground icing conditions are in effect or expected. Record the event in the AS400 computer.
c) Advise contract vendors when deicing may be required or is required.
d) Advise the PIC if a contract vendor is trained and qualified under the Corporate Air program.

4.5 Contract Deicing Personnel

a) Apply deicing/anti-icing fluid as specified in this program.
b) Communicate to the PIC the beginning of the deicing procedure.
c) Inspect the aircraft's critical surfaces during the deicing procedure for the clean aircraft concept.
d) Advise the PIC the aircraft is free or not free of frozen contaminants after the completion of the deicing procedure.

4.6 Pilot-in-Command

a) Has the final authority whether the aircraft requires deicing when ground deicing procedures are in effect.
b) Has final authority to determine holdover times.
c) Has final authority determining whether or not the aircraft critical surfaces are free of frozen contaminants prior to takeoff.
d) Ensure the critical surfaces are free of contaminants by a pre-takeoff check.
e) Advise the Chief Pilot when revisions to this program are necessary.
f) Train contract vendor personnel under the provisions of this program.
g) Monitor the deicing procedure from the exterior of the aircraft when contract vendor personnel are not trained under the provisions of this program.

4.7 First Officer

a) Train contract vendor personnel under the provisions of this program.
b) Advise the Chief Pilot when revisions to this program are necessary.
c) Performs duties as assigned by the PIC.

4.8 Director of Safety

Assures the quality control of this program and that aircraft deicing functions are being performed correctly in accordance with Internal Evaluation Program of the Safety Manual.

5.0 Types and Characteristics of Deicing and Anti-icing Fluids

5.1 Types of Deicing Fluid

a) **Type I Deicing Fluid –** A fluid that consists of a concentrate solution of glycol that is normally mixed with water and heated. It is applied under pressure to clean ice and snow from an aircraft. This fluid is considered "unthickened" because of its relatively low viscosity and has very little holdover time. Fluids supplied as concentrated for dilution with water prior to use will not be used undiluted.
Type I Fluid is orange in color.

Type I fluids are heavily dependent on the heating of the aircraft surfaces. These fluids are not thickened, as are Type II, III, and IV, and flow of the aircraft surfaces relatively soon after application.
Type I fluid dilutes rapidly under precipitation conditions; however, the heat absorbed by aircraft surfaces will tend to keep the temperature of the diluted fluid above its freezing point for a limited time, which is considerably longer for metallic structures than for composite material structures since composites do not transfer heat very efficiently.

Type I fluid fails as the temperature of the surface aircraft becomes equal to the freezing point of the fluid. The fluid will tend to fail first in:

- Structurally thin areas
- Areas with minimal substructure, such as trailing edges, leading edges and wing tips.

The minimum temperature for application of Type I fluid is 60°C (140°F).

b) **Type II Deicing Fluid –** These fluids provide longer holdover times than Type I fluids. Type II fluids can be applied hot as a deicing agent or applied cold as an anti-icing agent, and may be applied in a two step procedure with hot fluid for deicing and cold fluid for anti-icing. Type II fluids are not recommended for aircraft with rotation speeds below 85KIAS.

Type II Fluid is pale or clear in color.

Corporate Air does not use Type II Fluid

c) **Type III Deicing Fluid –** These fluid types are essentially diluted thickened fluids that provide longer holdover times than Type I fluids. Because this fluid type is of low viscosity (thinner) it can be used as an anti-icing fluid on aircraft with low rotation speeds. Type III fluids are applied hot and act as both a deicing and anti-icing fluid. The deicing/anti-icing procedure is a one step process instead of the more familiar two step procedure when both deicing and anti-icing is required. Type III fluid may be applied in either an undiluted or diluted state. The undiluted state provides the longest holdover times. At temperatures below -10C, Type III fluid must be applied in the undiluted state.

Type III fluid is yellow in color.

Corporate Air does not use Type III fluid.

d) **Type IV Deicing Fluid –** A water and glycol mixture that includes a polymer as a thickening agent and provides a longer holdover time in comparison to the Type I. The fluid normally is applied cold on clean aircraft surfaces for anti-icing protection, but may be applied heated for deicing. When applied hot for aircraft deicing, Type IV fluid provides longer holdover times than Type I fluids. It adheres to the airfoil rather than running off, and during takeoff roll, the fluid blows off the aircraft to leave a clean surface. Fluid buildup on the runway takeoff end may reduce runway coefficient of friction. This fluid will not be used on airplanes with a rotation speed of less than 85 knots. In other cases there may be a performance penalty.

Testing conducted for the FAA found the application of heated (60°C/140°F) Type IV was just as effective as a cold application of Type IV fluid and there is no basis for reducing current HOT guidelines when properly applied heated Type IV is used.

NOTE: If the airplane has to be re-deiced/anti-iced (for example, the holdover time has lapsed), the Type IV fluid must be removed with Type I fluid before the Type IV may be reapplied.

Type IV fluid is green in color.

6.0 Explanation of Holdover Time Charts 121.629 (c), (3)

6.1 Interpretation of Holdover Time Charts

a) Holdover time (HOT) guidelines are intended to provide an indication of the approximate length of time that a freezing point depressant (FPD) fluid will protect aircraft surfaces during icing conditions while on the ground. It does not imply icing protection while airborne. Of all fluids tested, the lowest HOT value is entered in each column for each precipitation condition. Therefore, for any brand of fluid, its holdover time will be as good or better than the value in the appropriate worst-case chart. This can be important if the brand of fluid is not known.

b) The holdover time of a FPD fluid is primarily a function of the OAT, precipitation type and intensity, and percent FPD fluid concentration applied. The icing precipitation condition (i.e., frost, freezing fog, snow, freezing drizzle, light freezing rain, and rain on a cold soaked wing) implies that these meteorological conditions are active. The type of wing surface, aluminum or composite, also affects the holdover times. Because Corporate Air has no aircraft with composite wing surfaces, only the tables and/or data for aluminum wing surfaces are used.

   NOTE: All HOT values (except those for snow) are determined in the lab under no-wind conditions. Wind generally has the effect of reducing holdover time. Snow testing is conducted outdoors and may or may not involve varying winds. This can have varying effects on the test results.

c) The guideline for holdover times anticipated for SAE TYPE I Fluid Mixture as a function of weather conditions and OAT, and instructions on its use are in Table 1 and on the following page.

6.2 HOT Table and How It Is Used (Example Only. See App E for current tables)

TABLE 1. FAA GUIDELINES FOR HOLDOVER TIMES SAE TYPE I FLUID MIXTURES ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF ALUMINUM AS A FUNCTION OF WEATHER CONDITIONS AND OUTSIDE AIR TEMPERATURE

CAUTION: THIS TABLE IS FOR DEPARTURE PLANNING ONLY AND SHOULD BE USED IN CONJUNCTION WITH PRETAKEOFF CHECK PROCEDURES

Outside Air Temperature		Wing Surface	Approximate Holdover Times Under Various Weather Conditions (hours: minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow, Snow Grains or Snow Pellets			Freezing Drizzle*	Light Freezing Rain	Rain on Cold Soaked Wing**	Other#
				Very Light‡	Light†	Moderate				
-3 and above	27 and above	Aluminum	0:11-0:17	0:16-0:22	0:11-0:16	0:05-0:11	0:09-0:13	0:02-0:05	0:02-0:05	
below -3 to -6	below 27 to 21	Aluminum	0:08-0:13	0:14-0:17	0:08-0:14	0:05-0:08	0:05-0:09	0:02-0:05	CAUTION: No holdover time guidelines exist	
below -6 to -10	below 21 to 14	Aluminum	0:08-0:10	0:11-0:13	0:08-0:11	0:04-0:08	0:04-0:07	0:02-0:05		
Below -10	below 14	Aluminum	0:05-0:09	0:07-0:08	0:04-0:07	0:02-0:04				

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER.

* Use light freezing rain holdover times if positive identification of freezing drizzle is not possible
** This column is for use at temperatures above 0 degrees Celsius (32 degrees Fahrenheit) only
‡ Heavy snow, ice pellets, moderate and heavy freezing rain, hail
† Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.

SAE Type I fluid/water mixture is selected so that the freezing point of the mixture is at least 10 °C (18 °F) below OAT.

CAUTIONS:

- THE TIME OF PROTECTION WILL BE SHORTENED IN HEAVY WEATHER CONDITIONS. HEAVY PRECIPITATION RATES OR HIGH MOISTURE CONTENT, HIGH WIND VELOCITY, OR JET BLAST MAY REDUCE HOLDOVER TIME BELOW THE LOWEST TIME STATED IN THE RANGE. HOLDOVER TIME MAY BE REDUCED WHEN AIRCRAFT SKIN TEMPERATURE IS LOWER THAN OAT.
- SAE TYPE I FLUID USED DURING GROUND DEICING/ANTI-ICING IS NOT INTENDED FOR AND DOES NOT PROVIDE PROTECTION DURING FLIGHT.

a) Determine current outside air temperature (OAT) in °C from ATIS or most current weather report.

b) If applicable, determine the snowfall intensity. When establishing a holdover time, the "Snowfall Intensities as a Function of Visibility Chart" (see example given below) must normally be used to determine the snow intensity that will be used to enter the Holdover Times Tables. An exception to using the "Snowfall Intensities as a Function of Visibility Chart" is the situation when the weather report includes more than one restriction to the visibility. If the visibility is being reduced by other forms of obscuration, such as fog, haze, smoke, blowing snow, etc., the FAA Snowfall Intensity Table need not be used to estimate the snowfall intensity for holdover time determination. In that case, the PIC may use the reported snowfall intensity from the weather report to establish a holdover time. For instance, the following is reported: "Visibility $^{1}/_{2}$ mile, light snow and blowing snow". In this case, the PIC may enter the holdover time chart in the Light Snow column.

c) Based on the various weather conditions actually being experienced (frost/fog/snow, etc.) determine applicable holdover time.

d) Example: If the outside air temperature is -5°C during light snow conditions, the holdover time for deice/anti-ice fluid varies from 8 to 14 minutes, depending on other factors, such as moisture content, wind, etc. The PIC will determine the exact time to be used that is within this range.

e) The Pre-takeoff Contamination Check must be completed when the holdover time has been exceeded (or if a holdover time was never established), and this check must also be completed within 5 minutes of takeoff, or the crew must complete another Pre-takeoff Contamination Check or taxi back to be deiced again.

TABLE 1C – SNOWFALL INTENSITIES AS A FUNCTION OF PREVAILING VISIBILITY

Time of Day	Temp.		Visibility Statute Miles (Meters)									Snowfall Intensity
	Degrees Celsius	Degrees Fahrenheit	≥ 2 1/2 (≥4000)	2 (3200)	1 3/4 (2800)	1 1/2 (2400)	1 1/4 (2000)	1 (1600)	3/4 (1200)	1/2 (800)	≤ 1/4 (≤ 400)	
Day	colder/equal -1	colder/equal 30	Very Light	Very Light	Very Light	Light	Light	Light	Moderate	Moderate	Heavy	
	warmer/than -1	warmer/than 30	Very Light	Light	Light	Light	Light	Moderate	Moderate	Heavy	Heavy	
Night	colder/equal -1	colder/than 30	Very Light	Light	Light	Moderate	Moderate	Moderate	Moderate	Heavy	Heavy	
	warmer/than -1	warmer/than 30	Very Light	Light	Moderate	Moderate	Moderate	Moderate	Heavy	Heavy	Heavy	

Note 1: This table is for estimating snowfall intensity. It is based upon the technical report, "The Estimation of Snowfall Rate Using Visibility," Rasmussen, et al., Journal of Applied Meteorology, October 1999 and additional in situ data.
Note 2: This table is to be used with Type I, II, III, and IV fluid guidelines.
Note 3: If visibility from a source other than the METAR is used, round to the nearest visibility in the table, rounding down if it is right in between two values. For example, .6 and .625 (5/8) would both be rounded to .5 (1/2).

HEAVY = Caution – No Holdover Time Guidelines Exist

During snow conditions alone, the use of Table 1C in determining snowfall intensities does not require pilot company coordination or company reporting procedures since this table is more conservative than the visibility table used by official weather observers in determining snowfall intensities.Because the FAA Snow Intensity Table uses visibility to determine snowfall intensities, and if the visibility is being reduced by snow along with other forms of obscuration such as fog, haze, smoke, etc., the FAA Snow Intensity Table does not need to be used to estimate the snow fall intensity for HOT determination. Use of the FAA snow Intensity Table under these conditions may needlessly overestimate the actual snowfall intensity and therefore the snowfall intensity being reported by the weather observer or automated service observing system (ASOS) may be used.

6.3 Type IV HOT Tables (Example Only. See App E for current tables)

a) The tables for Type IV fluid are very similar to those of Type I. A notable exception is Type IV fluid has differing holdover characteristics, depending on the concentration. Currently, Corporate Air normally uses cold Type IV fluid in only the 100/0% concentration, but the other concentrations (75/25% or 50/50%) could be used. The fluid concentration must be established with the deicing technician for correct use of the HOT table.

b) Table 4 is the Generic Type IV Fluid table and may be used with any approved Type IV fluid. It represents the worst case for each of the approved fluids. Significantly better holdover times may be available by referencing the table specific to the brand name of Type IV fluid being used.

TABLE 4. FAA GUIDELINES FOR HOLDOVER TIMES SAE TYPE IV FLUID MIXTURES AS A FUNCTION OF WEATHER CONDITIONS AND OUTSIDE AIR TEMPERATURE

CAUTION: THIS TABLE IS FOR DEPARTURE PLANNING ONLY AND SHOULD BE USED IN CONJUNCTION WITH PRETAKEOFF CHECK PROCEDURES.

Outside Air Temperature		Type IV Fluid Concentration Neat-Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours: minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow, Snow Grains or Snow Pellets†	Freezing Drizzle*	Light Freezing Rain	Rain on Cold Soaked Wing**	Other‡
-3 and above	27 and above	100/0	1:45-3:10	0:40-1:20	0:50-1:30	0:35-0:55	0:10-1:15	CAUTION: No holdover time guidelines exist
		75/25	1:00-1:45	0:30-0:55	0:40-1:05	0:25-0:40	0:09-0:50	
		50/50	0:20-0:35	0:07-0:15	0:10-0:20	0:07-0:10		
below -3 to -14	below 27 to 7	100/0	0:20-1:20	0:30-0:55	***0:20-1:00	***0:10-0:25		
		75/25♦	0:25-0:50	0:20-0:40	***0:15-1:00	***0:10-0:25		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0**	0:15-0:40	0:15-0:30				

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER.

* Use light freezing rain holdover times if positive identification of freezing drizzle is not possible
** This column is for use at temperatures above 0 °C (32 °F) only
*** No holdover time guidelines exist for this condition below -10 °C (14 °F)
‡ Heavy snow, ice pellets, moderate and heavy freezing rain, and hail
† Use light freezing rain holdover times in conditions of light snow mixed with light rain.
♦ For Lyondell Arctic Shield temperature is limited to -9.6 °C (15 °F); for Cryotech Polar Guard temperature is limited to -6.6 °C (22 °F).
♦♦ For Cryotech Polar Guard, temperature is limited to -23.0 °C (-10.3 °F)F) and for Lyondell Arctic Shield temperature limited to -24.0 °C (-12.1 °F). If the fluid-specific brand is unknown, all of the temperature limitations in this and the preceding note apply.

CAUTIONS:

- THE TIME OF PROTECTION WILL BE SHORTENED IN HEAVY WEATHER CONDITIONS. HEAVY PRECIPITATION RATES OR HIGH MOISTURE CONTENT, HIGH WIND VELOCITY, OR JET BLAST MAY REDUCE HOLDOVER TIME BELOW THE LOWEST TIME STATED IN THE RANGE. HOLDOVER TIME MAY BE REDUCED WHEN AIRCRAFT SKIN TEMPERATURE IS LOWER THAN OAT.
- SAE TYPE IV FLUID USED DURING GROUND DEICING/ANTI-ICING IS NOT INTENDED FOR AND DOES NOT PROVIDE PROTECTION DURING FLIGHT.

c) As an example: After receiving the most current temperature of -11°C, SAE Type IV fluid with a concentration of 100% fluid and 0% water, the holdover time in snow is between 30 minutes and 55 minutes. If a 75/25% solution is used, then the holdover times are between 20 minutes and 40 minutes. Please note the “Other” column and the weather conditions for which no holdover time guidelines exist. Also note there are various manufacturers of Type IV fluid, and the holdover times vary from manufacturer to manufacturer for the same type weather conditions and temperatures.

d) It must be established with the deicing technician .the manufacturer or product type of Type IV fluid is being applied

e) Note that differing atmospheric conditions can reduce or increase the holdover times. No holdover times exist for conditions that include heavy snow, moderate and heavy freezing rain, and hail. Use the

6.4 **Active Frost HOT Table (Example Only. See App E for current tables)**

a) Table 0 is the HOT table that is used during conditions of Active Frost. The table is split into two portions, one for Type I fluids and the other for Type II, III, and IV fluids.

b) Active Frost is a condition that exists when frost is forming. During active frost conditions, frost will form on an unprotected surface or re-form on a surface protected with deicing/anti-icing fluid where the HOT has expired. If the exposed surface temperature is equal to or below the frost point, frost will begin to accrete on the surface. Once formed, residual accreted frost may remain after the active frost phase if the exposed surface temperature remains below freezing. If so, it must be removed prior to flight.

c) Deicing/Anti-icing in active frost Conditions. Frost forming after removal is an indication of active frost. During active frost, anti-icing protection is required and operations should be conducted in accordance with the HOT guidelines. In active frost conditions, deicing alone is insufficient; therefore, once the frost has been removed, a preventative anti-icing coating (using heated Type I or cold Type II, III, or IV) is required.

d) Note that Type I fluids may be used down to the Lowest Operational Use Temperature (LOUT), which may include temperatures colder than -25°C (-13°F), but still at or above the LOUT. On the other hand, Types II, III, and IV fluids are limited to the LOUT or -25°C (-13°F) whichever is warmer.

TABLE 0. FAA GUIDELINES FOR HOLDOVER TIMES IN ACTIVE FROST, SAE TYPE I, TYPE II, TYPE III, AND TYPE IV FLUIDS

Outside Air Temperature		Approximate Holdover Times (hours:minutes)
		Active Frost
Degrees Celsius	Degrees Fahrenheit	Type I [1,2]
-1 and Above	30 and above	0.45 (0:35)[4]
Below -1 to -3	Below 30 to 27	
Below -3 to -10	Below 27 to 14	
Below -10 to -14	Below 14 to 7	
Below -14 to -21	Below 7 to -6	
Below -21 to LOUT	Below -6 to LOUT	

Outside Air Temperature		Concentration Neat Fluid/Water (Volume%/Volume%)	Approximate Holdover Times (hours:minutes)		
			Active Frost		
Degrees Celsius	Degrees Fahrenheit		Type II[3]	Type III[3]	Type IV[3]
-1 and Above	30 and above	100/0	8:00	2:00	12:00
		75/25	5:00	1:00	5:00
		50/50	3:00	0:30	3:00
Below -1 to -3	Below 30 to 27	100/0	8:00	2:00	12:00
		75/25	5:00	1:00	5:00
		50/50	1:30	0:30	3:00
Below -3 to -10	Below 27 to 14	100/0	8:00	2:00	10:00
		75/25	5:00	1:00	5:00
Below -10 to -14	Below 14 to 7	100/0	6:00	2:00	6:00
		75/25	1:00	1:00	1:00
Below -14 to -21	Below 7 to -6	100/0	6:00	2:00	6:00
Below -21 to -25	Below -6 to -13	100/0	2:00	2:00	4:00

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

NOTES:

1. Type I Fluid / Water Mixture is selected so that the freezing point of the mixture is at least 10°C (18°F) below outside air temperature.
2. Ensure that the lowest operational use temperature (LOUT) of the fluid is not exceeded (see Table 7).
3. These fluids may not be used below -25°C (-13°F) in active frost conditions. For Type II, III, or IV fluids with a LOUT warmer than -25°C (-13F) undiluted or -3°C (27°F) in the 50/50 dilution, or -14°C (7°F) in the 75/25 dilution, limit usage to the actual LOUT value.
4. Value in parenthesis is for composite aircraft.

CAUTION: FLUIDS USED DURING GROUND DEICING/ANTI-ICING DO NOT PROVIDE IN-FLIGHT ICING PROTECTION.

Paragraphs 6.5 and 6.6 removed.

7.0 Adjusting HOT 121.629 (c)(3)

a) The PIC has the authority to adjust the HOT due to changing weather conditions. Whether using Type I or Type IV fluid, for each type of icing condition, the HOT chart offers a range of time the fluid's protection will last. The PIC may adjust the HOT within this range depending if conditions are improving or deteriorating.

1) Changing weather conditions after the completion of the deicing procedure, most notably worsening weather conditions, presents an especially challenging situation for the PIC. As an example, if the aircraft deicing has been completed, then heavy snowfall begins half way through the holdover time, the PIC must be aware that the fluid integrity may not hold up in the worsening conditions. If this be the case, the aircraft will be returned to the gate for an exterior inspection or re-deicing.

2) The following is a list of items that affect the HOT and the PIC must factor these into any decision of whether to increase or decrease the Holdover Time.

- Ambient temperature.
- Aircraft surface (skin) temperature.
- FPD fluid application procedure.
- FPD aqueous solution (strength)
- FPD fluid film thickness.
- FPD fluid temperature.
- FPD fluid type.
- Operation in close proximity to other aircraft, equipment, and structures.
- Operation on snow, slush, or wet ramps, taxiways, and runways.
- Precipitation type and rate.
- Presence of FPD fluid.
- Radiation cooling.
- Residual moisture on the aircraft surface.
- Relative humidity.
- Solar radiation.
- Wind velocity and direction.

b) For snowfall, the FAA has smartly supplied a chart that correlates the rate of snowfall for day/night and various temperatures with visibility. By referring to this chart, the PIC can readily determine if the weather is deteriorating or improving based on visibility during snowfall.

c) A couple of items to note:
   1) The chart is applicable for Type I and Type IV fluid. This table is located in Appendix E.
   2) No holdover times (guidelines) exist for heavy snowfall. During periods of heavy snowfall, deicing activities will not be started. The PIC will wait until weather conditions improve.
   3) Fog may exist during snowfall. The PIC must determine if the low visibility is due to heavy snowfall or fog.

8.0 Effects of Frozen Contamination on Aircraft Performance

a) The formation of ice, snow, or frost disturbs the normal flow of air over the airfoil surfaces and also alters the distribution of weight on the aircraft. The importance of clean airfoil surfaces cannot be overemphasized. The effects of ice/snow/frost may occur in varying combinations and degrees of the following:
   1) Loss of Lift
      Frozen accumulations may destroy the lifting ability of an airfoil, resulting in the failure of the aircraft to become airborne or to remain airborne.
   2) Increased Drag and Weight
      An aircraft may fail to reach takeoff speed in the proper distance due to the increased drag placed on the airfoil and/or the increased weight of the aircraft from the frozen accumulation.
   3) Decreased Control
      Frozen accumulations may impair the ability of control surfaces, such as the rudder, elevators, ailerons, and trim tables to such a degree that the aircraft cannot be controlled. Ice deposits may form in hinge areas of control surfaces and restrict or prohibit their movement.
   4) Flutter
      Frozen accumulations may increase conditions that result in separations of airflow and dynamic instability of the airfoil surface.
   5) Plugged Ram-Air Intakes/Static Ports
      During subfreezing weather, ram-air intakes and/or static ports may become partially or completely plugged by frozen accumulations. These blockages may result in hazardous operation of the aircraft, aircraft components, and/or engines.

9.0 Ground Deicing Procedures Applicable to All Aircraft

9.1 Determination of Ground Deicing/Anti-icing Conditions Exist 121/629 (c), (1)(i)

a) Flight Following will monitor weather conditions through the FedEx Weather System, the ADDS website or the Universal Weather website. The specific weather conditions for each type of aircraft are found in the appropriate aircraft type appendix.

b) If any of these conditions exists, FF will record ground deicing/anti-icing conditions exist, in what cities these conditions exist and it will be recorded on the AS400.

c) FF will advise the PIC when the flight calls into position.

9.2 Responsibility for Deciding that Ground Deicing/Anti-icing Operational Procedures Must Be in Effect 121.629 (c), (1)(ii)

a) The following personnel may determine when ground deicing operational procedures must be in effect:
   1) The Director of Operations
   2) The Chief Pilot
   3) Flight Following personnel
   4) The Pilot-in-Command

b) If the PIC determines ground deicing procedures are in effect, then the PIC will advise FF so it may be recorded on the AS400.

9.3 Procedures for Implementing Ground Deicing/Anti-icing Operational Procedures 121.629(c)(1)(iii)

a) Ground deice/anti-ice procedures will be implemented when the predetermined conditions in 9.1 exist at the departure airport, the destination airport, or any alternate airport for the planned flight.
   1) FF will monitor the conditions at all airports where operations are likely to be conducted for the possibility of ground icing conditions.
   2) FF will notify ground personnel (vendor) and the crew the program is in effect at the respective airports.
   3) FF will log in the FF AS400 all airports that ground deicing/anti-icing procedures are in effect.
   4) FF will notify ground personnel to: 1) prepare equipment and 2) ensure trained personnel are available.
   5) When ground deicing/anti-icing procedures are “in effect,” the PIC will conduct a cold weather preflight inspection at the effected airport.
   6) After completion of the preflight cold weather inspection, the PIC will determine if deicing/anti-icing is required. The PIC will advise FF and the vendor.
   7) FF will continue to monitor the weather at the airports for the intended operation and may extend or cancel the program as weather conditions dictate.

i) FF will advise the PIC if ground deicing procedures remain in effect other airports on the route including alternate airports when the PIC calls FF after landing (Part 135).

8) The PIC has the final authority determining whether the aircraft undergoes deicing procedures.

9.4 A cold weather preflight inspection will occur whenever:

a) The DO/FF declares the Ground Deicing/Anti-icing program is in effect when the weather conditions specified for a specific type aircraft exist. These weather conditions are found in the appendices for the specific type aircraft.

b) In most cases, it is fairly easy to see contamination on the airplane, but the pilots need to be aware of a few areas that need special consideration. It also should be understood that an airplane that has just landed may need deicing as much as one that has been sitting on the ramp in precipitation. Ice can build up on airplane surfaces during flight through clouds or precipitation.

c) Clear ice formation is extremely difficult to detect. When there is a possibility of clear ice, or any doubt that it may be formed, a close check will be made to ensure that all deposits have been found and removed. This “close check” will include the PIC physically touching (tactile inspection) the aircraft on the nose section of the fuselage and the wings to determine if clear ice or light freezing rain/freezing drizzle is adhering to the aircraft. If necessary, with the assistance of a ladder, the PIC will check the horizontal and elevator tail surfaces.

d) Clear ice can form below a layer of snow or slush. It is important that the surfaces specified in paragraph (c) above be closely checked for hidden clear ice deposits.

e) When there is slush in on the runways and taxiways, examine the following areas for collected slush:

1) Leading edges, air intakes, engine air inlets, flaps, aileron, rudder, elevators, rudder, water drains and skin panels for collected ice.

2) The landing gear wheelwell areas for ice and snow collection and packing.

f) For aircraft that have landed, the possibility exists for inflight icing adhering to the aircraft on the leading edges of airfoils, nose of the aircraft and probes which are in the airflow. This ice must be removed prior to departure.

g) An aircraft may need deicing after landing in precipitation with the surface temperatures just above freezing. The aircraft skin being colder than freezing may cause the precipitation to freeze on the aircraft. An inspection of the aircraft is in order by the PIC prior to departure when these conditions exist.

h) Deposits of clear ice may form in the vicinity of the fuel tanks, on wing upper surfaces, as well as under the wing. Aircraft are most vulnerable in regard to this type of buildup when:
   1) Wing temperature remains below 0°C during a turnaround
   2) Ambient temperatures between -2°C and 10°C are experienced, although clear ice may form at other temperatures if the conditions specified in (a)and (c) exist.
   3) Precipitation occurs while the aircraft is on the ground.

9.4(a) Pilot Assessments of Precipitation Intensity Procedures
Pilots may act based on their own assessment of precipitation intensity only in cases where the officially reported metrological precipitation intensity is grossly different from that is what obviously occurring (e.g., precipitation is reported when there is not actual precipitation occurring). If in the judgment of the pilot the intensity level is greater or in a different form of precipitation exists than that being reported, then the appropriate course of action and applicable HOTs/allowances times for the higher intensity or different form of precipitation must be applied. **When in doubt, Corporate Air crewmembers are expected to error on the conservative side and apply the lower HOT times.**

The FAA allows the use of a pilot's assessments of precipitation intensity with the following provisions:

a) A new weather observation is made form the approved weather observation service,

OR

b) The officially reported precipitation intensity remains grossly different from that which is obviously occurring

Corporate Air will only use the pilot's assessment of the intensity of precipitation when conditions of (b) in the above paragraph are met. If this occurs the pilot will:

a) Advise Flight Following of the decision and state what intensity level of precipitation is occurring.
b) Flight Following will log this into the AS400 Flight Following Turnover Log.
c) The pilot will accomplish a tactile inspection of the aircraft as specified in this manual five minutes prior to takeoff.

Lastly, when in doubt apply the most conservative HOT time.

9.5 Final Determination Whether Ground Deicing/Anti-icing Is Required After a thorough cold weather preflight inspection has been conducted by the PIC when ground deicing/anti-icing procedures are in effect, the PIC is the final authority determining whether actual deicing/anti-icing procedures are required. The PIC will inform FF of the decision and FF will record this decision on the AS400
.

10.0 Communications During the Deicing Procedures (Hand Signals and Radio Communication)

Before any deicing procedure begins, the PIC will review with the deicing technician at least the following particulars regarding the deicing procedure.

a) Critical surfaces
b) Sensitive surfaces
c) Areas and surfaces requiring special attention
d) Type of fluid and the concentration/mixture
e) Ensures the fluid meets the minimum temperature at the nozzle of 60°C and is applied in accordance with the table in Appendix E
f) Spray pattern

10.1 Communications Using Hand Signals

a) The PIC will discuss with the deicing technician the items specified in 10.0. After the closing of all cargo doors and the PIC is satisfied the deicing technician is ready to begin the deicing, the PIC will enter the aircraft, close the main cabin door and take his seat on the flightdeck. The deice equipment should be positioned near the starting point for the specific aircraft. The PIC will make eye contact with the ground signal man in front of the aircraft. The ground signal man will give a “thumbs up” signal to the PIC signifying the deicing crew is ready to begin the deicing procedure. The PIC will respond to this “thumbs up” signaling the crew is ready for the procedure to begin. The deice vendor will not start the procedure until a “thumbs up” signal is received from the PIC. The PIC will note when the fluid leaves the nozzle and record this time on the Deicing Job Aid as well as the expiration of HOT. (See Deicing Job Aid on next page.)b) When the deicing procedure has been completed, the ground equipment will move away from the aircraft. The ground signal person will make eye contact with the PIC and signal “thumbs” up only if the following provisions are met:
   1) The aircraft has been completely deiced.
   2) It meets the clean aircraft concept
   3) The engine start can be commenced.

c) The PIC will signal the ground signal man with a “thumbs up” indicating he has received and understands the deicing procedure was successful. When ready, the PIC can commence with the engine start.

d) If for any reason the ground deicing procedure is not successful, the deice equipment will move away from the aircraft, and the ground signal person will make eye contact with PIC and give a “thumbs down” signal. The PIC will respond with a “thumbs down” signifying the signal is understood. There are several reasons why a deicing procedure may not be successful:
   1) The deice crew was unable to attain a clean aircraft.
   2) The deice equipment broke down.
   3) The deice truck ran out of fluid.

e) If unsuccessful, it is necessary for the PIC to know the reason why. He will open the main cabin door (possibly a messy process with fluid running off the top of the fuselage) and speak directly with the deicing technician or the ground signal person.

f) In this case the PIC will void HOT start and expiration time on the Deicing Job Aid. If unsuccessful, the spraying of the aircraft will be started from the beginning point of the procedure again.

10.2 Radio Communications: One Step Deicing Procedure

In the event radio communication is available between the aircraft and the ground application unit, the following in-communication procedure is used:

a) The PIC and the ground deicing technician will establish the VHF frequency in use. The crew, when on the flight deck, will monitor this frequency.
b) The ground deicing technician will make radio contact with the captain.
c) For a one-step, Type I deicing procedure, the ground technician will confirm with the flightcrew the aircraft is properly configured for deicing by asking the Captain, “Is your aircraft ready for deicing?” The PIC will respond appropriately.
d) The ground technician will specify Type I fluid is being used.
e) The ground technician will advise the beginning of the deice procedure, and the crew will document this time on the Deicing Job Aid.
f) When notified the deicing procedure and the post deicing inspection procedure completed, the Captain will verify the aircraft meets the clean aircraft concept.
g) Confirm with the ground technician, the equipment is moved away from the aircraft and ground personnel are ready for engine start.

10.3 Radio Communication: Two-step deice/anti-ice, Type IV fluid application

In the event a two step procedure is used the following communications will take place:

a) The ground technician checks with the flightcrew if the aircraft is configured for fluid application.
b) He will advise the crew the process is a two-step procedure beginning with the application of Type I fluid.
c) The ground technician will advise the fluid/water mix ratio by volume of the Type IV fluid.
d) The ground technician will advise the beginning of deicing procedure then the beginning of the anti-icing fluid application. The flightcrew will document the start of the anti-ice fluid application on the Deicing Job Aid.
e) After the completion of anti-icing application procedure and the completion and the post-anti-icing inspection, the ground technician will advise the crew.
f) The Captain will verify with the ground technician the aircraft meets the clean aircraft concept.
g) Confirm with the ground technician, the equipment is moved away from the aircraft and ground personnel are ready for engine start.

11.0 Application of Deicing and Anti-icing Fluid

NOTE: The following are general application and spraying procedures for applying deicing or anti-icing fluids. Refer to each aircraft type for the recommended application patterns.

NOTE: Prior to any deicing/anti-icing event, the PIC will ensure the minimum nozzle temperature has been attained and the fluid is applied in accordance with the table in Appendix E.

11.1 Fluid Applications

a) Ice, slush, snow, and frost will be removed from the airplane surfaces prior to dispatch or prior to anti-icing. For maximum effect, heated Type I fluid needs to be applied close to the surface to minimize heat loss. The freeze point of the fluid should be as low as possible, but not less than 10°F lower than the OAT.

b) The heat in the fluid effectively melts any frost, as well as light deposits of slush, snow, and ice. Heavier accumulations require the heat to break the bond between the frozen deposits and the structure; the hydraulic force of the fluid spray then is used to flush off the residue. The deicing fluid will prevent refreezing for a period of time, depending on airplane skin temperature, OAT, the fluid used, and the weather.

c) To remove frost and light ice, a nozzle setting giving a coarse spray is recommended. This ensures the largest droplet pattern available, thus retaining the maximum heat in the fluid. A minimal amount of fluid will be required to melt the deposit if it is applied close to the airplane's skin.

d) For the removal of snow, the heavier the deposits, the heavier the fluid flow required to effectively remove it from the airplane. Remove light deposits of wet or dry snow as you would frost. Wet snow is more difficult to remove than dry snow, and unless deposits are relatively light, selection of a high fluid flow will be more effective. Under certain conditions, it will be possible to use the heat, combined with the hydraulic force of the fluid spray to melt and subsequently flush off frozen deposits. However, where snow has bonded to the airplane skin, it needs to be removed in the same way as ice. Heavy accumulation of snow will be difficult to remove from airplane surfaces and large quantities of fluid will be consumed in the attempt. Be careful when removing ice and snow from the tail and wing surfaces where vortex generators may be installed.

e) When removing ice, heated fluid will be needed to break the ice bond. The high thermal conductivity of the metal skin is utilized, and a jet of hot fluid is directed at close range onto one spot until the bare surface is just exposed. This bare surface then will transmit the heat laterally in all directions, raising the temperature above the freezing point and thereby breaking the adhesion of the frozen mass with the aircraft surface. By repeating this procedure a number of times, the adhesion of a large area of frozen snow or glazed ice can be broken. The deposits then can be flushed off with either a low or high flow, depending on the amount of deposit.

f) If weather conditions warrant where the aircraft most likely won't be able to depart within the holdover times published for Type I fluid, the aircraft will be deiced with Type I fluid then Type IV will be applied cold. In this case use the appropriate Type IV HOT.

g) It is critical that the PIC communicate with ATC to verify the flight departure time. This is so deicing/anti-icing fluid can be applied as close to the departure time as possible to maximize HOT.

h) The deicing procedure is a messy process. Deicing fluid may run over sensitive areas of the aircraft. This is acceptable; direct spraying on sensitive areas is not acceptable. When spraying the airplane with deicing fluids, observe the following techniques and precautions:
   1) Avoid direct spraying lubricated areas and sensitive areas.
   2) Do not spray into fuel tank vent openings or into the slots between fixed and moveable airfoil surfaces.
   3) Do not let fluid enter the brake units or come into contact with the landing gear wheels, tires, or shock absorbers.
   4) Do not spray onto cockpit windows or windshields.
   5) Use spray to clear the engine nacelles of snow, ice, and slush. Use hot air to clear the engine intakes.
   6) Refer to the section of this manual addressing aircraft specific procedures for fluid application with the APU operating.
   7) Refer to the section of this manual addressing aircraft specific procedures for fluid application with the engines operating.

i) Please note, Type I fluids supplied as concentrates for dilution with water prior to use shall not be used undiluted. This is due to adverse aerodynamic effects of propylene glycol-based fluid and the freeze point characteristics of ethylene glycol-based fluids. The value of Type I fluid as an anti-icing agent to prevent frozen precipitation from adhering to the airplane is very limited.

11.2 Recommended Fluid Application Patterns

NOTE: The patterns specified below are generally accepted procedures for applying deicing fluid. The spray patterns recommended by the aircraft manufacturers are specified in the section for each type aircraft in this document.

a) Spray in slow, sweeping motions and apply just enough fluid to melt away any deposits and prevent refreezing. Do not point a solid stream directly to the aircraft's surface. Apply at a low angle to prevent damage to the aircraft surface.
b) Position the deicing unit at the starting point for the specific type of aircraft.
c) When spraying wings, wash the fluid down the wing (leading edge to trailing edge). Ensure the application process covers the entire wing from wingtip to wing root. The spray process must be applied to avoid direct spraying into wing flap to wing trailing edge joining areas.
d) Spray the nose of the aircraft forward of the windscreen avoiding direct spraying onto sensitive surfaces/items on this section of the aircraft.
e) When spraying the tail surfaces, begin at the highest point on the tail and let the fluid wash down the vertical stabilizer and rudder.
f) When spraying the stabilizer and elevator, avoid the sensitive areas.
g) When spraying the top of the fuselage, let the fluid cascade across the window areas and down the fuselage.
h) Reposition the deicing equipment away from the aircraft.

12.0 Clean Aircraft Concept and Post-Deicing/Anti-icing Inspections

12.1 Clean Aircraft Concept Determination

a) The purpose of a ground deicing program is to take an aircraft with frozen contaminants on it and usually through the application of deicing/anti-icing fluid, remove the frozen contaminant.
b) The deicing technician is generally elevated in a bucket or platform above the aircraft and should be able to assess the efforts of the deicing procedures. The deicing technician will look for any irregularities under the coat of deicing fluid. This could be an ice contaminant and indicate that further deicing/anti-icing is necessary for that area.
c) After the fluid has been applied, a smooth glossy-like sheen will be noticed with no irregularities under the coat of fluid. If the deicing technician has any doubts regarding frozen contaminant on a critical area after the application of the fluid, he will move bucket/platform to that area for a closer look. If doubt still remains, fluid will be reapplied to that area.
d) The deicing technician will not signal the PIC that the deicing procedure is completed until he is assured that critical areas of the aircraft are free (clean) of frozen contaminants.

