

Transport Canada Holdover Time (HOT) Guidelines Winter 2017-2018

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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.

Questions or comments on the content of the holdover time guidelines should be addressed to Transport Canada Civil Aviation Communication Centre
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CHANGE CONTROL RECORDS

This page indicates any changes made to individual pages within the document. Changed pages have sidebars to assist in identifying where significant changes have been made on these pages.

It is the responsibility of the end user to periodically check the following website for updates:
<http://www.tc.gc.ca/eng/civilaviation/standards/commerce-holdovertime-menu-1877.htm>.

| REVISION | DATE | DESCRIPTION OF CHANGES | AFFECTED PAGES | AUTHOR |
|----------|--------------|---|-------------------------------------|------------------|
| 1.0 | Oct 12, 2017 | <ol style="list-style-type: none">1. Additional holdover times for snow, snow grains and snow pellets for select Type II and Type IV fluids for the temperature band “below -3 to -8 °C” added as Appendix D.2. The summary of changes has been updated to reflect the allowable use of Kifrost ABC-3 for winter 2017-18.3. Temperature band typo corrected on page A-19. | 1, 2, 3, 4, 5 A-19 Appendix D | Transport Canada |
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HOW TO USE THIS DOCUMENT

Complementary Document

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.

Applicability

A new version of this document is published for each winter operating season, typically early in the August preceding the winter operating season. Updates to the winter's document may be published any time after the Original Issue document is published. When a new document is published, either mid-season or each new season, the previous document becomes obsolete. It is the responsibility of the end user to periodically check for document updates on the following website: <http://www.tc.gc.ca/eng/civilaviation/standards/commerce-holdovertime-menu-1877.htm>.

Main Document Structure and Content

This document is divided into several sections.

- Change Control Records: Provides details of any changes made to the document in mid-season document updates.
- Table of Contents: Provides a list of sections, tables, and appendices in the document.
- How to Use This Document: Provides top level guidance on how to use the document.
- Summary of Changes from Previous Year: Describes key changes made to the document for the current winter operating season.
- Holdover Time Guidelines: Series of tables which provide estimated holdover times (in hh:mm). Fluids are divided by fluid type (Type I, II, III, and IV), aircraft construction materials (Type I only), fluid brand (Type II, III, IV), aircraft rotation speed (Type III only), and fluid application temperature (Type III only). Columns in the tables divide the information by precipitation type; rows in the tables divide the information by temperature and fluid dilution.
- Allowance Times Tables: Tables which provide allowance times (in minutes) for Type III and Type IV fluids. Rows in the tables divide the information by precipitation type; columns in the tables divide the information by temperature.
- Supplementary Guidance: Series of tables which provide supplementary information for using the holdover time guidelines and allowance times tables. Includes a table for estimating snowfall intensity from prevailing visibility, tables of fluid information (one table per fluid type), and tables of fluid application guidance (by fluid type).

Appendices

The appendices contain complementary content.

- Appendix A: Provides adjusted holdover time guidelines (holdover time guidelines and allowance times tables) for operations when flaps and slats are deployed prior to de/anti-icing.
- Appendix B: Provides changes to TP 14052E. They are recorded here in advance of the next revision to TP 14052E due to the longer life cycle time associated with the updating and publication of TP 14052E. They are for immediate use.
- Appendix C: Provides information on laboratories involved in testing de/anti-icing fluids.
- Appendix D: Provides additional holdover times for select Type II and Type IV fluids. Use of these holdover times is optional.

SUMMARY OF CHANGES FROM PREVIOUS YEAR

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

Reformatting of Document and Tables

- Formatting and structural changes have been made to this document for the winter of 2017-18. These changes have been made in support of Government of Canada document accessibility requirements, harmonization efforts between Transport Canada and the FAA, and to improve overall usability of the document. The following changes are of note:
 - Some sections of the document have been restructured/reordered and complementary content have been moved to appendices.
 - Table titles and numbering have been simplified (all tables now ordered sequentially).
 - The number of heading rows and heading columns in holdover time (HOT) tables has been reduced.
 - A complete table of contents has been added.
 - A how to use this document section has been added.
- Further changes may be implemented in future years.

Holdover Time Tables

- With the exception of the formatting changes described above, the active frost and Type I HOT guidelines are unchanged.
- Fluid-specific HOT guidelines have been created for three new fluids: ABAX ECOWING AD-2 (Type II), Chemco CHEMR EG IV (Type IV), and Oksayd Defrost ECO 4 (Type IV).
- Supplemental testing with a higher viscosity sample of AllClear AeroClear MAX resulted in changes to its holdover times and to its lowest on-wing viscosity value and measurement method.
- The HOT guidelines for Kilfrost ABC-3 (Type II) have been removed. For winter 2017-18 inclusively, users of Kilfrost ABC-3 may use the fluid with the Type I fluid HOT guidelines in Tables 1, 2, 3, ADJ-1, ADJ-2 or ADJ-3 and according to the application methodology found in Table 45, down to the LOUT of -27°C (-16.6°F) for the 100/0 dilution. This fluid may only be used on aircraft conforming to the SAE AS5900 high speed aerodynamic test criterion.
- Type IV fluids have been removed from the calculation of the Type II generic holdover times as a result of an industry accepted change in protocol.
- Significant changes (both increases and decreases) have been made to the Type II and Type IV generic holdover times as a result of the new and removed fluids and data.
- Changes have been made to snow holdover times for the six fluids listed below as a result of supplemental research in heavy snow conditions.
 - Cryotech Polar Guard Advance (100/0, 75/25, 50/50)
 - Cryotech Polar Guard II (100/0, 75/25, 50/50)
 - ABAX ECOWING AD-49 (100/0, 75/25)
 - Dow FlightGuard AD-49 (100/0, 75/25)
 - ABAX ECOWING 26 (75/25, 50/50)
 - Clariant Max Flight SNEG (100/0)
- Further testing in very cold snow conditions has enabled fluid-specific holdover times to be provided in very cold snow (below -14°C) for the seven Type II/IV fluids listed below.
 - Clariant Safewing MP II FLIGHT (Type II)
 - Clariant Safewing MP IV LAUNCH (Type IV)
 - Clariant Safewing MP IV LAUNCH PLUS (Type IV)
 - Cryotech Polar Guard Advance (Type IV)

- Cryotech Polar Guard II (Type II)
- Dow Endurance EG106 (Type IV)
- LNT Solutions E450 (Type IV)
- All other Type II/IV fluids retain generic holdover times in very cold snow (generic times are different for ethylene vs. propylene based fluids). Reductions have been made to some very cold snow generic values for propylene based fluids.
- There are now three temperature bands for temperatures below -14°C in Type II and Type IV HOT tables: below -14 to -18°C, below -18 to -25°C, and below -25°C to LOUT. Fluids with LOUTs \geq -25°C have two temperature bands: below -14 to -18°C and below -18°C to LOUT.

Allowance Times Tables

- The operational guidance for ice pellets and small hail has been relocated to TP 14052. This has been done so that all pertinent guidance material is provided in a single document.
- The precipitation type categories included in the allowance times tables have been modified to reflect METAR reported precipitation types. Specifically, intensity designators have been removed from the second precipitation type in mixed precipitation categories and the resulting duplicate categories have been removed.

Fluid Application Tables

- Changes have been made to the fluid application tables to improve harmonization with the FAA and SAE fluid application tables.

Changes to TP 14052 Guidelines for Aircraft Ground Icing Operations

- The first paragraph in Section 10.4 has been updated to make clear that the fluid application guidance provided in the Transport Canada fluid application tables, and not guidance provided by other entities, must be followed to use the holdover times and allowance times published by Transport Canada.
- Guidance has been added, as Section 10.8.1, on the potentially detrimental impact of non-glycol deicing fluids containing alkali organic salts on anti-icing fluids.
- The guidance for longer holdover times for 75/25 dilutions, provided in Section 11.1.13, has been modified.
- Guidance on the differences between holdover times and allowance times has been added as Section 11.1.15.
- Operational Guidance for allowance times has been relocated to Section 11.1.16 from this document.

Adjusted Holdover Times for Flaps/Slats Deployed Prior to De/Anti-Icing

- Research into holdover times on deployed flaps/slats began in the winter of 2009-2010, and since 2011-2012 has included cooperative efforts with industry. Data collected has provided a substantive amount of evidence that demonstrates extended flaps/slats can accelerate anti-icing fluid runoff from aircraft wings, in turn negatively affecting the protection capacity of the fluid. This results in a potential safety risk. The protection capacity of the fluid is affected by many elements: the aircraft design, the slope of the surface, the type of fluid, the aircraft skin and ambient temperature, the type of precipitation, the amount of fluid applied, and the effective wind.
- To mitigate this safety risk, it was determined by the Federal Aviation Administration and Transport Canada that adjusting the published de/anti-icing fluid holdover and allowance times to 76% of the current published values would provide the sufficient safety margin to safely allow operations when flaps and slats are deployed prior to de/anti-icing. Therefore, when flaps and/or slats are extended to the takeoff configuration prior to de/anti-icing fluid application and remain in that configuration while taxiing to takeoff, the specific HOT and allowance times tables identified as "Adjusted" must be used. These 76% adjusted tables replace the 90% adjusted tables that were published for the winters of 2015-2016 to 2016-2017. Note that the standard holdover and allowance times can be used if flaps and slats are deployed as close to departure as safety allows. The 76% adjusted tables appear in Appendix A of this document.

HOLDOVER TIME (HOT) GUIDELINES FOR WINTER 2017-2018

TABLE 1: ACTIVE FROST HOLDOVER TIMES FOR SAE TYPE I, TYPE II, TYPE III, AND TYPE IV FLUIDS

| Outside Air Temperature ^{1,2,3} | Type I | Outside Air Temperature ^{2,3} | Concentration Fluid/Water By % Volume | Type II | Type III ⁴ | Type IV |
|---|--------------------------|--|---------------------------------------|-----------------------------------|-----------------------|---------|
| -1°C and above (30°F and above) | 0:45 (0:35) ⁵ | -1°C and above (30°F and above) | 100/0 | 8:00 | 2:00 | 12:00 |
| below -1 to -3°C (below 30 to 27°F) | | | 75/25 | 5:00 | 1:00 | 5:00 |
| below -3 to -10°C (below 27 to 14°F) | | | 50/50 | 3:00 | 0:30 | 3:00 |
| below -10 to -14°C (below 14 to 7°F) | | below -1 to -3°C (below 30 to 27°F) | 100/0 | 8:00 | 2:00 | 12:00 |
| below -14 to -21°C (below 7 to -6°F) | | | 75/25 | 5:00 | 1:00 | 5:00 |
| below -21 to -25°C (below -6 to -13°F) | | | 50/50 | 1:30 | 0:30 | 3:00 |
| below -25°C to LOUT (below -13°F to LOUT) | | below -3 to -10°C (below 27 to 14°F) | 100/0 | 8:00 | 2:00 | 10:00 |
| | | | 75/25 | 5:00 | 1:00 | 5:00 |
| | | below -10 to -14°C (below 14 to 7°F) | 100/0 | 6:00 | 2:00 | 6:00 |
| | | | 75/25 | 1:00 | 1:00 | 1:00 |
| | | below -14 to -21°C (below 7 to -6°F) | 100/0 | 6:00 | 2:00 | 6:00 |
| | | below -21 to -25°C (below -6 to -13°F) | 100/0 | 2:00 | 2:00 | 4:00 |
| | | below -25°C (below -13°F) | 100/0 | No Holdover Time Guidelines Exist | | |

NOTES

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

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE 2: HOLDOVER TIMES FOR SAE TYPE I FLUID ON CRITICAL AIRCRAFT SURFACES
COMPOSED PREDOMINANTLY OF ALUMINUM**

| Outside Air Temperature ^{1,2} | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{3,4} | Light Snow, Snow Grains or Snow Pellets ^{3,4} | Moderate Snow, Snow Grains or Snow Pellets ³ | Freezing Drizzle ⁵ | Light Freezing Rain | Rain on Cold Soaked Wing ⁶ | Other ⁷ |
|--|------------------------------|---|--|---|-------------------------------|---------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 0:11 - 0:17 | 0:18 | 0:11 - 0:18 | 0:06 - 0:11 | 0:09 - 0:13 | 0:04 - 0:06 | 0:02 - 0:05 | |
| below -3 to -6°C (below 27 to 21°F) | 0:08 - 0:13 | 0:14 | 0:08 - 0:14 | 0:05 - 0:08 | 0:05 - 0:09 | 0:04 - 0:06 | | |
| below -6 to -10°C (below 21 to 14°F) | 0:06 - 0:10 | 0:11 | 0:06 - 0:11 | 0:04 - 0:06 | 0:04 - 0:07 | 0:02 - 0:05 | | CAUTION: No holdover time guidelines exist |
| below -10°C (below 14°F) | 0:05 - 0:09 | 0:07 | 0:04 - 0:07 | 0:02 - 0:04 | | | | |

NOTES

- 1 Type I fluid / water mixture must be selected so that the freezing point of the mixture is at least 10°C (18°F) below outside air temperature.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected.
- 3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 5 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 6 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS

- These holdover times apply to aircraft with critical surfaces constructed predominantly or entirely of aluminum materials that have demonstrated satisfactory use of these holdover times.
- The responsibility for the application of these data remains with the user.
- Takeoff after the longest applicable holdover time has been exceeded is not permitted for Type I fluids.
- The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE 3: HOLDOVER TIMES FOR SAE TYPE I FLUID ON CRITICAL AIRCRAFT SURFACES
COMPOSED PREDOMINANTLY OF COMPOSITES**

| Outside Air Temperature ^{1,2} | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{3,4} | Light Snow, Snow Grains or Snow Pellets ^{3,4} | Moderate Snow, Snow Grains or Snow Pellets ³ | Freezing Drizzle ⁵ | Light Freezing Rain | Rain on Cold Soaked Wing ⁶ | Other ⁷ |
|--|------------------------------|---|--|---|-------------------------------|---------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 0:09 - 0:16 | 0:12 | 0:06 - 0:12 | 0:03 - 0:06 | 0:08 - 0:13 | 0:04 - 0:06 | 0:01 - 0:05 | |
| below -3 to -6°C (below 27 to 21°F) | 0:06 - 0:08 | 0:11 | 0:05 - 0:11 | 0:02 - 0:05 | 0:05 - 0:09 | 0:04 - 0:06 | | |
| below -6 to -10°C (below 21 to 14°F) | 0:04 - 0:08 | 0:09 | 0:05 - 0:09 | 0:02 - 0:05 | 0:04 - 0:07 | 0:02 - 0:05 | | CAUTION: No holdover time guidelines exist |
| below -10°C (below 14°F) | 0:04 - 0:07 | 0:07 | 0:04 - 0:07 | 0:02 - 0:04 | | | | |

NOTES

- 1 Type I fluid / water mixture must be selected so that the freezing point of the mixture is at least 10°C (18°F) below outside air temperature.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected.
- 3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 5 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 6 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS

- These holdover times apply to newer aircraft with critical surfaces constructed predominantly or entirely of composite materials.
- The responsibility for the application of these data remains with the user.
- Takeoff after the longest applicable holdover time has been exceeded is not permitted for Type I fluids.
- The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 4: GENERIC HOLDOVER TIMES FOR SAE TYPE II FLUIDS

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Snow, Snow Grains or Snow Pellets ^{2,3} | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|--|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:55 - 1:45 | 0:25 - 0:50 | 0:35 - 1:05 | 0:25 - 0:35 | 0:07 - 0:45 | |
| | 75/25 | 0:25 - 0:55 | 0:15 - 0:25 | 0:15 - 0:40 | 0:10 - 0:20 | 0:04 - 0:25 | |
| | 50/50 | 0:15 - 0:25 | 0:05 - 0:10 | 0:08 - 0:15 | 0:06 - 0:09 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:30 - 1:05 | 0:15 - 0:30 | 0:20 - 0:45 ⁷ | 0:15 - 0:20 ⁷ | | |
| | 75/25 | 0:25 - 0:50 | 0:08 - 0:20 | 0:15 - 0:25 ⁷ | 0:08 - 0:15 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:15 - 0:35 | 0:06 - 0:20 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:15 - 0:35 | 0:02 - 0:09 | | | | |
| below -25°C to LOUT (below -13°F to LOUT) | 100/0 | 0:15 - 0:35 ⁸ | 0:01 - 0:06 ⁸ | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).
- 8 If the LOUT is unknown, no holdover time guidelines exist below -25°C (-13°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 5: TYPE II HOLDOVER TIMES FOR ABAX ECOWING 26

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---------------------------------------|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:25 - 2:35 | 1:35 | 1:00 - 1:35 | 0:40 - 1:00 | 0:50 - 1:35 | 0:40 - 0:50 | 0:20 - 1:25 | CAUTION: No holdover time guidelines exist |
| | 75/25 | 1:05 - 1:55 | 1:20 | 0:40 - 1:20 | 0:20 - 0:40 | 0:45 - 1:05 | 0:25 - 0:35 | 0:10 - 1:00 | |
| | 50/50 | 0:30 - 0:45 | 0:40 | 0:20 - 0:40 | 0:07 - 0:20 | 0:15 - 0:25 | 0:08 - 0:10 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:45 - 2:15 | 1:25 | 0:55 - 1:25 | 0:35 - 0:55 | 0:30 - 1:10 ⁷ | 0:15 - 0:35 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:35 - 1:15 | 0:55 | 0:30 - 0:55 | 0:15 - 0:30 | 0:20 - 0:50 ⁷ | 0:15 - 0:25 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:25 - 0:45 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:25 - 0:45 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 6: TYPE II HOLDOVER TIMES FOR ABAX ECOWING AD-2

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:20 - 3:00 | 2:00 | 1:15 - 2:00 | 0:40 - 1:15 | 0:40 - 1:40 | 0:30 - 0:45 | 0:09 - 1:25 | |
| | 75/25 | 1:15 - 1:25 | 1:45 | 0:55 - 1:45 | 0:25 - 0:55 | 0:35 - 1:05 | 0:20 - 0:30 | 0:04 - 0:50 | |
| | 50/50 | 0:15 - 0:30 | 0:35 | 0:15 - 0:35 | 0:07 - 0:15 | 0:09 - 0:15 | 0:06 - 0:09 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:45 - 2:30 | 1:45 | 0:55 - 1:45 | 0:30 - 0:55 | 0:25 - 1:10 ⁷ | 0:20 - 0:30 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:35 - 1:55 | 1:35 | 0:50 - 1:35 | 0:25 - 0:50 | 0:15 - 0:55 ⁷ | 0:20 - 0:35 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:15 - 0:40 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:15 - 0:40 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |
| below -25 to -27°C (below -13 to -16.6°F) | 100/0 | 0:15 - 0:40 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 7: TYPE II HOLDOVER TIMES FOR AVIATION SHAANXI HI-TECH CLEANWING II

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Snow, Snow Grains or Snow Pellets ^{2,3} | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---------------------------------------|---|------------------------------|--|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:55 - 1:50 | 0:30 - 0:55 | 0:35 - 1:05 | 0:25 - 0:35 | 0:10 - 0:55 | |
| | 75/25 | 0:50 - 1:20 | 0:25 - 0:45 | 0:35 - 1:00 | 0:20 - 0:30 | 0:07 - 0:50 | |
| | 50/50 | 0:35 - 1:00 | 0:15 - 0:30 | 0:20 - 0:40 | 0:10 - 0:20 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:45 - 1:50 | 0:30 - 0:55 | 0:30 - 0:55 ⁷ | 0:20 - 0:25 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:40 - 1:45 | 0:25 - 0:45 | 0:35 - 0:40 ⁷ | 0:20 - 0:25 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:20 - 0:50 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:20 - 0:50 | 0:02 - 0:09 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 8: TYPE II HOLDOVER TIMES FOR BEIJING YADILITE AVIATION YD-102 TYPE II

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:10 - 2:00 | 1:40 | 0:50 - 1:40 | 0:25 - 0:50 | 0:40 - 1:15 | 0:35 - 0:40 | 0:10 - 1:00 | |
| | 75/25 | 0:25 - 0:55 | 0:50 | 0:25 - 0:50 | 0:15 - 0:25 | 0:15 - 0:40 | 0:10 - 0:20 | 0:04 - 0:25 | |
| | 50/50 | 0:15 - 0:25 | 0:25 | 0:10 - 0:25 | 0:05 - 0:10 | 0:08 - 0:15 | 0:07 - 0:09 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:45 - 1:30 | 1:00 | 0:30 - 1:00 | 0:15 - 0:30 | 0:35 - 0:50 ⁷ | 0:25 - 0:25 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:30 - 0:50 | 0:35 | 0:20 - 0:35 | 0:08 - 0:20 | 0:15 - 0:25 ⁷ | 0:09 - 0:15 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:20 - 0:45 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:20 - 0:45 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:20 - 0:45 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 9: TYPE II HOLDOVER TIMES FOR CLARIANT SAFEWING MP II FLIGHT

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 3:30 - 4:00 | 2:00 | 1:35 - 2:00 | 1:00 - 1:35 | 1:20 - 2:00 | 0:45 - 1:25 | 0:10 - 1:30 | |
| | 75/25 | 1:50 - 2:45 | 2:00 | 1:20 - 2:00 | 0:40 - 1:20 | 1:10 - 1:30 | 0:30 - 0:55 | 0:06 - 0:50 | |
| | 50/50 | 0:55 - 1:45 | 0:45 | 0:25 - 0:45 | 0:10 - 0:25 | 0:20 - 0:30 | 0:10 - 0:15 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:55 - 1:45 | 1:50 | 1:05 - 1:50 | 0:40 - 1:05 | 0:35 - 1:30 ⁷ | 0:25 - 0:45 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:25 - 1:05 | 1:20 | 0:40 - 1:20 | 0:20 - 0:40 | 0:25 - 1:10 ⁷ | 0:20 - 0:35 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:30 - 0:50 | 1:10 | 0:25 - 1:10 | 0:08 - 0:25 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:30 - 0:50 | 0:30 | 0:10 - 0:30 | 0:03 - 0:10 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:30 - 0:50 | 0:20 | 0:07 - 0:20 | 0:02 - 0:07 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 10: TYPE II HOLDOVER TIMES FOR CLARIANT SAFEWING MP II FLIGHT PLUS

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Snow, Snow Grains or Snow Pellets ^{2,3} | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|--|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:40 - 4:00 | 0:50 - 1:50 | 1:25 - 2:00 | 0:45 - 1:00 | 0:15 - 2:00 | |
| | 75/25 | 2:35 - 4:00 | 1:00 - 1:45 | 1:35 - 2:00 | 0:50 - 1:15 | 0:15 - 1:15 | |
| | 50/50 | 1:05 - 2:20 | 0:15 - 0:25 | 0:30 - 1:05 | 0:15 - 0:20 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:40 - 2:20 | 0:35 - 1:15 | 0:35 - 1:25 ⁷ | 0:35 - 0:55 ⁷ | | |
| | 75/25 | 0:30 - 1:45 | 0:55 - 1:40 | 0:25 - 1:10 ⁷ | 0:30 - 0:45 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:20 - 0:40 | 0:06 - 0:20 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:20 - 0:40 | 0:02 - 0:09 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:20 - 0:40 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 11: TYPE II HOLDOVER TIMES FOR CRYOTECH POLAR GUARD® II

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:50 - 4:00 | 2:00 | 1:55 - 2:00 | 1:05 - 1:55 | 1:35 - 2:00 | 1:15 - 1:30 | 0:15 - 2:00 | |
| | 75/25 | 2:30 - 4:00 | 2:00 | 1:25 - 2:00 | 0:40 - 1:25 | 1:40 - 2:00 | 0:40 - 1:10 | 0:09 - 1:40 | |
| | 50/50 | 0:50 - 1:25 | 1:10 | 0:25 - 1:10 | 0:10 - 0:25 | 0:20 - 0:45 | 0:09 - 0:20 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:55 - 2:30 | 2:00 | 1:10 - 2:00 | 0:40 - 1:10 | 0:35 - 1:35 ⁷ | 0:35 - 0:45 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:40 - 1:30 | 2:00 | 0:55 - 2:00 | 0:25 - 0:55 | 0:25 - 1:05 ⁷ | 0:35 - 0:45 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:25 - 0:50 | 1:35 | 0:35 - 1:35 | 0:10 - 0:35 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:25 - 0:50 | 0:40 | 0:15 - 0:40 | 0:04 - 0:15 | | | | |
| below -25 to -30.5°C (below -13 to -22.9°F) | 100/0 | 0:25 - 0:50 | 0:25 | 0:08 - 0:25 | 0:02 - 0:08 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 12: TYPE II HOLDOVER TIMES FOR KILFROST ABC-ICE CLEAR II

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:00 - 1:45 | 1:45 | 0:50 - 1:45 | 0:25 - 0:50 | 0:40 - 1:05 | 0:25 - 0:35 | 0:07 - 0:45 | |
| | 75/25 | 0:50 - 1:10 | 1:20 | 0:40 - 1:20 | 0:20 - 0:40 | 0:30 - 0:45 | 0:20 - 0:30 | 0:05 - 0:35 | |
| | 50/50 | 0:15 - 0:30 | 0:20 | 0:15 - 0:20 | 0:08 - 0:15 | 0:10 - 0:20 | 0:07 - 0:10 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:40 - 1:35 | 1:15 | 0:35 - 1:15 | 0:20 - 0:35 | 0:25 - 1:00 ⁷ | 0:15 - 0:30 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:40 - 1:20 | 0:55 | 0:25 - 0:55 | 0:15 - 0:25 | 0:25 - 0:45 ⁷ | 0:15 - 0:20 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:20 - 0:40 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:20 - 0:40 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |
| below -25 to -29.5°C (below -13 to -21.1°F) | 100/0 | 0:20 - 0:40 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 13: TYPE II HOLDOVER TIMES FOR KILFROST ABC-K PLUS

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Snow, Snow Grains or Snow Pellets ^{2,3} | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|--|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:15 - 3:45 | 1:00 - 1:40 | 1:50 - 2:00 | 1:00 - 1:25 | 0:20 - 2:00 | |
| | 75/25 | 1:40 - 2:30 | 0:35 - 1:10 | 1:25 - 2:00 | 0:50 - 1:10 | 0:15 - 2:00 | |
| | 50/50 | 0:35 - 1:05 | 0:07 - 0:15 | 0:20 - 0:30 | 0:10 - 0:15 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:30 - 1:05 | 0:50 - 1:25 | 0:25 - 1:00 ⁷ | 0:15 - 0:35 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:25 - 1:25 | 0:35 - 1:05 | 0:20 - 0:55 ⁷ | 0:09 - 0:30 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:30 - 0:55 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:30 - 0:55 | 0:02 - 0:09 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:30 - 0:55 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 14: TYPE II HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY-2

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Snow, Snow Grains or Snow Pellets ^{2,3} | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|--|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:15 - 2:25 | 0:30 - 0:55 | 0:35 - 1:05 | 0:25 - 0:35 | 0:08 - 0:45 | |
| | 75/25 | 0:50 - 1:30 | 0:20 - 0:40 | 0:25 - 0:45 | 0:15 - 0:25 | 0:05 - 0:25 | |
| | 50/50 | 0:25 - 0:35 | 0:15 - 0:25 | 0:10 - 0:20 | 0:07 - 0:10 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:45 - 1:30 | 0:15 - 0:30 | 0:20 - 0:45 ⁷ | 0:15 - 0:20 ⁷ | | |
| | 75/25 | 0:30 - 1:05 | 0:10 - 0:20 | 0:15 - 0:30 ⁷ | 0:08 - 0:15 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:25 - 0:35 | 0:06 - 0:20 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:25 - 0:35 | 0:02 - 0:09 | | | | |
| below -25 to -28°C (below -13 to -18.4°F) | 100/0 | 0:25 - 0:35 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 15: TYPE II HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY-2 BIO+

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:25 - 2:30 | 2:00 | 1:05 - 2:00 | 0:30 - 1:05 | 0:50 - 1:20 | 0:25 - 0:45 | 0:08 - 1:15 | |
| | 75/25 | 0:45 - 1:20 | 1:20 | 0:40 - 1:20 | 0:20 - 0:40 | 0:25 - 0:50 | 0:15 - 0:25 | 0:06 - 0:35 | |
| | 50/50 | 0:15 - 0:30 | 0:25 | 0:15 - 0:25 | 0:08 - 0:15 | 0:10 - 0:20 | 0:08 - 0:10 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:40 - 1:30 | 1:00 | 0:30 - 1:00 | 0:15 - 0:30 | 0:35 - 1:05 ⁷ | 0:15 - 0:30 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:30 - 1:05 | 0:35 | 0:20 - 0:35 | 0:08 - 0:20 | 0:20 - 0:35 ⁷ | 0:15 - 0:20 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:20 - 1:00 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:20 - 1:00 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |
| below -25 to -28.5°C (below -13 to -19.3°F) | 100/0 | 0:20 - 1:00 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE 16: TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX
APPLIED UNHEATED ON LOW SPEED AIRCRAFT¹**

| Outside Air Temperature ² | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{3,4} | Light Snow, Snow Grains or Snow Pellets ^{3,4} | Moderate Snow, Snow Grains or Snow Pellets ³ | Freezing Drizzle ⁵ | Light Freezing Rain | Rain on Cold Soaked Wing ⁶ | Other ⁷ |
|--|---|------------------------------|---|--|---|-------------------------------|---------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:45 - 1:55 | 1:20 | 0:40 - 1:20 | 0:18 - 0:40 | 0:25 - 0:50 | 0:14 - 0:25 | 0:05 - 0:40 | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -10°C (below 27 to 14°F) | 100/0 | 0:50 - 1:40 | 1:20 | 0:40 - 1:20 | 0:18 - 0:40 | 0:25 - 0:45 | 0:15 - 0:25 | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | | |
| below -10 to -16°C (below 14 to 3.2°F) | 100/0 | 0:40 - 1:45 | 1:20 | 0:40 - 1:20 | 0:18 - 0:40 | | | | |

NOTES

- 1 These holdover times are for aircraft conforming to the SAE AS5900 low speed aerodynamic test criterion. Fluid must be applied unheated to use these holdover times. No holdover times exist for this fluid applied heated.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type III fluid cannot be used.
- 3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 5 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 6 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE 17: TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX
APPLIED UNHEATED ON HIGH SPEED AIRCRAFT¹**

| Outside Air Temperature ² | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{3,4} | Light Snow, Snow Grains or Snow Pellets ^{3,4} | Moderate Snow, Snow Grains or Snow Pellets ³ | Freezing Drizzle ⁵ | Light Freezing Rain | Rain on Cold Soaked Wing ⁶ | Other ⁷ |
|---|---|------------------------------|---|--|---|-------------------------------|---------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:45 - 1:55 | 1:20 | 0:40 - 1:20 | 0:18 - 0:40 | 0:25 - 0:50 | 0:14 - 0:25 | 0:05 - 0:40 | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -10°C (below 27 to 14°F) | 100/0 | 0:50 - 1:40 | 1:20 | 0:40 - 1:20 | 0:18 - 0:40 | 0:25 - 0:45 | 0:15 - 0:25 | | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -10 to -25°C (below 14 to -13°F) | 100/0 | 0:40 - 1:45 | 1:20 | 0:40 - 1:20 | 0:18 - 0:40 | | | | |
| below -25 to -35°C (below -13 to -31°F) | 100/0 | 0:25 - 1:00 | 0:45 | 0:20 - 0:45 | 0:10 - 0:20 | | | | |

NOTES

- 1 These holdover times are for aircraft conforming to the SAE AS5900 high speed aerodynamic test criterion. Fluid must be applied unheated to use these holdover times. No holdover times exist for this fluid applied heated.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type III fluid cannot be used.
- 3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 5 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 6 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 38 provides allowance times for ice pellets and small hail).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE 18: TYPE III HOLDOVER TIMES FOR CLARIANT SAFEWING MP III 2031 ECO
APPLIED HEATED ON LOW SPEED AIRCRAFT¹**

| Outside Air Temperature ² | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{3,4} | Light Snow, Snow Grains or Snow Pellets ^{3,4} | Moderate Snow, Snow Grains or Snow Pellets ³ | Freezing Drizzle ⁵ | Light Freezing Rain | Rain on Cold Soaked Wing ⁶ | Other ⁷ |
|--|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:25 - 0:50 | 0:40 | 0:20 - 0:40 | 0:10 - 0:20 | 0:17 - 0:30 | 0:10 - 0:14 | 0:05 - 0:30 | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:19 - 0:40 | 0:35 | 0:16 - 0:35 | 0:07 - 0:16 | 0:13 - 0:20 | 0:08 - 0:09 | 0:03 - 0:18 | |
| | 50/50 | 0:13 - 0:18 | 0:25 | 0:13 - 0:25 | 0:07 - 0:13 | 0:13 - 0:14 | 0:07 - 0:07 | | |
| below -3 to -10°C (below 27 to 14°F) | 100/0 | 0:35 - 1:15 | 0:40 | 0:20 - 0:40 | 0:10 - 0:20 | 0:14 - 0:30 | 0:09 - 0:13 | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:19 - 0:45 ⁸ | 0:25 ⁸ | 0:12 - 0:25 ⁸ | 0:05 - 0:12 ⁸ | 0:09 - 0:16 ⁸ | 0:06 - 0:08 ⁸ | | |
| below -10 to -16.5°C (below 14 to 2.3°F) | 100/0 | 0:25 - 0:45 | 0:40 | 0:19 - 0:40 | 0:09 - 0:19 | | | | |

NOTES

- 1 These holdover times are for aircraft conforming to the SAE AS5900 low speed aerodynamic test criterion. Fluid must be applied heated to use these holdover times. No holdover times exist for this fluid applied unheated.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type III fluid cannot be used.
- 3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 5 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 6 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 8 No holdover time guidelines exist for 75/25 fluid below -9°C (15.8°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE 19: TYPE III HOLDOVER TIMES FOR CLARIANT SAFEWING MP III 2031 ECO
APPLIED HEATED ON HIGH SPEED AIRCRAFT¹**

| Outside Air Temperature ² | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{3,4} | Light Snow, Snow Grains or Snow Pellets ^{3,4} | Moderate Snow, Snow Grains or Snow Pellets ³ | Freezing Drizzle ⁵ | Light Freezing Rain | Rain on Cold Soaked Wing ⁶ | Other ⁷ |
|---|---|------------------------------|---|--|---|-------------------------------|---------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:25 - 0:50 | 0:40 | 0:20 - 0:40 | 0:10 - 0:20 | 0:17 - 0:30 | 0:10 - 0:14 | 0:05 - 0:30 | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:19 - 0:40 | 0:35 | 0:16 - 0:35 | 0:07 - 0:16 | 0:13 - 0:20 | 0:08 - 0:09 | 0:03 - 0:18 | |
| | 50/50 | 0:13 - 0:18 | 0:25 | 0:13 - 0:25 | 0:07 - 0:13 | 0:13 - 0:14 | 0:07 - 0:07 | | |
| below -3 to -10°C (below 27 to 14°F) | 100/0 | 0:35 - 1:15 | 0:40 | 0:20 - 0:40 | 0:10 - 0:20 | 0:14 - 0:30 | 0:09 - 0:13 | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:19 - 0:45 | 0:25 | 0:12 - 0:25 | 0:05 - 0:12 | 0:09 - 0:16 | 0:06 - 0:08 | | |
| below -10 to -25°C (below 14 to -13°F) | 100/0 | 0:25 - 0:45 | 0:40 | 0:19 - 0:40 | 0:09 - 0:19 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:25 - 0:45 | 0:40 | 0:19 - 0:40 | 0:09 - 0:19 | | | | |

NOTES

- 1 These holdover times are for aircraft conforming to the SAE AS5900 high speed aerodynamic test criterion. Fluid must be applied heated to use these holdover times. No holdover times exist for this fluid applied unheated.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type III fluid cannot be used.
- 3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 5 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 6 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 38 provides allowance times for ice pellets and small hail).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 20: GENERIC HOLDOVER TIMES FOR SAE TYPE IV FLUIDS

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:15 - 2:40 | 2:00 | 1:10 - 2:00 | 0:35 - 1:10 | 0:40 - 1:30 | 0:25 - 0:40 | 0:08 - 1:10 | |
| | 75/25 | 1:25 - 2:40 | 2:00 | 1:15 - 2:00 | 0:40 - 1:15 | 0:50 - 1:20 | 0:30 - 0:45 | 0:09 - 1:15 | |
| | 50/50 | 0:25 - 0:50 | 0:40 | 0:25 - 0:40 | 0:10 - 0:25 | 0:15 - 0:30 | 0:09 - 0:15 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:20 - 1:35 | 1:20 | 0:45 - 1:20 | 0:25 - 0:45 | 0:25 - 1:20 ⁷ | 0:20 - 0:25 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:30 - 1:10 | 1:40 | 0:45 - 1:40 | 0:20 - 0:45 | 0:15 - 1:05 ⁷ | 0:15 - 0:25 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:20 - 0:40 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:20 - 0:40 ⁸ | 0:20 ⁸ | 0:09 - 0:20 ⁸ | 0:02 - 0:09 ⁸ | | | | |
| below -25°C to LOUT (below -13°F to LOUT) | 100/0 | 0:20 - 0:40 ⁸ | 0:20 ⁸ | 0:06 - 0:20 ⁸ | 0:01 - 0:06 ⁸ | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).
- 8 If the LOUT is unknown, no holdover time guidelines exist below -22.5°C (-8.5°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 21: TYPE IV HOLDOVER TIMES FOR ABAX ECOWING AD-49

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 3:20 - 4:00 | 2:00 | 1:55 - 2:00 | 1:00 - 1:55 | 1:25 - 2:00 | 1:00 - 1:25 | 0:10 - 1:55 | |
| | 75/25 | 2:25 - 4:00 | 2:00 | 1:35 - 2:00 | 0:45 - 1:35 | 1:55 - 2:00 | 0:50 - 1:30 | 0:10 - 1:40 | |
| | 50/50 | 0:25 - 0:50 | 0:40 | 0:25 - 0:40 | 0:15 - 0:25 | 0:15 - 0:30 | 0:10 - 0:15 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:20 - 1:35 | 2:00 | 1:15 - 2:00 | 0:40 - 1:15 | 0:25 - 1:25 ⁷ | 0:20 - 0:25 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:30 - 1:10 | 2:00 | 1:05 - 2:00 | 0:30 - 1:05 | 0:15 - 1:05 ⁷ | 0:15 - 0:25 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:25 - 0:40 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:25 - 0:40 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |
| below -25 to -26°C (below -13 to -14.8°F) | 100/0 | 0:25 - 0:40 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 22: TYPE IV HOLDOVER TIMES FOR CHEMCO CHEMR EG IV

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:05 - 3:35 | 2:00 | 1:15 - 2:00 | 0:35 - 1:15 | 0:45 - 1:40 | 0:25 - 0:40 | 0:09 - 1:45 | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 1:25 - 3:40 | 2:00 | 1:15 - 2:00 | 0:35 - 1:15 | 1:00 - 1:35 ⁷ | 0:35 - 0:50 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:40 - 1:25 | 0:40 | 0:30 - 0:40 | 0:15 - 0:30 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:40 - 1:25 | 0:40 | 0:30 - 0:40 | 0:15 - 0:30 | | | | |
| below -25 to -27°C (below -13 to -16.6°F) | 100/0 | 0:40 - 1:25 | 0:40 | 0:30 - 0:40 | 0:15 - 0:30 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 23: TYPE IV HOLDOVER TIMES FOR CLARIANT MAX FLIGHT 04

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:40 - 4:00 | 2:00 | 2:00 - 2:00 | 1:25 - 2:00 | 2:00 - 2:00 | 1:10 - 1:30 | 0:20 - 2:00 | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:50 - 2:30 | 2:00 | 1:10 - 2:00 | 0:35 - 1:10 | 0:25 - 1:30 ⁷ | 0:20 - 0:40 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:20 - 0:45 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -23.5°C (below 0 to -10.3°F) | 100/0 | 0:20 - 0:45 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 24: TYPE IV HOLDOVER TIMES FOR CLARIANT MAX FLIGHT AVIA

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 3:05 - 4:00 | 2:00 | 1:45 - 2:00 | 1:00 - 1:45 | 1:25 - 2:00 | 0:55 - 1:10 | 0:09 - 2:00 | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 1:45 - 3:55 | 2:00 | 1:15 - 2:00 | 0:40 - 1:15 | 1:10 - 2:00 ⁷ | 0:55 - 1:30 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:35 - 1:25 | 0:40 | 0:30 - 0:40 | 0:15 - 0:30 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:35 - 1:25 | 0:40 | 0:30 - 0:40 | 0:15 - 0:30 | | | | |
| below -25 to -28.5°C (below -13 to -19.3°F) | 100/0 | 0:35 - 1:25 | 0:40 | 0:30 - 0:40 | 0:15 - 0:30 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 25: TYPE IV HOLDOVER TIMES FOR CLARIANT MAX FLIGHT SNEG

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:25 - 4:00 | 2:00 | 1:40 - 2:00 | 0:55 - 1:40 | 2:00 - 2:00 | 0:50 - 1:40 | 0:20 - 1:30 | |
| | 75/25 | 4:00 - 4:00 | 2:00 | 1:30 - 2:00 | 0:55 - 1:30 | 1:30 - 2:00 | 1:05 - 1:20 | 0:15 - 1:45 | |
| | 50/50 | 1:30 - 3:30 | 1:45 | 0:45 - 1:45 | 0:20 - 0:45 | 0:35 - 1:10 | 0:15 - 0:30 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:45 - 2:20 | 2:00 | 1:10 - 2:00 | 0:40 - 1:10 | 0:30 - 1:25 ⁷ | 0:25 - 0:40 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:30 - 1:25 | 1:40 | 1:00 - 1:40 | 0:40 - 1:00 | 0:20 - 1:05 ⁷ | 0:20 - 0:40 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:20 - 0:50 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:20 - 0:50 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:20 - 0:50 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 26: TYPE IV HOLDOVER TIMES FOR CLARIANT SAFEWING EG IV NORTH

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:20 - 3:55 | 2:00 | 1:40 - 2:00 | 0:50 - 1:40 | 1:30 - 2:00 | 0:50 - 0:55 | 0:08 - 2:00 | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 1:45 - 4:00 | 2:00 | 1:30 - 2:00 | 0:50 - 1:30 | 1:05 - 1:50 ⁷ | 0:55 - 1:25 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:40 - 1:20 | 0:40 | 0:30 - 0:40 | 0:15 - 0:30 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:40 - 1:20 | 0:40 | 0:30 - 0:40 | 0:15 - 0:30 | | | | |
| below -25 to -30°C (below -13 to -22°F) | 100/0 | 0:40 - 1:20 | 0:40 | 0:30 - 0:40 | 0:15 - 0:30 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 27: TYPE IV HOLDOVER TIMES FOR CLARIANT SAFEWING MP IV LAUNCH

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 4:00 - 4:00 | 2:00 | 1:45 - 2:00 | 1:05 - 1:45 | 1:30 - 2:00 | 1:00 - 1:40 | 0:15 - 1:40 | |
| | 75/25 | 3:40 - 4:00 | 2:00 | 1:45 - 2:00 | 1:00 - 1:45 | 1:40 - 2:00 | 0:45 - 1:15 | 0:10 - 1:45 | |
| | 50/50 | 1:25 - 2:45 | 1:25 | 0:45 - 1:25 | 0:25 - 0:45 | 0:30 - 0:50 | 0:20 - 0:25 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 1:00 - 1:55 | 2:00 | 1:20 - 2:00 | 0:50 - 1:20 | 0:35 - 1:40 ⁷ | 0:25 - 0:45 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:40 - 1:20 | 2:00 | 1:25 - 2:00 | 0:45 - 1:25 | 0:25 - 1:10 ⁷ | 0:25 - 0:45 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:30 - 0:50 | 1:15 | 0:20 - 1:15 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:30 - 0:50 | 0:30 | 0:09 - 0:30 | 0:02 - 0:09 | | | | |
| below -25 to -28.5°C (below -13 to -19.3°F) | 100/0 | 0:30 - 0:50 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 28: TYPE IV HOLDOVER TIMES FOR CLARIANT SAFEWING MP IV LAUNCH PLUS

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|---|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 3:55 - 4:00 | 2:00 | 2:00 - 2:00 | 0:55 - 2:00 | 2:00 - 2:00 | 1:00 - 2:00 | 0:20 - 2:00 | CAUTION: No holdover time guidelines exist |
| | 75/25 | 3:55 - 4:00 | 2:00 | 1:55 - 2:00 | 0:50 - 1:55 | 2:00 - 2:00 | 1:20 - 1:25 | 0:20 - 1:50 | |
| | 50/50 | 1:15 - 1:50 | 1:35 | 0:45 - 1:35 | 0:20 - 0:45 | 0:25 - 1:00 | 0:15 - 0:20 | 0:20 - 2:00 | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:55 - 2:15 | 2:00 | 1:25 - 2:00 | 0:40 - 1:25 | 0:25 - 1:35 ⁷ | 0:25 - 0:40 ⁷ | 0:20 - 0:30 ⁷ | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:40 - 2:00 | 2:00 | 1:15 - 2:00 | 0:30 - 1:15 | 0:20 - 1:05 ⁷ | 0:20 - 0:30 ⁷ | 0:20 - 0:30 ⁷ | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:25 - 0:50 | 1:15 | 0:25 - 1:15 | 0:07 - 0:25 | CAUTION: No holdover time guidelines exist | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:25 - 0:50 | 0:30 | 0:09 - 0:30 | 0:03 - 0:09 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:25 - 0:50 | 0:20 | 0:06 - 0:20 | 0:02 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 29: TYPE IV HOLDOVER TIMES FOR CRYOTECH POLAR GUARD® ADVANCE

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:50 - 4:00 | 2:00 | 1:55 - 2:00 | 1:05 - 1:55 | 1:35 - 2:00 | 1:15 - 1:30 | 0:15 - 2:00 | |
| | 75/25 | 2:30 - 4:00 | 2:00 | 1:25 - 2:00 | 0:40 - 1:25 | 1:40 - 2:00 | 0:40 - 1:10 | 0:09 - 1:40 | |
| | 50/50 | 0:50 - 1:25 | 1:10 | 0:25 - 1:10 | 0:10 - 0:25 | 0:20 - 0:45 | 0:09 - 0:20 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:55 - 2:30 | 2:00 | 1:10 - 2:00 | 0:40 - 1:10 | 0:35 - 1:35 ⁷ | 0:35 - 0:45 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:40 - 1:30 | 2:00 | 0:55 - 2:00 | 0:25 - 0:55 | 0:25 - 1:05 ⁷ | 0:35 - 0:45 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:25 - 0:50 | 1:35 | 0:35 - 1:35 | 0:10 - 0:35 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:25 - 0:50 | 0:40 | 0:15 - 0:40 | 0:04 - 0:15 | | | | |
| below -25 to -30.5°C (below -13 to -22.9°F) | 100/0 | 0:25 - 0:50 | 0:25 | 0:08 - 0:25 | 0:02 - 0:08 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 30: TYPE IV HOLDOVER TIMES FOR DOW CHEMICAL UCAR™ ENDURANCE EG106

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:05 - 3:10 | 2:00 | 1:20 - 2:00 | 0:40 - 1:20 | 1:10 - 2:00 | 0:50 - 1:15 | 0:20 - 2:00 | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 1:50 - 3:20 | 2:00 | 1:05 - 2:00 | 0:30 - 1:05 | 0:55 - 1:50 ⁷ | 0:45 - 1:10 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:30 - 1:05 | 1:45 | 0:50 - 1:45 | 0:25 - 0:50 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:30 - 1:05 | 1:30 | 0:40 - 1:30 | 0:20 - 0:40 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:30 - 1:05 | 1:20 | 0:40 - 1:20 | 0:20 - 0:40 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 31: TYPE IV HOLDOVER TIMES FOR DOW CHEMICAL UCAR™ FLIGHTGUARD AD-49

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 3:20 - 4:00 | 2:00 | 1:55 - 2:00 | 1:00 - 1:55 | 1:25 - 2:00 | 1:00 - 1:25 | 0:10 - 1:55 | |
| | 75/25 | 2:25 - 4:00 | 2:00 | 1:35 - 2:00 | 0:45 - 1:35 | 1:55 - 2:00 | 0:50 - 1:30 | 0:10 - 1:40 | |
| | 50/50 | 0:25 - 0:50 | 0:40 | 0:25 - 0:40 | 0:15 - 0:25 | 0:15 - 0:30 | 0:10 - 0:15 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:20 - 1:35 | 2:00 | 1:15 - 2:00 | 0:40 - 1:15 | 0:25 - 1:25 ⁷ | 0:20 - 0:25 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:30 - 1:10 | 2:00 | 1:05 - 2:00 | 0:30 - 1:05 | 0:15 - 1:05 ⁷ | 0:15 - 0:25 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:25 - 0:40 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:25 - 0:40 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |
| below -25 to -26°C (below -13 to -14.8°F) | 100/0 | 0:25 - 0:40 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 32: TYPE IV HOLDOVER TIMES FOR INLAND TECHNOLOGIES ECO-SHIELD®

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:15 - 2:40 | 2:00 | 1:20 - 2:00 | 0:45 - 1:20 | 0:40 - 1:30 | 0:35 - 0:40 | 0:15 - 1:35 | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 1:10 - 2:35 | 1:55 | 1:05 - 1:55 | 0:35 - 1:05 | 0:50 - 1:25 ⁷ | 0:30 - 0:40 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:30 - 1:00 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:30 - 1:00 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |
| below -25 to -25.5°C (below -13 to -13.9°F) | 100/0 | 0:30 - 1:00 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 33: TYPE IV HOLDOVER TIMES FOR KILFROST ABC-S PLUS

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:10 - 4:00 | 2:00 | 2:00 - 2:00 | 1:15 - 2:00 | 1:50 - 2:00 | 1:05 - 2:00 | 0:25 - 2:00 | |
| | 75/25 | 1:25 - 2:40 | 2:00 | 1:15 - 2:00 | 0:45 - 1:15 | 1:00 - 1:20 | 0:30 - 0:50 | 0:10 - 1:20 | |
| | 50/50 | 0:30 - 0:55 | 1:00 | 0:30 - 1:00 | 0:15 - 0:30 | 0:15 - 0:40 | 0:15 - 0:20 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:55 - 3:30 | 2:00 | 1:45 - 2:00 | 1:00 - 1:45 | 0:25 - 1:35 ⁷ | 0:20 - 0:30 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:45 - 1:50 | 1:45 | 1:00 - 1:45 | 0:35 - 1:00 | 0:20 - 1:10 ⁷ | 0:15 - 0:25 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:40 - 1:00 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:40 - 1:00 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |
| below -25 to -28°C (below -13 to -18.4°F) | 100/0 | 0:40 - 1:00 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 34: TYPE IV HOLDOVER TIMES FOR LNT SOLUTIONS E450

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|--|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:50 - 2:55 | 2:00 | 1:35 - 2:00 | 1:00 - 1:35 | 1:35 - 2:00 | 0:55 - 1:20 | 0:25 - 2:00 | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 1:30 - 3:55 | 1:50 | 1:10 - 1:50 | 0:45 - 1:10 | 1:45 - 2:00 ⁷ | 1:05 - 1:40 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:35 - 1:05 | 2:00 | 1:05 - 2:00 | 0:20 - 1:05 | | | | |
| below -18 to -22.5°C (below 0 to -8.5°F) | 100/0 | 0:35 - 1:05 | 2:00 | 0:40 - 2:00 | 0:15 - 0:40 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 35: TYPE IV HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY 9311

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ | | |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---|--------------------|--|--|
| -3°C and above (27°F and above) | 100/0 | 1:55 - 4:00 | 2:00 | 1:10 - 2:00 | 0:35 - 1:10 | 1:10 - 2:00 | 0:40 - 1:05 | 0:15 - 1:25 | | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:35 - 2:05 | 1:35 | 0:50 - 1:35 | 0:25 - 0:50 | 0:35 - 1:20 ⁷ | 0:20 - 0:35 ⁷ | CAUTION: No holdover time guidelines exist | | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | | | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:30 - 0:55 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:30 - 0:55 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | | | |
| below -25 to -29.5°C (below -13 to -21.1°F) | 100/0 | 0:30 - 0:55 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 36: TYPE IV HOLDOVER TIMES FOR OKSAYD DEFROST ECO 4

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:30 - 2:40 | 2:00 | 1:15 - 2:00 | 0:35 - 1:15 | 1:05 - 1:30 | 0:40 - 1:05 | 0:15 - 1:10 | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:55 - 2:35 | 2:00 | 1:00 - 2:00 | 0:30 - 1:00 | 0:50 - 1:20 ⁷ | 0:35 - 0:50 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:30 - 0:50 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:30 - 0:50 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |
| below -25 to -25.5°C (below -13 to -13.9°F) | 100/0 | 0:30 - 0:50 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE 37: TYPE IV HOLDOVER TIMES FOR SHAANXI CLEANWAY AVIATION CLEANSURFACE IV

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:50 - 4:00 | 2:00 | 1:55 - 2:00 | 1:00 - 1:55 | 2:00 - 2:00 | 1:25 - 1:30 | 0:15 - 2:00 | |
| | 75/25 | 2:35 - 4:00 | 2:00 | 1:35 - 2:00 | 0:45 - 1:35 | 0:50 - 2:00 | 0:35 - 0:45 | 0:09 - 1:15 | |
| | 50/50 | 1:05 - 2:25 | 1:40 | 0:40 - 1:40 | 0:15 - 0:40 | 0:25 - 0:50 | 0:15 - 0:20 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 1:00 - 3:05 | 1:20 | 0:45 - 1:20 | 0:25 - 0:45 | 0:35 - 1:45 ⁷ | 0:20 - 0:35 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:50 - 1:55 | 1:40 | 0:45 - 1:40 | 0:20 - 0:45 | 0:30 - 1:20 ⁷ | 0:25 - 0:40 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:30 - 0:50 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:30 - 0:50 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |
| below -25 to -28.5°C (below -13 to -19.3°F) | 100/0 | 0:30 - 0:50 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | |

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

ALLOWANCE TIMES TABLES FOR WINTER 2017-2018

TABLE 38: ALLOWANCE TIMES FOR SAE TYPE III FLUIDS¹

| Precipitation Type | Outside Air Temperature | | |
|---|-------------------------|-------------------|--|
| | -5°C and above | Below -5 to -10°C | Below -10°C ² |
| Light Ice Pellets | 10 minutes | 10 minutes | Caution: No allowance times currently exist |
| Light Ice Pellets Mixed with Snow | 10 minutes | 10 minutes | |
| Light Ice Pellets Mixed with Freezing Drizzle | 7 minutes | 5 minutes | |
| Light Ice Pellets Mixed with Freezing Rain | 7 minutes | 5 minutes | |
| Light Ice Pellets Mixed with Rain | 7 minutes ³ | | |
| Moderate Ice Pellets (or Small Hail) ⁴ | 5 minutes | 5 minutes | |

NOTES

- 1 These allowance times are for use with undiluted (100/0) fluids applied unheated on aircraft with rotation speeds of 100 knots or greater.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected.
- 3 No allowance times exist in this condition for temperatures below 0°C; consider use of light ice pellets mixed with freezing rain.
- 4 If no intensity is reported with small hail, use the "moderate ice pellets or small hail" allowance times. If an intensity is reported with small hail, the ice pellet condition with the equivalent intensity can be used, e.g. if light small hail is reported, the "light ice pellets" allowance times can be used. This also applies in mixed conditions, e.g. if light small hail mixed with snow is reported, use the "light ice pellets mixed with snow" allowance times.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- Allowance time cannot be extended by an inspection of the aircraft critical surfaces.
- Takeoff is allowed up to 90 minutes after start of fluid application if the precipitation stops at or before the allowance time expires and does not restart. The OAT must not decrease during the 90 minutes to use this guidance in conditions of light ice pellets mixed with either: freezing drizzle, freezing rain or rain.

TABLE 39: ALLOWANCE TIMES FOR SAE TYPE IV FLUIDS¹

| Precipitation Type | Outside Air Temperature | | | |
|---|-------------------------|-------------------|-------------------------|--|
| | -5°C and above | Below -5 to -10°C | Below -10 to -16°C | Below -16 to -22°C ² |
| Light Ice Pellets | 50 minutes | 30 minutes | 30 minutes ³ | 30 minutes ³ |
| Light Ice Pellets Mixed with Snow | 40 minutes | 15 minutes | 15 minutes ³ | |
| Light Ice Pellets Mixed with Freezing Drizzle | 25 minutes | 10 minutes | | Caution: No allowance times currently exist |
| Light Ice Pellets Mixed with Freezing Rain | 25 minutes | 10 minutes | | |
| Light Ice Pellets Mixed with Rain | 25 minutes ⁴ | | | |
| Moderate Ice Pellets (or Small Hail)⁵ | 25 minutes ⁶ | 10 minutes | 10 minutes ³ | 10 minutes ⁷ |
| Moderate Ice Pellets (or Small Hail)⁵ Mixed with Freezing Drizzle | 10 minutes | 7 minutes | | Caution: No allowance times currently exist |
| Moderate Ice Pellets (or Small Hail)⁵ Mixed with Rain | 10 minutes ⁸ | | | |

NOTES

- 1 These allowance times are for use with undiluted (100/0) fluids applied on aircraft with rotation speeds of 100 knots or greater. All Type IV fluids are propylene glycol based with the exception of CHEMCO ChemR EG IV, Clariant Max Flight AVIA, Clariant Safewing EG IV NORTH, Dow EG106 and LNT Solutions E450, which are ethylene glycol based.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected.
- 3 No allowance times exist for propylene glycol (PG) fluids when used on aircraft with rotation speeds less than 115 knots. (For these aircraft, if the fluid type is not known, assume zero allowance time.)
- 4 No allowance times exist in this condition for temperatures below 0°C; consider use of light ice pellets mixed with freezing rain.
- 5 If no intensity is reported with small hail, use the "moderate ice pellets or small hail" allowance times. If an intensity is reported with small hail, the ice pellet condition with the equivalent intensity can be used, e.g. if light small hail is reported, the "light ice pellets" allowance times can be used. This also applies in mixed conditions, e.g. if light small hail mixed with snow is reported, use the "light ice pellets mixed with snow" allowance times.
- 6 Allowance time is 15 minutes for propylene glycol (PG) fluids or when the fluid type is unknown.
- 7 No allowance times exist for propylene glycol (PG) fluids in this condition for temperatures below -16°C.
- 8 No allowance times exist in this condition for temperatures below 0°C.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- Allowance time cannot be extended by an inspection of the aircraft critical surfaces.
- Takeoff is allowed up to 90 minutes after start of fluid application if the precipitation stops at or before the allowance time expires and does not restart. The OAT must not decrease during the 90 minutes to use this guidance in conditions of light ice pellets mixed with either: freezing drizzle, freezing rain or rain.

SUPPLEMENTAL GUIDANCE FOR WINTER 2017-2018

TABLE 40: SNOWFALL INTENSITIES AS A FUNCTION OF PREVAILING VISIBILITY¹

| Lighting | Temperature Range | | Visibility in Snow in Statute Miles (Metres) | | | |
|----------|-------------------|--------------|--|-------------------------------|------------------------------|---------------|
| | °C | °F | Heavy | Moderate | Light | Very Light |
| Darkness | -1 and above | 30 and above | ≤1 (≤1600) | >1 to 2½ (>1600 to 4000) | >2½ to 4 (>4000 to 6400) | >4 (>6400) |
| | Below -1 | Below 30 | ≤3/4 (≤1200) | >3/4 to 1½ (>1200 to 2400) | >1½ to 3 (>2400 to 4800) | >3 (>4800) |
| Daylight | -1 and above | 30 and above | ≤½ (≤800) | >½ to 1½ (>800 to 2400) | >1½ to 3 (>2400 to 4800) | >3 (>4800) |
| | Below -1 | Below 30 | ≤3/8 (≤600) | >3/8 to 7/8 (>600 to 1400) | >7/8 to 2 (>1400 to 3200) | >2 (>3200) |

NOTES

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

HOW TO READ AND USE THE TABLE

The METAR/SPECI reported visibility or flight crew observed visibility will be used with this visibility table to establish snowfall intensity for Type I, II, III and IV holdover time guidelines, during snow, snow grain, or snow pellet precipitation conditions.

This visibility table will also be used when snow, snow grains or snow pellets are accompanied by blowing or drifting snow in the METAR/SPECI.

RVR values should not be used with this table.

Example: CYVO 160200Z 15011G17KT 1SM -SN DRSN OVC009 M06/M08 A2948

In the above METAR the snowfall intensity is reported as light. However, based upon the Transport Canada "Snowfall Intensities as a Function of Prevailing Visibility" table, with a visibility of 1 statute mile, in darkness and a temperature of -6°C, the snowfall intensity is classified as moderate. The snowfall intensity of moderate - not the METAR reported intensity of light - will be used to determine which holdover time guideline value is appropriate for the fluid in use.

TABLE 41:
TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE
(see cautions and notes on page 58)

| COMPANY NAME | FLUID NAME | TYPE OF GLYCOL ¹ | EXPIRY ² (Y-M-D) | LOWEST OPERATIONAL USE TEMPERATURE ³ | | | | |
|--|---------------------------|-----------------------------|-----------------------------|---|---|--------------------------|--|-------|
| | | | | DILUTION ^{4,5} (FLUID/WATER) | LOW SPEED AERODYNAMIC TEST ⁶ | | HIGH SPEED AERODYNAMIC TEST ⁶ | |
| | | | | | °C | °F | °C | °F |
| ABAX Industries | DE-950 | PG | 18-05-01 | 71/29 | -26 | -14.8 | -31 | -23.8 |
| ADDCON EUROPE GmbH | IceFree I.80 | PG | 21-03-14 | 70/30 | -26 | -14.8 | -32 | -25.6 |
| ALAB Industries | WDF 1 | EG | 18-04-25 | 70/30 | -40 | -40 | -45 | -49 |
| AllClear Systems LLC | Lift-Off E-188 | EG | 18-07-15 | 70/30 | -40 | -40 | -41.5 | -42.7 |
| AllClear Systems LLC | Lift-Off P-88 | PG | 18-06-11 | 70/30 | -24.5 | -12.1 | -29.5 | -21.1 |
| Arcton Ltd. | Arctica DG ready-to-use | DEG | 18-06-02 | as supplied | -26 | -14.8 | -26 | -14.8 |
| Arcton Ltd. | Arctica DG 91 Concentrate | DEG | 17-07-16 ⁹ | 75/25 | -25 ¹⁴ | -13 ¹⁴ | -25 | -13 |
| AVIAFLUID International Ltd. | AVIAFLO EG | EG | 16-11-28 ¹³ | 70/30 | -40.5 | -40.9 | -44 | -47.2 |
| Aviation Shaanxi Hi-Tech Physical Chemical Co. Ltd. | Cleanwing I | PG | 19-09-30 | 75/25 | Not tested ¹⁰ | Not tested ¹⁰ | -39.5 | -39.1 |
| Aviation Xi'an High-Tech Physical Chemical Co. Ltd. | KHF-1 | PG | 19-05-22 | 75/25 | Not tested ¹⁰ | Not tested ¹⁰ | -38.5 | -37.3 |
| Beijing Wangye Aviation Chemical Product Co Ltd. | KLA-1 | EG | 19-09-08 | 60/40 | Not tested ¹⁰ | Not tested ¹⁰ | -30.5 | -22.9 |
| Beijing Wangye Aviation Chemical Product Co Ltd. | KLA-1A | EG | 18-09-23 | 60/40 | Not tested ¹⁰ | Not tested ¹⁰ | -32 | -25.6 |
| Beijing Yadilite Aviation Advanced Materials Corporation | YD-101 Type I | PG | 21-03-07 | 60/40 | Not tested ¹⁰ | Not tested ¹⁰ | -30 | -22 |
| Beijing Yadilite Aviation Advanced Materials Corporation | YD-101A Type I | EG | 21-03-07 | 70/30 | Not tested ¹⁰ | Not tested ¹⁰ | -38 | -36.4 |
| Boryszew S.A. | Borygo Plane I | PG | 17-12-04 | 75/25 | -25 | -13 | -30 | -22 |
| CHEMCO Inc. | CHEMR EG I | EG | 20-04-01 | 70/30 | -37 | -34.6 | -43 | -45.4 |
| CHEMCO Inc. | CHEMR REG I | EG | 16-07-08 ⁹ | 75/25 | -36 | -32.8 | -40.5 | -40.9 |
| Clariant Produkte (Deutschland) GmbH | Octafllo EF Concentrate | PG | 18-03-20 | 65/35 | -25 | -13 | -33 | -27.4 |
| Clariant Produkte (Deutschland) GmbH | Octafllo EF-80 | PG | 13-12-21 ⁹ | 70/30 | -25 | -13 | -33 | -27.4 |
| Clariant Produkte (Deutschland) GmbH | Octafllo EG Concentrate | EG | 17-07-23 ⁹ | 70/30 | -40.5 | -40.9 | -44 | -47.2 |
| Clariant Produkte (Deutschland) GmbH | Octafllo LYOD | EG | 20-03-16 | 70/30 | -40 | -40 | -45.5 | -49.9 |
| Clariant Produkte (Deutschland) GmbH | Safewing EG I 1996 (88) | EG | 19-10-15 | 70/30 | -39.5 | -39.1 | -41.5 | -42.7 |
| Clariant Produkte (Deutschland) GmbH | Safewing MP I 1938 ECO | PG | 20-05-11 | 65/35 | -25.5 | -13.9 | -32 | -25.6 |

TABLE 41 (cont'd):
TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE
(see cautions and notes on page 58)

| COMPANY NAME | FLUID NAME | TYPE OF GLYCOL ¹ | EXPIRY ² (Y-M-D) | LOWEST OPERATIONAL USE TEMPERATURE ³ | | | | |
|--|--|-----------------------------|-----------------------------|---|---|--------------------------|--|-------|
| | | | | DILUTION ^{4,5} (FLUID/WATER) | LOW SPEED AERODYNAMIC TEST ⁶ | | HIGH SPEED AERODYNAMIC TEST ⁶ | |
| | | | | | °C | °F | °C | °F |
| Clariant Produkte (Deutschland) GmbH | Safewing MP I 1938 ECO (80) | PG | 20-05-20 | 71/29 | -25 | -13 | -32.5 | -26.5 |
| Clariant Produkte (Deutschland) GmbH | Safewing MP I 1938 ECO (80) Premix 55% i.g. ready-to-use | PG | 21-02-24 | as supplied | Not tested ¹⁰ | Not tested ¹⁰ | -19 | -2.2 |
| Clariant Produkte (Deutschland) GmbH | Safewing MP I ECO PLUS (80) | PG | 19-03-13 | 71/29 | -25 | -13 | -33 | -27.4 |
| Clariant Produkte (Deutschland) GmbH | Safewing MP I LFD 88 | PG | 19-04-06 | 65/35 | -26 | -14.8 | -33 | -27.4 |
| Cryotech Deicing Technology | Polar Plus® | PG | 20-01-13 | 63/37 | -27 | -16.6 | -32 | -25.6 |
| Cryotech Deicing Technology | Polar Plus® LT | PG | 20-01-26 | 63/37 | -27 | -16.6 | -33 | -27.4 |
| Cryotech Deicing Technology | Polar Plus® LT (80) | PG | 20-04-12 | 70/30 | -27 | -16.6 | -33 | -27.4 |
| Cryotech Deicing Technology | Polar Plus® (80) | PG | 17-09-12 | 70/30 | -24.5 | -12.1 | -32.5 | -26.5 |
| Dow Chemical Company | UCAR™ ADF Concentrate | EG | 19-05-11 | 75/25 | -36 | -32.8 | -45 | -49 |
| Dow Chemical Company | UCAR™ ADF XL54 ¹⁶ | EG | 19-05-11 | as supplied | -33 | -27.4 | -33 | -27.4 |
| Dow Chemical Company | UCAR™ PG ADF Concentrate | PG | 19-05-11 | 65/35 | -25 | -13 | -32 | -25.6 |
| Dow Chemical Company | UCAR™ PG ADF Dilute 55/45 ¹⁷ | PG | 19-05-11 | as supplied | -24 | -11.2 | -25 | -13 |
| DR Energy Group LTD. | Northern Guard I | EG | 17-06-16 ¹³ | 65/35 | Not tested ¹⁰ | Not tested ¹⁰ | -39.5 | -39.1 |
| Heilongjiang Hangjie Aero-chemical Technology Co. Ltd. | HJF-1 | EG | 21-06-14 | 65/35 | Not tested ¹⁰ | Not tested ¹⁰ | -42 | -43.6 |
| Heilongjiang Hangjie Aero-chemical Technology Co. Ltd. | HJF-1A | EG | 16-09-02 ⁹ | 75/25 | Not tested ¹⁰ | Not tested ¹⁰ | -40.5 | -40.9 |
| HOC Industries | SafeTemp® ES Plus | PG | 20-04-12 | 65/35 | -25.5 | -13.9 | -29 | -20.2 |
| Inland Technologies | DuraGly-E Type I ADF Concentrate | EG | 19-01-13 | 60/40 | -33 | -27.4 | -33 | -27.4 |
| Inland Technologies | DuraGly-P Type I ADF Concentrate | PG | 15-02-04 ⁹ | 60/40 | -25 | -13 | -25 | -13 |
| Inland Technologies | Inland ADF Concentrate ¹² (Multiple Location) | EG | Y-M-D ¹² | 75/25 | -36 | -32.8 | -42.5 | -44.5 |
| Inland Technologies | Safetemp® ES Plus (Multiple Location) | PG | 18-08-29 | 65/35 | -25.5 | -13.9 | -31 | -23.8 |
| Kilfrost Limited | Kilfrost DF Plus | PG | 19-07-16 | 69/31 | -25.5 | -13.9 | -32 | -25.6 |
| Kilfrost Limited | Kilfrost DF Plus (80) | PG | 20-05-02 | 69/31 | -26 | -14.8 | -31.5 | -24.7 |
| Kilfrost Limited | Kilfrost DF Plus (88) | PG | 19-07-16 | 63/37 | -25.5 | -13.9 | -32 | -25.6 |

TABLE 41 (cont'd):
TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE
(see cautions and notes on page 58)

| COMPANY NAME | FLUID NAME | TYPE OF GLYCOL ¹ | EXPIRY ² (Y-M-D) | LOWEST OPERATIONAL USE TEMPERATURE ³ | | | | |
|---|--------------------------------|-----------------------------|-----------------------------|---|---|--------------------------|--|-------|
| | | | | DILUTION ^{4,5} (FLUID/WATER) | LOW SPEED AERODYNAMIC TEST ⁶ | | HIGH SPEED AERODYNAMIC TEST ⁶ | |
| | | | | | °C | °F | °C | °F |
| Kilfrost Limited | Kilfrost DF ^{Sustain} | NCG | 19-08-06 | 68/32 | -34 | -29.2 | -41 | -41.8 |
| LNT Solutions | LNT E188 | EG | 17-10-01 | 70/30 | -30.5 | -22.9 | -41 | -41.8 |
| LNT Solutions | LNT P180 | PG | 17-10-04 | 69/31 | -26 | -14.8 | -32 | -25.6 |
| LNT Solutions | LNT P188 | PG | 18-11-28 | 70/30 | -24.5 | -12.1 | -31.5 | -24.7 |
| Newave Aerochemical Co. Ltd. | FCY-1A | EG | 19-02-20 | 75/25 | -40 | -40 | -40 | -40 |
| Newave Aerochemical Co. Ltd. | FCY-1Bio+ | EG | 20-07-22 | 75/25 | Not tested ¹⁰ | Not tested ¹⁰ | -40.5 | -40.9 |
| Oksayd Co. Ltd. | DEFROST EG 88.1 | EG | 19-04-24 | 70/30 | -40.5 | -40.9 | -44.5 | -48.1 |
| Shaanxi Cleanway Aviation Chemical Co., Ltd | Cleansurface I | EG | 17-09-12 | 75/25 | -32.5 ¹⁴ | -26.5 ¹⁴ | -40.5 | -40.9 |
| Shaanxi Cleanway Aviation Chemical Co., Ltd | Cleansurface I-BIO | EG | 18-07-11 | 75/25 | Not tested ¹⁰ | Not tested ¹⁰ | -37 | -34.6 |
| Velvana a.s. ¹¹ | AIRVEL OK 1 | PG | 17-01-28 ⁹ | 70/30 | -26 | -14.8 | -30 | -22 |
| Xinjiang Zhongtian | Clearice-I Type I | EG | 19-05-24 | 60/40 | Not tested ¹⁰ | Not tested ¹⁰ | -30 | -22 |

TABLE 42:
TYPE II FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE
(see cautions and notes on page 58)

| COMPANY NAME | FLUID NAME | TYPE OF GLYCOL ¹ | EXPIRY ² (Y-M-D) | DILUTION (FLUID/WATER) | LOWEST OPERATIONAL USE TEMPERATURE ³ | | LOWEST ON-WING VISCOSITY ^{7,8} (mPa.s) | |
|--|----------------------------|-----------------------------|-----------------------------|------------------------|---|-------|---|----------------|
| | | | | | HIGH SPEED AERODYNAMIC TEST ⁶ | | MANUFACTURER METHOD | AS 9968 METHOD |
| | | | | | °C | °F | | |
| ABAX Industries | ECOWING 26 | PG | 17-04-28 ⁹ | 100/0 | -25 | -13 | 4 900 (f) | 4 600 (a) |
| | | | | 75/25 | -14 | 7 | 2 200 (a) | 2 200 (a) |
| | | | | 50/50 | -3 | 27 | 50 (a) | 50 (a) |
| ABAX Industries | ECOWING AD-2 | PG | 19-04-19 | 100/0 | -27 | -16.6 | 5 750 (a) | 5 750 (a) |
| | | | | 75/25 | -14 | 7 | 12 000 (c) | 12 000 (c) |
| | | | | 50/50 | -3 | 27 | 7 500 (a) | 7 500 (a) |
| Aviation Shaanxi Hi-Tech Physical Chemical Co. Ltd. | Cleanwing II | PG | 19-05-11 | 100/0 | -25 | -13 | 4 650 (d) | 4 500 (a) |
| | | | | 75/25 | -14 | 7 | 9 450 (d) | 10 000 (a) |
| | | | | 50/50 | -3 | 27 | 10 150 (d) | 10 200 (a) |
| Beijing Yadilite Aviation Advanced Materials Corporation | YD-102 Type II | PG | 18-02-26 | 100/0 | -29 | -20.2 | 4 500 (a) | 4 500 (a) |
| | | | | 75/25 | -14 | 7 | 12 850 (a) | 12 850 (a) |
| | | | | 50/50 | -3 | 27 | 820 (a) | 300 (k) |
| Clariant Produkte (Deutschland) GmbH | Safewing MP II FLIGHT | PG | 18-05-11 | 100/0 | -29 | -20.2 | 3 340 (a) | 3 340 (a) |
| | | | | 75/25 | -14 | 7 | 12 900 (c) | 12 900 (c) |
| | | | | 50/50 | -3 | 27 | 11 500 (a) | 11 500 (a) |
| Clariant Produkte (Deutschland) GmbH | Safewing MP II FLIGHT PLUS | PG | 18-04-06 | 100/0 | -29 | -20.2 | 3 650 (l) | 3 100 (a) |
| | | | | 75/25 | -14 | 7 | 12 400 (l) | 10 450 (a) |
| | | | | 50/50 | -3 | 27 | 7 800 (l) | 7 050 (a) |
| Cryotech Deicing Technology | Polar Guard® II | PG | 19-03-06 | 100/0 | -30.5 | -22.9 | 4 400 (e) | 4 050 (a) |
| | | | | 75/25 | -14 | 7 | 11 600 (e) | 9 750 (a) |
| | | | | 50/50 | -3 | 27 | 80 (a) | 80 (a) |
| Kilfrost Limited | ABC-Ice Clear II | PG | 17-05-13 ⁹ | 100/0 | -29.5 | -21.1 | 7 720 (a) | 7 720 (a) |
| | | | | 75/25 | -14 | 7 | 5 660 (a) | 5 660 (a) |
| | | | | 50/50 | -3 | 27 | 580 (a) | 558 (k) |
| Kilfrost Limited | ABC-K Plus | PG | 18-11-22 | 100/0 | -29 | -20.2 | 2 850 (d) | 2 640 (a) |
| | | | | 75/25 | -14 | 7 | 12 650 (d) | 12 650 (c) |
| | | | | 50/50 | -3 | 27 | 4 200 (d) | 5 260 (a) |
| Newave Aerochemical Co. Ltd. | FCY-2 | PG | 19-03-16 | 100/0 | -28 | -18.4 | 7 000 (d) | 8 920 (a) |
| | | | | 75/25 | -14 | 7 | 18 550 (d) | 18 550 (c) |
| | | | | 50/50 | -3 | 27 | 6 750 (d) | 7 030 (a) |

TABLE 42 (cont'd):
TYPE II FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE
(see cautions and notes on page 58)

| COMPANY NAME | FLUID NAME | TYPE OF GLYCOL ¹ | EXPIRY ² (Y-M-D) | DILUTION (FLUID/WATER) | LOWEST OPERATIONAL USE TEMPERATURE ³ | | LOWEST ON-WING VISCOSITY ^{7,8} (mPa.s) | |
|------------------------------|------------|-----------------------------|-----------------------------|------------------------|---|-------|---|----------------|
| | | | | | HIGH SPEED AERODYNAMIC TEST ⁶ | | MANUFACTURER METHOD | AS 9968 METHOD |
| | | | | | °C | °F | | |
| Newave Aerochemical Co. Ltd. | FCY-2 Bio+ | PG | 19-04-10 | 100/0 | -28.5 | -19.3 | 7 210 (a) | 7 210 (a) |
| | | | | 75/25 | -14 | 7 | 21 400 (c) | 21 400 (c) |
| | | | | 50/50 | -3 | 27 | 1 900 (a) | 1 900 (a) |

TABLE 43:
TYPE III FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE
(see cautions and notes on page 58)

| COMPANY NAME | FLUID NAME | TYPE OF GLYCOL ¹ | EXPIRY ² (Y-M-D) | DILUTION (FLUID/WATER) | LOWEST OPERATIONAL USE TEMPERATURE ³ | | | | LOWEST ON-WING VISCOSITY ^{7,8} (mPa.s) | |
|--------------------------------------|--------------------------|-----------------------------|-----------------------------|------------------------|---|------|--|-------|---|-----------------------------|
| | | | | | LOW SPEED AERODYNAMIC TEST ⁶ | | HIGH SPEED AERODYNAMIC TEST ⁶ | | MANUFACTURER METHOD | AS 9968 METHOD |
| | | | | | °C | °F | °C | °F | | |
| AllClear Systems LLC | AeroClear MAX | EG | 19-04-14 | 100/0 | -16 | 3.2 | -35 | -31 | 7 800 (j) | Not Available ¹⁵ |
| | | | | 75/25 | Dilution Not Applicable | | Dilution Not Applicable | | Dilution Not Applicable | |
| | | | | 50/50 | Dilution Not Applicable | | Dilution Not Applicable | | Dilution Not Applicable | |
| Clariant Produkte (Deutschland) GmbH | Safewing MP III 2031 ECO | PG | 15-08-15 ⁹ | 100/0 | -16.5 | 2.3 | -29 | -20.2 | 120 (k) | 120 (k) |
| | | | | 75/25 | -9 | 15.8 | -10 | 14 | 86 (k) | 86 (k) |
| | | | | 50/50 | -3 | 27 | -3 | 27 | 16 (k) | 16 (k) |

TABLE 44:
TYPE IV FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE
(see cautions and notes on page 58)

| COMPANY NAME | FLUID NAME | TYPE OF GLYCOL ¹ | EXPIRY ² (Y-M-D) | DILUTION (FLUID/WATER) | LOWEST OPERATIONAL USE TEMPERATURE ³ | | LOWEST ON-WING VISCOSITY ^{7,8} (mPa.s) | |
|--------------------------------------|---|-----------------------------|-----------------------------|------------------------|---|-------|---|----------------|
| | | | | | HIGH SPEED AERODYNAMIC TEST ⁶ | | MANUFACTURER METHOD | AS 9968 METHOD |
| | | | | | °C | °F | | |
| ABAX Industries | ECOWING AD-49 | PG | 18-04-22 | 100/0 | -26 | -14.8 | 12 150 (g) | 11 000 (a) |
| | | | | 75/25 | -14 | 7 | 30 700 (g) | 32 350 (c) |
| | | | | 50/50 | -3 | 27 | 19 450 (g) | 21 150 (c) |
| CHEMCO Inc. | ChemR EG IV | EG | 19-03-17 | 100/0 | -27 | -16.6 | 46 400 (i) | 19 450 (c) |
| | | | | 75/25 | Dilution Not Applicable | | Dilution Not Applicable | |
| | | | | 50/50 | Dilution Not Applicable | | Dilution Not Applicable | |
| Clariant Produkte (Deutschland) GmbH | Max Flight 04 | PG | 16-07-23 ⁹ | 100/0 | -23.5 | -10.3 | 5 540 (b) | 5 540 (a) |
| | | | | 75/25 | Dilution Not Applicable | | Dilution Not Applicable | |
| | | | | 50/50 | Dilution Not Applicable | | Dilution Not Applicable | |
| Clariant Produkte (Deutschland) GmbH | Max Flight AVIA | EG | 18-04-25 | 100/0 | -28.5 | -19.3 | 1 000 (k) | 1 000 (k) |
| | | | | 75/25 | Dilution Not Applicable | | Dilution Not Applicable | |
| | | | | 50/50 | Dilution Not Applicable | | Dilution Not Applicable | |
| Clariant Produkte (Deutschland) GmbH | Max Flight SNEG | PG | 18-03-09 | 100/0 | -29 | -20.2 | 8 700 (m) | 8 050 (a) |
| | | | | 75/25 | -14 | 7 | 20 200 (n) | 21 800 (c) |
| | | | | 50/50 | -3 | 27 | 13 600(n) | 15 000 (c) |
| Clariant Produkte (Deutschland) GmbH | Safewing EG IV NORTH | EG | 18-04-06 | 100/0 | -30 | -22 | 830 (k) | 830 (k) |
| | | | | 75/25 | Dilution Not Applicable | | Dilution Not Applicable | |
| | | | | 50/50 | Dilution Not Applicable | | Dilution Not Applicable | |
| Clariant Produkte (Deutschland) GmbH | Safewing MP IV LAUNCH | PG | 18-05-05 | 100/0 | -28.5 | -19.3 | 7 550 (a) | 7 550 (a) |
| | | | | 75/25 | -14 | 7 | 18 000 (a) | 18 000 (a) |
| | | | | 50/50 | -3 | 27 | 17 800 (a) | 17 800 (a) |
| Clariant Produkte (Deutschland) GmbH | Safewing MP IV LAUNCH PLUS | PG | 19-02-24 | 100/0 | -29 | -20.2 | 8 700 (m) | 8 450 (a) |
| | | | | 75/25 | -14 | 7 | 18 800 (n) | 17 200 (c) |
| | | | | 50/50 | -3 | 27 | 9 700 (m) | 12 150 (a) |
| Cryotech Deicing Technology | Polar Guard® Advance | PG | 19-02-16 | 100/0 | -30.5 | -22.9 | 4 400 (e) | 4 050 (a) |
| | | | | 75/25 | -14 | 7 | 11 600 (e) | 9 750 (a) |
| | | | | 50/50 | -3 | 27 | 80 (a) | 80 (a) |
| Dow Chemical Company | UCAR™ Endurance EG106 De/Anti-Icing Fluid | EG | 19-04-05 | 100/0 | -29 | -20.2 | 24 850 (h) | 2 230 (a) |
| | | | | 75/25 | Dilution Not Applicable | | Dilution Not Applicable | |
| | | | | 50/50 | Dilution Not Applicable | | Dilution Not Applicable | |

TABLE 44 (cont'd):
TYPE IV FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE
(see cautions and notes on page 58)

| COMPANY NAME | FLUID NAME | TYPE OF GLYCOL ¹ | EXPIRY ² (Y-M-D) | DILUTION (FLUID/WATER) | LOWEST OPERATIONAL USE TEMPERATURE ³ | | LOWEST ON-WING VISCOSITY ^{7,8} (mPa.s) | |
|---|-------------------------|-----------------------------|-----------------------------|------------------------|---|-------|---|-----------------------------|
| | | | | | HIGH SPEED AERODYNAMIC TEST ⁶ | | MANUFACTURER METHOD | AS 9968 METHOD |
| | | | | | °C | °F | | |
| Dow Chemical Company | UCAR™ FlightGuard AD-49 | PG | 19-04-12 | 100/0 | -26 | -14.8 | 12 150 (g) | 11 000 (a) |
| | | | | 75/25 | -14 | 7 | 30 700 (g) | 32 350 (c) |
| | | | | 50/50 | -3 | 27 | 19 450 (g) | 21 150 (c) |
| Inland Technologies | ECO-SHIELD® | PG | 18-02-22 | 100/0 | -25.5 | -13.9 | 11 050 (a) | 11 050 (a) |
| | | | | 75/25 | Dilution Not Applicable | | 30 700 (g) | 32 350 (c) |
| | | | | 50/50 | Dilution Not Applicable | | 19 450 (g) | 21 150 (c) |
| Kilfrost Limited | ABC-S Plus | PG | 19-05-03 | 100/0 | -28 | -18.4 | 17 900 (d) | 17 900 (c) |
| | | | | 75/25 | -14 | 7 | 18 300 (d) | 18 300 (c) |
| | | | | 50/50 | -3 | 27 | 7 500 (d) | 7 500 (a) |
| LNT Solutions | LNT E450 | EG | 17-07-29 ¹³ | 100/0 | -22.5 | -8.5 | 45 300 (i) | Not Available ¹⁶ |
| | | | | 75/25 | Dilution Not Applicable | | Dilution Not Applicable | |
| | | | | 50/50 | Dilution Not Applicable | | Dilution Not Applicable | |
| Newave Aerochemical Co. Ltd. | FCY 9311 | PG | 18-01-18 | 100/0 | -29.5 | -21.1 | 14 100 (c) | 14 100 (c) |
| | | | | 75/25 | Dilution Not Applicable | | Dilution Not Applicable | |
| | | | | 50/50 | Dilution Not Applicable | | Dilution Not Applicable | |
| Oksayd Co. Ltd. | Defrost ECO 4 | PG | 19-06-19 | 100/0 | -25.5 | -13.9 | 9 800 (g) | 12 350 (a) |
| | | | | 75/25 | Dilution Not Applicable | | Dilution Not Applicable | |
| | | | | 50/50 | Dilution Not Applicable | | Dilution Not Applicable | |
| Shaanxi Cleanway Aviation Chemical Co., Ltd | Cleansurface IV | PG | 19-02-24 | 100/0 | -28.5 | -19.3 | 15 200 (c) | 15 200 (c) |
| | | | | 75/25 | -14 | 7 | 28 500 (c) | 28 500 (c) |
| | | | | 50/50 | -3 | 27 | 17 500 (c) | 17 500 (c) |

CAUTIONS AND NOTES FOR TABLES 41, 42, 43, 44

CAUTIONS

- This table lists fluids that have been tested with respect to anti-icing performance and aerodynamic acceptance (Type I: SAE AMS1424 §3.5.2 and §3.5.3; Type II/ III/ IV: SAE AMS1428 §3.2.4 and §3.2.5) only. These tests were conducted by Anti-icing Materials International Laboratory: www.ugac.ca/ami. The end user is responsible for contacting the fluid manufacturer to confirm all other SAE AMS1424/1428 technical requirement tests, such as fluid stability, toxicity, materials compatibility, etc. have been conducted.
- LOUT data provided in these tables is based strictly on the manufacturer's data; the end user is responsible for verifying the validity of this data.
- Type I fluids supplied in concentrated form must not be used in that form and must be diluted.

NOTES

- 1 PG = conventional glycol (propylene glycol); EG = conventional glycol (ethylene glycol); DEG = conventional glycol (diethylene glycol); NCG = non-conventional glycol (organic non-ionic diols and triols, e.g. 1,3-propanediol, glycerine) and mixtures of non-conventional glycol and conventional glycol; NG = non-glycol (e.g. organic salts) and mixtures of non-glycol and glycol.
- 2 Expiry date is the earlier expiry date of the Aerodynamic Test(s) or Water Spray Endurance Test. Fluids that are tested after the issuance of this list will appear in a later update.
- 3 The values in this table were determined using test results from pre-production fluid samples when available. In some cases, the fluid manufacturer requested the publication of a more conservative value than the pre-production test value. The lowest operational use temperature (LOUT) for a given fluid is the higher (warmer) of:
 - a The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type;
 - b The actual freezing point of the fluid plus its freezing point buffer (Type I = 10°C/18°F; Type II/III/IV = 7°C/13°F); or
 - c For diluted Type II/III/IV fluids, the coldest temperature for which holdover times are published.
- 4 The LOUT for Type I fluids that are intended to be diluted is derived from a dilution that provides the lowest operational use temperature. For other Type I dilutions, determine the freezing point of the fluid and add a 10°C freezing point buffer, as a dilution will usually yield a higher and more restrictive operational use temperature. Consult the fluid manufacturer or fluid documentation for further clarification and guidance on establishing the appropriate operational use temperature of a diluted fluid.
- 5 Type I concentrate fluids have also been tested at 50/50 (glycol/water) dilution.
- 6 If uncertain whether the aircraft to be treated conforms to the low speed or the high speed aerodynamic test, consult the aircraft manufacturer. The aerodynamic test is defined in SAE AS5900 (latest version).
- 7 The viscosity values in this table are those of the fluids provided by the manufacturers for holdover time testing. For the holdover times to be valid, the viscosity of the fluid on the wing shall not be lower than that in this table. The user should periodically ensure that the viscosity of a fluid sample taken from the wing surface is not lower than that listed.
- 8 The SAE AS9968 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. Viscosity measurement methods are indicated as letters (in parentheses) beside each viscosity value. Details of each measurement method are shown in the table below. The exact measurement method (spindle, container, fluid volume, temperature, speed, duration) must be used to compare the viscosity of a sample to a viscosity given in this table.

| Method | Brookfield Spindle* | Container | Fluid Volume | Temp.** | Speed | Duration |
|--------|---------------------------|-------------------------------------|--------------|---------|---------|--------------|
| a | LV1 (with guard leg) | 600 mL low form (Griffin) beaker | 575 mL*** | 20°C | 0.3 rpm | 10.0 minutes |
| b | LV1 (with guard leg) | 600 mL low form (Griffin) beaker | 575 mL*** | 20°C | 0.3 rpm | 33.3 minutes |
| c | LV2-disc (with guard leg) | 600 mL low form (Griffin) beaker | 425 mL*** | 20°C | 0.3 rpm | 10.0 minutes |
| d | LV2-disc (with guard leg) | 150 mL tall form (Berzelius) beaker | 135 mL*** | 20°C | 0.3 rpm | 10.0 minutes |
| e | SC4-34/13R | small sample adapter | 10 mL | 20°C | 0.3 rpm | 10.0 minutes |
| f | SC4-34/13R | small sample adapter | 10 mL | 20°C | 0.3 rpm | 30.0 minutes |
| g | SC4-31/13R | small sample adapter | 10 mL | 20°C | 0.3 rpm | 10.0 minutes |
| h | SC4-31/13R | small sample adapter | 10 mL | 0°C | 0.3 rpm | 10.0 minutes |
| i | SC4-31/13R | small sample adapter | 9 mL | 0°C | 0.3 rpm | 10.0 minutes |
| j | SC4-31/13R | small sample adapter | 9 mL | 0°C | 0.3 rpm | 65.0 minutes |
| k | LV0 | ultra low adapter | 16 mL | 20°C | 0.3 rpm | 10.0 minutes |
| l | LV1 | big sample adapter | 50 mL | 20°C | 0.3 rpm | 10.0 minutes |
| m | LV1 | big sample adapter | 55 mL | 20°C | 0.3 rpm | 10.0 minutes |
| n | LV2-disc | big sample adapter | 60 mL | 20°C | 0.3 rpm | 10.0 minutes |

* Spindle must be attached to a Brookfield viscometer model equipped with an LV spring.

** Sample temperature will affect readings; ensure sufficient time is allowed for sample to reach thermal equilibrium before starting test. Use of a cooling bath strongly recommended.

*** If necessary, adjust fluid volume to ensure fluid is level with notch on the spindle shaft.

- 9 Fluids listed in italics have expired and will be removed from this listing four years after expiry.
- 10 Manufacturer has indicated fluid was not tested.
- 11 Manufacturer has not provided fluid information as required in SAE ARP5718A; fluid may be removed from this listing in subsequent revisions.
- 12 Dow UCAR™ ADF Concentrate, sold under the product name Inland ADF Concentrate, qualified from 2015-09-04.
- 13 Currently in the test/re-test process.
- 14 Fluid was not retested for low speed aerodynamics. This data will be removed four years after the expiry of the last low speed test.
- 15 Measurements using the SAE AS9968 method do not provide stable, reliable results. Use the manufacturer method to evaluate viscosity.
- 16 For UCAR™ ADF XL54, refer to primary site qualification of UCAR™ ADF Concentrate.
- 17 For UCAR™ PG ADF Dilute 55/45, refer to primary site qualification of UCAR™ PG ADF Concentrate.

TABLE 45: GUIDELINES FOR THE APPLICATION OF SAE TYPE I FLUID

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

NOTES

- 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. (This time may be higher than 3 minutes in some conditions, but potentially lower in heavy precipitation, colder temperatures, or for critical surfaces constructed of composite materials. If necessary, the second step shall be applied area by area.)

CAUTIONS

- This table is applicable for the use of Type I holdover time guidelines in all conditions, including active frost. If holdover times are not required, a temperature of 60°C (140°F) at the nozzle is desirable.
- If holdover times are required, the temperature of water or fluid/water mixtures shall be at least 60°C (140°F) at the nozzle. Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.
- To use Type I Holdover Times Guidelines in all conditions including active frost, an additional minimum of 1 litre/m² (~2 gal./100 sq. ft.) of heated Type I fluid mixture must be applied to the surfaces after all frozen contamination is removed. This application is necessary to heat the surfaces, as heat contributes significantly to the Type I fluid holdover times. The required protection can be provided using a 1-step method by applying more fluid than is strictly needed to just remove all of the frozen contamination (the same additional amount stated above is required).
- The lowest operational use temperature (LOUT) for a given Type I fluid is the higher (warmer) of:
 - 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).
- Wing skin temperatures may differ and in some cases may be lower than the OAT. A stronger mix (more glycol) may be needed under these conditions.

**TABLE 46: GUIDELINES FOR THE APPLICATION OF SAE TYPE II AND IV FLUID
(FLUID CONCENTRATIONS IN % VOLUME)**

| Outside Air Temperature (OAT) ¹ | One-Step Procedure De/Anti-icing | Two-Step Procedure | |
|--|--|---|---|
| | | First Step: Deicing | Second Step: Anti-icing ² |
| 0°C (32°F) and above | 100/0, 75/25 or 50/50 Heated ³ Type II or IV fluid/water mixture | Heated water or a heated Type I, II, III, or IV fluid/water mixture | 100/0, 75/25 or 50/50 Heated or unheated Type II or IV fluid/water mixture |
| Below 0°C (32°F) to -3°C (27°F) | 100/0, 75/25 or 50/50 Heated ³ Type II or IV fluid/water mixture | Heated Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below | 100/0, 75/25 or 50/50 Heated or unheated Type II or IV fluid/water mixture |
| Below -3°C (27°F) to -14°C (7°F) | 100/0 or 75/25 Heated ³ Type II or IV fluid/water mixture | Heated Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below | 100/0 or 75/25 Heated or unheated Type II or IV fluid/water mixture |
| Below -14°C (7°F) to LOUT | 100/0 Heated ³ Type II or IV fluid/water mixture | Heated Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below | 100/0 Heated or unheated Type II or IV fluid/water mixture |

NOTES

- One step or second step fluids must not be used at temperatures below their lowest operational use temperature (LOUT). First step fluids must not be used below their freezing points. Consideration should be given to the use of Type I/III fluid when Type II/IV fluid cannot be used due to LOUT limitations (see Table 45, 47, 48). The LOUT for a given Type II/IV fluid is the higher (warmer) of:
 - The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type;
 - The actual freezing point of the fluid plus its freezing point buffer of 7°C (13°F); or
 - For diluted Type II/IV fluids, the coldest temperature for which holdover times are published.
- To be applied before first step fluid freezes, typically within 3 minutes. (This time may be longer than 3 minutes in some conditions, but potentially shorter in heavy precipitation, in colder temperatures, or for critical surfaces constructed of composite materials. If necessary, the second step shall be applied area by area.)
- Clean aircraft may be anti-iced with unheated fluid.

CAUTIONS

- 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.
- Wing skin temperatures may differ and in some cases may be lower than the OAT. 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 or IV shall not be used for the anti-icing step because fluid freezing may occur.
- An insufficient amount of anti-icing fluid may cause a substantial loss of holdover time. This is particularly true when using a Type I fluid mixture for the first step in a two-step procedure.

**TABLE 47: GUIDELINES FOR THE APPLICATION OF
HEATED SAE TYPE III FLUID**
(FLUID CONCENTRATIONS IN % VOLUME)

| Outside Air Temperature (OAT) ¹ | One-Step Procedure De/Anti-icing | Two-Step Procedure | |
|--|---|--|---|
| | | First Step: Deicing | Second Step: Anti-icing ² |
| 0°C (32°F) and above | 100/0, 75/25 or 50/50 Heated Type III fluid/water mixture | Heated ³ water or a heated ³ Type I, II, III, or IV fluid/water mixture | 100/0, 75/25 or 50/50 Heated Type III fluid/water mixture |
| Below 0°C (32°F) to -3°C (27°F) | 100/0, 75/25 or 50/50 Heated Type III fluid/water mixture | Heated ³ Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below | 100/0, 75/25 or 50/50 Heated Type III fluid/water mixture |
| Below -3°C (27°F) to -10°C (14°F) | 100/0 or 75/25 Heated Type III fluid/water mixture | Heated ³ Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below | 100/0 or 75/25 Heated Type III fluid/water mixture |
| Below -10°C (14°F) to LOUT | 100/0 Heated Type III fluid/water mixture | Heated ³ Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below | 100/0 Heated Type III fluid/water mixture |

NOTES

- 1 One step or second step fluids must not be used at temperatures below their lowest operational use temperature (LOUT). First step fluids must not be used below their freezing points. Consider the use of Type I when Type III fluid cannot be used (see Table 45). The LOUT for a given Type III fluid is the higher (warmer) of:
 - a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type;
 - b) The actual freezing point of the fluid plus its freezing point buffer of 7°C (13°F); or
 - c) For diluted Type III fluid, the coldest temperature for which holdover times are published.
- 2 To be applied before first step fluid freezes, typically within 3 minutes. (This time may be longer than 3 minutes in some conditions, but potentially shorter in heavy precipitation, in colder temperatures, or for critical surfaces constructed of composite materials. If necessary, the second step shall be applied area by area.)
- 3 For heated fluids, a fluid temperature not less than 60°C (140°F) at the nozzle is desirable.

CAUTIONS

- To use Type III Holdover Times Guidelines in all conditions including active frost, an additional minimum of 1 litre/m² (~2 gal./100 sq. ft.) of heated Type III fluid mixture must be applied to the surfaces after all frozen contamination is removed. This application is necessary to heat the surfaces, as heat contributes significantly to the Type III fluid holdover times. The required protection can be provided using a 1-step method by applying more fluid than is strictly needed to just remove all of the frozen contamination (the same additional amount stated above is required).
- If holdover times are required, the temperature of 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.
- Wing skin temperatures may differ and in some cases may be lower than the OAT. 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 III shall not be used for the anti-icing step because fluid freezing may occur.
- An insufficient amount of anti-icing fluid may cause a substantial loss of holdover time. This is particularly true when using a Type I fluid mixture for the first step in a two-step procedure.

**TABLE 48: GUIDELINES FOR THE APPLICATION OF
UNHEATED SAE TYPE III FLUID**
(FLUID CONCENTRATIONS IN % VOLUME)

| Outside Air Temperature (OAT) ¹ | One-Step Procedure Anti-icing Only ⁴ | Two-Step Procedure | |
|--|---|--|---|
| | | First Step: Deicing | Second Step: Anti-icing ² |
| 0°C (32°F) and above | 100/0, 75/25 or 50/50 Unheated Type III fluid/water mixture | Heated ³ water or a heated ³ Type I, II, III, or IV fluid/water mixture | 100/0, 75/25 or 50/50 Unheated Type III fluid/water mixture |
| Below 0°C (32°F) to -3°C (27°F) | 100/0, 75/25 or 50/50 Unheated Type III fluid/water mixture | Heated ³ Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below | 100/0, 75/25 or 50/50 Unheated Type III fluid/water mixture |
| Below -3°C (27°F) to -10°C (14°F) | 100/0 or 75/25 Unheated Type III fluid/water mixture | Heated ³ Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below | 100/0 or 75/25 Unheated Type III fluid/water mixture |
| Below -10°C (14°F) to LOUT | 100/0 Unheated Type III fluid/water mixture | Heated ³ Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below | 100/0 Unheated Type III fluid/water mixture |

NOTES

- One step or second step fluids must not be used at temperatures below their lowest operational use temperature (LOUT). First step fluids must not be used below their freezing points. Consider the use of Type I when Type III fluid cannot be used (see Table 45). The LOUT for a given Type III fluid is the higher (warmer) of:
 - The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type;
 - The actual freezing point of the fluid plus its freezing point buffer of 7°C (13°F); or
 - For diluted Type III fluid, the coldest temperature for which holdover times are published.
- To be applied before first step fluid freezes, typically within 3 minutes. (This time may be longer than 3 minutes in some conditions, but potentially shorter in heavy precipitation, in colder temperatures, or for critical surfaces constructed of composite materials. If necessary, the second step shall be applied area by area.)
- For heated fluids, a fluid temperature not less than 60°C (140°F) at the nozzle is desirable.
- One-step procedure with unheated Type III fluid is only possible on a clean aircraft. If deicing is required, a two-step procedure must be used.

CAUTIONS

- Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.
- Wing skin temperatures may differ and in some cases may be lower than the OAT. 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 III shall not be used for the anti-icing step because fluid freezing may occur.
- An insufficient amount of anti-icing fluid may cause a substantial loss of holdover time. This is particularly true when using a Type I fluid mixture for the first step in a two-step procedure.

**APPENDIX A:
ADJUSTED HOLDOVER TIME GUIDELINES**

These tables are for use when flaps/slats are deployed prior to de/anti-icing. Holdover and allowance times have been adjusted to 76 percent of standard times. Standard holdover and allowance times can be used if flaps and slats are deployed as close to departure as safety allows.

ADJUSTED HOLDOVER TIME (HOT) GUIDELINES FOR WINTER 2017-2018

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**TABLE ADJ-1: ADJUSTED ACTIVE FROST HOLDOVER TIMES
FOR SAE TYPE I, TYPE II, TYPE III, AND TYPE IV FLUIDS**

| Outside Air Temperature ^{1,2,3} | Type I | Outside Air Temperature ^{2,3} | Concentration Fluid/Water By % Volume | Type II | Type III ⁴ | Type IV |
|---|-----------------------------|--|---------------------------------------|-----------------------------------|-----------------------|---------|
| -1°C and above (30°F and above) | 0:34 (0:26) ⁵ | -1°C and above (30°F and above) | 100/0 | 6:04 | 1:31 | 9:07 |
| below -1 to -3°C (below 30 to 27°F) | | | 75/25 | 3:48 | 0:45 | 3:48 |
| below -3 to -10°C (below 27 to 14°F) | | | 50/50 | 2:16 | 0:22 | 2:16 |
| below -10 to -14°C (below 14 to 7°F) | | below -1 to -3°C (below 30 to 27°F) | 100/0 | 6:04 | 1:31 | 9:07 |
| below -14 to -21°C (below 7 to -6°F) | | | 75/25 | 3:48 | 0:45 | 3:48 |
| below -21 to -25°C (below -6 to -13°F) | | | 50/50 | 1:08 | 0:22 | 2:16 |
| below -25°C to LOUT (below -13°F to LOUT) | | below -3 to -10°C (below 27 to 14°F) | 100/0 | 6:04 | 1:31 | 7:36 |
| | | | 75/25 | 3:48 | 0:45 | 3:48 |
| | | below -10 to -14°C (below 14 to 7°F) | 100/0 | 4:33 | 1:31 | 4:33 |
| | | | 75/25 | 0:45 | 0:45 | 0:45 |
| | | below -14 to -21°C (below 7 to -6°F) | 100/0 | 4:33 | 1:31 | 4:33 |
| | | below -21 to -25°C (below -6 to -13°F) | 100/0 | 1:31 | 1:31 | 3:02 |
| | | below -25°C (below -13°F) | 100/0 | No Holdover Time Guidelines Exist | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

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

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-2: ADJUSTED HOLDOVER TIMES FOR SAE TYPE I FLUID ON CRITICAL AIRCRAFT SURFACES
COMPOSED PREDOMINANTLY OF ALUMINUM**

| Outside Air Temperature ^{1,2} | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{3,4} | Light Snow, Snow Grains or Snow Pellets ^{3,4} | Moderate Snow, Snow Grains or Snow Pellets ³ | Freezing Drizzle ⁵ | Light Freezing Rain | Rain on Cold Soaked Wing ⁶ | Other ⁷ |
|--|------------------------------|---|--|---|-------------------------------|---------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 0:08 - 0:13 | 0:14 | 0:08 - 0:14 | 0:05 - 0:08 | 0:07 - 0:10 | 0:03 - 0:05 | 0:02 - 0:04 | |
| below -3 to -6°C (below 27 to 21°F) | 0:06 - 0:10 | 0:11 | 0:06 - 0:11 | 0:04 - 0:06 | 0:04 - 0:07 | 0:03 - 0:05 | | |
| below -6 to -10°C (below 21 to 14°F) | 0:05 - 0:08 | 0:08 | 0:05 - 0:08 | 0:03 - 0:05 | 0:03 - 0:05 | 0:02 - 0:04 | | CAUTION: No holdover time guidelines exist |
| below -10°C (below 14°F) | 0:04 - 0:07 | 0:05 | 0:03 - 0:05 | 0:02 - 0:03 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Type I fluid / water mixture must be selected so that the freezing point of the mixture is at least 10°C (18°F) below outside air temperature.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected.
- 3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 5 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 6 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS

- These holdover times apply to aircraft with critical surfaces constructed predominantly or entirely of aluminum materials that have demonstrated satisfactory use of these holdover times.
- The responsibility for the application of these data remains with the user.
- Takeoff after the longest applicable holdover time has been exceeded is not permitted for Type I fluids.
- The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE ADJ-3: ADJUSTED HOLDOVER TIMES FOR SAE TYPE I FLUID ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF COMPOSITES

| Outside Air Temperature ^{1,2} | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{3,4} | Light Snow, Snow Grains or Snow Pellets ^{3,4} | Moderate Snow, Snow Grains or Snow Pellets ³ | Freezing Drizzle ⁵ | Light Freezing Rain | Rain on Cold Soaked Wing ⁶ | Other ⁷ |
|--|------------------------------|---|--|---|-------------------------------|---------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 0:07 - 0:12 | 0:09 | 0:05 - 0:09 | 0:02 - 0:05 | 0:06 - 0:10 | 0:03 - 0:05 | 0:01 - 0:04 | |
| below -3 to -6°C (below 27 to 21°F) | 0:05 - 0:06 | 0:08 | 0:04 - 0:08 | 0:02 - 0:04 | 0:04 - 0:07 | 0:03 - 0:05 | | |
| below -6 to -10°C (below 21 to 14°F) | 0:03 - 0:06 | 0:07 | 0:04 - 0:07 | 0:02 - 0:04 | 0:03 - 0:05 | 0:02 - 0:04 | | CAUTION: No holdover time guidelines exist |
| below -10°C (below 14°F) | 0:03 - 0:05 | 0:05 | 0:03 - 0:05 | 0:02 - 0:03 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Type I Fluid / Water Mixture must be selected so that the freezing point of the mixture is at least 10°C (18°F) below outside air temperature.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected.
- 3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 5 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 6 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS

- These holdover times apply to newer aircraft with critical surfaces constructed predominantly or entirely of composite materials.
- The responsibility for the application of these data remains with the user.
- Takeoff after the longest applicable holdover time has been exceeded is not permitted for Type I fluids.
- The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE ADJ-4: ADJUSTED GENERIC HOLDOVER TIMES FOR SAE TYPE II FLUIDS

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Snow, Snow Grains or Snow Pellets ^{2,3} | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|--|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:42 - 1:20 | 0:19 - 0:38 | 0:27 - 0:49 | 0:19 - 0:27 | 0:05 - 0:34 | |
| | 75/25 | 0:19 - 0:42 | 0:11 - 0:19 | 0:11 - 0:30 | 0:08 - 0:15 | 0:03 - 0:19 | |
| | 50/50 | 0:11 - 0:19 | 0:04 - 0:08 | 0:06 - 0:11 | 0:05 - 0:07 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:23 - 0:49 | 0:11 - 0:23 | 0:15 - 0:34 ⁷ | 0:11 - 0:15 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:19 - 0:38 | 0:06 - 0:15 | 0:11 - 0:19 ⁷ | 0:06 - 0:11 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:11 - 0:27 | 0:05 - 0:15 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:11 - 0:27 | 0:02 - 0:07 | | | | |
| below -25°C to LOUT (below -13°F to LOUT) | 100/0 | 0:11 - 0:27 ⁸ | 0:01 - 0:05 ⁸ | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).
- 8 If the LOUT is unknown, no holdover time guidelines exist below -25°C (-13°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-5: ADJUSTED TYPE II HOLDOVER TIMES FOR
ABAX ECOWING 26**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ | | |
|---------------------------------------|---|------------------------------|---|--|---|-------------------------------|--------------------------|--|--------------------|--|--|
| -3°C and above (27°F and above) | 100/0 | 1:05 - 1:58 | 1:12 | 0:46 - 1:12 | 0:30 - 0:46 | 0:38 - 1:12 | 0:30 - 0:38 | 0:15 - 1:05 | | | |
| | 75/25 | 0:49 - 1:27 | 1:01 | 0:30 - 1:01 | 0:15 - 0:30 | 0:34 - 0:49 | 0:19 - 0:27 | 0:08 - 0:46 | | | |
| | 50/50 | 0:23 - 0:34 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | 0:11 - 0:19 | 0:06 - 0:08 | | | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:34 - 1:43 | 1:05 | 0:42 - 1:05 | 0:27 - 0:42 | 0:23 - 0:53 ⁷ | 0:11 - 0:27 ⁷ | CAUTION: No holdover time guidelines exist | | | |
| | 75/25 | 0:27 - 0:57 | 0:42 | 0:23 - 0:42 | 0:11 - 0:23 | 0:15 - 0:38 ⁷ | 0:11 - 0:19 ⁷ | | | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:19 - 0:34 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:19 - 0:34 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-6: ADJUSTED TYPE II HOLDOVER TIMES FOR
ABAX ECOWING AD-2**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|--|
| -3°C and above (27°F and above) | 100/0 | 1:01 - 2:17 | 1:50 | 0:57 - 1:50 | 0:30 - 0:57 | 0:30 - 1:16 | 0:23 - 0:34 | 0:07 - 1:05 | |
| | 75/25 | 0:57 - 1:05 | 1:20 | 0:42 - 1:20 | 0:19 - 0:42 | 0:27 - 0:49 | 0:15 - 0:23 | 0:03 - 0:38 | |
| | 50/50 | 0:11 - 0:23 | 0:27 | 0:11 - 0:27 | 0:05 - 0:11 | 0:07 - 0:11 | 0:05 - 0:07 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:34 - 1:54 | 1:20 | 0:42 - 1:20 | 0:23 - 0:42 | 0:19 - 0:53 ⁷ | 0:15 - 0:23 ⁷ | | |
| | 75/25 | 0:27 - 1:27 | 1:12 | 0:38 - 1:12 | 0:19 - 0:38 | 0:11 - 0:42 ⁷ | 0:15 - 0:27 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:11 - 0:30 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:11 - 0:30 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | |
| below -25 to -27°C (below -13 to -16.6°F) | 100/0 | 0:11 - 0:30 | 0:15 | 0:05 - 0:15 | 0:01 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-7: ADJUSTED TYPE II HOLDOVER TIMES FOR
AVIATION SHAANXI HI-TECH CLEANWING II**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Snow, Snow Grains or Snow Pellets ^{2,3} | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---------------------------------------|---|------------------------------|--|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:42 - 1:24 | 0:23 - 0:42 | 0:27 - 0:49 | 0:19 - 0:27 | 0:08 - 0:42 | |
| | 75/25 | 0:38 - 1:01 | 0:19 - 0:34 | 0:27 - 0:46 | 0:15 - 0:23 | 0:05 - 0:38 | |
| | 50/50 | 0:27 - 0:46 | 0:11 - 0:23 | 0:15 - 0:30 | 0:08 - 0:15 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:34 - 1:24 | 0:23 - 0:42 | 0:23 - 0:42 ⁷ | 0:15 - 0:19 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:30 - 1:20 | 0:19 - 0:34 | 0:27 - 0:30 ⁷ | 0:15 - 0:19 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:15 - 0:38 | 0:05 - 0:15 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:15 - 0:38 | 0:02 - 0:07 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-8: ADJUSTED TYPE II HOLDOVER TIMES FOR
BEIJING YADILITE AVIATION YD-102 TYPE II**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:53 - 1:31 | 1:16 | 0:38 - 1:16 | 0:19 - 0:38 | 0:30 - 0:57 | 0:27 - 0:30 | 0:08 - 0:46 | |
| | 75/25 | 0:19 - 0:42 | 0:38 | 0:19 - 0:38 | 0:11 - 0:19 | 0:11 - 0:30 | 0:08 - 0:15 | 0:03 - 0:19 | |
| | 50/50 | 0:11 - 0:19 | 0:19 | 0:08 - 0:19 | 0:04 - 0:08 | 0:06 - 0:11 | 0:05 - 0:07 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:34 - 1:08 | 0:46 | 0:23 - 0:46 | 0:11 - 0:23 | 0:27 - 0:38 ⁷ | 0:19 - 0:19 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:23 - 0:38 | 0:27 | 0:15 - 0:27 | 0:06 - 0:15 | 0:11 - 0:19 ⁷ | 0:07 - 0:11 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:15 - 0:34 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:15 - 0:34 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:15 - 0:34 | 0:15 | 0:05 - 0:15 | 0:01 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-9: ADJUSTED TYPE II HOLDOVER TIMES FOR
CLARIANT SAFEWING MP II FLIGHT**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|--|
| -3°C and above (27°F and above) | 100/0 | 2:40 - 3:02 | 1:58 | 1:12 - 1:58 | 0:46 - 1:12 | 1:01 - 1:31 | 0:34 - 1:05 | 0:08 - 1:08 | |
| | 75/25 | 1:24 - 2:05 | 1:58 | 1:01 - 1:58 | 0:30 - 1:01 | 0:53 - 1:08 | 0:23 - 0:42 | 0:05 - 0:38 | |
| | 50/50 | 0:42 - 1:20 | 0:34 | 0:19 - 0:34 | 0:08 - 0:19 | 0:15 - 0:23 | 0:08 - 0:11 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:42 - 1:20 | 1:24 | 0:49 - 1:24 | 0:30 - 0:49 | 0:27 - 1:08 ⁷ | 0:19 - 0:34 ⁷ | | |
| | 75/25 | 0:19 - 0:49 | 1:01 | 0:30 - 1:01 | 0:15 - 0:30 | 0:19 - 0:53 ⁷ | 0:15 - 0:27 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:23 - 0:38 | 0:53 | 0:19 - 0:53 | 0:06 - 0:19 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:23 - 0:38 | 0:23 | 0:08 - 0:23 | 0:02 - 0:08 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:23 - 0:38 | 0:15 | 0:05 - 0:15 | 0:02 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-10: ADJUSTED TYPE II HOLDOVER TIMES FOR
CLARIANT SAFEWING MP II FLIGHT PLUS**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Snow, Snow Grains or Snow Pellets ^{2,3} | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|--|-------------------------------|--------------------------|---------------------------------------|--|
| -3°C and above (27°F and above) | 100/0 | 2:02 - 3:02 | 0:38 - 1:24 | 1:05 - 1:31 | 0:34 - 0:46 | 0:11 - 1:31 | |
| | 75/25 | 1:58 - 3:02 | 0:46 - 1:20 | 1:12 - 1:31 | 0:38 - 0:57 | 0:11 - 0:57 | |
| | 50/50 | 0:49 - 1:46 | 0:11 - 0:19 | 0:23 - 0:49 | 0:11 - 0:15 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:30 - 1:46 | 0:27 - 0:57 | 0:27 - 1:05 ⁷ | 0:27 - 0:42 ⁷ | | |
| | 75/25 | 0:23 - 1:20 | 0:42 - 1:16 | 0:19 - 0:53 ⁷ | 0:23 - 0:34 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:15 - 0:30 | 0:05 - 0:15 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:15 - 0:30 | 0:02 - 0:07 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:15 - 0:30 | 0:01 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-11: ADJUSTED TYPE II HOLDOVER TIMES FOR
CRYOTECH POLAR GUARD® II**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|--|
| -3°C and above (27°F and above) | 100/0 | 2:09 - 3:02 | 2:00 | 1:27 - 2:00 | 0:49 - 1:27 | 1:12 - 1:31 | 0:57 - 1:08 | 0:11 - 1:31 | |
| | 75/25 | 1:54 - 3:02 | 2:00 | 1:05 - 2:00 | 0:30 - 1:05 | 1:16 - 1:31 | 0:30 - 0:53 | 0:07 - 1:16 | |
| | 50/50 | 0:38 - 1:05 | 0:53 | 0:19 - 0:53 | 0:08 - 0:19 | 0:15 - 0:34 | 0:07 - 0:15 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:42 - 1:54 | 1:31 | 0:53 - 1:31 | 0:30 - 0:53 | 0:27 - 1:12 ⁷ | 0:27 - 0:34 ⁷ | | |
| | 75/25 | 0:30 - 1:08 | 1:31 | 0:42 - 1:31 | 0:19 - 0:42 | 0:19 - 0:49 ⁷ | 0:27 - 0:34 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:19 - 0:38 | 1:12 | 0:27 - 1:12 | 0:08 - 0:27 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:19 - 0:38 | 0:30 | 0:11 - 0:30 | 0:03 - 0:11 | | | | |
| below -25 to -30.5°C (below -13 to -22.9°F) | 100/0 | 0:19 - 0:38 | 0:19 | 0:06 - 0:19 | 0:02 - 0:06 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-12: ADJUSTED TYPE II HOLDOVER TIMES FOR
KILFROST ABC-ICE CLEAR II**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:46 - 1:20 | 1:20 | 0:38 - 1:20 | 0:19 - 0:38 | 0:30 - 0:49 | 0:19 - 0:27 | 0:05 - 0:34 | |
| | 75/25 | 0:38 - 0:53 | 1:01 | 0:30 - 1:01 | 0:15 - 0:30 | 0:23 - 0:34 | 0:15 - 0:23 | 0:04 - 0:27 | |
| | 50/50 | 0:11 - 0:23 | 0:15 | 0:11 - 0:15 | 0:06 - 0:11 | 0:08 - 0:15 | 0:05 - 0:08 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:30 - 1:12 | 0:57 | 0:27 - 0:57 | 0:15 - 0:27 | 0:19 - 0:46 ⁷ | 0:11 - 0:23 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:30 - 1:01 | 0:42 | 0:19 - 0:42 | 0:11 - 0:19 | 0:19 - 0:34 ⁷ | 0:11 - 0:15 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:15 - 0:30 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:15 - 0:30 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | |
| below -25 to -29.5°C (below -13 to -21.1°F) | 100/0 | 0:15 - 0:30 | 0:15 | 0:05 - 0:15 | 0:01 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-13: ADJUSTED TYPE II HOLDOVER TIMES FOR
KILFROST ABC-K PLUS**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Snow, Snow Grains or Snow Pellets ^{2,3} | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|--|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:43 - 2:51 | 0:46 - 1:16 | 1:24 - 1:31 | 0:46 - 1:05 | 0:15 - 1:31 | |
| | 75/25 | 1:16 - 1:54 | 0:27 - 0:53 | 1:05 - 1:31 | 0:38 - 0:53 | 0:11 - 1:31 | |
| | 50/50 | 0:27 - 0:49 | 0:05 - 0:11 | 0:15 - 0:23 | 0:08 - 0:11 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:23 - 0:49 | 0:38 - 1:05 | 0:19 - 0:46 ⁷ | 0:11 - 0:27 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:19 - 1:05 | 0:27 - 0:49 | 0:15 - 0:42 ⁷ | 0:07 - 0:23 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:23 - 0:42 | 0:05 - 0:15 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:23 - 0:42 | 0:02 - 0:07 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:23 - 0:42 | 0:01 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-14: ADJUSTED TYPE II HOLDOVER TIMES FOR
NEWAVE AEROCHEMICAL FCY-2**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Snow, Snow Grains or Snow Pellets ^{2,3} | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|--|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:57 - 1:50 | 0:23 - 0:42 | 0:27 - 0:49 | 0:19 - 0:27 | 0:06 - 0:34 | |
| | 75/25 | 0:38 - 1:08 | 0:15 - 0:30 | 0:19 - 0:34 | 0:11 - 0:19 | 0:04 - 0:19 | |
| | 50/50 | 0:19 - 0:27 | 0:11 - 0:19 | 0:08 - 0:15 | 0:05 - 0:08 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:34 - 1:08 | 0:11 - 0:23 | 0:15 - 0:34 ⁷ | 0:11 - 0:15 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:23 - 0:49 | 0:08 - 0:15 | 0:11 - 0:23 ⁷ | 0:06 - 0:11 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:19 - 0:27 | 0:05 - 0:15 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:19 - 0:27 | 0:02 - 0:07 | | | | |
| below -25 to -28°C (below -13 to -18.4°F) | 100/0 | 0:19 - 0:27 | 0:01 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-15: ADJUSTED TYPE II HOLDOVER TIMES FOR
NEWAVE AEROCHEMICAL FCY-2 BIO+**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:05 - 1:54 | 1:46 | 0:49 - 1:46 | 0:23 - 0:49 | 0:38 - 1:01 | 0:19 - 0:34 | 0:06 - 0:57 | |
| | 75/25 | 0:34 - 1:01 | 1:01 | 0:30 - 1:01 | 0:15 - 0:30 | 0:19 - 0:38 | 0:11 - 0:19 | 0:05 - 0:27 | |
| | 50/50 | 0:11 - 0:23 | 0:19 | 0:11 - 0:19 | 0:06 - 0:11 | 0:08 - 0:15 | 0:06 - 0:08 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:30 - 1:08 | 0:46 | 0:23 - 0:46 | 0:11 - 0:23 | 0:27 - 0:49 ⁷ | 0:11 - 0:23 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:23 - 0:49 | 0:27 | 0:15 - 0:27 | 0:06 - 0:15 | 0:15 - 0:27 ⁷ | 0:11 - 0:15 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:15 - 0:46 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:15 - 0:46 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | |
| below -25 to -28.5°C (below -13 to -19.3°F) | 100/0 | 0:15 - 0:46 | 0:15 | 0:05 - 0:15 | 0:01 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-16: ADJUSTED TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX
APPLIED UNHEATED ON LOW SPEED AIRCRAFT¹**

| Outside Air Temperature ² | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{3,4} | Light Snow, Snow Grains or Snow Pellets ^{3,4} | Moderate Snow, Snow Grains or Snow Pellets ³ | Freezing Drizzle ⁵ | Light Freezing Rain | Rain on Cold Soaked Wing ⁶ | Other ⁷ |
|--|---|------------------------------|---|--|---|-------------------------------|---------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:34 - 1:27 | 1:01 | 0:30 - 1:01 | 0:14 - 0:30 | 0:19 - 0:38 | 0:11 - 0:19 | 0:04 - 0:30 | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -10°C (below 27 to 14°F) | 100/0 | 0:38 - 1:16 | 1:01 | 0:30 - 1:01 | 0:14 - 0:30 | 0:19 - 0:34 | 0:11 - 0:19 | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | | |
| below -10 to -16°C (below 14 to 3.2°F) | 100/0 | 0:30 - 1:20 | 1:01 | 0:30 - 1:01 | 0:14 - 0:30 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 These holdover times are for aircraft conforming to the SAE AS5900 low speed aerodynamic test criterion. Fluid must be applied unheated to use these holdover times. No holdover times exist for this fluid applied heated.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type III fluid cannot be used.
- 3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 5 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 6 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-17: ADJUSTED TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX
APPLIED UNHEATED ON HIGH SPEED AIRCRAFT¹**

| Outside Air Temperature ² | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{3,4} | Light Snow, Snow Grains or Snow Pellets ^{3,4} | Moderate Snow, Snow Grains or Snow Pellets ³ | Freezing Drizzle ⁵ | