Transport Canada
Holdover Time (HOT) Guidelines
Winter 2010-2011

Original Issue, July 2010

This document should be used in conjunction with *Guidelines for Aircraft Ground-Icing Operations* (TP 14052E, second edition, April 2005).

The two documents complement each other and should be used together for a thorough understanding of the subject matter.

CHANGE CONTROL RECORDS

This page indicates any changes made to individual pages within the document. Changed pages have the appropriate revision date in the footer. Sidebars are shown to assist in identifying where the changes have been made on these pages.

It is the responsibility of the end user to periodically check the following website for updates on Holdover Time Guidelines:
http://www.tc.gc.ca/CivilAviation/commerce/HoldoverTime/menu.htm.

REVISION	*DATE*	*DESCRIPTION OF CHANGES*	*AFFECTED PAGES*	*AUTHOR*

SUMMARY OF CHANGES FROM PREVIOUS YEAR

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

Type I Fluid

- As a result of extensive research and testing showing that holdover times of Type I fluids are shorter on composite surfaces than on aluminum surfaces, holdover time values for composite surfaces have been added to the Type I table. The holdover times for aluminum surfaces are unchanged.
- The snow column has been modified to include snow pellets (see below).

Type II Fluid

- The lowest on-wing viscosity for the 75/25 dilution of Clariant Safewing MP II Flight has changed. This resulted in changes being made to the Clariant Safewing MP II Flight fluid-specific holdover times. Specifically, reductions have been made in five 75/25 cells. These changes did not impact the generic holdover times.
- The snow column has been modified to include snow pellets (see below).

Type III Fluid

- The Type III holdover time guideline values are unchanged.
- The snow column has been modified to include snow pellets (see below).

Type IV Fluid

- A fluid-specific table has been created for a new Type IV fluid: Cryotech Polar Guard. The addition of this fluid did not impact the generic holdover times.
- A fluid-specific table has also been created for another Type IV fluid: Dow Chemical UCAR™ FlightGuard AD-49. This fluid is identical to ABAX Ecowing AD-49. Its holdover time table and viscosity values are also identical to those of ABAX Ecowing AD-49.
- Octagon Max-Flight has been removed from the Type IV guidelines as per the protocol for removing obsolete data. Removal of this fluid did not impact the generic holdover times.
- The snow column has been modified to include snow pellets (see below).

Frost Table

- The “above -1°C” / “above 30°F” row has been corrected to “-1°C and above” / “30°F and above”.
- A holdover time for Type I fluids on composite surfaces has been added (see Type I fluid).

Snow Pellets

- Recent testing has shown that snow holdover times can be used in snow pellet conditions. As a result of this testing, the snow columns in all Type I, Type II, Type III and Type IV fluid holdover time tables have been modified to include snow pellets.

Lowest Operational Use Temperature (LOUT) Table

- At the request of users, Lowest Operational Use Temperature (LOUT) information for Type I, II, III and IV fluids has been added to the holdover time guidelines. This information has been provided to Transport Canada by the fluid manufacturers. The LOUT information can be found in Table 10. Contact the fluid manufacturer if further clarification with respect to the information in these tables is required.

Operations during Ice Pellet Conditions

- Research has shown that propylene glycol (PG) and ethylene glycol (EG) fluids behave differently under certain temperature and ice pellet precipitation conditions. Specifically, higher aircraft rotation speeds are required to effectively remove PG fluid contaminated with light or moderate ice pellets at temperatures less than -10°C. Therefore, there are no allowance times associated with the use of PG fluids on aircraft with rotation speeds of less than 115 knots in conditions of light or moderate ice pellets at temperatures below -10°C.
- Furthermore, recent research with newer generation type airfoils has shown that the allowance times are shorter when using PG fluids under certain conditions. Since it is challenging to determine exactly which aircraft may be affected, the allowance time when using PG fluids at temperatures of -5°C and above is limited to 15 minutes in moderate ice pellets.

General Format of Holdover Tables

- Several changes were made to the footnotes of the tables in an attempt to harmonize with the Association of European Airline tables and to structure the notes in an orderly fashion.

CHANGES TO *Guidelines for Aircraft Ground-Icing Operations* (TP 14052E, second ed., April 2005)

The following changes will be incorporated into TP 14052E at its next revision. They are recorded here in advance due to the longer life cycle time associated with the updating and publication of TP 14052E and are for immediate use.

Replace Sub-Paragraph 10.4 (6th paragraph), "Procedure Selection", with the following:

The temperature of cold soaked wings can be considerably below the ambient temperature; therefore frost can build up in localized areas. When active frost is anticipated, the holdover times will be shortened when the wings are cold soaked, particularly when using Type I fluids. Consider applying SAE Type II or IV fluid to the surfaces as these will provide greater holdover times than Type I, along with better safety margins to prevent frost accumulation. Both wings should receive a symmetrical treatment for aerodynamic reasons.

Replace Sub-Paragraph 10.4.2 (2nd paragraph), "Two Step Deicing/Anti-Icing", with the following:

If a two-step procedure is used, the first step is typically performed using a deicing fluid; however, alternate deicing technology or mechanical methods may be used depending on the circumstances. The selection of fluid type and concentration depends on the ambient temperature, the weather conditions and the desired holdover time. When performing a two-step process, the freezing point of a fluid used for the first step must not be more than 3°C above ambient temperature. The freezing point of an SAE Type I fluid used for a one-step process, or as the second step of a two-step operation, must be at least 10°C below the ambient temperature. The second step must be completed as quickly as possible following first step fluid application (not more than 3 minutes). The two-step process may need to be performed area-by-area. When deicing fluid is used in step 1, the application of the second step fluid will flush away the first step fluid and leave a film of anti-icing fluid which, is designed to be of adequate thickness. If freezing of the deicing fluid has occurred, step 1 must be repeated. Refer to the SAE ARP 4737 document for additional details.

Replace Sub-Paragraph 10.11, "Applying Anti-Icing Fluid in a Hangar", with the following:

There are operational conditions when air operators may choose to anti-ice their aircraft while the aircraft is in a heated hangar. This is one way to reduce the consumption of deicing fluid and to minimize the environmental impact of deicing.

The period of time after fluid application and the air temperature in the hangar both have an effect on the ability of the fluid to protect the aircraft when it is pulled out of the hangar and into freezing/frozen precipitation. The HOT for a fluid is based largely on the fluid's thickness on the surface. The fluid thickness varies with time and temperature. Unless otherwise approved in an air operator's program, the holdover time clock must be started at the time of the first application of anti-icing fluid onto a clean wing. It may not be started when the aircraft is first exposed to freezing/frozen precipitation.

Replace Sub-Paragraph 10.12.1 (5th paragraph), "Brooms", with the following:

Using the wing broom to remove contamination does not always mean that the wing surface is clean and safe for flight. Every time a broom is used to remove contamination, a tactile inspection must be performed.

Replace Sub-Paragraph 10.13.3, "Hot Water", with the following:

Hot water may be used to remove large amounts of contamination (such as ice) from an aircraft, provided that the Outside Air Temperature is -3°C and above as per the application procedures for SAE Type I, II, III and IV fluids described in tables 6 & 7 of the Transport Canada HOT Guidelines document.

Delete Sub-Paragraph 10.13.3.1 Item g) only.

Replace entire contents of 10.13.5 to 10.13.5.4 with the following:

10.13.5 Ground Ice Detection Systems (GIDS)

The development of ground ice detection sensors has been stimulated by the difficulty in determining whether an aircraft is free of frozen contaminants prior to takeoff. Humans have a limited ability to accurately evaluate the condition of an aircraft's critical surface during ground icing operations. Impediments to ensuring the aircraft is free of frozen contaminants include poor lighting conditions, visibility restrictions due to blowing snow, and the difficulty in determining whether clear ice is present.

For the purposes of this document, these sensors are referred to as Remote on Ground Ice Detection Systems (ROGIDS). A Minimum Operational Performance Specification (MOPS) for these systems is identified in the SAE document AS 5681.

Air operators or service providers seeking authorization to incorporate ROGIDS into their operations should consult Transport Canada Advisory Circular AC 602-001, "Operational Use of Remote on Ground Ice Detection Systems (ROGIDS) for Post De-Icing Applications". This document is available at the following website:

http://www.tc.gc.ca/media/documents/ca-opssvs/602-001.pdf

Add the following sentence immediately before the example of Sub-Paragraph 11.1.4.1.a "Estimating the Precipitation Rate":

This estimate applies to all Type I, II, III, and IV fluids.

Replace Sub-Paragraph 11.1.5, "Elapsed time is less than the lowest time in the HOT cell", with the following:

Transport Canada has previously considered that, under an approved ground icing program, if the lowest time in a cell has NOT been exceeded for conditions covered by the Guidelines, there is no requirement to inspect the aircraft's critical surfaces prior to commencing a takeoff.

This position was based on evidence gained during fluids testing. The HOT values are conservative for the lowest number in the cell, if:

a) The conditions present are NOT in excess of those conditions represented by the table (e.g. for snow, it would be a moderate snow condition); and

b) The impact of other factors (e.g. jet blast) has been considered and deemed not to affect the HOT.

If there is doubt surrounding the conditions associated with using the lowest time as a decision-making criterion, an inspection prior to takeoff would be prudent. This inspection should be conducted in accordance with the procedures described in the Air Operator's Approved Ground Icing Program.

Replace Paragraph 11.1.8 with the following:

The HOT Guidelines do not include guidelines for all meteorological conditions.

Holdover time guidelines have not been assessed for the following conditions: a) Hail; b) Moderate and Heavy Freezing Rain; and c) Heavy Snow.

Note: Operators need to assess whether operations can be safely conducted under these conditions.

Additionally, holdover time guidelines have not been assessed for ice pellets, since a formal protocol for ice pellet testing has not yet been developed and included in standard SAE testing methodologies and no visual failure criteria have yet been identified for ice pellet conditions. Instead, an allowance time based upon research has been developed for operations during ice pellet conditions.

Add Paragraph 11.1.12: Type I HOT Guidelines for Aircraft with Critical Surfaces Constructed Using Composite Materials

The recent introduction of new aircraft constructed primarily with composite materials required a review of Type I fluid holdover time performance when used on these aircraft. This review has shown that the holdover time performance of Type I fluids on composite surfaces is reduced when compared to aluminum surfaces. Type I fluid holdover time evaluations were conducted and holdover times have been developed for use with aircraft critical surfaces constructed primarily with composite materials.

It is not the intent that the composite holdover times be used on aircraft which are already in service (unless those aircraft have predominately or entirely composite critical surfaces) where previous experience has shown the acceptable use of aluminum holdover times. If there is any doubt, consult with the aircraft manufacturer to determine whether to use aluminum or composite holdover times.

Replace Paragraph 12.1.2 with the following:

Holdover time guidelines have not been assessed for ice pellets, since a formal protocol for ice pellet testing has not yet been developed and included in standard SAE testing methodologies and no visual failure criteria have been identified for ice pellet conditions.

However, comprehensive ice pellet research was conducted jointly by the research teams of the FAA and Transport Canada. This research consisted of extensive climatic chamber, wind tunnel, and live aircraft testing with ice pellets (light and moderate) and light ice pellets mixed with other forms of precipitation. Results of this research provide the basis for allowance times for operations in light and moderate ice pellets, as well as allowance times for operations in light ice pellets mixed with other forms of precipitation.

Replace Sub-Paragraph 12.3 (5th paragraph), "Configuration During Deicing Procedures", with the following:

Two possible options are: delaying slat/flap deployment until just prior to take-off; or deploying the devices prior to deicing/anti-icing so that the surfaces under these devices are treated. With the second option, the holdover time will be reduced due to the steeper angles of the slat/flap in the deployed configuration.

Delaying the slat/flap deployment may be the preferred option for optimum protection from ice buildup. If it is necessary to remove contamination from the slats/flaps, it may be best to deploy the slats/flaps for deicing and then retract them prior to the anti-icing process. Consult the Aircraft Operating Manual and/or aircraft manufacturer for more details.

HOLDOVER TIME (HOT) GUIDELINES FOR WINTER 2010-2011

TABLE 0

ACTIVE FROST HOLDOVER GUIDELINES FOR WINTER 2010-2011

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

Outside Air Temperature		Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times (hours:minutes)			
			Active Frost			
Degrees Celsius	Degrees Fahrenheit		Type I[1,2]	Type II[3]	Type III[3]	Type IV[3]
-1 and above	30 and above	100/0	0:45 *(0:35)*[4]	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

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 May be used below -25°C (-13°F) provided the lowest operational use temperature (LOUT) of the fluid is respected.
3 These fluids may not be used below -25°C (-13°F) in active frost conditions.
4 Value in parentheses is for composite surfaces.

CAUTIONS

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

TABLE 1

SAE TYPE I FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]

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

Outside Air Temperature[2]		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[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	Aluminum	11 – 17	18	11 – 18	6 – 11	9 – 13	4 – 6	2 – 5	
		Composite	9 – 16	12	6 – 12	3 – 6	8 – 13	4 – 6	1 – 5	
below -3 to -6	below 27 to 21	Aluminum	8 – 13	14	8 – 14	5 – 8	5 – 9	4 – 6	CAUTION: No holdover time guidelines exist	
		Composite	6 – 8	11	5 – 11	2 – 5	5 – 9	4 – 6		
below -6 to -10	below 21 to 14	Aluminum	6 – 10	11	6 – 11	4 – 6	4 – 7	2 – 5		
		Composite	4 – 8	9	5 – 9	2 – 5	4 – 7	2 – 5		
below -10	below 14	Aluminum	5 – 9	7	4 – 7	2 – 4				
		Composite	4 – 7	7	4 – 7	2 – 4				

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) is respected.
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, and hail.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 2-Generic

SAE TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]

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

Outside Air Temperature[2]		Type II 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[3]**	**Freezing Drizzle[4]**	**Light Freezing Rain**	**Rain on Cold Soaked Wing[5]**	**Other[6]**
-3 and above	27 and above	100/0	0:35 – 1:30	0:20 – 0:45	0:30 – 0:55	0:15 – 0:30	0:05 – 0:40	
		75/25	0:25 – 1:00	0:15 – 0:30	0:20 – 0:45	0:10 – 0:25	0:05 – 0:25	
		50/50	0:15 – 0:30	0:05 – 0:15	0:05 – 0:15	0:05 – 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:20 – 1:05	0:15 – 0:30	0:20 – 0:45[7]	0:10 – 0:20[7]		
		75/25	0:25 – 0:50	0:10 – 0:20	0:15 – 0:30[7]	0:05 – 0:15[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:15 – 0:35	0:15 – 0:30				

NOTES

1 Based on the lowest holdover times of the fluids listed in Table 5-2 and Table 5-4.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type II fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 2-A-E26

ABAX TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
ECOWING 26

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

Outside Air Temperature[2]		Type II 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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	1:25 – 2:35	0:40 – 1:00	0:50 – 1:35	0:40 – 0:50	0:20 – 1:25	
		75/25	1:05 – 1:55	0:25 – 0:45	0:45 – 1:05	0:25 – 0:35	0:10 – 1:00	
		50/50	0:30 – 0:45	0:10 – 0:20	0:15 – 0:25	0:05 – 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:45 – 2:15	0:35 – 0:55	0:30 – 1:10[7]	0:15 – 0:35[7]		
		75/25	0:35 – 1:15	0:25 – 0:40	0:20 – 0:50[7]	0:15 – 0:25[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:25 – 0:45	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type II fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 2-AS-CLEANWING II

AVIATION SHAANXI HI-TECH TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
CLEANWING II

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

Outside Air Temperature[2]		Type II 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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	0:55 – 1:50	0:30 – 0:55	0:35 – 1:05	0:25 – 0:35	0:10 – 0:55	
		75/25	0:50 – 1:20	0:25 – 0:45	0:35 – 1:00	0:20 – 0:30	0:05 – 0:50	
		50/50	0:35 – 1:00	0:15 – 0:30	0:20 – 0:40	0:10 – 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:45 – 1:50	0:30 – 0:55	0:30 – 0:55[7]	0:20 – 0:25[7]		
		75/25	0:40 – 1:45	0:25 – 0:45	0:35 – 0:40[7]	0:20 – 0:25[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:20 – 0:50	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type II fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 2-C-2025

CLARIANT TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
SAFEWING MP II 2025 ECO

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

Outside Air Temperature[2]		Type II 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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	1:30 – 2:05	0:40 – 1:10	0:40 – 1:00	0:25 – 0:35	0:10 – 1:15	
		75/25	0:55 – 1:45	0:25 – 0:45	0:25 – 0:45	0:20 – 0:25	0:05 – 0:50	
		50/50	0:20 – 0:35	0:05 – 0:15	0:10 – 0:15	0:05 – 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:45 – 1:50	0:35 – 1:00	0:35 – 1:05[7]	0:20 – 0:35[7]		
		75/25	0:40 – 1:20	0:25 – 0:45	0:30 – 0:40[7]	0:15 – 0:25[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:25 – 0:45	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type II fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 2-C-Flight

CLARIANT TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
SAFEWING MP II FLIGHT

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

Outside Air Temperature[2]		Type II 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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	3:30 – 4:00	1:00 – 1:35	1:20 – 2:00	0:45 – 1:25	0:10 – 1:30	
		75/25	1:50 – 2:45	0:40 – 1:20	1:10 – 1:30	0:30 – 0:55	0:05 – 0:50	
		50/50	0:55 – 1:45	0:10 – 0:25	0:20 – 0:30	0:10 – 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:55 – 1:45	0:40 – 1:05	0:35 – 1:30[7]	0:25 – 0:45[7]		
		75/25	0:25 – 1:05	0:20 – 0:40	0:25 – 1:10[7]	0:20 – 0:35[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:30 – 0:50	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type II fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 2-K-ABC-2000

KILFROST TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
ABC-2000

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

Outside Air Temperature[2]		Type II 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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	1:30 – 3:05	0:30 – 1:00	0:55 – 1:35	0:40 – 0:50	0:15 – 1:10	
		75/25	1:40 – 3:30	0:30 – 1:05	0:45 – 1:15	0:40 – 0:50	0:15 – 1:40	
		50/50	1:00 – 2:10	0:15 – 0:30	0:15 – 0:25	0:05 – 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:35 – 1:25	0:25 – 0:45	0:25 – 0:50[7]	0:10 – 0:30[7]		
		75/25	0:35 – 1:15	0:25 – 0:50	0:25 – 0:55[7]	0:15 – 0:30[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:20 – 0:45	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type II fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 2-K-ABC-K+

KILFROST TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
ABC-K PLUS

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

Outside Air Temperature[2]		Type II 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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:15 – 3:45	1:00 – 1:40	1:50 – 2:00	1:00 – 1:25	0:20 – 2:00	
		75/25	1:40 – 2:30	0:35 – 1:10	1:25 – 2:00	0:50 – 1:10	0:15 – 2:00	
		50/50	0:35 – 1:05	0:05 – 0:15	0:20 – 0:30	0:10 – 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:30 – 1:05	0:50 – 1:25	0:25 – 1:00[7]	0:15 – 0:35[7]		
		75/25	0:25 – 1:25	0:35 – 1:05	0:20 – 0:55[7]	0:05 – 0:30[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:30 – 0:55	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type II fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 2-N-FCY-2

NEWAVE AEROCHEMICAL TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
FCY-2

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

Outside Air Temperature[2]		Type II 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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	1:15 – 2:25	0:30 – 0:55	0:35 – 1:05	0:25 – 0:35	0:05 – 0:45	
		75/25	0:50 – 1:30	0:20 – 0:40	0:25 – 0:45	0:15 – 0:25	0:05 – 0:25	
		50/50	0:25 – 0:35	0:15 – 0:25	0:10 – 0:20	0:05 – 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:45 – 1:30	0:15 – 0:30	0:20 – 0:45[7]	0:15 – 0:20[7]		
		75/25	0:30 – 1:05	0:10 – 0:20	0:15 – 0:30[7]	0:05 – 0:15[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:25 – 0:35	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type II fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 2-O-EM-II

OCTAGON TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]

E MAX II

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

Outside Air Temperature[2]		Type II 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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:05 – 3:45	0:40 – 1:20	0:45 – 1:35	0:30 – 0:40	0:15 – 1:30	
		75/25	1:25 – 2:50	0:25 – 0:55	0:40 – 1:10	0:20 – 0:30	0:10 – 1:05	
		50/50	0:30 – 0:55	0:10 – 0:25	0:15 – 0:30	0:10 – 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:50 – 1:45	0:35 – 1:10	0:35 – 1:00[7]	0:20 – 0:30[7]		
		75/25	0:30 – 1:20	0:25 – 0:50	0:35 – 1:05[7]	0:15 – 0:30[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:20 – 0:35	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type II fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 3

SAE TYPE III FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011

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

Outside Air Temperature[1]		Type III Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow, Snow Grains or Snow Pellets			Freezing Drizzle[3]	Light Freezing Rain	Rain on Cold Soaked Wing[4]	Other[5]
				Very Light[2]	Light[2]	Moderate				
-3 and above	27 and above	100/0	20 – 40	35	20 – 35	10 – 20	10 – 20	8 – 10	6 – 20	
		75/25	15 – 30	25	15 – 25	8 – 15	8 – 15	6 – 10	2 – 10	
		50/50	10 – 20	15	8 – 15	4 – 8	5 – 9	4 – 6	CAUTION: No holdover time guidelines exist	
below -3 to -10	below 27 to 14	100/0	20 – 40	30	15 – 30	9 – 15	10 – 20	8 – 10		
		75/25[6]	15 – 30	25	10 – 25	7 – 10	9 – 12	6 – 9		
below -10	below 14	100/0	20 – 40	30	15 – 30	8 – 15				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type III fluid cannot be used.
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 guidelines exist for this condition for 0°C (32°F) and below.
5 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
6 For aircraft with rotation speeds less than 100 knots, these holdover times only apply to outside air temperatures of -9°C (15.8°F) and above.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **High wind velocity or jet blast may reduce holdover time.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-Generic

SAE TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	1:15 – 2:30	0:35 – 1:15	0:40 – 1:10	0:25 – 0:40	0:10 – 1:05	
		75/25	1:00 – 1:45	0:20 – 0:55	0:35 – 0:50	0:15 – 0:30	0:05 – 0:40	
		50/50	0:15 – 0:35	0:05 – 0:15	0:10 – 0:20	0:05 – 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:20 – 1:20	0:20 – 0:40	0:20 – 0:45[7]	0:10 – 0:25[7]		
		75/25	0:25 – 0:50	0:15 – 0:35	0:15 – 0:30[7]	0:10 – 0:20[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:15 – 0:40	0:15 – 0:30				

NOTES

1 Based on the lowest holdover times of the fluids listed in Table 5-4.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-A-AD-480

ABAX TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
AD-480

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:00 – 3:30	0:40 – 1:20	0:50 – 1:30	0:35 – 0:55	0:15 – 1:35	
		75/25	1:30 – 2:45	0:30 – 1:05	0:50 – 1:15	0:30 – 0:45	0:10 – 1:15	
		50/50	0:30 – 0:45	0:10 – 0:20	0:15 – 0:25	0:05 – 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:20 – 1:20	0:30 – 0:55	0:25 – 1:20[7]	0:15 – 0:30[7]		
		75/25	0:25 – 0:50	0:20 – 0:45	0:25 – 1:05[7]	0:15 – 0:30[7]		
below -14 to -25 or LOUT	below -7 to -13 or LOUT	100/0	0:15 – 0:40	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-A-Ecowing AD-49

ABAX TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
ECOWING AD-49

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	3:20 – 4:00	1:10 – 1:50	1:25 – 2:00	1:00 – 1:25	0:10 – 1:55	
		75/25	2:25 – 4:00	1:20 – 1:40	1:55 – 2:00	0:50 – 1:30	0:10 – 1:40	
		50/50	0:25 – 0:50	0:15 – 0:25	0:15 – 0:30	0:10 – 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:20 – 1:35	1:10 – 1:50	0:25 – 1:25[7]	0:20 – 0:25[7]		
		75/25	0:30 – 1:10	1:20 – 1:40	0:15 – 1:05[7]	0:15 – 0:25[7]		
below -14 to -25 or LOUT	below -7 to -13 or LOUT	100/0	0:25 – 0:40	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-C-2001

CLARIANT TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
SAFEWING MP IV 2001

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	1:20 – 3:20	1:00 – 1:55	0:55 – 1:55	0:40 – 1:00	0:15 – 2:00	
		75/25	1:20 – 2:00	0:35 – 1:00	0:35 – 1:10	0:25 – 0:35	0:10 – 1:25	
		50/50	0:15 – 0:40	0:10 – 0:20	0:10 – 0:20	0:05 – 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:45 – 1:35	0:30 – 0:50	0:55 – 1:35[7]	0:30 – 0:45[7]		
		75/25	0:30 – 1:00	0:20 – 0:35	0:40 – 1:10[7]	0:20 – 0:30[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:20 – 0:45	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-C-2012

CLARIANT TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
SAFEWING MP IV 2012 PROTECT

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	1:15 – 2:30	0:40 – 1:15	0:40 – 1:10	0:25 – 0:45	0:10 – 1:05	
		75/25	1:10 – 2:05	0:25 – 0:55	0:35 – 0:50	0:15 – 0:30	0:05 – 0:40	
		50/50	0:25 – 0:45	0:15 – 0:25	0:15 – 0:20	0:05 – 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:45 – 1:45	0:20 – 0:40	0:25 – 0:45[7]	0:15 – 0:25[7]		
		75/25	0:25 – 1:05	0:20 – 0:40	0:15 – 0:30[7]	0:10 – 0:20[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:20 – 0:45	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-C-Launch

CLARIANT TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
SAFEWING MP IV LAUNCH

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	4:00 – 4:00	1:05 – 1:45	1:30 – 2:00	1:00 – 1:40	0:15 – 1:40	
		75/25	3:40 – 4:00	1:00 – 1:45	1:40 – 2:00	0:45 – 1:15	0:10 – 1:45	
		50/50	1:25 – 2:45	0:25 – 0:45	0:30 – 0:50	0:20 – 0:25	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	1:00 – 1:55	0:50 – 1:20	0:35 – 1:40[7]	0:25 – 0:45[7]		
		75/25	0:40 – 1:20	0:45 – 1:25	0:25 – 1:10[7]	0:25 – 0:45[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:30 – 0:50	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-CR-Polar Guard

CRYOTECH TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
POLAR GUARD

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:15 – 3:30	0:50 – 1:30	1:15 – 2:00	0:50 – 1:15	0:15 – 1:25	
		75/25	1:40 – 2:40	0:35 – 1:10	1:05 – 1:25	0:35 – 1:00	0:10 – 1:15	
		50/50	0:25 – 0:40	0:10 – 0:15	0:15 – 0:25	0:10 – 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:45 – 1:45	0:30 – 0:55	0:25 – 1:10[7]	0:15 – 0:35[7]		
		75/25	0:35 – 1:30	0:20 – 0:40	0:25 – 1:05[7]	0:20 – 0:30[7]		
below -14 to -23.5	below 7 to -10.3	100/0	0:20 – 0:40	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-D-ULTRA+

DOW CHEMICAL TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
UCAR™ ADF/AAF ULTRA+

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	1:35 – 3:35	0:35 – 1:15	0:45 – 1:35	0:25 – 0:40	0:10 – 1:20	
		75/25					CAUTION: No holdover time guidelines exist	
		50/50						
below -3 to -14	below 27 to 7	100/0	1:25 – 3:00	0:25 – 0:55	0:45 – 1:25[7]	0:30 – 0:45[7]		
		75/25						
below -14 to -24	below 7 to -11	100/0	0:40 – 2:10	0:20 – 0:45				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **luids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-D-E106