12.2 Post deicing inspection

a) Immediately after the completion of the deicing procedure, the deicing technician will closely inspect the aircraft to ensure all critical areas are free of frozen contaminants.

b) This post-deicing inspection is separate from the deicing procedure. It begins at the area of the aircraft where the deicing procedure began and it follows the same vehicle sequencing as the deicing procedure.

1) Please note the post-deicing procedure is conducted while the clock qis running on the HOT. If the ground deicing personnel have not been trained to this program, then the PIC will supervise the ground deicing/anti-icing procedure from the outside of the aircraft, and the PIC will conduct the post-deicing procedure.

12.3 Post anti-icing inspection

a) For anti-icing procedures, which are applied to a clean aircraft surface (non-contaminated) with cold Type IV fluid, the deicing technician is inspecting the critical surfaces of the aircraft for a uniform application of the fluid. There will be no irregularities of the fluid coat (bare spots) and the fluid will be smooth over these surfaces of the aircraft.

b) The inspection procedure will follow the same vehicle sequencing as the deicing/anti-icing procedure.

1) Please note that a non-contaminated surface is a surface to which no frozen contaminants are adhering.

2) Surfaces which have been deiced with Type I fluid, and Type IV fluid is applied directly over the Type I fluid. The application of Type I fluid must remove all frozen surface contaminates prior to the application of cold Type IV fluid.

c) In the event no precipitation is falling during the deicing procedure, the post deice/anti-icing inspection may be accomplished during the deice/anti-icing procedure.

d) In the event of freezing drizzle, light freezing rain, or rain on a cold-soaked wing (see Holdover Time Table), the PIC will conduct the above-referenced post deicing or post anti-icing inspections, as well as physically checking the nose fuselage and the wings for possible ice contaminants after the deicing/anti-icing procedures. This means that the PIC will monitor the deicing procedure from outside the aircraft so as to complete this external check in a timely manner.

12.4 Pre-takeoff Check 121.629 (c)(3)(i), 121.629 (c)(4)

a) After the deicing/anti-icing procedure, a pre-takeoff check must be completed just prior to departure and within the specified time limits of the HOT. This check is done by the flight crew from the flightdeck observing a glossy-like sheen on the representative surfaces.

b) If operating an aircraft requiring two crewmembers, the PIC will ask the SIC for verification of the clean representative surfaces on the right side of the aircraft. If the surfaces still show a glossy sheen with no contaminant building on the fluid, the aircraft meets the clean aircraft concept and is good to go.

c) The PIC must be aware throughout the entire HOT, fluid failure may occur and it may be necessary to return to the gate for additional deicing/anti-icing prior to the "just before takeoff" pretakeoff check. The PIC will monitor the weather conditions throughout the HOT for changes that could result in a fluid failure.
An example:
The aircraft was deiced during light snow conditions and during taxi; but prior to the pre-takeoff check and expiration of the HOT, it snows heavily for several minutes. This heavy snow may contaminate the clean aircraft concept and require a return to the gate for additional fluid application, or even perhaps waiting until conditions improve for any subsequent applications. If fluid failure is observed before the pre-takeoff check or during the pre-takeoff check, the aircraft will return to the gate.

d) The pre-takeoff check is to verify the effectiveness of fluid performance to maintain the clean aircraft concept on the representative surfaces.
   1) Failure of Type I is characterized by lack of glossiness or sheen on the representative surfaces or the buildup of frozen contaminants (example: snow) on top of the fluid of the representative surfaces.
   2) For Type IV fluid, failure of the fluid is characterized when ice becomes visible in the fluid. When this occurs, the fluid begins to appear "opaque" rather than transparent and glossy, and/or the inability to discern structural details (rivets, screws, seams) through the fluid becomes apparent.

12.5 Pre-takeoff Contamination Check 121.629 (c)(3)(iii), 121.629 (c)(4)

a) If the HOT is exceeded, the aircraft must be inspected for possible frozen contaminants from the exterior of the aircraft.

b) This inspection must be done within five minutes of departure.

c) This may be impractical due to the location of the aircraft (most likely on a taxiway) and the logistics required repositioning hoist equipment to aircraft.

d) In the event the HOT is exceeded, the PIC will return the aircraft to the ramp or to a suitable location for an exterior inspection of the critical surfaces of the aircraft. If the exterior inspection of the critical surfaces of the aircraft reveals the integrity of the fluid is satisfactory and departure can be made within 5 minutes of the completion of that inspection, the PIC may elect to taxi out for departure. If the exterior inspection reveals deicing/anti-icing fluid failure, the aircraft will be redeiced or anti-iced prior to departure. At this point the crew will configure the aircraft for fluid application.

NOTE: If re-deicing/anti-icing is required and the aircraft was anti-iced with Type IV fluid, the Type IV must be removed from the aircraft with Type I fluid before applying Type IV again.

Paragraph 13.0 Removed

14.0 Use of Contract Deicing/Anti-icing Vendors

a) Corporate Air does not have any in-house deicing capabilities. All ground deicing must be done by contract vendors.
b) Ground deicing vendors come in many forms. Some may be regional airlines, very large air carriers, fixed base operations, or companies that specialize in ground deicing services. These companies may provide deicing services to many different air carriers and private parties at an airport.
c) Corporate Air may use a contract vendor for deicing/anti-icing provided the following conditions are met:
   1) The Director of Training or his designees (PIC, SIC, Instructor Pilot, Check Airman, Chief Pilot or trained contract company trainer) train the contract company's personnel to the policies and procedures of this manual. Under the Train-the-Trainer concept, the Director of Training or his designees, may train-the-trainer(s), who may then train other contract company personnel to the policies and procedures of this manual.

2) Corporate Air can use a contract vendor if the vendor has been trained in the approved procedures of another Part 121 air carrier if:
   i) The program meets the requirements of AC 120-60B (most current edition).
   ii) The vendor has records of the individuals who have been trained to the above standards.
   iii) Those records are either faxed to Flight Following or the Director of Operations for our approval. The Director of Operations has final approval of contract vendors for deicing. In his absence, the Manager of Flight Following may approve the vendor.
   iv) After review by the DO or Manager of FF, the records will be forwarded to the Director of Training for recording in the training records.
3) Any one of the following is verification of training by another air carrier under the AC120-60B (current edition):
   i) Copies of the individual's training records with a reference to AC120-60B on those records.
   ii) If the training records do not indicate training under the most current AC120-60B, the DO or the manager of FF will ask the vendor to send or fax a copy of the air carrier's program.
   iii) The DO or manager of FF will also ask the vendor for a contact phone number of the air carrier under whose program they were trained to confirm verification of training per AC120-60B.
   iv) Unless verification is received and recorded in a contract vendor's training records, indicating training by another Part 121 air carrier, in accordance with AC120-60B (most current edition), then that vendor must receive the initial training course of instruction.
   v) Flight Following personnel will assess a vendor's deicing capabilities and training in as far in advance prior to operation into an airport so appropriate training may be set up.
   vi) If the vendor meets the training requirements for another qualified Part 121 Air Carrier, the PIC or SIC will train vendor personnel in the following areas:
      A) Sensitive areas of the aircraft.
      B) Critical surfaces of the aircraft.
      C) Spray and distribution pattern of deicing/anti-icing fluids for the aircraft.
      D) Communications during the deicing procedure including if the deicing procedure is not successful.
      E) Clean aircraft concept for the aircraft.

15.0 Training [121.629 (c)(2)(i-vii) and AC120-60B]

Corporate Air will conduct initial training and annual recurrent training for flightcrews, flight followers and ground personnel regarding ground deicing/anti-icing procedures.

15.1 Initial and Recurrent training [121.629(c)(2)(i-viii)]

a) Initial and Recurrent training will include the following subjects:
   1) The use of holdover times.
   2) Aircraft deicing/anti-icing procedures, including inspection and check procedures and responsibilities.
   3) Communications procedures.
   4) Aircraft surface contamination (i.e., adherence of frost, ice, or snow) and critical (critical surfaces) area identification, and how contamination adversely affects aircraft performance and flight characteristics.
   5) Types and characteristics of deicing/anti-icing fluids.
   6) Cold weather preflight inspection procedures.
   7) Techniques for recognizing contamination on the aircraft.
   8) Duties, responsibilities, and functions for each person (job function) involved in the program (contained in this manual).
   9) The Director of Training is responsible for recording and tracking all training using the AS400 computer for proof of qualification of persons under this program.

b) Personnel must be able to adequately read, speak, and understand English in order to follow written and oral procedures applicable to this program.

15.2 Training Curriculum (AC120-60B)

The initial and recurrent training program contains the following material. This information will be presented to flightcrews (F), Flight Following personnel (FF), and Ground Personnel (G) as specified for each subject matter.

a) Effects of Frozen Contaminants on Aircraft Surfaces. (F/FF/G)
   Provide an understanding of the critical effect the presence of minute amounts of frost, ice, or snow has on flight surfaces. This discussion will include, but is not limited to:
   1) Loss of lift.
   2) Increased drag and weight.
   3) Decreased control.
   4) Tendency for rapid pitch-up and roll-off during rotation. (F/FF only)
   5) Stall occurs at lower-than-normal angle of attack. (F/FF only)
   6) Buffet or stall occurs before activation of stall warning. (F/FF only)

7) Aircraft specific areas:
   i) Engine foreign object damage potential.
   ii) Ram air intakes.
   iii) Instrument pickup points.
   iv) Leading edge device (LED) aircraft (aircraft that have slats or leading edge flaps) and non-LED aircraft.
   v) Airworthiness Directives/Specific inspections.
   vi) Winglets.

b) Aircraft Ground Icing Conditions. (F/FF/G)
Describe conditions that cause implementation of deicing/anti-icing procedures (F/FF/G).
1) In-flight Ice Accumulation. Certificate holders will have procedures for flightcrews on arriving flights to report occurrences of in-flight icing to the personnel responsible for executing the certificate holder's deicing/anti-icing program. In-flight ice accumulation could result in a ground-deicing situation when flights are scheduled for short turnaround times (i.e., for 30 minutes or less and when ambient temperatures on the ground are at or below freezing).
2) Frost, including hoarfrost.
3) Freezing precipitation (snow, freezing rain, freezing drizzle, or hail, which could adhere to aircraft surfaces).
4) Freezing fog.
5) Rain or high humidity on cold soaked wing.
6) Rain or high humidity on cold soaked wing fuel tanks.
7) Under-wing frost (may not require deicing/anti-icing within certain limits).
8) Cold weather preflight inspection.
9) Recognition of frozen contamination.

c) Fluid failure identification. (F/FF/G)

d) Location of specific deicing/anti-icing procedures (F/FF and/or G, as appropriate). (F/FF/G)

e) Communications procedures between the flightcrew, ground personnel, ATC, and company station personnel (F/FF/G).
NOTE: Use caution when exercising 3-way communication. They may be confusing, misleading, or misdirected. Communication procedures must include ground crew confirmation to the flightcrew after the deicing and anti-icing process is completed that all personnel and equipment are clear before reconfiguring or moving the aircraft.

f) Means for obtaining most current weather information. (F/FF/G)

g) Characteristics and capabilities of fluids used. (F/FF/G)
   1) General fluid descriptions.
   2) Composition and appearance.
   3) Differences between Type I and Type II/IV deicing/anti-icing fluids.
   4) Purpose for each type.
   5) Deicing fluids.
   6) Anti-icing fluids.
   7) De/anti-icing fluids capabilities.
   8) Approved deicing/anti-icing fluids for use (SAE, ISO, etc.).
   9) Fluid-specific information provided by fluid or aircraft manufacturer (F/FF/G).
   10) Fluid temperature requirements (Hot vs. Cold).
   11) Properties associated with infrared deicing/anti-icing.

h) Fluid Storage and Handling (G).
   1) Fluid storage.
   2) Fluid handling.
   3) Fluid sampling.
   4) Fluid testing.

i) Deicing/Anti-icing Facilities and Equipment Operation Procedures. (G)
   An understanding of the capabilities of the deicing equipment and the qualifications for operation. The equipment portion of the training program includes the following:
   1) Description of Various Equipment Types:
      i) Deicing vehicles.
      ii) Infrared facilities.
      iii) Hard stands.
   2) Operation of the equipment.
   3) Emergency procedures.

j) Health, Safety, and First Aid. (F/FF/G)

k) Environmental Considerations. (G)

l) Fluid Selection (F/FF/G).

m) Contractor Deicing/Anti-icing. (F/FF/G) Train-the-trainer (per the approved program).
   Train contractor deice/anti-ice personnel, using the items listed in the curriculum that are marked with a “G.”

n) Methods/Procedures. (F/FF/G))
   1) Inspection of critical surfaces.
   2) Clear ice precautions.
   3) Flightcrew/ground crew preflight check requirement.
   4) Deicing/anti-ice determination.
   5) Deicing/anti-ice location.
   6) Communication before deicing/anti-icing.
   7) General deicing/anti-ice precautions.
   8) Aircraft specific requirement

9) Deicing:
   i) Requirements.
   ii) Effective removal of frost, snow, and ice. (G)
10) Anti-icing:
   i) Requirements.
   ii) Preventative anti-icing. (G)
   iii) Application. (G)
11) Deicing/anti-icing:
   i) One step.
   ii) Two step.
12) Guidelines for the application of deicing/anti-icing fluids.
13) Post deicing/anti-icing checks requirement.
14) Flight control check.
15) Communications after deicing/anti-icing.
16) Use of the deicing/anti-icing log.

o) Use of HOTs. (F/FF/G)
   1) Definition of HOT.
   2) When HOT begins and ends.
   3) Limitations and cautions associated with the use of HOTs.
   4) Source of HOT data.
   5) Relationship of HOT to particular fluid concentrations and for different types of fluids.
   6) Precipitation category (e.g., fog, drizzle, rain, or snow).
   7) Precipitation intensity.
   8) Pilot assessment of precipitation intensity.
   9) How to determine a specific HOT from the HOT range that accounts for moderate or light weather conditions (F/FF).
   10) Adjusting HOT for changing weather conditions. (F/FF)

   NOTE: Ground personnel will receive familiarization training on determining a specific HOT from the HOT range and adjusting the HOT for changing weather conditions.

p) Pre-takeoff Check Requirement. (F/FF)
   Identification of representative surfaces.

q) Pre-takeoff Contamination Check Requirement. (F/FF/G)
   Communications.

r) Aircraft Surface Contamination Recognition. (F/FF/G)

15.3 Training and Testing

a) Training and testing for the Ground Deicing Program is incorporated into the appropriate modules of the Corporate Air Flight Operating Training Manual (FOTM).

b) Training and Testing of Vendor Personnel is recorded on a Corporate Air Ramp Deice Ground School Attendance Record.

