

# **Transport Canada Holdover Time (HOT) Guidelines Winter 2008-2009**

**Original Issue, July 2008**

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>.

<i>REVISION</i>	<i>DATE</i>	<i>DESCRIPTION OF CHANGES</i>	<i>AFFECTED PAGES</i>	<i>AUTHOR</i>

OBSOLETE

## SUMMARY OF CHANGES FROM PREVIOUS YEAR

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

### Type I Fluid

The Type I holdover time guideline values are unchanged.

### Type II Fluid

A fluid-specific table has been created for one new Type II fluid: Kilfrost ABC-K Plus. This fluid is currently in the qualification process. The Type II generic holdover time guideline values are unchanged.

Transport Canada and the FAA have been notified that there were possible viscosity issues with the Aviation Xi'an High-Tech KHF II fluid, which was first commercialized for use in winter 2007-2008.

Specifically, there may still be batches of this fluid on the market that were shipped/delivered with viscosities lower than the published Lowest On-Wing Viscosities for use with the HOT guidelines.

We have been advised that the fluid manufacturer is taking measures to correct this situation.

A fluid-specific holdover time guideline table has been retained for this fluid; however, Table 5 "Currently Qualified Fluids (2008-2009)" was amended to indicate that this fluid is currently in re-qualification.

It is highly recommended that operators intending to utilize holdover time guidelines associated with this fluid:

- 1) Contact the vendor for further details; and
- 2) Carefully assess this fluid's on-wing viscosity at time of use.

### Type III Fluid

The Type III holdover time guideline values are unchanged.

### Type IV Fluid

Removal of obsolete Type IV data has resulted in increases to the values in the cold soaked wing cells of the generic holdover time guidelines.

A fluid-specific table has been added for Dow Chemical UCAR™ FlightGuard AD-480. This product is identical to ABAX (ex SPCA) AD-480; therefore, the holdover time guideline values for these tables are the same.

### Holdover Times in Frost Conditions

A note has been included in the Type II and Type IV generic and fluid-specific tables to advise that radiational cooling during active frost conditions may reduce holdover time when operating close to the lower end of the outside air temperature range.

## **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 10.13.3, “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  $-3^{\circ}\text{C}$  and above as per the application procedures for SAE Type I and SAE Type 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 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 decision making criteria, 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) Snow Pellets; b) Hail; c) Moderate and Heavy Freezing Rain; and d) Heavy Snow.

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

Additionally, holdover time guidelines have not been assessed for the 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 has yet been identified for ice pellet conditions. Instead, an allowance time based upon research has been developed for operations during ice pellet conditions.

### **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 yet 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.

**HOLDOVER TIME (HOT) GUIDELINES FOR WINTER 2008-2009**

Table 1	SAE Type I Fluid Holdover Guidelines
Table 2-Generic	SAE Type II Fluid Holdover Guidelines
Table 2-A-E26	ABAX (ex SPCA) Type II Fluid Holdover Guidelines Ecowing 26
Table 2-A-KHF-II	Aviation Xi'an High-Tech Type II Fluid Holdover Guidelines KHF-II
Table 2-C-2025	Clariant Type II Fluid Holdover Guidelines Safewing MP II 2025 ECO
Table 2-C-Flight	Clariant Type II Fluid Holdover Guidelines Safewing MP II Flight
Table 2-K-ABC-2000	Kilfrost Type II Fluid Holdover Guidelines ABC-2000
Table 2-K-ABC-II+	Kilfrost Type II Fluid Holdover Guidelines ABC-II PLUS
Table 2-K-ABC-K+	Kilfrost Type II Fluid Holdover Guidelines ABC-K PLUS
Table 2-N-FCY-2	Newave Aerochemical Type II Fluid Holdover Guidelines FCY-2
Table 2-O-EM-II	Octagon Type II Fluid Holdover Guidelines E Max II
Table 3	SAE Type III Fluid Holdover Guidelines
Table 4-Generic	SAE Type IV Fluid Holdover Guidelines
Table 4-A-AD-480	ABAX (ex SPCA) Type IV Fluid Holdover Guidelines AD-480
Table 4-C-2001	Clariant Type IV Fluid Holdover Guidelines Safewing MP IV 2001
Table 4-C-2012	Clariant Type IV Fluid Holdover Guidelines Safewing MP IV 2012 Protect
Table 4-C-Launch	Clariant Type IV Fluid Holdover Guidelines Safewing MP IV Launch
Table 4-D-ULTRA+	Dow Chemical Type IV Fluid Holdover Guidelines UCAR™ ADF/AAF ULTRA+
Table 4-D-E106	Dow Chemical Type IV Fluid Holdover Guidelines UCAR™ Endurance EG106
Table 4-D-AD-480	Dow Chemical Type IV Fluid Holdover Guidelines UCAR™ FlightGuard AD-480
Table 4-K-ABC-S	Kilfrost Type IV Fluid Holdover Guidelines ABC-S
Table 4-K-ABC-S PLUS	Kilfrost Type IV Fluid Holdover Guidelines ABC-S PLUS
Table 4-L-ARCTIC Shield	Lyondell Type IV Fluid Holdover Guidelines ARCTIC Shield™
Table 4-O-MF	Octagon Type IV Fluid Holdover Guidelines Max-Flight
Table 4-O-MF-04	Octagon Type IV Fluid Holdover Guidelines Max-Flight 04
Table 4-O-MFLO	Octagon Type IV Fluid Holdover Guidelines MaxFlo
Table 5	Currently Qualified Fluids
Table 6	SAE Type I Deicing Fluid Application Procedures
Table 7	SAE Type II, Type III and Type IV Anti-Icing Fluid Application Procedures
Table 8	Visibility in Snow vs. Snowfall Intensity Chart
Table 9	Lowest On-Wing Viscosity Values for Anti-Icing Fluids
Table 10	Ice Pellet Allowance Times

TABLE 1

**SAE TYPE I<sup>3</sup> FLUID HOLDOVER GUIDELINES FOR WINTER 2008-2009**

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

Outside Air Temperature <sup>5</sup>		Approximate Holdover Times Under Various Weather Conditions (minutes)								
Degrees Celsius	Degrees Fahrenheit	Active Frost	Freezing Fog	Snow or Snow Grains <sup>1</sup>			Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
				Very Light	Light	Moderate				
-3 and above	27 and above	45	11 – 17	18	11 – 18	6 – 11	9 – 13	4 – 6	2 – 5	CAUTION: No holdover time guidelines exist
below -3 to -6	below 27 to 21	45	8 – 13	14	8 – 14	5 – 8	5 – 9	4 – 6		
below -6 to -10	below 21 to 14	45	6 – 10	11	6 – 11	4 – 6	4 – 7	2 – 5		
below -10	below 14	45	5 – 9	7	4 – 7	2 – 4				

**NOTES**

- 1 To use these times, the fluid must be heated to a minimum temperature providing 60°C (140°F) at the nozzle and an average rate of at least 1 litre/m<sup>2</sup> (2 gal./100 sq. ft.) must be applied to deiced surfaces, OTHERWISE TIMES WILL BE SHORTER.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 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.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOUT) is respected.

**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 2008-2009<sup>1</sup>**

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

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	8:00	0:35 – 1:30	0:20 – 0:45	0:30 – 0:55	0:15 – 0:30	0:05 – 0:40	CAUTION: No holdover time guidelines exist
		75/25	5:00	0:25 – 1:00	0:15 – 0:30	0:20 – 0:45	0:10 – 0:25	0:05 – 0:25	
		50/50	3:00 <sup>5</sup>	0:15 – 0:30	0:05 – 0:15	0:05 – 0:15	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	8:00 <sup>5</sup>	0:20 – 1:05	0:15 – 0:30	0:15 – 0:45 <sup>3</sup>	0:10 – 0:20 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:20 – 0:55	0:10 – 0:20	0:15 – 0:30 <sup>3</sup>	0:05 – 0:15 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	8:00 <sup>5,6</sup>	0:15 – 0:20 <sup>6</sup>	0:15 – 0:30 <sup>6</sup>				
below -25	below -13	100/0	Type II fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type II fluid cannot be used.						

**NOTES**

- 1 Based on the lowest holdover times of the Type II fluids listed in Table 5-2.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.
- 6 Ensure that the lowest operational use temperature (LOUT) is respected.

**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 (ex SPCA) TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2008-2009<sup>1</sup>**  
**ECOWING 26**

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

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	8:00	1:25 – 2:35	0:40 – 1:00	0:50 – 1:35	0:40 – 0:50	0:20 – 1:25	CAUTION: No holdover time guidelines exist
		75/25	5:00	1:05 – 1:55	0:25 – 0:45	0:45 – 1:05	0:25 – 0:35	0:10 – 1:00	
		50/50	3:00 <sup>5</sup>	0:30 – 0:45	0:10 – 0:20	0:15 – 0:25	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	8:00 <sup>5</sup>	0:45 – 2:15	0:35 – 0:55	0:30 – 1:10 <sup>3</sup>	0:15 – 0:35 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:35 – 1:15	0:25 – 0:40	0:20 – 0:50 <sup>3</sup>	0:15 – 0:25 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	8:00 <sup>5</sup>	0:25 – 0:45	0:15 – 0:30				
below -25	below -13	100/0	Type II fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type II fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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-KHF-II

**AVIATION XI'AN HIGH-TECH TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2008-2009<sup>1</sup>**  
**KHF-II**

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

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	8:00	1:15 – 2:15	0:45 – 1:20	0:50 – 1:30	0:30 – 0:45	0:10 – 1:15	CAUTION: No holdover time guidelines exist
		75/25	5:00	0:45 – 1:00	0:25 – 0:40	0:25 – 0:45	0:15 – 0:25	0:05 – 0:45	
		50/50	3:00 <sup>5</sup>	0:20 – 0:30	0:15 – 0:25	0:10 – 0:15	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	8:00 <sup>5</sup>	1:10 – 2:40	0:35 – 1:00	0:20 – 1:35 <sup>3</sup>	0:25 – 0:40 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:45 – 1:20	0:15 – 0:30	0:20 – 0:45 <sup>3</sup>	0:15 – 0:20 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	8:00 <sup>5</sup>	0:35 – 0:50	0:15 – 0:30				
below -25	below -13	100/0	Type II fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type II fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>**  
**SAFEWING MP II 2025 ECO**

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

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	8:00	1:30 – 2:05	0:40 – 1:10	0:40 – 1:00	0:25 – 0:35	0:10 – 1:15	CAUTION: No holdover time guidelines exist
		75/25	5:00	0:55 – 1:45	0:25 – 0:45	0:25 – 0:45	0:20 – 0:25	0:05 – 0:50	
		50/50	3:00 <sup>5</sup>	0:20 – 0:35	0:05 – 0:15	0:10 – 0:15	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	8:00 <sup>5</sup>	0:45 – 1:50	0:35 – 1:00	0:35 – 1:05 <sup>3</sup>	0:20 – 0:35 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:40 – 1:20	0:25 – 0:45	0:30 – 0:40 <sup>3</sup>	0:15 – 0:25 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	8:00 <sup>5</sup>	0:25 – 0:45	0:15 – 0:30				
below -25	below -13	100/0	Type II fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type II fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>**  
**SAFEWING MP II FLIGHT**

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

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	8:00	3:30 – 4:00	1:00 – 1:35	1:20 – 2:00	0:45 – 1:25	0:10 – 1:30	CAUTION: No holdover time guidelines exist
		75/25	5:00	2:30 – 4:00	0:40 – 1:20	1:15 – 2:00	0:30 – 0:55	0:05 – 1:20	
		50/50	3:00 <sup>5</sup>	0:55 – 1:45	0:10 – 0:25	0:20 – 0:30	0:10 – 0:15		
below -3 to -14	below 27 to 7	100/0	8:00 <sup>5</sup>	0:55 – 1:45	0:40 – 1:05	0:35 – 1:30 <sup>3</sup>	0:25 – 0:45 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:40 – 1:10	0:20 – 0:40	0:25 – 1:10 <sup>3</sup>	0:30 – 0:40 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	8:00 <sup>5</sup>	0:30 – 0:50	0:15 – 0:30				
below -25	below -13	100/0	Type II fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type II fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>  
ABC-2000**

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

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	8:00	1:30 – 3:05	0:30 – 1:00	0:55 – 1:35	0:40 – 0:50	0:15 – 1:10	CAUTION: No holdover time guidelines exist
		75/25	5:00	1:40 – 3:30	0:30 – 1:05	0:45 – 1:15	0:40 – 0:50	0:15 – 1:40	
		50/50	3:00 <sup>5</sup>	1:00 – 2:10	0:15 – 0:30	0:15 – 0:25	0:05 – 0:15		
below -3 to -14	below 27 to 7	100/0	8:00 <sup>5</sup>	0:35 – 1:25	0:25 – 0:45	0:25 – 0:50 <sup>3</sup>	0:10 – 0:30 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:35 – 1:15	0:25 – 0:50	0:25 – 0:55 <sup>3</sup>	0:15 – 0:30 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	8:00 <sup>5</sup>	0:20 – 0:45	0:15 – 0:30				
below -25	below -13	100/0	Type II fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type II fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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-II+

**KILFROST TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2008-2009<sup>1</sup>  
ABC-II PLUS**

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

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	8:00	1:10 – 2:25	0:25 – 0:55	0:35 – 1:10	0:30 – 0:40	0:05 – 1:00	CAUTION: No holdover time guidelines exist
		75/25	5:00	1:10 – 2:25	0:25 – 0:50	0:30 – 1:00	0:20 – 0:40	0:05 – 0:50	
		50/50	3:00 <sup>5</sup>	0:15 – 0:45	0:15 – 0:35	0:05 – 0:25	0:05 – 0:15		
below -3 to -14	below 27 to 7	100/0	8:00 <sup>5</sup>	0:30 – 1:05	0:15 – 0:35	0:15 – 0:45 <sup>3</sup>	0:10 – 0:30 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:20 – 0:55	0:15 – 0:35	0:15 – 0:30 <sup>3</sup>	0:10 – 0:20 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	8:00 <sup>5</sup>	0:15 – 0:20	0:15 – 0:30				
below -25	below -13	100/0	Type II fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type II fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>**  
**ABC-K PLUS**

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

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	8:00	2:15 – 3:45	1:00 – 1:40	1:50 – 2:00	1:00 – 1:25	0:20 – 2:00	CAUTION: No holdover time guidelines exist
		75/25	5:00	1:40 – 2:30	0:35 – 1:10	1:25 – 2:00	0:50 – 1:10	0:15 – 2:00	
		50/50	3:00 <sup>5</sup>	0:35 – 1:05	0:05 – 0:15	0:20 – 0:30	0:10 – 0:15		
below -3 to -14	below 27 to 7	100/0	8:00 <sup>5</sup>	0:30 – 1:05	0:50 – 1:25	0:25 – 1:00 <sup>3</sup>	0:15 – 0:35 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:25 – 1:25	0:35 – 1:05	0:20 – 0:55 <sup>3</sup>	0:05 – 0:30 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	8:00 <sup>5</sup>	0:30 – 0:55	0:15 – 0:30				
below -25	below -13	100/0	Type II fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type II fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>  
FCY-2**

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

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	8:00	1:15 – 2:25	0:30 – 0:55	0:35 – 1:05	0:25 – 0:35	0:05 – 0:45	
		75/25	5:00	0:50 – 1:30	0:20 – 0:40	0:25 – 0:45	0:15 – 0:25	0:05 – 0:25	
		50/50	3:00 <sup>5</sup>	0:25 – 0:35	0:15 – 0:25	0:10 – 0:20	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	8:00 <sup>5</sup>	0:45 – 1:30	0:15 – 0:30	0:20 – 0:45 <sup>3</sup>	0:15 – 0:20 <sup>3</sup>	CAUTION: No holdover time guidelines exist	
		75/25	5:00 <sup>5</sup>	0:30 – 1:05	0:10 – 0:20	0:15 – 0:30 <sup>3</sup>	0:05 – 0:15 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	8:00 <sup>5</sup>	0:25 – 0:35	0:15 – 0:30				
below -25	below -13	100/0	Type II fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type II fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>**  
**E MAX II**

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

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	8:00	2:05 – 3:45	0:40 – 1:20	0:45 – 1:35	0:30 – 0:40	0:15 – 1:30	CAUTION: No holdover time guidelines exist
		75/25	5:00	1:25 – 2:50	0:25 – 0:55	0:40 – 1:10	0:20 – 0:30	0:10 – 1:05	
		50/50	3:00 <sup>5</sup>	0:30 – 0:55	0:10 – 0:25	0:15 – 0:30	0:10 – 0:15		
below -3 to -14	below 27 to 7	100/0	8:00 <sup>5</sup>	0:50 – 1:45	0:35 – 1:10	0:35 – 1:00 <sup>3</sup>	0:20 – 0:30 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:30 – 1:20	0:25 – 0:50	0:35 – 1:05 <sup>3</sup>	0:15 – 0:30 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	8:00 <sup>5</sup>	0:20 – 0:35	0:15 – 0:30				
below -25	below -13	100/0	Type II fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type II fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009**

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

Outside Air Temperature <sup>3</sup>		Approximate Holdover Times Under Various Weather Conditions (minutes)									
Degrees Celsius	Degrees Fahrenheit	Type III Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Active Frost	Freezing Fog	Snow or Snow Grains			Freezing Drizzle <sup>1</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
					Very Light	Light	Moderate				
-3 and above	27 and above	100/0	120	20 – 40	35	20 – 35	10 – 20	10 – 20	8 – 10	6 – 20	CAUTION: No holdover time guidelines exist
		75/25	60	15 – 30	25	15 – 25	8 – 15	8 – 15	6 – 10	2 – 10	
		50/50	30	10 – 20	15	8 – 15	4 – 8	5 – 9	4 – 6		
below -3 to -10	below 27 to 14	100/0	120	20 – 40	30	15 – 30	9 – 15	10 – 20	8 – 10		
		75/25	60	15 – 30	25	10 – 25	7 – 10	9 – 12	6 – 9		
below -10	below 14	100/0	120	20 – 40	30	15 – 30	8 – 15				

**NOTES**

- 1 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type III fluid cannot be used.

**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 2008-2009<sup>1</sup>**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	12:00	1:15 – 2:30	0:35 – 1:15	0:40 – 1:10	0:25 – 0:40	0:10 – 1:05	CAUTION: No holdover time guidelines exist
		75/25	5:00	1:05 – 1:45	0:20 – 0:55	0:35 – 0:50	0:15 – 0:30	0:05 – 0:40	
		50/50	3:00 <sup>5</sup>	0:15 – 0:35	0:05 – 0:15	0:10 – 0:20	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	0:20 – 1:20	0:20 – 0:40	0:20 – 0:45 <sup>3</sup>	0:10 – 0:25 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:25 – 0:50	0:15 – 0:35	0:15 – 0:30 <sup>3</sup>	0:10 – 0:20 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5,6</sup>	0:15 – 0:40 <sup>6</sup>	0:15 – 0:30 <sup>6</sup>				
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type IV fluid cannot be used.						

**NOTES**

- 1 Based on the lowest holdover times of the Type IV fluids listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.
- 6 Ensure that the lowest operational use temperature (LOUT) is respected.

**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 (ex SPCA) TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2008-2009<sup>1</sup>  
AD-480**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	12:00	2:00 – 3:30	0:40 – 1:20	0:50 – 1:30	0:35 – 0:55	0:15 – 1:35	CAUTION: No holdover time guidelines exist
		75/25	5:00	1:30 – 2:45	0:30 – 1:05	0:50 – 1:15	0:30 – 0:45	0:10 – 1:15	
		50/50	3:00 <sup>5</sup>	0:30 – 0:45	0:10 – 0:20	0:15 – 0:25	0:05 – 0:15		
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	0:20 – 1:20	0:30 – 0:55	0:25 – 1:20 <sup>3</sup>	0:15 – 0:30 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:25 – 0:50	0:20 – 0:45	0:25 – 1:05 <sup>3</sup>	0:15 – 0:30 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5</sup>	0:15 – 0:40	0:15 – 0:30				
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type IV fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>**  
**SAFEWING MP IV 2001**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>	
-3 and above	27 and above	100/0	12:00	1:20 – 3:20	1:00 – 1:55	0:55 – 1:55	0:40 – 1:00	0:15 – 2:00	CAUTION: No holdover time guidelines exist	
		75/25	5:00	1:20 – 2:00	0:35 – 1:00	0:35 – 1:10	0:25 – 0:35	0:10 – 1:25		
		50/50	3:00 <sup>5</sup>	0:15 – 0:40	0:10 – 0:20	0:10 – 0:20	0:05 – 0:15			
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	0:45 – 1:35	0:30 – 0:50	0:55 – 1:35 <sup>3</sup>	0:30 – 0:45 <sup>3</sup>			
		75/25	5:00 <sup>5</sup>	0:30 – 1:00	0:20 – 0:35	0:40 – 1:10 <sup>3</sup>	0:20 – 0:30 <sup>3</sup>			
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5</sup>	0:20 – 0:45	0:15 – 0:30					
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type IV fluid cannot be used.							

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>**  
**SAFEWING MP IV 2012 PROTECT**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	12:00	1:15 – 2:30	0:40 – 1:15	0:40 – 1:10	0:25 – 0:45	0:10 – 1:05	CAUTION: No holdover time guidelines exist
		75/25	5:00	1:10 – 2:05	0:25 – 0:55	0:35 – 0:50	0:15 – 0:30	0:05 – 0:40	
		50/50	3:00 <sup>5</sup>	0:25 – 0:45	0:15 – 0:25	0:15 – 0:20	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	0:45 – 1:45	0:20 – 0:40	0:25 – 0:45 <sup>3</sup>	0:15 – 0:25 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:25 – 1:05	0:20 – 0:40	0:15 – 0:30 <sup>3</sup>	0:10 – 0:20 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5</sup>	0:20 – 0:45	0:15 – 0:30				
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type IV fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>**  
**SAFEWING MP IV LAUNCH**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	12:00	4:00 – 4:00	1:05 – 1:45	1:30 – 2:00	1:00 – 1:40	0:15 – 1:40	CAUTION: No holdover time guidelines exist
		75/25	5:00	3:40 – 4:00	1:00 – 1:45	1:40 – 2:00	0:45 – 1:15	0:10 – 1:45	
		50/50	3:00 <sup>5</sup>	1:25 – 2:45	0:25 – 0:45	0:30 – 0:50	0:20 – 0:25		
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	1:00 – 1:55	0:50 – 1:20	0:35 – 1:40 <sup>3</sup>	0:25 – 0:45 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:40 – 1:20	0:45 – 1:25	0:25 – 1:10 <sup>3</sup>	0:25 – 0:45 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5</sup>	0:30 – 0:50	0:15 – 0:30				
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type IV fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>**  
**UCAR™ ADF/AAF ULTRA+**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	12:00	1:35 – 3:35	0:35 – 1:15	0:45 – 1:35	0:25 – 0:40	0:10 – 1:20	CAUTION: No holdover time guidelines exist
		75/25							
		50/50							
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	1:25 – 3:00	0:25 – 0:55	0:45 – 1:25 <sup>3</sup>	0:30 – 0:45 <sup>3</sup>		
		75/25							
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5,6</sup>	0:40 – 2:10 <sup>6</sup>	0:20 – 0:45 <sup>6</sup>				
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. <sup>5</sup> Consider use of Type I when Type IV fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.
- 6 These holdover times only apply to outside air temperatures to -24°C (-11°F).