DOW CHEMICAL TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
UCAR™ ENDURANCE EG106

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:05 – 3:10	0:40 – 1:20	1:10 – 2:00	0:50 – 1:15	0:20 – 2:00	
		75/25					CAUTION: No holdover time guidelines exist	
		50/50						
below -3 to -14	below 27 to 7	100/0	1:50 – 3:20	0:30 – 1:05	0:55 – 1:50[7]	0:45 – 1:10[7]		
		75/25						
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:30 – 1:05	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-D-AD-480

DOW CHEMICAL TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
UCAR™ FLIGHTGUARD AD-480

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:00 – 3:30	0:40 – 1:20	0:50 – 1:30	0:35 – 0:55	0:15 – 1:35	
		75/25	1:30 – 2:45	0:30 – 1:05	0:50 – 1:15	0:30 – 0:45	0:10 – 1:15	
		50/50	0:30 – 0:45	0:10 – 0:20	0:15 – 0:25	0:05 – 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:20 – 1:20	0:30 – 0:55	0:25 – 1:20[7]	0:15 – 0:30[7]		
		75/25	0:25 – 0:50	0:20 – 0:45	0:25 – 1:05[7]	0:15 – 0:30[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:15 – 0:40	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-D-AD-49

DOW CHEMICAL TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
UCAR™ FLIGHTGUARD AD-49

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	3:20 – 4:00	1:10 – 1:50	1:25 – 2:00	1:00 – 1:25	0:10 – 1:55	
		75/25	2:25 – 4:00	1:20 – 1:40	1:55 – 2:00	0:50 – 1:30	0:10 – 1:40	
		50/50	0:25 – 0:50	0:15 – 0:25	0:15 – 0:30	0:10 – 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:20 – 1:35	1:10 – 1:50	0:25 – 1:25[7]	0:20 – 0:25[7]		
		75/25	0:30 – 1:10	1:20 – 1:40	0:15 – 1:05[7]	0:15 – 0:25[7]		
below -14 to -25 or LOUT	below -7 to -13 or LOUT	100/0	0:25 – 0:40	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-K-ABC-4^{sustain}

KILFROST TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
ABC-4^{sustain}

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	1:45 – 3:55	1:00 – 1:45	1:35 – 2:00	1:05 – 1:30	0:20 – 2:00	
		75/25	1:00 – 1:50	0:30 – 0:55	0:40 – 1:05	0:25 – 0:40	0:10 – 1:20	
		50/50	0:20 – 0:35	0:05 – 0:15	0:10 – 0:20	0:05 – 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:55 – 2:55	1:00 – 1:45	0:35 – 1:50[7]	1:05 – 1:25[7]		
		75/25	0:35 – 2:10	0:30 – 0:55	0:25 – 1:20[7]	0:15 – 0:40[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:40 – 1:00	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-K-ABC-S

KILFROST TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
ABC-S

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:35 – 4:00	1:00 – 1:40	1:20 – 1:50	1:00 – 1:25	0:20 – 1:15	
		75/25	1:05 – 1:45	0:30 – 0:55	0:45 – 1:10	0:35 – 0:50	0:10 – 0:50	
		50/50	0:20 – 0:35	0:05 – 0:15	0:15 – 0:20	0:05 – 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:45 – 2:05	0:45 – 1:20	0:20 – 1:00[7]	0:10 – 0:30[7]		
		75/25	0:25 – 1:00	0:25 – 0:50	0:20 – 1:10[7]	0:10 – 0:35[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:20 – 0:40	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-K-ABC-S PLUS

KILFROST TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
ABC-S PLUS

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:10 – 4:00	1:15 – 2:00	1:50 – 2:00	1:05 – 2:00	0:25 – 2:00	
		75/25	1:25 – 2:40	0:45 – 1:15	1:00 – 1:20	0:30 – 0:50	0:10 – 1:20	
		50/50	0:30 – 0:55	0:15 – 0:30	0:15 – 0:40	0:15 – 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:55 – 3:30	1:00 – 1:45	0:25 – 1:35[7]	0:20 – 0:30[7]		
		75/25	0:45 – 1:50	0:35 – 1:00	0:20 – 1:10[7]	0:15 – 0:25[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:40 – 1:00	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-L-ARCTIC Shield

LYONDELL TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
ARCTIC SHIELD™

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	1:55 – 3:10	0:50 – 1:25	0:55 – 1:40	0:45 – 1:05	0:15 – 1:25	
		75/25	1:20 – 2:15	0:40 – 1:05	0:55 – 1:25	0:30 – 0:45	0:05 – 1:20	
		50/50	0:35 – 0:45	0:20 – 0:35	0:20 – 0:30	0:10 – 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	1:00 – 2:25	0:45 – 1:15	0:25 – 1:30[7]	0:25 – 0:30[7]		
		75/25	0:50 – 1:45	0:35 – 0:55	0:30 – 1:15[7]	0:25 – 0:30[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:25 – 0:45	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-O-MF-04

OCTAGON TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
MAX-FLIGHT 04

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:40 – 4:00	1:25 – 2:00	2:00 – 2:00	1:10 – 1:30	0:20 – 2:00	
		75/25	2:05 – 3:15	1:05 – 2:00	1:50 – 2:00	1:00 – 1:20	0:20 – 2:00	
		50/50	0:55 – 1:45	0:25 – 1:15	0:35 – 1:10	0:25 – 0:35	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:50 – 2:30	0:35 – 1:10	0:25 – 1:30[7]	0:20 – 0:40[7]		
		75/25	0:30 – 1:05	0:40 – 1:20	0:20 – 1:00[7]	0:15 – 0:30[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:20 – 0:45	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 4-O-MFLO

OCTAGON TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2010-2011[1]
MAXFLO

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

Outside Air Temperature[2]		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[3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:20 – 3:35	0:40 – 1:30	1:20 – 2:00	0:30 – 1:00	0:10 – 2:00	
		75/25	1:25 – 2:00	0:20 – 0:55	0:40 – 1:05	0:20 – 0:35	0:05 – 1:15	
		50/50	0:20 – 0:40	0:05 – 0:15	0:10 – 0:20	0:05 – 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	1:10 – 2:20	0:25 – 1:00	0:35 – 1:45[7]	0:30 – 0:50[7]		
		75/25	0:40 – 1:25	0:15 – 0:40	0:35 – 1:15[7]	0:15 – 0:30[7]		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:30 – 1:00	0:15 – 0:30				

NOTES

1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
3 Use light freezing rain holdover times in conditions of 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 guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, and hail.
7 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **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.**
- **Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.**

TABLE 5
CURRENTLY QUALIFIED FLUIDS (2010-2011)

Table 5-1: Qualified Type I Anti-icing Fluids[1] [2]			
#	COMPANY NAME	FLUID NAME	EXPIRY (Y-M-D)
1-1	ABAX Industries	DE-950	12-06-25
1-2	ABAX Industries	DE-950 Colorless	12-06-26
1-3	Arcton Ltd.	Arctica DG ready-to-use	13-04-08
1-4	Aviation Shaanxi High-Tech Physical Co. Ltd.	Cleanwing I	12-01-06
1-5	Aviation Xi'an High-Tech Physical Co. Ltd.	KHF-1	11-09-20
1-6	*Battelle Memorial Institute*	*D^3: Degradable by Design™ ADF1006A*	*08-01-13*[3]
1-7	Beijing Phoenix Air Traffic Product Development and Trading Co.	CBSX-1	12-04-21
1-8	Beijing Wangye Aviation Chemical Product Co.	KLA-1	11-09-20
1-9	Beijing Wangye Aviation Chemical Product Co.	*YJF-1*	*09-02-23*[3]
1-10	*Clariant Produkte (Deutschland) GmbH*	*Safewing MP I 1938 TF*	*08-08-21*[3]
1-11	*Clariant Produkte (Deutschland) GmbH*	*Safewing MP I 1938 TF PreMix 60% i.g. ready-to-use (multiple location)*	*07-09-14*[3]
1-12	Clariant Produkte (Deutschland) GmbH	Safewing MP I 1938 ECO (80)	12-07-24
1-13	Clariant Produkte (Deutschland) GmbH	Safewing MP I 1938 ECO (80) PreMix 55% i.g. ready-to-use	13-05-20
1-14	Clariant Produkte (Deutschland) GmbH	Safewing MP I 1938 ECO	12-06-10
1-15	Clariant Produkte (Deutschland) GmbH	Safewing EG I 1996	12-06-10
1-16	Clariant Produkte (Deutschland) GmbH	Safewing EG I 1996 (88)	11-08-26
1-17	Clariant Produkte (Deutschland) GmbH	Safewing MP I ECO PLUS (80)	11-03-20
1-18	*Chemical Specialists Development Inc.*	*Prist Wing De-Icer*	*08-05-17*[3]
1-19	Cryotech Deicing Technology	Polar Plus	12-02-09
1-20	Dow Chemical Company	UCAR™ Aircraft Deicing Fluid Concentrate	11-09-10
1-21	Dow Chemical Company	UCAR™ ADF XL54	13-01-21
1-22	Dow Chemical Company	UCAR™ PG Aircraft Deicing Fluid Concentrate	12-02-05
1-23	Dow Chemical Company	UCAR™ PG ADF Dilute 55/45	12-02-05
1-24	Harbin Aeroclean Aviation Tech Co. Ltd.	HJF-1	13-10-05
1-25	*HOC Industries*	*SafeTemp I ES*	*07-10-27*[3]
1-26	HOC Industries	SafeTemp ES Plus	11-10-04
1-27	Kilfrost Limited	DF Plus	11-09-27
1-28	Kilfrost Limited	DF Plus (80)	12-07-21
1-29	Kilfrost Limited	DF Plus (88)	11-09-27
1-30	Kilfrost Limited	DF^{sustain}™	13-02-10
1-31	*Lyondell Chemical Company*	*ARCOPlus*	*08-02-14*[3]
1-32	Newave Aerochemical Co. Ltd.	FCY-1A	11-08-21
1-33	Octagon Process Inc.	EcoFlo Concentrate	13-07-06
1-34	Octagon Process Inc.	Octaflo EF Concentrate	14-03-25
1-35	Octagon Process Inc.	Octaflo EF-80	13-12-21
1-36	Octagon Process Inc.	Octaflo EG Concentrate	13-06-10
1-37	*Viterbo S.A.*	*Jarkleer SAE Type I*	*07-01-20*[3]

[1] Qualified solely with respect to anti-icing performance and aerodynamic acceptance by the Anti-icing Materials International Laboratory, Université du Québec à Chicoutimi. Web site: http://www.uqac.ca/amil/index.htm. The expiry date was determined based upon the earliest qualification date of the High Speed Aerodynamic Test or Water Spray Endurance Test.
For other specification requirements for Type I fluids, see SAE AMS 1424 (latest version). Fluids that successfully qualify after the issuance of this list will appear in a later update.

[2] Concentrate fluids have also been qualified at 50/50 (glycol/water) dilution.

[3] Fluids listed in italics have expired and will be removed from this listing four years after expiry.

[4] Currently in qualification/re-qualification process.

TABLE 5 (cont.)

CURRENTLY QUALIFIED FLUIDS (2010-2011)

Table 5-2: Qualified[1] Type II Anti-icing Fluids			
#	COMPANY NAME	FLUID NAME	EXPIRY (Y-M-D)
2-1	ABAX Industries	Ecowing 26	11-08-19
2-2	Aviation Shaanxi Hi-Tech Physical Chemical Co. Ltd.	Cleanwing II	11-02-19
2-3	Clariant Produkte (Deutschland) GmbH	Safewing MP II 1951	11-05-20
2-4	*Clariant Produkte (Deutschland) GmbH*	*Safewing MP II 2025 ECO*	*08-06-28*[2]
2-5	Clariant Produkte (Deutschland) GmbH	Safewing MP II FLIGHT	12-06-03
2-6	Kilfrost Limited	ABC-3	10-07-16[3]
2-7	*Kilfrost Limited*	*ABC-2000*	*10-07-21*[2]
2-8	*Kilfrost Limited*	*ABC-K PLUS*	*10-07-10*[2][3]
2-9	Newave Aerochemical Co. Ltd.	FCY-2	11-05-27
2-10	*Octagon Process Inc.*	*E Max II*	*08-10-31*[2]

Table 5-3: Qualified[1] Type III Anti-icing Fluids			
#	COMPANY NAME	FLUID NAME	EXPIRY (Y-M-D)
3-1	Clariant Produkte (Deutschland) GmbH	Safewing MP III 2031 ECO	11-06-16 11-06-08[4]
	CAUTION: The lowest operational use temperature (LOUT) is -16.5°C (2°F) for aircraft with rotation speeds less than 100 knots or -29°C (-20°F) for aircraft with higher rotation speeds.		

Table 5-4: Qualified[1] Type IV Anti-icing Fluids			
#	COMPANY NAME	FLUID NAME	EXPIRY (Y-M-D)
4-1	ABAX Industries	AD-480	11-07-17
4-2	ABAX Industries	Ecowing AD-49	10-12-12
4-3	*Clariant Produkte (Deutschland) GmbH*	*Safewing MP IV 2001*	*08-06-26*[2]
4-4	*Clariant Produkte (Deutschland) GmbH*	*Safewing MP IV 2012 Protect*	*07-07-12*[2]
4-5	Clariant Produkte (Deutschland) GmbH	Safewing MP IV LAUNCH	12-05-28
4-6	Cryotech Deicing Technology	Polar Guard	Y-M-D[3]
4-7	*Dow Chemical Company*	*UCAR™ ADF/AAF ULTRA+*	*08-08-21*[2]
4-8	Dow Chemical Company	UCAR™ Endurance EG106 De/Anti-Icing Fluid	11-07-30
4-9	Dow Chemical Company	UCAR™ FlightGuard AD-480	12-06-15
4-10	Dow Chemical Company	UCAR™ FlightGuard AD-49	10-12-12
4-11	Kilfrost Limited	ABC-4^{sustain}	11-07-28
4-12	Kilfrost Limited	ABC-S	11-07-06
4-13	Kilfrost Limited	ABC-S PLUS	11-06-01
4-14	*Lyondell Chemical Company*	*ARCTIC Shield™*	*10-05-21*[2]
4-15	Octagon Process Inc.	Max-Flight 04	12-07-13
4-16	*Octagon Process Inc.*	*MaxFlo*	*07-03-24*[2][3]

[1] Qualified solely with respect to anti-icing performance and aerodynamic acceptance by the Anti-icing Materials International Laboratory, Université du Québec à Chicoutimi. Web site: http://www.uqac.ca/amil/index.htm. The expiry date was determined based upon the earliest qualification date of the High Speed Aerodynamic Test or Water Spray Endurance Test, unless otherwise noted.
For other specification requirements for Type II, III or IV fluids, see SAE AMS 1428 (latest version). Fluids that successfully qualify after the issuance of this list will appear in a later update.

[2] Fluids listed in italics have expired and will be removed from this listing four years after expiry.

[3] Currently in qualification/re-qualification process.

[4] Expiry date based upon the Low Speed Aerodynamic Test.

TABLE 6

SAE TYPE I DEICING FLUID APPLICATION PROCEDURES

Guidelines for the application of SAE Type I fluid mixtures at minimum concentrations for the prevailing outside air temperature (OAT)

Outside Air Temperature (OAT)[1]	One-Step Procedure Deicing/Anti-icing	Two-Step Procedure	
		First Step: Deicing	Second Step: Anti-icing[2]
-3°C (27°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 mix of fluid and water	Heated mix of fluid and water with a freezing point of at least 10°C (18°F) below OAT
Below -3°C (27°F)		Freezing point of heated fluid mixture shall not be more than 3°C (5°F) above OAT	

1 Fluids must not be used at temperatures below their lowest operational use temperature (LOUT).
2 To be applied before first step fluid freezes, typically within 3 minutes.

NOTES

- 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 time guidelines, at least 1 litre/m² (~ 2 gal./100 sq. ft.) must be applied to the deiced surfaces.
- This table is applicable for the use of Type I Holdover Time Guidelines. If holdover times are not required, a temperature of 60°C (140°F) at the nozzle is desirable.
- The lowest operational use temperature (LOUT) for a given fluid is the higher of:
  a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
  b) The actual freezing point of the fluid plus its freezing point buffer of 10°C (18°F).

CAUTION

- **Wing skin temperatures may differ and in some cases may be lower than outside air temperatures; a stronger mix (more glycol) may be needed under these conditions.**

TABLE 7

SAE TYPE II, TYPE III and TYPE IV ANTI-ICING FLUID APPLICATION PROCEDURES

Guidelines for the application of SAE Type II, III and IV fluid mixtures
(minimum concentrations in % by volume) as a function of outside air temperature (OAT)

Outside Air Temperature (OAT)[1]	One-Step Procedure Deicing/Anti-icing	Two-Step Procedure	
		First Step: Deicing	Second Step: Anti-icing[2]
-3°C (27°F) and above	50/50 Heated[3] Type II/III/IV	Heated water or a heated mix of Type I, II, III or IV with water	50/50 Type II/III/IV
-14°C (7°F) and above	75/25 Heated[3] Type II/III/IV	Heated suitable mix of Type I, Type II/III/IV and water with FP not more than 3°C (5°F) above actual OAT	75/25 Type II/III/IV
-25°C (-13°F) and above	100/0 Heated[3] Type II/III/IV	Heated suitable mix of Type I, Type II/III/IV and water with FP not more than 3°C (5°F) above actual OAT	100/0 Type II/III/IV
Below -25°C (-13°F)	Type II/III/IV fluid may be used below -25°C (-13°F) provided that the OAT is at or above the LOUT. Consider the use of Type I when Type II/III/IV fluid cannot be used (see Table 6).		

1 Fluids must not be used at temperatures below their lowest operational use temperature (LOUT).
2 To be applied before first step fluid freezes, typically within 3 minutes.
3 Clean aircraft may be anti-iced with unheated fluid.

NOTES

- For heated fluids, a fluid temperature not less than 60°C (140°F) at the nozzle is desirable. When the first step is performed using a fluid/water mix with a freezing point above OAT, the temperature at the nozzle shall be at least 60°C and at least 1 litre/m^2 (2 gal./100 sq. ft.) shall be applied to the surfaces to be de-iced.
- Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.
- The lowest operational use temperature (LOUT) for a given fluid is the higher of:
  a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
  b) The actual freezing point of the fluid plus its freezing point buffer of 7°C (13°F).

CAUTIONS

- **Wing skin temperatures may differ and in some cases may be lower than outside air temperatures; a stronger mix (more glycol) may be needed under these conditions.**
- **Whenever frost or ice occurs on the lower surface of the wing in the area of the fuel tank, indicating a cold soaked wing, the 50/50 dilutions of Type II, III or IV shall not be used for the anti-icing step because fluid freezing may occur.**
- **An insufficient amount of anti-icing fluid may cause a substantial loss of holdover time. This is particularly true when using a Type I fluid mixture for the first step in a two-step procedure.**

TABLE 8

VISIBILITY IN SNOW VS. SNOWFALL INTENSITY CHART[1]

Lighting	Temperature Range		Visibility in Snow (Statute Miles)			
	°C	°F	Heavy	Moderate	Light	Very Light
Darkness	-1 and above	30 and above	≤1	>1 to 2½	>2½ to 4	>4
	Below -1	Below 30	≤3/4	>3/4 to 1½	>1½ to 3	>3
Daylight	-1 and above	30 and above	≤½	>½ to 1½	>1½ to 3	>3
	Below -1	Below 30	≤3/8	>3/8 to 7/8	>7/8 to 2	>2

1 Based on: *Relationship between Visibility and Snowfall Intensity* (TP 14151E), Transportation Development Centre, Transport Canada, November 2003; and *Theoretical Considerations in the Estimation of Snowfall Rate Using Visibility* (TP 12893E), Transportation Development Centre, Transport Canada, November 1998.

HOW TO READ AND USE THE TABLE

This visibility table applies to all Types I, II, III, and IV fluids.

Assume that the daytime visibility in snowfall is 1 statute mile and the temperature is -7°C. Based on these conditions, the snowfall intensity is light. This snowfall intensity is used to determine which holdover time guideline value is appropriate for the fluid in use.

TABLE 9

LOWEST ON-WING VISCOSITY VALUES FOR ANTI-ICING FLUIDS
(See Table 9 endnotes)

Table 9-1: Type II Anti-Icing Fluids			
FLUID NAME	**FLUID DILUTION**	**LOWEST ON-WING VISCOSITY [a] (mPa.s)**	
		MANUFACTURER METHOD	**AIR 9968 REVISION A METHOD**
ABAX Ecowing 26	100/0	4 900 [e]	4 600 [g]
	75/25	2 200 [g]	2 200 [g]
	50/50	50 [g]	50 [g]
Aviation Shaanxi Hi-Tech Cleanwing II	100/0	4 650 [c]	4 500 [g]
	75/25	9 450 [c]	10 000 [g]
	50/50	10 150 [c]	10 200 [g]
Clariant Safewing MP II 2025 ECO	100/0	5 500 [b]	5 750 [g]
	75/25	10 000 [b]	10 000 [g]
	50/50	3 000 [b]	3 250 [g]
Clariant Safewing MP II Flight	100/0	3 340 [g]	3 340 [g]
	75/25	12 900 [l]	12 900 [l]
	50/50	11 500 [g]	11 500 [g]
Clariant Safewing MP II 1951	100/0	2 500 [b]	2 750 [g]
	75/25	2 900 [b]	3 000 [g]
	50/50	50 [b]	50 [g]
Kilfrost ABC-3	100/0	2 500 [c]	2 500 [j]
	75/25	2 000 [c]	2 000 [j]
	50/50	400 [c]	400 [j]
Kilfrost ABC-2000	100/0	2 350 [c]	2 350 [g]
	75/25	3 000 [c]	3 000 [j]
	50/50	1 000 [c]	1 000 [j]
Kilfrost ABC-K Plus	100/0	2 850 [c]	2 640 [g]
	75/25	12 650 [c]	12 650 [c]
	50/50	4 200 [c]	5 260 [g]
Newave Aerochemical FCY-2	100/0	7 000 [c]	8 920 [g]
	75/25	18 550 [c]	18 550 [c]
	50/50	6 750 [c]	7 030 [g]
Octagon E Max II	100/0	13 520 [d]	13 520 [g]
	75/25	11 400 [g]	11 400 [g]
	50/50	2 820 [g]	2 820 [g]

Table 9-2: Type III Anti-Icing Fluids			
FLUID NAME	**FLUID DILUTION**	**LOWEST ON-WING VISCOSITY [a] (mPa.s)**	
		MANUFACTURER METHOD	**AIR 9968 REVISION A METHOD**
Clariant Safewing MP III 2031 ECO	100/0	30 [h]	Not Applicable
	75/25	55 [h]	Not Applicable
	50/50	10 [h]	Not Applicable

TABLE 9 (cont.)

LOWEST ON-WING VISCOSITY VALUES FOR ANTI-ICING FLUIDS

(See Table 9 endnotes)

Table 9-3: Type IV Anti-Icing Fluids			
FLUID NAME	**FLUID DILUTION**	**LOWEST ON-WING VISCOSITY [a] (mPa.s)**	
		MANUFACTURER METHOD	**AIR 9968 REVISION A METHOD**
ABAX AD-480	100/0	15 200 [e]	12 800 [c]
	75/25	16 000 [e]	12 400 [c]
	50/50	4 000 [e]	3 800 [g]
ABAX Ecowing AD-49	100/0	12 150 [k]	11 000 [g]
	75/25	30 700 [k]	32 350 [l]
	50/50	19 450 [k]	21 150 [l]
Clariant Safewing MP IV 2001	100/0	18 000 [b]	18 000 [c]
	75/25	8 000 [b]	11 500 [g]
	50/50	1 200 [b]	1 750 [g]
Clariant Safewing MP IV 2012 Protect	100/0	7 800 [b]	7 250 [g]
	75/25	17 800 [b]	17 700 [c]
	50/50	4 500 [b]	4 250 [g]
Clariant Safewing MP IV Launch	100/0	7 550 [g]	7 550 [g]
	75/25	18 000 [g]	18 000 [g]
	50/50	17 800 [g]	17 800 [g]
Cryotech Polar Guard	100/0	32 100 [m]	36 300 [l]
	75/25	24 200 [m]	27 800 [l]
	50/50	6 200 [m]	7 500 [g]
Dow UCAR™ ADF/AAF ULTRA+	100/0	36 000 [f]	28 000 [c]
	75/25	Dilution Not Applicable	Dilution Not Applicable
	50/50	Dilution Not Applicable	Dilution Not Applicable
Dow UCAR™ Endurance EG106	100/0	24 850 [f]	2 230 [g]
	75/25	Dilution Not Applicable	Dilution Not Applicable
	50/50	Dilution Not Applicable	Dilution Not Applicable
Dow UCAR™ FlightGuard AD-480	100/0	15 200 [e]	12 800 [c]
	75/25	16 000 [e]	12 400 [c]
	50/50	4 000 [e]	3 800 [g]
Dow UCAR™ FlightGuard AD-49	100/0	12 150 [k]	11 000 [g]
	75/25	30 700 [k]	32 350 [l]
	50/50	19 450 [k]	21 150 [l]
Kilfrost ABC-4^{sustain}	100/0	18 400 [c]	18 400 [c]
	75/25	15 400 [c]	15 400 [c]
	50/50	4 700 [c]	5 050 [g]
Kilfrost ABC-S	100/0	17 000 [c]	17 000 [c]
	75/25	12 000 [c]	12 000 [c]
	50/50	2 000 [c]	2 000 [j]
Kilfrost ABC-S PLUS	100/0	17 900 [c]	17 900 [c]
	75/25	18 300 [c]	18 300 [c]
	50/50	7 500 [c]	7 500 [j]

See next page for additional Type IV fluids

TABLE 9 (cont.)

LOWEST ON-WING VISCOSITY VALUES FOR ANTI-ICING FLUIDS

(See Table 9 endnotes)

Table 9-3: Type IV Anti-Icing Fluids (cont.)			
FLUID NAME	**FLUID DILUTION**	**LOWEST ON-WING VISCOSITY [a] (mPa.s)**	
		MANUFACTURER METHOD	**AIR 9968 REVISION A METHOD**
Lyondell ARCTIC Shield™	100/0	23 150 [i]	28 000 [c]
	75/25	21 700 [i]	22 100 [c]
	50/50	6 400 [i]	7 640 [g]
Octagon Max-Flight 04	100/0	5 540 [d]	5 540 [g]
	75/25	15 000 [g]	15 000 [g]
	50/50	5 200 [g]	5 200 [g]
Octagon MaxFlo	100/0	8 670 [g]	8 670 [g]
	75/25	8 200 [g]	8 200 [g]
	50/50	2 200 [g]	2 200 [g]

NOTES

a The Aerospace Information Report (AIR) 9968 Revision A (December 2004) viscosity method should only be used for field verification and auditing purposes; when in doubt as to which method is appropriate, use the manufacturer method.
b Brookfield Spindle SC4-34/13R, small sample adapter, 10 mL of fluid, at 20ºC, 0.3 rpm, for 15 minutes 0 seconds.
c Brookfield Spindle LV2-disc with guard leg, 150 mL of fluid, at 20ºC, 0.3 rpm, for 10 minutes 0 seconds.
d Brookfield Spindle LV1 with guard leg, 500 mL of fluid, at 20ºC, 0.3 rpm, for 33 minutes 20 seconds.
e Brookfield Spindle SC4-34/13R, small sample adapter, 10 mL of fluid, at 20ºC, 0.3 rpm, for 30 minutes 0 seconds.
f Brookfield Spindle SC4-31/13R, small sample adapter, 10 mL of fluid, at 0ºC, 0.3 rpm, for 10 minutes 0 seconds.
g Brookfield Spindle LV1 with guard leg, 500 mL of fluid, at 20ºC, 0.3 rpm, for 10 minutes 0 seconds.
h Brookfield Spindle LV0, UL-Adapter, 16 mL of fluid, at 20ºC, 0.3 rpm, for 10 minutes 0 seconds.
i Brookfield Spindle SC4-31/13R, small sample adapter, 9 mL of fluid, at 20ºC, 0.3 rpm, for 33 minutes 0 seconds.
j Brookfield Spindle LV1 with guard leg, 150 mL of fluid, at 20ºC, 0.3 rpm, for 10 minutes 0 seconds.
k Brookfield Spindle SC4-31/13R, small sample adapter, 10 mL of fluid, at 20ºC, 0.3 rpm, for 10 minutes 0 seconds.
l Brookfield Spindle LV-2 disc with guard leg, 500 mL of fluid, at 20ºC, 0.3 rpm, for 10 minutes 0 seconds.
m Brookfield Spindle SC4-31/13R, small sample adapter, 9 mL of fluid, at 20ºC, 0.3 rpm, for 10 minutes 0 seconds.

SIGNIFICANCE OF THIS TABLE

The viscosity values of the fluids in this table are those of the fluids provided by the manufacturers for holdover time testing. For the holdover time guidelines to be valid, the viscosity of the fluid on the wing shall not be lower than that listed in this table. The user should periodically ensure that the viscosity value of a fluid sample taken from the wing is not lower than that listed.

TABLE 10

LOWEST OPERATIONAL USE TEMPERATURES[1] OF ANTI-ICING FLUIDS (2010-2011)

Table 10-1: Type I Anti-Icing Fluids

FLUID NAME	LOWEST OPERATIONAL USE TEMPERATURES			
	LOW SPEED AERODYNAMIC TEST		HIGH SPEED AERODYNAMIC TEST	
	DEGREES CELSIUS	DEGREES FAHRENHEIT	DEGREES CELSIUS	DEGREES FAHRENHEIT
ABAX DE-950	Not tested[3]	Not tested[3]	-24	-11.2
ABAX DE-950 Colorless	Not tested[3]	Not tested[3]	-24	-11.2
Arcton Arctica DG ready-to-use	Not available[2]	Not available[2]	Not available[2]	Not available[2]
Aviation Shaanxi Hi-Tech Cleanwing I	Not available[2]	Not available[2]	Not available[2]	Not available[2]
Aviation Xi'an Hi-Tech KHF-1	Not available[2]	Not available[2]	Not available[2]	Not available[2]
Batelle D[3]: Degradable by Design™ ADF1006A	Not available[2]	Not available[2]	Not available[2]	Not available[2]
Beijing Phoenix Air Traffic CBSX-1	Not available[2]	Not available[2]	Not available[2]	Not available[2]
Beijing Wangye Aviation Chemical KLA-1	Not available[2]	Not available[2]	Not available[2]	Not available[2]
Beijing Wangye Aviation Chemical YJF-1	Not available[2]	Not available[2]	Not available[2]	Not available[2]
Clariant Safewing EG I 1996	Not tested[3]	Not tested[3]	-45	-49
Clariant Safewing EG I 1996 (88)	-39.5	-39.1	-44	-47.2
Clariant Safewing MP I 1938 ECO	-25.5	-13.9	-32	-25.6
Clariant Safewing MP I 1938 ECO (80)	-25	-13	-32.5	-26.5
Clariant Safewing MP I 1938 ECO (80) PreMix 55 i.e. ready-to-use	Not tested[3]	Not tested[3]	-18	-0.4
Clariant Safewing MP I 1938 TF	Not available[2]	Not available[2]	Not available[2]	Not available[2]
Clariant Safewing MP I 1938 TF PreMix 60% i.e. ready-to-use (multiple location)	Not available[2]	Not available[2]	Not available[2]	Not available[2]
Clariant Safewing MP I ECO PLUS (80)	-25	-13	-33	-27.4
Chemical Specialists Prist Wing De-Icer	Not available[2]	Not available[2]	Not available[2]	Not available[2]

See next page for additional Type I fluids

NOTES

1 The lowest operational use temperature (LOUT) for a given fluid is the higher of:
   a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
   b) The actual freezing point of the fluid plus its freezing point buffer of 10°C (18°F).
   The values in this table were provided by the fluid manufacturer and were determined using pre-production fluid samples when available.
2 Manufacturer has not provided LOUT information at the time of this publication. Contact the fluid manufacturer or use another fluid.
3 Manufacturer has indicated fluid was not tested. Consult with the fluid manufacturer and/or airframe manufacturer for further guidance.

CAUTION

- For the fluids in the table that are intended to be diluted, the LOUT is derived from a dilution that provides the lowest possible operational use temperature. For other dilutions, determine the freezing point of the fluid, and add a 10°C freeze point buffer, as this will usually yield a higher and more restrictive operational use temperature. Consult the fluid manufacturer or fluid documentation for further clarification and guidance on establishing the appropriate operational use temperature of a diluted fluid.

TABLE 10 (cont.)

LOWEST OPERATIONAL USE TEMPERATURES[1] OF ANTI-ICING FLUIDS (2010-2011)

Table 10-1: Type I Anti-Icing Fluids (cont.)

FLUID NAME	LOWEST OPERATIONAL USE TEMPERATURES			
	LOW SPEED AERODYNAMIC TEST		HIGH SPEED AERODYNAMIC TEST	
	DEGREES CELSIUS	DEGREES FAHRENHEIT	DEGREES CELSIUS	DEGREES FAHRENHEIT
Cryotech Polar Plus	-27	-16.6	-32	-25.6
Dow UCAR™ ADF XL54	Not tested[3]	Not tested[3]	-41.5	-42.7
Dow UCAR™ Aircraft Deicing Fluid Concentrate	-36.5	-33.7	-45	-49
Dow UCAR™ PG ADF Dilute 55/45	Not tested[3]	Not tested[3]	-29.5	-21.1
Dow UCAR™ PG Aircraft Deicing Fluid Concentrate	-25	-13	-32	-25.6
Harbin Aeroclean Aviation HJF-1	Not tested[3]	Not tested[3]	-19	-2.2
HOC SafeTemp I ES	Not tested[3]	Not tested[3]	-23.5	-10.3
HOC SafeTemp ES Plus	Not tested[3]	Not tested[3]	-29	-20.2
Kilfrost DF Plus	-24	-11.2	-32	-25.6
Kilfrost DF Plus (80)	-23.5	-10.3	-31.5	-24.7
Kilfrost DF Plus (88)	-24	-11.2	-32	-25.6
Kilfrost DF^{sustain}™	-36	-32.8	-41.5	-42.7
Lyondell ARCOPlus	Not available[2]	Not available[2]	Not available[2]	Not available[2]
Newave FCY-1A	-34.5	-30.1	-35.5	-31.9
Octagon EcoFlo Concentrate	-27	-16.6	-30.5	-22.9
Octagon Octaflo EF Concentrate	-25	-13	-33	-27.4
Octagon Octaflo EF-80 Concentrate	-33	-27.4	-33	-27.4
Octagon Octaflo EG Concentrate	-40.5	-40.9	-44	-47.2
Viterbo Jarkleer SAE Type I	Not available[2]	Not available[2]	Not available[2]	Not available[2]

NOTES

1 The lowest operational use temperature (LOUT) for a given fluid is the higher of:
   a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
   b) The actual freezing point of the fluid plus its freezing point buffer of 10°C (18°F).
   The values in this table were provided by the fluid manufacturer and were determined using pre-production fluid samples when available.
2 Manufacturer has not provided LOUT information at the time of this publication. Contact the fluid manufacturer or use another fluid.
3 Manufacturer has indicated fluid was not tested. Consult with the fluid manufacturer and/or airframe manufacturer for further guidance.

CAUTION

- For the fluids in the table that are intended to be diluted, the LOUT is derived from a dilution that provides the lowest possible operational use temperature. For other dilutions, determine the freezing point of the fluid, and add a 10°C freeze point buffer, as this will usually yield a higher and more restrictive operational use temperature. Consult the fluid manufacturer or fluid documentation for further clarification and guidance on establishing the appropriate operational use temperature of a diluted fluid.

TABLE 10 (cont.)

LOWEST OPERATIONAL USE TEMPERATURES[1] OF ANTI-ICING FLUIDS (2010-2011)

Table 10-2: Type II (100/0) Anti-Icing Fluids		
FLUID NAME	LOWEST OPERATIONAL USE TEMPERATURES	
	HIGH SPEED AERODYNAMIC TEST	
	DEGREES CELSIUS	DEGREES FAHRENHEIT
ABAX Ecowing 26	-29	-20.2
Aviation Shaanxi Hi-Tech Cleanwing II	Not available[2]	Not available[2]
Clariant Safewing MP II 1951	-29	-20.2
Clariant Safewing MP II 2025 ECO	-28	-18.4
Clariant Safewing MP II Flight	-29	-20.2
Kilfrost ABC-3	-27	-16.6
Kilfrost ABC-2000	Not available[2]	Not available[2]
Kilfrost ABC-K Plus	-29	-20.2
Newave Aerochemical FCY-2	-28	-18.4
Octagon E Max II	-28	-18.4

Table 10-3: Type III (100/0) Anti-Icing Fluids				
FLUID NAME	LOWEST OPERATIONAL USE TEMPERATURES			
	LOW SPEED AERODYNAMIC TEST		HIGH SPEED AERODYNAMIC TEST	
	DEGREES CELSIUS	DEGREES FAHRENHEIT	DEGREES CELSIUS	DEGREES FAHRENHEIT
Clariant Safewing MP III 2031	-16.5	2.3	-29	-20.2

NOTES

1 The lowest operational use temperature (LOUT) for a given fluid is the higher of:
   a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
   b) The actual freezing point of the fluid plus its freezing point buffer of 7°C (13°F).
   The values in this table were provided by the fluid manufacturer and were determined using pre-production fluid samples when available.

2 Manufacturer has not provided LOUT information at the time of this publication. Contact the fluid manufacturer or use another fluid.

TABLE 10 (cont.)

LOWEST OPERATIONAL USE TEMPERATURES[1] OF ANTI-ICING FLUIDS (2010-2011)

Table 10-4: Type IV (100/0) Anti-Icing Fluids		
FLUID NAME	LOWEST OPERATIONAL USE TEMPERATURES	
	HIGH SPEED AERODYNAMIC TEST	
	DEGREES CELSIUS	DEGREES FAHRENHEIT
ABAX AD-480	-29	-20.2
ABAX Ecowing AD-49	-26	-14.8
Clariant Safewing MP IV 2001	-28	-18.4
Clariant Safewing MP IV 2012 Protect	-27	-16.6
Clariant Safewing MP IV LAUNCH	-28.5	-19.3
Cryotech Polar Guard	-23.5	-10.3
Dow UCAR™ ADF/AAF ULTRA+	Not available[2]	Not available[2]
Dow UCAR™ Endurance EG106 De/Anti-Icing Fluid	-27	-16.6
Dow UCAR™ FlightGuard AD-480	-29	-20.2
Dow UCAR™ FlightGuard AD-49	-26	-14.8
Kilfrost ABC-4^{sustain}	-29	-20.2
Kilfrost ABC-S	-28	-18.4
Kilfrost ABC-S PLUS	-28	-18.4
Lyondell ARCTIC Shield™	Not available[2]	Not available[2]
Octagon Max-Flight 04	-28	-18.4
Octagon MaxFlo	-28	-18.4

NOTES

1 The lowest operational use temperature (LOUT) for a given fluid is the higher of:
   a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
   b) The actual freezing point of the fluid plus its freezing point buffer of 7°C (13°F).
   The values in this table were provided by the fluid manufacturer and were determined using pre-production fluid samples when available.

2 Manufacturer has not provided LOUT information at the time of this publication. Contact the fluid manufacturer or use another fluid.

ICE PELLET ALLOWANCE TIMES FOR WINTER 2010-2011

Comprehensive ice pellet research was conducted jointly by the research teams of the FAA and Transport Canada. This research consisted of extensive climatic chamber, wind tunnel, and live aircraft testing with ice pellets (light or moderate) and light ice pellets mixed with other forms of precipitation.

Results of this research provide the basis for allowance times for operations in ice pellets (light or moderate) and operations in light ice pellets mixed with other forms of precipitation.

Additionally, Type IV anti-icing fluid with ice pellets embedded was evaluated for its aging qualities over periods of time beyond the allowance times, when the active precipitation time was limited to the allowance times.

Operational Guidelines

1) Tests have shown that ice pellets generally remain in a frozen state embedded in Type IV anti-icing fluid and are not dissolved by the fluid in the same manner as other forms of precipitation. Using current guidelines for determining anti-icing fluid failure, the presence of a contaminant not dissolved by the fluid (remaining embedded) is an indication that the fluid has failed. These embedded ice pellets are generally not readily detectable by the human eye during pre-takeoff contamination inspection procedures.

2) The research data have also shown that after proper deicing and anti-icing, the accumulation of light ice pellets, moderate ice pellets, and light ice pellets mixed with other forms of precipitation in Type IV fluid will not prevent the fluid from flowing off of the aerodynamic surfaces during takeoff.

3) The allowance times were developed based on this aerodynamic testing and are contained in Table 11.

4) Research has also shown that propylene glycol (PG) and ethylene glycol (EG) fluids behave differently under certain temperature and ice pellet precipitation conditions. Specifically, higher aircraft rotation speeds are required to effectively remove PG fluid contaminated with light or moderate ice pellets at temperatures less than -10°C. Therefore, there are no allowance times associated with the use of PG fluids on aircraft with rotation speeds of less than 115 knots in conditions of light or moderate ice pellets at temperatures below -10°C.

5) Furthermore, recent research with newer generation type airfoils has shown that the allowance times are shorter when using PG fluids under certain conditions. Since it is challenging to determine exactly which aircraft may be affected, the allowance time when using PG fluids at temperatures of -5°C and above is limited to 15 minutes in moderate ice pellets.

6) The ice pellet allowances are contingent on the operator's approved ground icing program being updated to incorporate the ice pellet information contained herein, including the following conditions and restrictions that must be satisfied:

    a) The aircraft critical surfaces must be properly deiced before the application of Type IV anti-icing fluid;

    b) The allowance time is valid only if the aircraft is anti-iced with undiluted Type IV fluid;

    c) These allowance times are applicable from the start of the Type IV anti-icing fluid application;

d) The allowance time is limited to aircraft with a rotation speed of 100 knots or greater (subject to 4) above);

e) If the takeoff is not accomplished within the applicable allowance time in Table 11, the aircraft must be completely deiced, and if precipitation is still present, anti-iced again prior to a subsequent takeoff;

f) The allowance time cannot be extended by an inspection of the aircraft critical surfaces from either inside or outside the aircraft;

g) If the temperature decreases below the temperature on which the allowance time was based, where the new lower temperature has an associated allowance time for the precipitation condition and the present time is within the new allowance time, then that new time must be used as the allowance time limit;

h) If ice pellet precipitation becomes heavier than moderate or if the light ice pellets mixed with other forms of allowable precipitation exceeds the listed intensities or temperature range, the allowance time cannot be used;

i) If the precipitation condition stops at, or before, the time limit of the applicable allowance time in Table 11 and does not restart, the aircraft may take off up to 90 minutes after the start of the application of the Type IV anti-icing fluid. However, under conditions of light ice pellets mixed with light freezing rain, the OAT must not decrease during the 90-minute period.

7) Examples:

a) Type IV anti-icing fluid is applied with a start of application time of 10:00, OAT is 0°C, light ice pellets fall until 10:20 and stop and do not restart. The allowance time stops at 10:50; however, provided that no precipitation restarts after the allowance time of 10:50; the aircraft may take off without any further action until 11:30.

b) Type IV anti-icing fluid is applied with a start of application time of 10:00, OAT is 0°C, light ice pellets mixed with freezing drizzle falls until 10:10, stops and restarts at 10:15, and stops at 10:20. The allowance time stops at 10:25; however, provided no precipitation restarts after the end of the allowance time at 10:25, the aircraft may take off without any further action until 11:30.

c) Type IV anti-icing fluid is applied with a start of application time of 10:00, OAT is 0°C, light ice pellets mixed with light freezing rain falls until 10:10, stops and restarts at 10:15, and stops at 10:20. The allowance time stops at 10:25; however, provided that the OAT remains constant or increases and no precipitation restarts after the end of the allowance time at 10:25, the aircraft may take off without any further action until 11:30.

d) On the other hand, if Type IV anti-icing fluid is applied with a start of application time of 10:00, OAT is 0°C, light ice pellets mixed with freezing drizzle falls until 10:10, stops and restarts at 10:30, with the allowance time stopping at 10:25, the aircraft may not take off, no matter how short the time or type of precipitation after 10:25, without being deiced and anti-iced if precipitation is present.

TABLE 11

ICE PELLET ALLOWANCE TIMES FOR WINTER 2010-2011

	OAT -5°C and above	OAT less than -5°C to -10°C	OAT less than -10°C
Light Ice Pellets	50 minutes	30 minutes	30 minutes[1]
Moderate Ice Pellets	25 minutes[2]	10 minutes	10 minutes[1]
Light Ice Pellets Mixed with Light or Moderate Freezing Drizzle	25 minutes	10 minutes	**Caution: No allowance times currently exist**
Light Ice Pellets Mixed with Light Freezing Rain	25 minutes	10 minutes	
Light Ice Pellets Mixed with Light Rain	25 minutes		
Light Ice Pellets Mixed with Moderate Rain	25 minutes		
Light Ice Pellets Mixed with Light Snow	25 minutes	15 minutes	
Light Ice Pellets Mixed with Moderate Snow	10 minutes		

NOTES

1 No allowance times exist for propylene glycol (PG) fluids, when used on aircraft with rotation speeds less than 115 knots. (For these aircraft, if the fluid type is not known, assume zero allowance time).

2 Allowance time is 15 minutes for propylene glycol (PG) fluids, or when the fluid type is unknown.