15.4 Training Records

a) The person giving the training is responsible for completing the proper documentation of training as listed above.

b) The completed record is given (mailed via COMAT) to the Director of Training for recording into the appropriate records on the AS400 computer.

c) The Director of Training is responsible for advising the Manager of Flight Following what personnel and at what stations trained deicing technicians are located.

   1) This is transmitted to the Manager of FF via company email.
   2) The Manager of FF will make this information available to persons under his supervision.

Corporate Air
RECORD OF AIRCRAFT DEICING/ANTI-ICING TRAINING PER AC120-608

DATE LOCATION INTIAL / RECURRENT

Employee Name (print)	Employee Classification	Employee Number	Company	Course Result (S / U)	Signature
1.					
Received Training from Another Carrier Y / N	Name of Carrier	Type Aircraft	Date Completed	V	Enter Aircraftof Corporate Air
Employee Name (print)	Employee Classification	Employee Number	Company	curse Result (S / U)	Signature
2					
Received Training from Another Carrier Y / N	Name of Carrier	Type Aircraft	Date Completed		Enter Aircraft of Corporate Air
Employee Name (print)	Employee Classification	Employee Number	Company	Course Result (S / U)	Signature
3					
Received Training from Another Carder Y / N	Name of Carder	Type Aircraft	Date Completed	r A	Enter Aircraft of Corporate Air
Employee Name (print)	Employee Classification	Employee Number	Company	Course Result (S / U)	Signature
4.					
Received Training from Another Carrier Y / N	Name of Carrier	Type Aircraft	Date Completed		Enter Aircraft of Corporate Air
Employee Name (print)	Employee Classification	Employee Number	Company	se Result (S / U)	Signature
5.					
Received Training from Another Carrier Y / N	Name of Carrier	Type Aircraft	Date Completed		Enter Aircraft of Corporate Air

INSTRUCTOR(1) NAME	INSTRUCTOR (2) NAME
SIGNATURE	SIGNATURE
EMPLOYEE NUMBER _____	EMPLOYEE NUMBER _____

16.0 Hangaring Aircraft

a) Aircraft that are kept in a hangar during periods of time that ground icing conditions exists, may not need deicing even though ground deicing conditions are declared in effect.

b) The PIC will conduct a cold weather preflight inspection to determine if any contaminants are adhering to the aircraft. If no contaminants are present, the flight may continue without further deicing action.
   1) In this case, the PIC will advise FF and FF will record the event on the FF Turnover Log.

c) Use of a hangar is also an acceptable method for removing frozen contaminants from the aircraft whether the aircraft has sat on the ground for a period of time gathering snow/ice or after landing with an inflight accumulation. In either case, the PIC will do a thorough cold weather preflight inspection. Special attention will be paid to area where moisture can gather then refreeze when removed from the hangar.
   1) The PIC will advise FF whether ground deicing is required. FF will record this event in the FF turnover log.

16.1 Cities Where Hangaring is Available

Base:	Cities Where Hangaring is Available:
CPR	BFF, COD, CPR, HDN, RKS
GFK	BIS, BJI, DIK, GFK, ISN, MOT
GTF	BZN, GTF, OLF*
SLC	PIH, SLC, SUN, TWF
* Open Hangar – not suitable for warming an aircraft to remove frozen contamination	

17.0 Cities Capable of FAR 121.629(c) Ground Deicing/Anti-icing

a) The Corporate Air Ground Deicing Program may be implemented at the cities listed below:

CPR	GFK
GTF	SLC
BZN	COD

When the program is implemented at these cities, holdover times may be used. In the event the 121.629(c) is not implemented at the above cities then the Alternate Procedure specified on the following page may be used.

.Deicing/anti-icing is allowed at cities other than those listed above, but the Corporate Air Ground Deicing Program may not be implemented and therefore holdover times are not to be used. The Alternate Procedure (Tactile Check), described on the next page, must be used and takeoff must be made within 5 minutes of successful completion of that check.

18.0 Operations Under FAR 135.227(b)(1)(2); Alternate Procedure

a) In the event a vendor does not meet the requirements of FAR 121.629(c) (full ground deicing/anti-icing program), ground deicing may take place under the provisions of FAR 135.227(b)(1)(2) for all aircraft operating under Part 135. CE-208 aircraft deicing/anti-icing must be in accordance with Appendix C and the aircraft must be operated in accordance with the POH Limitations and Procedures. When using the Alternate Procedure, Holdover Times (HOT) are advisory only and serve only as guidance to the pilot in making takeoff decisions.

b) Provisions for ground deicing procedures under FAR 135.227(b)(1)(2)

1) The PIC has received the training required by the FAR 121.629(c) program.
2) Corporate Air has determined the equipment used by the vendor is capable of deicing the aircraft properly. This is generally done during the month of September, prior to the icing season. The inspection of the vendor and their equipment shall be conducted by the Director of Safety, Director of Operations, Chief Pilot, and lead pilots.
3) Individuals performing the deicing procedures will be trained on the following:
   - Type of fluid authorized in Corporate Air's operation.
   - Areas requiring deicing (critical surfaces).
   - Areas to avoid directly spraying (sensitive surfaces and areas).
   - Reviews the areas of contamination on the aircraft with the PIC.
   - Reviews the appropriate fluid application pattern for the specific type aircraft with the PIC.
4) The PIC will supervise the ground deicing event from the exterior of the aircraft.
5) The PIC will perform the post-deicing inspection.
6) The above procedure must be accomplished prior to each flight.
7) The PIC must conduct a pre-takeoff contamination check 5 minutes prior to beginning takeoff.
   NOTE: The critical surfaces requiring inspection are listed under the applicable appendix for each type aircraft in this program.
8) If five minutes have elapsed since the Pre-takeoff Contamination Check was completed, the crew must complete another successful Pre-takeoff Contamination Check or return to the ramp and be re-deiced prior to takeoff.
9) Use of deice/anti-ice fluids is not allowed when the outside air temperature is below the Lowest Operational Use Temperature (LOUT). See Appendix E for information concerning LOUT.

19.0 Stations Not Requiring a Ground Deicing/Anti-icing Procedure

All Hawaiian Locations.

No person may take off an aircraft at any Hawaiian location when frost, ice, or snow is adhering, or may reasonably be expected to adhere to the wings, control surfaces, propellers, engine inlets, or other critical surfaces of the aircraft.

APPENDIX A AND APPENDIX B HAVE BEEN REMOVED
THESE APPENDICES HAVE BEEN RESERVED FOR FUTURE EXPANSION WHEN REQUIRED

C208 Specifics

1.1 Approved Fluids and Heated Air

a) Approved Fluids:
   1) Type I fluid
   2) Type IV fluid (NOTE: Type IV fluid requires a rotation speed of 85 knots or higher.)

b) Caution – the use of Type IV fluid applied over the top of Type I fluid.
   1) Type IV fluid must be applied to "clean" airplane within three minutes after deicing is completed (with Type I fluid) due to the limited holdover times of Type I fluid.

c) Use of heated Type IV fluid
   1) Using Type IV heated may change the characteristics of the thickening agents in fluid, and therefore it must be considered as a Type I fluid regarding holdover times.

d) High velocity heated air is approved for "pre-cleaning" of snow prior to application of deicing fluid.

1.2 Ground Deicing Conditions for the C208 Aircraft

a) Ground icing conditions are defined as:
   1) The OAT is 2°C or below, and visible moisture is present (i.e., rain, drizzle, sleet, snow, fog, water is present on the wind, etc.), OR
   2) The OAT is 5°C or below and conditions are conducive to active frost formation (e.g., clear night with a dew point temperature/OAT difference of 3°C or less).

1.3 Cold Weather Preflight Inspection

a) The following areas, surfaces, and components require special attention during the preflight when ground deicing conditions are in effect to ensure either the aircraft is free of frozen contaminants, or the aircraft has frozen contaminants that will need removing during the deicing procedure and prior to flight:
   1) Wings – Visual and tactile inspection.
   2) Horizontal stabilizer – Visual and tactile inspection.
   3) Vertical stabilizer – Visual and tactile inspection.
   4) Pitot/Static probes and Stall heat transducers – free and clear of frozen contaminants, warm to the touch after turned on.
   5) Wing, Wing strut, and stabilizer anti-ice TKS panels – check condition.
   6) Propeller Anti-ice boots – check condition.
   7) Control surface static dischargers – check condition

1.4 Critical Surfaces on the C208

a) The following are critical surfaces:
   1) Wing leading edges, upper surfaces and lower surfaces
   2) Horizontal and vertical stabilizers
   3) All control surfaces and control surface gaps
   4) Spoilers
   5) Windshield for clear visibility
   6) Engine inlets
   7) Antennas
   8) All pitot and static probes/ports
   9) Fuel tank and fuel cap vents
   10) Air inlet scoops
   11) Landing gear

1.5 Sensitive Areas on the C208

a) The following areas on the C208 aircraft must not receive direct application of deicing or anti-icing fluids:
   1) Engine inlets and exhaust
   2) Windshields and windows
   3) Brakes
   4) Pitot-static tubes
   5) Stall warning vane

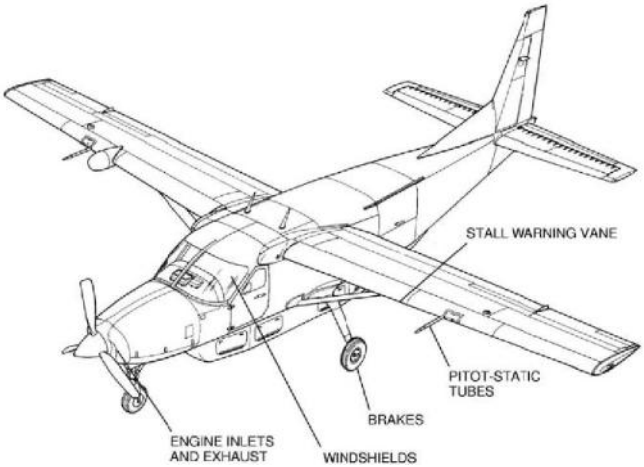


Figure 1 – Areas to be Avoided by Direct Fluid Spray

1.6 Wheel Brake Deice Procedure

a) Use the following procedures for deicing the wheel brakes when a full deicing procedure is not required:
   1) Use a ground heater if available.
   2) Spray or pour isopropyl alcohol on the brakes.
   3) Cycle the brakes asymmetrically while engine power is applied.
   4) In slush conditions, spraying alcohol on the brakes before taxi and takeoff will help prevent the brakes from freezing in flight.

1.7 Spray Pattern and Mobile Deicing/Anti-icing Unit Sequencing

a) The engine must be shutdown during deicing/anti-icing.
b) Application of Deicing Fluids:
   1) Begin on the left side fuselage from the spinner to the wing strut area.
   2) Apply fluid on the upper fuselage above the cockpit.
   3) Deice left wing.
   4) Deice left fuselage from wing strut area to the tail.
   5) Tail section, left and right side.
   6) Right side fuselage from the tail to the wing strut area.
   7) Right wing.
   8) Right side fuselage above the cockpit.
   9) Right side fuselage from the wing strut area to the spinner.

NOTE: BY STARTING DEICE APPLICATION AT LEFT NOSE, THE PILOT CAN GET A CONSERVATIVE ESTIMATE OF ICE REFORMATION FROM INSIDE THE COCKPIT. SINCE THIS WAS THE FIRST AREA DEICED, IT WILL BE THE FIRST AREA TO EXPERIENCE NEW ICE REFORMATION.

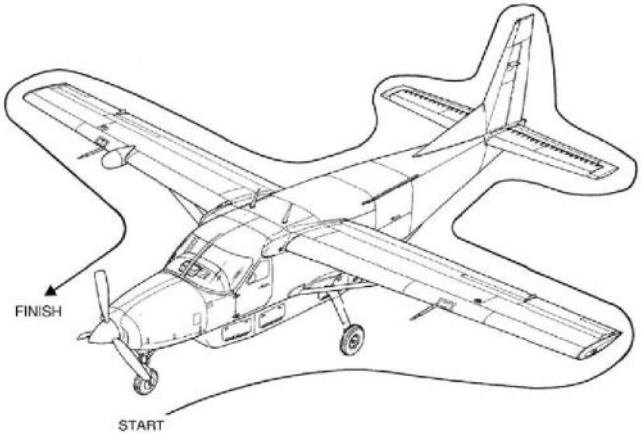
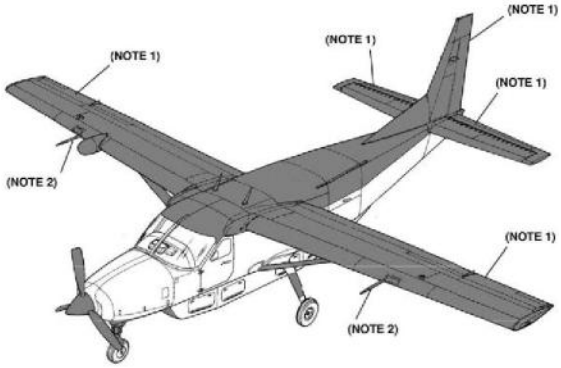


Figure 2 – Fluid Application Sequence



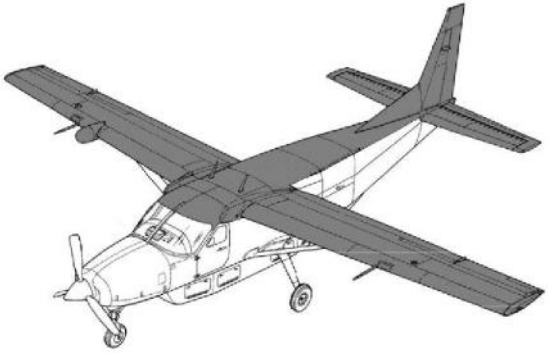
NOTE 1: FAY SPECIAL ATTENTION TO THE GAPS FETWEEN THE FLIGHT CONTROLS. ALL SNOW, ICE AND SLUSH MUST BE FEMOVED FROM THESE GAPS.

NOTE 2: FEMOVE SNOW, ICE AND SLUSH FROM FITOT TUBES BY HAND ONLY.

NOTE: SHADED AREAS INDICATE ESSENTIAL AREAS TO BE DEICED.

Figure 3 – Essential Areas for Deice Fluid Application

c) Application of Anti-icing Fluids:
   1) Apply anti-ice fluid to the left wing.
   2) Left and right tail sections and empennage.
   3) Right wing.



NOTE 1: ANTI-ICE FLUID SHOULD BE APPLIED AT LOW PRESSURE TO FORM A THIN FILM ON SURFACE. FLUID SHOULD JUST COVER AIRPLANES WITHOUT RUNOFF.

NOTE 2: SHADED AREAS INDICATE AREAS WHERE ANTI-ICE FLUID IS APPLIED.

NOTE 3: AVOID DIRECT SPRAY ON PITOT STATIC TUBES, WINDSHIELDS, CABIN WINDOWS, AND STALL WARNING VANE.

Figure 4 – Essential Areas for Anti-Ice Fluid Application

1.8 Post Application Checks

a) After completion of the deicing procedure, a qualified deicing technician or the PIC must check the following critical areas are free of ice, snow, or slush.
   1) Wing leading edges, upper surfaces and lower surfaces
   2) Horizontal and vertical stabilizers
   3) All control surfaces and control surface gaps
   4) Spoilers
   5) Windshield for clear visibility
   6) Engine inlets
   7) Antennas
   8) All pitot and static probes/ports
   9) Fuel tank and fuel cap vents
   10) Air inlet scoops
   11) Landing gear

1.9 Representative Surfaces on the C208

a) The following surfaces of the C208 are considered representative surfaces for the C208 aircraft. These surfaces are inspected by the crew from the flight deck just prior to departure and before the expiration of the HOT. These surfaces must be free of any frozen contamination:
   1) The left wing leading edge
   2) The nose section for the aircraft in front of the windscreen
   3) The radome

1.10 Underwing Frost in the Area of the Fuel Tanks

a) The C208 is not approved for takeoff with frost adhering to the underside of the wing in the vicinity of the fuel cells.

1.11 Special Pre-takeoff Inspection Procedure

a) When the C208 is deiced or anti-iced under this program—after deicing, but before the expiration of the HOT—the PIC will do a tactile inspection of a portion of the upper wing.

b) If the aircraft is deiced or anti-iced outside the parameters of this program, the PIC will conduct a tactile check of the leading edge and upper surface of the wing. During ground icing conditions, takeoff must be accomplished within 5 minutes of completing the tactile inspection.

1.12 C-208 Extended-Flaps Mitigation Measures

a) A no-flap takeoff is required after the C-208 is deiced/anti-iced. Mitigation measures are not required to account for rapid deicing/anti-icing fluid loss on a highly sloped configuration due to extended flaps or slats.

TABLE 7. SNOWFALL INTENSITIES AS A FUNCTION OF PREVAILING VISIBILITY

Time of Day	Temp.		Visibility in Statute Miles (Meters)									
	Degrees Celsius	Degrees Fahrenheit	≥ 2 1/2 (≥ 4000)	2 (3200)	1 3/4 (2800)	1 1/2 (2400)	1 1/4 (2000)	1 (1600)	3/4 (1200)	1/2 (800)	≤ 1/4 (≤ 400)	
Day	colder/equal -1	colder/equal 30	Very Light	Very Light	Very Light	Light	Light	Light	Moderate	Moderate	**Heavy**	Snowfall Intensity
	warmer than -1	warmer than 30	Very Light	Light	Light	Light	Light	Moderate	Moderate	**Heavy**	**Heavy**	
Night	colder/equal -1	colder/equal 30	Very Light	Light	Light	Moderate	Moderate	Moderate	Moderate	**Heavy**	**Heavy**	
	warmer than -1	warmer than 30	Very Light	Light	Moderate	Moderate	Moderate	Moderate	**Heavy**	**Heavy**	**Heavy**	

NOTE 1: This table is for estimating snowfall intensity. It is based upon the technical report, "The Estimation of Snowfall Rate Using Visibility," Rasmussen, et al., Journal of Applied Meteorology, October 1999 and additional in situ data.

NOTE 2: This table is to be used with Type I, II, III, and IV fluid guidelines.

NOTE 3: The use of Runway Visual Range (RVR) is not permitted for determining visibility used with the holdover tables.

NOTE 4: Some METARS contain tower visibility as well as surface visibility. Whenever surface visibility is available from an official source, such as a METAR, in either the main body of the METAR or in the Remarks ("RMK") section, the preferred action is to use the surface visibility value.

NOTE 5: If visibility from a source other than the METAR is used, round to the nearest visibility in the table, rounding down if it is right in between two values. For example, .6 and .625 (5/8) would both be rounded to .5 (1/2).

HEAVY = Caution—No Holdover Time Guidelines Exist

During snow conditions alone, the use of Table 7 in determining snowfall intensities does not require pilot company coordination or company reporting procedures since this table is more conservative than the visibility table used by official weather observers in determining snowfall intensities.

Because the FAA Snowfall Intensities Table, like the FMH-1 Table, uses visibility to determine snowfall intensities, if the visibility is being reduced by snow along with other forms of obscuration such as fog, haze, smoke, etc., the FAA Snowfall Intensities Table does not need to be used to estimate the snowfall intensity for HOT determination during the presence of these obscurations. Use of the FAA Snowfall Intensities as a Function of Prevailing Visibility Table under these conditions may needlessly overestimate the actual snowfall intensity. Therefore, the snowfall intensity being reported by the weather observer or automated surface observing system (ASOS), from the FMH-1 Table, may be used.

•To establish a Holdover Time, the temperature of the fluid at the nozzle must be at least 60°C (140°F) or warmer
•Use ATIS or current local weather report to get OAT and type and intensity of precipitation, except snow
•Determine snowfall intensity using the "Snowfall Intensities as a Function of Visibility" chart. If more than one obscuration to visibility is reported, the reported snowfall intensity may be used to enter this chart

TABLE 1A. HOLDOVER TIME GUIDELINES FOR SAE TYPE I FLUID ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF ALUMINUM

Outside Air Temperature[1,2]		Wing Surface	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[3]			Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold Soaked Wing[6]	Other[7]
				Very Light[4]	Light[4]	Moderate				
-3 and above	27 and above	Aluminum	0:11-0:17	0:18-0:22	0:11-0:18	0:06-0:11	0:09-0:13	0:02-0:05	0:02-0:05	
below -3 to -6	below 27 to 21	Aluminum	0:08-0:13	0:14-0:17	0:08-0:14	0:05-0:08	0:05-0:09	0:02-0:05	CAUTION: No holdover time guidelines exist	
below -6 to -10	below 21 to 14	Aluminum	0:06-0:10	0:11-0:13	0:06-0:11	0:04-0:06	0:04-0:07	0:02-0:05		
Below -10	below 14	Aluminum	0:05-0:09	0:07-0:08	0:04-0:07	0:02-0:04				

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER.

GOM: **No takeoffs** during actual conditions of: Freezing Drizzle, Freezing Rain, Ice Pellets, Snow Pellets, Hail, or Heavy Snow

1) Type I fluid / water mixture must be selected so that the freezing point of the mixture is at least 10 °C (18 °F) below outside air temperature.
2) Ensure that the lowest operational use temperature (LOUT) of the fluid is respected.
3) To determine snowfall intensity, the SNOWFALL INTENSITIES AS A FUNCTION OF PREVAILING VISIBILITY table (Table 1C) is required.
4) Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
5) Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.

6) No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7) Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CRYOTECH POLAR PLUS TYPE I FLUID

Use of the Lowest Operational Use Temperature (LOUT)	**Type I Fluid Cryotech Polar Plus**
If the OAT is colder than the LOUT, the aircraft may not be deiced/anti-iced using this fluid	**Lowest LOUT of -25.6°F (-32°C) at 63% Polar Plus/37% water dilution**
	Lowest LOUT of -10°F (-23.3°C) at 55% Polar Plus/45% water dilution
	The Cyrotech Polar Plus LOUT specifications is from the manufacturer's webpage

FAA Notes Concerning Table 1A

1) Type I fluid / water mixture must be selected so that the freezing point of the mixture is at least 10 °C (18 °F) below outside air temperature.
2) Ensure that the lowest operational use temperature (LOUT) is respected.
3) To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 7) is required.
4) Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
   Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5) No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
6) Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS:

The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.

Fluids used during ground de/anti-icing do not provide in-flight icing protection.

This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 0. HOLDOVER TIME GUIDELINES FOR SAE TYPE I AND TYPE IV FLUIDS IN ACTIVE FROST

Outside Air Temperature[1,2,3]		Approximate Holdover Times (hours:minutes)
Degrees Celsius	Degrees Fahrenheit	Active Frost Type I
-1 and above	30 and above	0:45 (0:35)[5]
below -1 to -3	below 30 to 27	
below -3 to -10	below 27 to 14	
below -10 to -14	below 14 to 7	
below -14 to -21	below 7 to -6	
below -21 to LOUT	below -6 to LOUT	

Outside Air Temperature[2,3]		Concentration Neat Fluid/Water (Volume %/ Volume %)	Approximate Holdover Times (hours:minutes)		
Degrees Celsius	Degrees Fahrenheit		Active Frost		
					Type IV
-1 and above	30 and above	100/0			12:00
		75/25			5:00
		50/50			3:00
below -1 to -3	below 30 to 27	100/0			12:00
		75/25			5:00
		50/50			3:00
below -3 to -10	below 27 to 14	100/0			10:00
		75/25			5:00
below -10 to -14	below 14 to 7	100/0			6:00
		75/25			1:00
below -14 to -21	below 7 to -6	100/0			6:00
below -21	below -6	100/0			4:00
Below -25	Below -13	No holdover time guidelines exist			

HE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

1) Type I Fluid / Water Mixture must be selected so that the freezing point of the mixture is at least 10 °C (18 °F) below outside air temperature.
2) Ensure that the lowest operational use temperature (LOUT) is respected.
3) Changes in outside air temperature (OAT) over the course of longer frost events can be significant; the appropriate holdover time to use is the one provided for the coldest OAT that has occurred in the time between the de/anti-icing fluid application and takeoff.
4) To use the Type III fluid frost holdover times, the fluid brand being used must be known. AllClear AeroClear MAX must be applied unheated. Clariant Safewing MP III 2031 ECO must be applied heated.
5) Value in parentheses is for aircraft with critical surfaces that are predominantly or entirely constructed of composite materials.

CAUTIONS:
Fluids used during ground de/anti-icing do not provide in-flight icing protection.
This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 4-GENERIC. TYPE IV HOLDOVER TIME GUIDELINES FOR SAE TYPE IV FLUIDS

Outside Air Temperature[1]		Type IV Fluid Concentration Neat-Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:15-2:40	2:20-2:45	1:10-2:20	0:35-1:10	0:40-1:30	0:35-0:40	0:08-1:25	
		75/25	1:25-2:40	2:05-2:15	1:15-2:05	0:45-1:15	0:50-1:20	0:30-0:45	0:09-1:15	
		50/50	0:25-0:50	0:40-0:45	0:25-0:40	0:15-0:25	0:15-0:30	0:09-0:15	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:20-1:35	1:20-1:40	0:45-1:20	0:25-0:45	0:25-1:20[7]	0:20-0:25[7]		
		75/25	0:30-1:10	1:40-2:00	0:45-1:40	0:20-0:45	0:15-1:05[7]	0:15-0:25[7]		
below-14 to LOUT	Below 7 to LOUT	100/0	0:20-0:40[8]	0:20-0:25[8]	0:10-0:20[8]	0:08-0:10[8]				

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER.

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.

6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).

7 No holdover time guidelines exist for this condition below -10 °C (14 °F).

8 If the LOUT is unknown, no holdover time guidelines exist below -22.5 °C (-8.5 °F).

CAUTIONS:

- **The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**
- **This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.**

TABLE 4H. TYPE IV HOLDOVER TIME GUIDELINES FOR CRYOTECH POLAR GUARD® ADVANCE

Outside Air Temperature[1]		Type IV Fluid Concentration Neat-Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:50-4:00	2:35-2:50	1:50-2:35	1:20-1:50	1:35-2:00	1:15-1:30	0:15-2:00	
		75/25	2:30-4:00	2:25-2:55	1:20-2:25	0:45-1:20	1:40-2:00	0:40-1:10	0:09-1:40	
		50/50	0:50-1:25	1:20-1:45	0:35-1:20	0:15-0:35	0:20-0:45	0:09-0:20	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:55-2:30	1:45-1:55	1:15-1:45	0:55-1:15	0:35-1:35[7]	0:35-0:45[7]		
		75/25	0:40-1:30	1:45-2:05	1:00-1:45	0:35-1:00	0:25-1:05[7]	0:35-0:45[7]		
Below -14 to -30.5	Below 7 to -22.9	100/0	0:25-0:50	0:20-0:25	0:10-0:20	0:08-0:10				

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER.

	Fluid Name	Published LOUT
TYPE IV Fluids:		
	Cryotech Polar Guard Advance	-30.5°C (-22.9°F)

Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.

1) To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 7) is required.
2) Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
3) Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
4) No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
5) Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
6) No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS:

- **The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**
- **This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.**

TABLE 9. GUIDELINES FOR THE APPLICATION OF SAE TYPE I FLUID

Outside Air Temperature (OAT)[1]	**One-Step Procedure De/Anti-icing**	**Two-Step Procedure**	
		First Step: Deicing	**Second Step: Anti-icing[2]**
0 °C (32 °F) and above	Heated mix of fluid and water with a freezing point of at least 10 °C (18 °F) below OAT	Heated water or a heated fluid/water mixture	Heated mix of fluid and water with a freezing point of at least 10 °C (18 °F) below OAT
Below 0 °C (32 °F) to LOUT		Heated fluid/water mixture with a freezing point at OAT or below	

Fluids must not be used at temperatures below their lowest operational use temperature (LOUT).
To be applied before first-step fluid freezes, typically within 3 minutes. (This time may be higher than 3 minutes in some conditions, but potentially lower in heavy precipitation, colder temperatures, or for critical surfaces constructed of composite materials. If necessary, the second step shall be applied area by area.)

NOTES:
This table is applicable for the use of Type I holdover time guidelines in all conditions, including active frost. If holdover times are not required, a temperature of 60 °C (140 °F) at the nozzle is desirable.
If holdover times are required, the temperature of water or fluid/water mixtures shall be at least 60 °C (140 °F) at the nozzle. Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.

To use Type I Holdover Times Guidelines in all conditions including active frost, an additional minimum of 1 litre/m^2 (~2 gal./100 sq. ft.) of heated Type I fluid mixture must be applied to the surfaces after all frozen contamination is removed. This application is necessary to heat the surfaces, as heat contributes significantly to the Type I fluid holdover times. The required protection can be provided using a 1-step method by applying more fluid than is strictly needed to just remove all of the frozen contamination (the same additional amount stated above is required).

The lowest operational use temperature (LOUT) for a given Type I fluid is the higher (warmer) of:

The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type, or

The actual freezing point of the fluid plus a freezing point buffer of 10 °C (18 °F).

CAUTION:

Wing skin temperatures may differ and, in some cases, be lower than OAT. A stronger mix (more glycol) may be needed under these conditions.

C-208 Ground Deicing Checklist - One Step Procedure:

1) Before Deicing get the following information, as needed:
   a) Confirm Type I Fluid
   b) Fluid Mixture
   c) Fluid Freeze Point
   d) Confirm Fluid Temp is ≥ 60°C (140°F)
   e) If needed, review procedures with Deice Technician and confirm they are trained in CA procedures
2) **Aircraft Preparation**
   a) Parking rake…….. SET
   b) Engine……. SHUTDOWN
   c) Tail stand……..……INSTALL (IF REQUIRED)
   d) Doors & Windows…… CLOSE
3) **During Deicing**

Determine "**HOT BEGINS**" time. This is the time first drop of fluid hits aircraft during final fluid application

Determine Holdover Time (HOT) using table(s) on reverse side. For snow, use Snowfall Intensity chart to determine snowfall intensity to enter the HOT Table unless more than one obscuration is reported. If so, HOT table may be entered using reported snow intensity.

Add **HOT** to "**HOT BEGINS**" time. This is the "**HOT EXPIRES**" time.
Monitor deicing procedure

After Deicing
"Deicing Inspection Complete" Signal……ACKNOWLEDGE (critical surfaces are clean)
Tactile Inspection……COMPLETE (open door and check a portion of upper wing surface)
Tail Stand……..REMOVE AND STOW
Area……..……..…CONFIRM CLEAR AND START ENGINE
Normal Checklists……,,,,,……COMPLETE
Holdover Time…..…ADJUST AS NEEDED

Procedures for Takeoff
Flaps……..……..……. ZERO
Minimum Rotation speed..,,,,,,,,,,,. 83KIAS
Minimum Climb speed……..… 104KIAS

C-208 Critical Surfaces (must be clean):

- Wings- leading edges, upper & lower surfaces
- Horizontal and Vertical Stabilizers
- All Control Surfaces and Control Surface Gaps
- Spoilers
- Windshield (for clear visibility)
- Engine Inlets
- Antennas
- Pitot and Static Probes/Ports
- Fuel Tank Vents and Fuel Cap Vents
- Air Inlet Scoops
- Landing Gear

If HOT is still valid, perform the:
PRE-TAKEOFF CHECK:

1) Inspect Representative Surfaces visible from inside cockpit for frozen contamination. These are the:
   - Left Wing Leading Edge
   - Nose section in front of windscreen
   - Radome
2) Look for signs that fluid is losing effectiveness:
   - Loss of glossiness
   - Surfaces turning opaque
   - Patchy white spots/snowflakes visible
   - Snow or ice accumulations
   - Surfaces area(s) freezing
   - Surface markings or details indistinct/obscured
3) If any Representative Surface fails, you must assume that all Critical Surfaces have failed
4) Takeoff Allowed If: This Pre-Takeoff Check passes, and takeoff is begun before HOT expires.

If HOT has expired or if HOT could not be established, perform the:

PRE-TAKEOFF CONTAMINATION CHECK:

1. Parking Brake…….. SET
2. Engine……..….. SHUTDOWN
3. Tactile Inspection…… COMPLETE (open door and check wing leading edge and a portion of upper wing surface)
4. Time Successful Tactile Inspection Complete…….. NOTE
5. Area……. CONFIRM CLEAR AND RESTART ENGINE
6. Pre-Takeoff Check…..… COMPLETE JUST PRIOR TO TAKEOFF (as listed above to ensure fluid has not failed)

Takeoff **must** begin within 5 minutes of successful completion of this Pre-Takeoff Contamination Check **and** aircraft is **still free of frozen contamination**

C-208 Sensitive Surfaces (avoid direct spray):

- Engine Inlets and Exhaust
- Windshield and Windows
- Brakes
- Pitot Static Tubes
- Stall Warning Vane

Information extracted from the Corporate Air Ground Deicing Manual. For detailed information, refer to the Ground Deicing Manual. 10 01 2016

END OF PROCEDURE

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TABLE 8-1
LIST OF TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE
(see cautions and notes in Appendix E)

COMPANY NAME	FLUID NAME	TYPE OF GLYCOL [1]	EXPIRY[2] (Y-M-D)	LOWEST OPERATIONAL USE TEMPERATURE[3]				
				DILUTION[4,5] (FLUID/WATER)	LOW SPEED AERODYNAMIC TEST[6]		HIGH SPEED AERODYNAMIC TEST[6]	
					°C	°F	°C	°F
CRYOTECH DEICING TECHNOLOGY	POLAR PLUS	PG	20-01-13	63/37	-27	-16.6	-32	-25.6

TABLE 8-4
LIST OF TYPE IV FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE
(see cautions and notes in Appendix E)

COMPANY NAME	FLUID NAME	TYPE OF GLYCOL [1]	EXPIRY[2] (Y-M-D)	LOWEST OPERATIONAL USE TEMPERATURE[3]				
				DILUTION[4,5] (FLUID/WATER)	HIGH SPEED AERODYNAMIC TEST[6]		Not Applicable	
					°C	°F		
CRYOTECH DEICING TECHNOLOGY	POLAR GUARD ADVANCE	PG	17-03-11	100/0	-30.5	-22.9		
				75/25	-14	7		
				50/50	-3	27		

See the discussion in the main body in Appendix E of the Ground Deicing/Anti-icing Manual for an explanation of the NOTES regarding these two tables.

C-208 Ground Deicing/Anti-icing Checklist Two Step:

1) Before Deicing/Anti-icing get the following information:
   a) **For 1st Step – Deicing**:
      i) Type I Fluid. . . . . CONFIRM
      ii) Fluid Temp.....CHECK (see chart above)
      iii) LOUT.....CHECK OAT AT/ABOVE LOUT
   b) **For 2nd Step - Anti-icing (as applicable)**:
      i) Type IV Fluid.....CONFIRM
      ii) Fluid Mixture.....CONFIRM 100/00
      iii) LOUT.....CHECK OAT AT/ABOVE LOUT
      iv) Fluid Temp.....COLD ONLY (see chart above)
   c) If needed, review procedures with Deice Technician
      and confirm they are trained in CA procedures

2) **Aircraft Preparation**
   a) Parking Brake.....SET
   b) Engine…….…….SHUTDOWN
   c) Tail Stand.....,,,,,,....INSTALL (if required)
   d) Doors and Windows.....CLOSE

3) **During 1st Step – Deicing**
   a) Deicing Procedure.....MONITOR

4) **During 2nd Step - Anti-Icing**
   a) Anti-Icing Procedure.....MONITOR
   b) Application should begin **within 3 minutes of Step On**
   c) Determine "**HOT BEGINS**" time. This is the time first drop of fluid hits aircraft during final application of fluid
   d) Determine Holdover Time (HOT) using table(s) on reverse side or Table for specific Type IV product from the Corporate Air Ground Deicing Manual
   e) Add **HOT** to "**HOT BEGINS**" time. This is the "**HOT EXPIRES" time**

5) After Deicing/Anti-icing
   a) "Deice/Anti-ice Complete" Signal AKNOWLEDGE (critical surfaces are clean)
   b) Tactile Inspection.....COMPLETE (open door and check a portion of upper wing surface)
   c) Tail Stand ……..REMOVE AND STOW
   d) Area…….CONFIRM CLEAR AND START ENGINE
   e) Normal Checklists ……..……COMPLETE
   Holdover Time…….. ADJUST AS NEEDED

6) **Procedures for Takeoff**
   a) Flaps……..…..ZERO
   b) Minimum Rotation Speed……....83KIAS
   c) Minimum Climb .Speed….....……104KIAS

If HOT is still valid, perform the:

PRE-TAKEOFF CHECK – COMPLETE JUST BEFORE TAKEOFF

1) **Inspect Representative Surfaces visible from inside cockpit for frozen contamination. These are the**:
   a) Left Wing Leading Edge
   b) Nose section in front of windscreen
   c) Radome

2) **Look for signs that fluid is losing effectiveness:**
   a) Loss of glossiness
   b) Surfaces turning opaque
   c) Patchy white spots/snowflakes visible
   d) Snow or ice accumulations
   e) Surfaces area(s) freezing
   f) Surface markings or details indistinct/obscured

If ANY Representative Surface fails, you must assume that
all Critical Surfaces have failed.

3) **Takeoff Allowed if**:
   a) This Pre-Takeoff Check passes, and
   b) Takeoff is begun before HOT expires, and
   c) Aircraft is still free of frozen contamination

If HOT has expired or if HOT could not be established,perform the:

PRE-TAKEOFF CONTAMINATION CHECK:

1) Parking Brake.....SET
2) Engine……..…..…SHUTDOWN
3) Tactile Inspection…….COMPLETE (open door and check wing leading edge and a portion of upper wing surface)
4) Successful Tactile Inspection Complete…..NOTE TIME
5) Area.....CONFIRM CLEAR AND RESTART ENGINE

Pre-Takeoff Check.....COMPLETE JUST PRIOR TO TAKEOFF (as listed above to ensure fluid has not failed)

6) Takeoff Allowed If:
   a) This Pre-Takeoff Contamination Check Passes, and
   b) Takeoff is begun within 5 minutes of successful completion of this Pre-Takeoff Contamination Check, and
   c) Aircraft is still free of frozen contamination

END OF PROCEDURE

For lists of Critical Surfaces & Sensitive Surfaces: See opposite side

Information extracted from the Corporate Air Ground Deicing Manual. For detailed information, refer to the Ground Deicing Manual 10-01-2016

C-208 Critical Surfaces (must be clean):

- Spoilers
- Pitot and Static Probes/Ports
- Wings- leading edges, upper & lower surfaces
- Windshield (for clear visibility)
- Fuel Tank Vents and Fuel Cap Vent
- Horizontal and Vertical Stabilizers
- Engine Inlets
- Air Inlet Scoops
- All Control Surfaces and Control Surface Gaps
- Antennas
- Landing Gear

C-208 Sensitive Surfaces (avoid direct spray):

- Brakes
- Windshield and Windows
- Engine Inlets and Exhaust
- Stall Warning Vane
- Pitot Static Tubes

Information extracted from the Corporate Air Ground Deicing Manual. For detailed information, refer to the Ground Deicing Manual 10-01-2016

Summary of Some Key Point

Appendix D summarizes or sometimes directly quotes material for FAA NOTICE N8900.374. Much of the material is not pertinent considering the scope of our operation and therefore it is not reproduced in its entirety. If you care the read the entire document, and there is much good information in it, you can download or view the NOTICE from the FAA's website or another FAA website FSIMS.

The thickness of the aircraft structure and Type I fluid failure

Theoretically, when the temperature of the surface equals the freezing point of the fluid, the fluid is considered to have failed. Because structural mass varies throughout an aircraft with a corresponding variation in absorbed heat, the fluid will tend to fail first in:

- Structurally thin areas, and
- Areas with minimal substructure, such as trailing edges, leading edges, and wing tips.

Note: FAA Type I HOT guidelines are not approved for use with unheated Type I fluid mixtures.

Minimun temperature for Type I Fluid application is 60°C (140°F).

Application of Heated Type IV Fluid

During tests conducted by APS Aviation Inc. for the FAA and Transport Canada (TC) using the existing test protocol, HOT performance of heated 60° C (140° F) Type II and IV fluids was found to equal or exceed the HOT performance of unheated Type II and IV fluids for the same fluid concentrations, temperatures, and precipitation conditions. Therefore, these and other test results have indicated that there is no basis for reducing the current HOT guideline values for Type II and IV fluids or using the Type I fluid HOT guidelines when heated Type II and IV fluids are properly applied.

- **Note:** The use of HOT guidelines is associated with anti-icing procedures and does not apply to deicing. (This means if deiced with Type IV fluid, Type I holdover times apply. To use Type IV HOT for deice and anti-ice, a two-step procedure must be used)

Use of Generic Type IV Fluid

Generic and Minimum HOT Values. The FAA Type II (refer to FAA HOT Guidelines, Table 2-Generic, Type II Holdover Time Guidelines for SAE Type II Fluids) and Type IV (refer to Table 4-Generic, Type IV Holdover Time Guidelines for SAE Type IV Fluids) generic HOT guidelines comprise the generic HOT values which are derived from the minimum (worst case) HOT values for all fluids for a specific precipitation condition, precipitation rate, temperature range, and fluid mixture concentration. An analysis of all available Type II and Type IV fluids is done annually to determine these values. Air carriers may only use the fluid-specific HOT guidelines (refer to Tables 2A-2J and Tables 4A-4O) when these specific fluids are used during the anti-icing process. If a carrier cannot positively determine which specific Type II or IV fluid was used, it must use the generic HOTs from Table 2-Generic or Table 4-Generic, as appropriate.

Guidelines for Pilot Assessments of Precipitation Intensity Procedures.

Pilot Discretion. Pilots may act based on their own assessment of precipitation intensity only in those cases where the officially reported meteorological precipitation intensity is grossly different from that which is obviously occurring (e.g., precipitation is reported when there is no actual precipitation occurring). As always, if, in the pilot's judgment, the intensity is greater, or a different form of precipitation exists than that being reported, then the appropriate course of action and applicable HOTs/allowance times for the higher intensity or different form of precipitation must be applied (e.g., if precipitation is being reported as light ice pellets and the pilot assessment is that it is moderate ice pellets, then the pilot must apply the allowance time for moderate ice pellets).

Reporting New Observation. Before a pilot takes action on his or her own precipitation intensity assessment, he or she will request that a new observation be taken. A pilot must not take action based on his or her own precipitation intensity assessment unless either a new observation is not taken and reported, or the new precipitation intensity officially reported remains grossly different from that which is obviously occurring.

Use of Company Coordination Procedures. The company's approved deicing program, in accordance with § 121.629, must contain the required company coordination procedures for a pilot when he or she chooses to take actions that are based on his or her precipitation intensity assessment that is less than the precipitation intensity that is being officially reported (e.g., the official weather report is moderate freezing rain, and the pilot's assessment is that there is no liquid precipitation; or the reported weather is moderate snow and light ice pellets, and by the pilot's assessment there is light snow and no ice pellets). These procedures require coordination with the company before the pilot takes such action, or if the approved company program allows, a report of action taken after the pilot has opted to exercise this option.

Pretakeoff Contamination Check. When a pilot acts based on his or her own assessment that precipitation intensity levels are lower than the official reported intensity level, a check at least as comprehensive as the operator's pretakeoff contamination check (when HOTs have been exceeded) per the approved procedure for the applicable aircraft is required within 5 minutes of beginning the takeoff.

Permissible Use of Pilot Assessment of Precipitation Intensity.

Under the following conditions, a pilot may act based on his or her own assessment of precipitation intensity levels that are less than that being officially reported. Pilot assessment of precipitation intensity levels may only be used when sufficient natural sunlight or artificial lighting is available to provide adequate exterior visibility. The snowfall intensity table provided in the FAA HOT Guidelines, Table 7, Snowfall Intensities as a Function of Prevailing Visibility, is based on prevailing visibility, and allowances are made in the table for the effects of night (darkness) conditions.

Snow. The snowfall visibility table, Table 7, has previously been published with the annual FAA HOT tables for use in determining snow intensity rates based on prevailing visibility and must be used in place of official reported intensities. Thus, this table should be used for pilot assessment of snowfall intensity rates unless snow and an obscuration (fog, smoke, haze, or any other obscuration) are reported. For simplification purposes, portions of the table may be included in an air carrier's winter operations plan in non-table format. An example would be: "Since very light snow is in the Type IV tables, and since the METAR and the associated ATIS do not report very light snow, a METAR-reported visibility of 2.5 miles or higher can be used as an indication that the snowfall intensity is very light." An air carrier certainly would also have the option of providing a more detailed description utilizing lower METAR-reported visibilities for specific day/night and temperature conditions.

Note: The use of Runway Visual Range (RVR) **is not permitted** for determining visibility used with the holdover tables.

Note: Some METARS contain tower visibility as well as surface visibility. Whenever surface visibility is available from an official source, such as a METAR, in either the main body of the METAR or in the Remarks ("RMK") section, **the preferred action is to use the surface visibility value.**

Inspection of Single-Engine, High Wing Turboprop Aircraft.

In recent years, there has been a disproportionate number of ground icing accidents associated with improper checking/inspection of single-engine, high wing turboprop aircraft employed in commercial service. This is especially true of such aircraft operated from remote locations with minimum facilities. In several of these accidents, it could not be determined whether the aircraft had been inspected/checked by the operator/pilot prior to departure. HOTs were not an issue because, at the time of attempted departure, there was no active precipitation. Typically, these accidents occurred during the first flight of the day following a freezing precipitation event that had occurred earlier.

For these types of operations, the single pilot/operator was usually the final person to perform the pretakeoff check. On one aircraft in particular, it has been shown that it is difficult to see clear frozen contamination from a glancing view of the upper wing surface area (looking rearward from the wing's leading edge) when the pilot uses the wing strut/step to see the aft portion of the wing. Visual inspections can best be achieved by using inspection ladders or deicing ladders to achieve a higher vantage point to view the aft upper wing surface area. A number of ladder manufacturers provide wing inspection ladders that are ideal for this task. POIs are encouraged to discuss these observations with their operators and to ensure that operators employ adequate means to allow a pilot to clearly see the entire upper wing surface from a suitable height above the wing.

Summary of Changes for Winter 2016-2017 From FAA Documentation

Appendix E summarizes the changes from the previous year's FAA Holdover Time Guidelines. The information below is verbatim from the Winter 2017-2017 Season. The entire document is not printed in its entirety due to the scope of our operation. A majority of the document is tables with holdover time for a wide variety of deicing fluids of which Corporate Air will never use. However, if you care to read the entire document you can download it from the FAA's website.

Summary of Changes for Winter 2016-2017 From FAA Documentation

The principal changes from the previous year are briefly indicated herein.

ACTIVE FROST

- A note has been added to the active frost holdover time (HOT) table to provide guidance on the appropriate outside air temperature to select in changing conditions.

TYPE I FLUIDS

- The Type I HOT guidelines are unchanged.

TYPE II FLUIDS

- Fluid-specific HOT guidelines have been created for the new Type II fluid Beijing Yadilite Aviation YD-102 Type II.
- LNT Solutions P250 has been removed from the Type II guidelines.
- Significant changes (both increases and decreases) have been made to the Type II generic holdover times as a result of the new and removed Type II fluids.
- The holdover times for snow in the "below -14°C to LOUT" row have been reduced for all Type II and Type IV fluids. This is the result of a two-year research program showing the new holdover times are more appropriate.

TYPE III FLUIDS

- Supplemental testing with AllClear AeroClear MAX resulted in changes to most of its holdover times for winter 2016-2017.

TYPE IV FLUIDS

- Fluid-specific HOT guidelines have been created for three new Type IV fluids: Clariant Max Flight AVIA, Clariant Safewing EG IV NORTH and Shaanxi Cleanway Aviation Cleansurface IV.
- Cryotech Polar Guard and Dow Chemical UCAR™ FlightGuard AD-480 have been removed from the Type IV guidelines as per the protocol for removing obsolete fluids.
- Supplemental testing with Deicing Solutions ECO-SHIELD® resulted in changes to most of its holdover times for winter 2016-2017. Its lowest operational use temperature (LOUT) and lowest on-wing viscosity (LOWV) have also changed.

- Significant changes (both increases and decreases) have been made to the Type IV generic holdover times as a result of the new and removed Type IV fluids. In addition, the Type IV generic HOT table has been expanded to include holdover times for three snowfall intensities: very light, light and moderate. This was possible as, for the first time, all fluid-specific Type IV holdover time tables include light, very light and moderate snow holdover times.
- The holdover times for snow in the “below -14°C to LOUT” row have been reduced for all Type II and Type IV fluids. This is the result of a two-year research program showing the new holdover times are more appropriate.

ICE PELLET AND SMALL HAIL ALLOWANCE TIMES

- The rows in both the Type III and Type IV allowance time tables, each containing a specific precipitation condition, have been reordered for ease of use.
- A note has been added to both the Type III and Type IV allowance time tables indicating they are for use with aircraft with rotation speeds of 100 knots or greater only.
- A review of existing data resulted in a change to the Type III allowance time for “Light Ice Pellets Mixed with Moderate Snow” in the “Below -5 to -10°C” cell (from 10 to 5 minutes).
- Allowance times have been added for Type IV fluid in “Light Ice Pellets Mixed with Light Snow” and “Light Ice Pellets Mixed with Moderate Snow” in the “Below -10 to -16°C” temperature band.
- New rows / allowance times have been added to the Type IV table for two new precipitation conditions: “Moderate Ice Pellets (or Small Hail) Mixed with Moderate Freezing Drizzle” and “Moderate Ice Pellets (or Small Hail) Mixed with Moderate Rain”.
- The coldest temperature band in the Type IV table has been divided into two temperature bands: “Below -10 to -16°C” and “Below -16 to -22°C.”

FLUID APPLICATION TABLES

- Guidance for the application of Type III fluid was previously provided in the same table as the guidance for the application of Type II/IV fluid. For the winter of 2016-2017, this guidance is provided in two separate Type III fluid application tables. Table 11-H provides guidance for the application of heated Type III fluid and Table 11-U provides guidance for the application of unheated Type III fluid.
- Changes have been made to the Type I and Type II/IV fluid application tables to improve harmonization with the Transport Canada and SAE fluid application tables.

EARLY FLUID FAILURE ON EXTENDED SLATS AND FLAPS

- Research has determined that fluid degradation is accelerated by the steeper angles of the flaps/slats in the takeoff configuration. The degree of potential degradation is significantly affected by the specific aircraft design. For the winter of 2014-2015, holdover time and allowance time tables were published which include 90% adjusted holdover / allowance times. These adjusted tables will continue to be used for winter 2016-2017.
- The 90% adjusted tables provide holdover / allowance times that must be used when flaps and slats are deployed prior to de/anti-icing. Standard holdover / allowance times can be used if flaps and slats are deployed as close to departure as safety allows. Additional guidance is provided in the FAA N 8900 series notice "Revised FAA-Approved Deicing Program Updates, Winter 2016-2017."

IMPORTANT NOTE ON HOTS FOR NON-STANDARD DILUTIONS OF TYPE II, III, AND IV FLUIDS

- When a Type II, III, or IV fluid is diluted to other than the published 100/0, 75/25 or 50/50 dilutions, the more conservative holdover time and LOUT associated with either the dilution above or below the selected dilution are applicable. For example:
  a) The holdover time and LOUT of an 80/20 dilution would be the more conservative holdover time and LOUT of either the 100/0 or 75/25 dilutions;
  b) The holdover time and LOUT of a 60/40 dilution would be the more conservative holdover time and LOUT of either the 75/25 or 50/50 dilutions.

RELOCATION OF KEY GUIDANCE CONTENT

The guidance material previously contained in this document under the heading "Key Guidance" has been relocated to the related FAA N 8900 series notice "Revised FAA-Approved Deicing Program Updates, Winter 2016-2017." This has been done so that all pertinent guidance material is provided in a single document.