**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-E106

**DOW CHEMICAL TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2008-2009<sup>1</sup>**  
**UCAR™ ENDURANCE EG106**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	12:00	2:05 – 3:10	0:40 – 1:20	1:10 – 2:00	0:50 – 1:15	0:20 – 2:00	CAUTION: No holdover time guidelines exist
		75/25							
		50/50							
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	1:50 – 3:20	0:30 – 1:05	0:55 – 1:50 <sup>3</sup>	0:45 – 1:10 <sup>3</sup>		
		75/25							
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5</sup>	0:30 – 1:05	0:15 – 0:30				
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type IV fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>**  
**UCAR™ FLIGHTGUARD AD-480**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	12:00	2:00 – 3:30	0:40 – 1:20	0:50 – 1:30	0:35 – 0:55	0:15 – 1:35	CAUTION: No holdover time guidelines exist
		75/25	5:00	1:30 – 2:45	0:30 – 1:05	0:50 – 1:15	0:30 – 0:45	0:10 – 1:15	
		50/50	3:00 <sup>5</sup>	0:30 – 0:45	0:10 – 0:20	0:15 – 0:25	0:05 – 0:15		
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	0:20 – 1:20	0:30 – 0:55	0:25 – 1:20 <sup>3</sup>	0:15 – 0:30 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:25 – 0:50	0:20 – 0:45	0:25 – 1:05 <sup>3</sup>	0:15 – 0:30 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5</sup>	0:15 – 0:40	0:15 – 0:30				
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type IV fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>**  
**ABC-S**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	12:00	2:35 – 4:00	1:00 – 1:40	1:20 – 1:50	1:00 – 1:25	0:20 – 1:15	CAUTION: No holdover time guidelines exist
		75/25	5:00	1:05 – 1:45	0:30 – 0:55	0:45 – 1:10	0:35 – 0:50	0:10 – 0:50	
		50/50	3:00 <sup>5</sup>	0:20 – 0:35	0:05 – 0:15	0:15 – 0:20	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	0:45 – 2:05	0:45 – 1:20	0:20 – 1:00 <sup>3</sup>	0:10 – 0:30 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:25 – 1:00	0:25 – 0:50	0:20 – 1:10 <sup>3</sup>	0:10 – 0:35 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5</sup>	0:20 – 0:40	0:15 – 0:30				
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type IV fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>  
ABC-S PLUS**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	12:00	2:10 – 4:00	1:15 – 2:00	1:50 – 2:00	1:05 – 2:00	0:25 – 2:00	CAUTION: No holdover time guidelines exist
		75/25	5:00	1:25 – 2:40	0:45 – 1:15	1:00 – 1:20	0:30 – 0:50	0:10 – 1:20	
		50/50	3:00 <sup>5</sup>	0:30 – 0:55	0:15 – 0:30	0:15 – 0:40	0:15 – 0:20		
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	0:55 – 3:30	1:00 – 1:45	0:25 – 1:35 <sup>3</sup>	0:20 – 0:30 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:45 – 1:50	0:35 – 1:00	0:20 – 1:10 <sup>3</sup>	0:15 – 0:25 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5</sup>	0:40 – 1:00	0:15 – 0:30				
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type IV fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>**  
**ARCTIC SHIELD™**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	12:00	1:55 – 3:10	0:50 – 1:25	0:55 – 1:40	0:45 – 1:05	0:15 – 1:25	CAUTION: No holdover time guidelines exist
		75/25	5:00	1:20 – 2:15	0:40 – 1:05	0:55 – 1:25	0:30 – 0:45	0:05 – 1:20	
		50/50	3:00 <sup>5</sup>	0:35 – 0:45	0:20 – 0:35	0:20 – 0:30	0:10 – 0:15		
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	1:00 – 2:25	0:45 – 1:15	0:25 – 1:30 <sup>3</sup>	0:25 – 0:30 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:50 – 1:45	0:35 – 0:55	0:30 – 1:15 <sup>3</sup>	0:25 – 0:30 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5</sup>	0:25 – 0:45	0:15 – 0:30				
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type IV fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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

**OCTAGON TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2008-2009<sup>1</sup>**  
**MAX-FLIGHT**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>
-3 and above	27 and above	100/0	12:00	2:40 – 4:00	0:50 – 1:35	0:55 – 2:00	0:35 – 1:00	0:15 – 1:15	CAUTION: No holdover time guidelines exist
		75/25	5:00	2:05 – 3:15	0:45 – 1:45	1:15 – 2:00	0:35 – 1:10	0:10 – 0:40	
		50/50	3:00 <sup>5</sup>	0:55 – 1:45	0:25 – 1:15	0:35 – 1:00	0:15 – 0:30		
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	0:50 – 2:30	0:25 – 0:50	0:25 – 1:10 <sup>3</sup>	0:20 – 0:40 <sup>3</sup>		
		75/25	5:00 <sup>5</sup>	0:30 – 1:05	0:20 – 0:50	0:20 – 1:00 <sup>3</sup>	0:15 – 0:30 <sup>3</sup>		
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5</sup>	0:20 – 0:45	0:15 – 0:30				
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type IV fluid cannot be used.						

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>**  
**MAX-FLIGHT 04**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>	
-3 and above	27 and above	100/0	12:00	2:40 – 4:00	1:25 – 2:00	2:00 – 2:00	1:10 – 1:30	0:20 – 2:00	CAUTION: No holdover time guidelines exist	
		75/25	5:00	2:05 – 3:15	1:05 – 2:00	1:50 – 2:00	1:00 – 1:20	0:20 – 2:00		
		50/50	3:00 <sup>5</sup>	0:55 – 1:45	0:25 – 1:15	0:35 – 1:10	0:25 – 0:35			
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	0:50 – 2:30	0:35 – 1:10	0:25 – 1:30 <sup>3</sup>	0:20 – 0:40 <sup>3</sup>			
		75/25	5:00 <sup>5</sup>	0:30 – 1:05	0:40 – 1:20	0:20 – 1:00 <sup>3</sup>	0:15 – 0:30 <sup>3</sup>			
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5</sup>	0:20 – 0:45	0:15 – 0:30					
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type IV fluid cannot be used.							

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 2008-2009<sup>1</sup>**  
**MAXFLO**

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

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Active Frost	Freezing Fog	Snow or Snow Grains	Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing	Other <sup>2</sup>	
-3 and above	27 and above	100/0	12:00	2:20 – 3:35	0:40 – 1:30	1:20 – 2:00	0:30 – 1:00	0:10 – 2:00	CAUTION: No holdover time guidelines exist	
		75/25	5:00	1:25 – 2:00	0:20 – 0:55	0:40 – 1:05	0:20 – 0:35	0:05 – 1:15		
		50/50	3:00 <sup>5</sup>	0:20 – 0:40	0:05 – 0:15	0:10 – 0:20	0:05 – 0:10			
below -3 to -14	below 27 to 7	100/0	12:00 <sup>5</sup>	1:10 – 2:20	0:25 – 1:00	0:35 – 1:45 <sup>3</sup>	0:30 – 0:50 <sup>3</sup>			
		75/25	5:00 <sup>5</sup>	0:40 – 1:25	0:15 – 0:40	0:35 – 1:15 <sup>3</sup>	0:15 – 0:30 <sup>3</sup>			
below -14 to -25	below 7 to -13	100/0	12:00 <sup>5</sup>	0:30 – 1:00	0:15 – 0:30					
below -25	below -13	100/0	Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the outside air temperature and the aerodynamic acceptance criteria are met. Consider use of Type I when Type IV fluid cannot be used.							

**NOTES**

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Radiational cooling during active frost conditions may reduce holdover times when operating close to the lower end of the outside air temperature range.

**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 (2008-2009)**

**Table 5-1: Qualified Type I Anti-icing Fluids<sup>(1) (2)</sup>**

#	COMPANY NAME	FLUID NAME	EXPIRY (Y-M-D)
1-1	ABAX Industries (ex SPCA)	ABAX DE-950	12-06-25
1-2	ABAX Industries (ex SPCA)	ABAX DE-950 Colorless	12-06-26
1-3	<i>Arcton Ltd.</i>	<i>Arctica DG</i>	<i>08-04-10<sup>(3)</sup></i>
1-4	Aviation Xi'an High-Tech	Aviation Xi'an KHF-1	11-09-20
1-5	<i>Battelle</i>	<i>D<sup>3</sup>: Degradable by Design Deicer™ ADF 1006A</i>	<i>08-01-13<sup>(3)</sup></i>
1-6	Beijing Wangye Aviation Chemical Product Co. Ltd.	KLA-1	11-09-20
1-7	Beijing Wangye Aviation Chemical Product Co. Ltd.	YJF-1	09-02-23
1-8	Clariant GmbH	Clariant Safewing MP I 1938 TF	08-08-21
1-9	<i>Clariant GmbH</i>	<i>Clariant Safewing MP I 1938 TF Pre-Mix</i>	<i>07-09-14<sup>(3)</sup></i>
1-10	Clariant GmbH	Clariant Safewing MP I 1938 ECO (80)	12-06-10
1-11	Clariant GmbH	Clariant Safewing MP I 1938 ECO (80) Pre-Mix	09-03-01
1-12	Clariant GmbH	Clariant Safewing MP I 1938 ECO	12-06-10
1-13	Clariant GmbH	Clariant Safewing EG I 1996	12-06-10
1-14	<i>Chemical Specialists and Development Inc.</i>	<i>Prist Wing De-Icer</i>	<i>08-05-17<sup>(3)</sup></i>
1-15	Dow Chemical Company	Dow UCAR™ Aircraft Deicing Fluid Concentrate	11-09-10
1-16	Dow Chemical Company	Dow UCAR™ ADF XL-54	09-02-01
1-17	Dow Chemical Company	Dow UCAR™ PG ADF Aircraft Deicing Fluid Concentrate	12-02-05
1-18	Dow Chemical Company	Dow UCAR™ PG ADF Dilute 55/45	12-02-05
1-19	<i>HOC Industries</i>	<i>SafeTemp I ES</i>	<i>07-10-27<sup>(3)</sup></i>
1-20	HOC Industries	SafeTemp ES Plus	11-10-04
1-21	<i>Inland Technologies Inc.</i>	<i>Inland Duragly-P ready to use</i>	<i>05-09-11<sup>(3)</sup></i>
1-22	<i>Inland Technologies Inc.</i>	<i>Inland Duragly-E ready to use</i>	<i>05-10-20<sup>(3)</sup></i>
1-23	Kilfrost Limited	Kilfrost DF Plus	11-09-27
1-24	Kilfrost Limited	Kilfrost DF Plus (80)	08-07-12 <sup>(4)</sup>
1-25	Kilfrost Limited	Kilfrost DF Plus (88)	11-09-27
1-26	Kilfrost Limited	Kilfrost DF <sup>sustain</sup> ™	09-01-26
1-27	<i>Lyondell Chemical Co.</i>	<i>Lyondell ARCOPlus®</i>	<i>08-02-14<sup>(3)</sup></i>
1-28	<i>Lyondell Chemical Co.</i>	<i>Lyondell ARCTIC Plus®</i>	<i>08-04-10<sup>(3)</sup></i>
1-29	Newave Aerochemical Co. Ltd.	Newave FCY-1A	11-08-21
1-30	Octagon Process Inc.	Octagon EcoFlo	09-07-30
1-31	Octagon Process Inc.	Octagon Octaflo EF	11-07-11
1-32	<i>Octagon Process Inc.</i>	<i>Octagon Octaflo EG</i>	<i>07-05-12<sup>(3)</sup></i>
1-33	<i>Viterbo S.A.</i>	<i>Jarkleer SAE Type I</i>	<i>07-01-20<sup>(3)</sup></i>

<sup>(1)</sup>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.ugac.ca/amil/index.htm>  
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.

<sup>(2)</sup>Concentrate fluids have also been qualified at 50/50 (glycol/water) dilution.

<sup>(3)</sup>Fluids listed in italics have expired and will be removed from this listing four years after expiry.

<sup>(4)</sup>Currently in qualification/re-qualification process.



TABLE 5 (cont.)

CURRENTLY QUALIFIED FLUIDS (2008-2009)

Table 5-2: Qualified <sup>(1)</sup> Type II Anti-icing Fluids			
#	COMPANY NAME	FLUID NAME	EXPIRY (Y-M-D)
2-1	ABAX Industries (ex SPCA)	Ecowing 26	09-08-21
2-2	Aviation Xi'an High-Tech	Aviation Xi'an KHF-II	08-06-15 <sup>(3)</sup>
2-3	Clariant GmbH	Clariant Safewing MP II 1951	09-05-08
2-4	<i>Clariant GmbH</i>	<i>Clariant Safewing MP II 2025 ECO</i>	<i>08-06-28<sup>(2)</sup></i>
2-5	Clariant GmbH	Clariant Safewing MP II Flight	10-06-16
2-6	<i>Kilfrost Limited</i>	<i>Kilfrost ABC-II PLUS</i>	<i>05-10-29<sup>(2)</sup></i>
2-7	Kilfrost Limited	Kilfrost ABC-3	10-07-16
2-8	Kilfrost Limited	Kilfrost ABC-2000	08-07-12 <sup>(3)</sup>
2-9	Kilfrost Limited	Kilfrost ABC-K PLUS	Y-M-D <sup>(3)</sup>
2-10	Newave Aerochemical Co. Ltd.	Newave FCY-2	09-01-11
2-11	Octagon Process Inc.	Octagon E Max II	08-10-31

Table 5-3: Qualified <sup>(1)</sup> Type III Anti-icing Fluids			
#	COMPANY NAME	FLUID NAME	EXPIRY (Y-M-D)
3-1	Clariant GmbH	Clariant Safewing MP III 2031 ECO	09-05-02
	<b>CAUTION:</b> 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 <sup>(1)</sup> Type IV Anti-icing Fluids			
#	COMPANY NAME	FLUID NAME	EXPIRY (Y-M-D)
4-1	ABAX Industries (ex SPCA)	ABAX AD-480	09-07-30
4-2	<i>Clariant GmbH</i>	<i>Clariant Safewing MP IV 2001</i>	<i>08-06-26<sup>(2)</sup></i>
4-3	<i>Clariant GmbH</i>	<i>Clariant Safewing MP IV 2012 Protect</i>	<i>07-07-12<sup>(2)</sup></i>
4-4	Clariant GmbH	Clariant Safewing MP IV Launch	10-06-18
4-5	Dow Chemical Company	Dow UCAR ADF/AAF ULTRA+	08-08-21
4-6	Dow Chemical Company	UCAR™ Endurance EG106	09-09-04
4-7	Dow Chemical Company	UCAR FlightGuard AD-480	10-04-30
4-8	<i>Ely Chemical Company</i>	<i>Octagon Max-Flight</i>	<i>06-07-06<sup>(2)</sup></i>
4-9	Kilfrost Limited	Kilfrost ABC-S	09-06-29
4-10	Kilfrost Limited	ABC-S PLUS	09-03-07
4-11	Lyondell Chemical Co.	Lyondell ARCTIC Shield™	10-05-21
4-12	<i>Octagon Process Inc.</i>	<i>Octagon Max-Flight</i>	<i>06-07-06<sup>(2)</sup></i>
4-13	Octagon Process Inc.	Octagon Max-Flight 04	10-04-29
4-14	<i>Octagon Process Inc.</i>	<i>Octagon MaxFlo</i>	<i>07-03-24<sup>(2)</sup></i>

<sup>(1)</sup> 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.ugac.ca/amil/index.htm>  
 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.

<sup>(2)</sup> Fluids listed in italics have expired and will be removed from this listing four years after expiry.

<sup>(3)</sup> Currently in qualification/re-qualification process.

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) <sup>1</sup>	One-Step Procedure Deicing/Anti-icing	Two-Step Procedure	
		First Step: Deicing	Second Step: Anti-icing <sup>2</sup>
-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
Below -3°C (27°F)		Freezing point of heated fluid mixture shall not be more than 3°C (5°F) above OAT	(18°F) below 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 in snow conditions, at least 1 litre/m<sup>2</sup> (~ 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) <sup>1</sup>	One-Step Procedure Deicing/Anti-icing	Two-Step Procedure	
		First Step: Deicing	Second Step: Anti-icing <sup>2</sup>
-3°C (27°F) and above	50/50 Heated <sup>3</sup> 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 <sup>3</sup> 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 <sup>3</sup> 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.
- 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 should 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<sup>1</sup>

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	≤¾	>¾ 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	≤¾	>¾ 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 THE TABLE**

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)

<b>Table 9-1: Type II Anti-Icing Fluids</b>			
<b>FLUID NAME</b>	<b>FLUID DILUTION</b>	<b>LOWEST ON-WING VISCOSITY<sup>a</sup></b> (mPa.s)	
		<b>MANUFACTURER METHOD</b>	<b>AIR 9968 REVISION A METHOD</b>
ABAX (ex SPCA) Ecowing 26	100/0	4 900 <sup>e</sup>	4 600 <sup>g</sup>
	75/25	2 200 <sup>g</sup>	2 200 <sup>g</sup>
	50/50	50 <sup>g</sup>	50 <sup>g</sup>
Aviation Xi'An Hi-Tech KHF-II	100/0	8 750 <sup>c</sup>	7 690 <sup>g</sup>
	75/25	6 400 <sup>c</sup>	6 890 <sup>g</sup>
	50/50	2 950 <sup>c</sup>	3 150 <sup>g</sup>
Clariant Safewing MP II 2025 ECO	100/0	5 500 <sup>b</sup>	5 750 <sup>g</sup>
	75/25	10 000 <sup>b</sup>	10 000 <sup>g</sup>
	50/50	3 000 <sup>b</sup>	3 250 <sup>g</sup>
Clariant Safewing MP II Flight	100/0	3 340 <sup>g</sup>	3 340 <sup>g</sup>
	75/25	17 500 <sup>g</sup>	17 500 <sup>g</sup>
	50/50	11 500 <sup>g</sup>	11 500 <sup>g</sup>
Clariant Safewing MP II 1951	100/0	2 500 <sup>b</sup>	2 750 <sup>g</sup>
	75/25	2 900 <sup>b</sup>	3 000 <sup>g</sup>
	50/50	50 <sup>b</sup>	50 <sup>g</sup>
Kilfrost ABC-3	100/0	2 500 <sup>c</sup>	2 500 <sup>j</sup>
	75/25	2 000 <sup>c</sup>	2 000 <sup>j</sup>
	50/50	400 <sup>c</sup>	400 <sup>j</sup>
Kilfrost ABC-2000	100/0	2 350 <sup>c</sup>	2 350 <sup>g</sup>
	75/25	3 000 <sup>c</sup>	3 000 <sup>j</sup>
	50/50	1 000 <sup>c</sup>	1 000 <sup>j</sup>
Kilfrost ABC-II Plus	100/0	3 600 <sup>c</sup>	3 600 <sup>g</sup>
	75/25	4 000 <sup>c</sup>	4 000 <sup>j</sup>
	50/50	1 000 <sup>c</sup>	1 000 <sup>j</sup>
Kilfrost ABC-K Plus	100/0	2 850 <sup>c</sup>	2 640 <sup>g</sup>
	75/25	12 650 <sup>c</sup>	12 650 <sup>c</sup>
	50/50	4 200 <sup>c</sup>	5 260 <sup>g</sup>
Newave Aerochemical FCY-2	100/0	7 000 <sup>c</sup>	8 920 <sup>g</sup>
	75/25	18 550 <sup>c</sup>	18 550 <sup>c</sup>
	50/50	6 750 <sup>c</sup>	7 030 <sup>g</sup>
Octagon E Max II	100/0	13 520 <sup>d</sup>	13 520 <sup>g</sup>
	75/25	11 400 <sup>g</sup>	11 400 <sup>g</sup>
	50/50	2 820 <sup>g</sup>	2 820 <sup>g</sup>

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

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

<b>Table 9-3: Type IV Anti-Icing Fluids</b>			
<b>FLUID NAME</b>	<b>FLUID DILUTION</b>	<b>LOWEST ON-WING VISCOSITY<sup>a</sup></b>	
		<b>(mPa.s)</b>	
		<b>MANUFACTURER METHOD</b>	<b>AIR 9968 REVISION A METHOD</b>
ABAX (ex SPCA) AD-480	100/0	15 200 <sup>e</sup>	12 800 <sup>c</sup>
	75/25	16 000 <sup>e</sup>	12 400 <sup>c</sup>
	50/50	4 000 <sup>e</sup>	3 800 <sup>g</sup>
Clariant Safewing MP IV 2001	100/0	18 000 <sup>b</sup>	18 000 <sup>c</sup>
	75/25	8 000 <sup>b</sup>	11 500 <sup>g</sup>
	50/50	1 200 <sup>b</sup>	1 750 <sup>g</sup>
Clariant Safewing MP IV 2012 Protect	100/0	7 800 <sup>b</sup>	7 250 <sup>g</sup>
	75/25	17 800 <sup>b</sup>	17 700 <sup>c</sup>
	50/50	4 500 <sup>b</sup>	4 250 <sup>g</sup>
Clariant Safewing MP IV Launch	100/0	7 550 <sup>g</sup>	7 550 <sup>g</sup>
	75/25	18 000 <sup>g</sup>	18 000 <sup>g</sup>
	50/50	17 800 <sup>g</sup>	17 800 <sup>g</sup>
Dow UCAR ADF/AAF ULTRA+	100/0	36 000 <sup>f</sup>	28 000 <sup>c</sup>
	75/25	Dilution Not Applicable	Dilution Not Applicable
	50/50	Dilution Not Applicable	Dilution Not Applicable
Dow UCAR Endurance EG106	100/0	24 850 <sup>f</sup>	2 230 <sup>g</sup>
	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 <sup>e</sup>	12 800 <sup>c</sup>
	75/25	16 000 <sup>e</sup>	12 400 <sup>c</sup>
	50/50	4 000 <sup>e</sup>	3 800 <sup>g</sup>
Kilfrost ABC-S	100/0	17 000 <sup>c</sup>	17 000 <sup>c</sup>
	75/25	12 000 <sup>c</sup>	12 000 <sup>c</sup>
	50/50	2 000 <sup>c</sup>	2 000 <sup>j</sup>
Kilfrost ABC-S PLUS	100/0	17 900 <sup>c</sup>	17 900 <sup>c</sup>
	75/25	18 300 <sup>c</sup>	18 300 <sup>c</sup>
	50/50	7 500 <sup>c</sup>	7 500 <sup>j</sup>
Lyondell ARCTIC Shield™	100/0	23 150 <sup>i</sup>	28 000 <sup>c</sup>
	75/25	21 700 <sup>i</sup>	22 100 <sup>c</sup>
	50/50	6 400 <sup>i</sup>	7 640 <sup>g</sup>
Octagon Max-Flight	100/0	5 540 <sup>d</sup>	5 540 <sup>g</sup>
	75/25	15 000 <sup>g</sup>	15 000 <sup>g</sup>
	50/50	5 200 <sup>g</sup>	5 200 <sup>g</sup>
Octagon Max-Flight 04	100/0	5 540 <sup>d</sup>	5 540 <sup>g</sup>
	75/25	15 000 <sup>g</sup>	15 000 <sup>g</sup>
	50/50	5 200 <sup>g</sup>	5 200 <sup>g</sup>
Octagon MaxFlo	100/0	8 670 <sup>g</sup>	8 670 <sup>g</sup>
	75/25	8 200 <sup>g</sup>	8 200 <sup>g</sup>
	50/50	2 200 <sup>g</sup>	2 200 <sup>g</sup>

TABLE 9 (cont.)

## LOWEST ON-WING VISCOSITY VALUES FOR ANTI-ICING FLUIDS

## 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 20°C, 0.3 rpm, for 15 minutes 0 seconds.
- c Brookfield Spindle LV2-disc with guard leg, 150 mL of fluid, at 20°C, 0.3 rpm, for 10 minutes 0 seconds.
- d Brookfield Spindle LV1 with guard leg, 500 mL of fluid, at 20°C, 0.3 rpm, for 33 minutes 20 seconds.
- e Brookfield Spindle SC4-34/13R, small sample adapter, 10 mL of fluid, at 20°C, 0.3 rpm, for 30 minutes 0 seconds.
- f Brookfield Spindle SC4-31/13R, small sample adapter, 10 mL of fluid, at 0°C, 0.3 rpm, for 10 minutes 0 seconds.
- g Brookfield Spindle LV1 with guard leg, 500 mL of fluid, at 20°C, 0.3 rpm, for 10 minutes 0 seconds.
- h Brookfield Spindle LV0, UL-Adapter, 16 mL of fluid, at 20°C, 0.3 rpm, for 10 minutes 0 seconds.
- i Brookfield Spindle SC4-31/13R, small sample adapter, 9 mL of fluid, at 20°C, 0.3 rpm, for 33 minutes 0 seconds.
- j Brookfield Spindle LV1 with guard leg, 150 mL of fluid, at 20°C, 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.

## ICE PELLETT ALLOWANCE TIMES FOR WINTER 2008-2009

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 when 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 the 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) would be 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 the aerodynamic surfaces during takeoff.
- 3) The allowance times were developed based on this aerodynamic testing and are contained in Table 10.
- 4) 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 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;
  - e) If the takeoff is not accomplished within the applicable allowance time in Table 10, 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 limits of the applicable allowance time in Table 10 and does not restart, the aircraft may takeoff 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.

5) 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 takeoff without any further action up to 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, and 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 takeoff without any further action up to 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, and 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 that no precipitation restarts after the end of the allowance time at 10:25, the aircraft may takeoff without any further action up to 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, and stops and restarts at 10:30 with the allowance time stopping at 10:25, the aircraft may not takeoff, no matter how short the time or type of precipitation after 10:25, without being deiced and anti-iced if precipitation is present.

TABLE 10  
ICE PELLET ALLOWANCE TIMES FOR WINTER 2008-2009

	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
Moderate Ice Pellets	25 minutes	10 minutes	10 minutes
Light Ice Pellets Mixed with Light or Moderate Freezing Drizzle	25 minutes	10 minutes	<b>Caution: No allowance times currently exist</b>
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 Light or Moderate Snow	25 minutes		

OBSOLETE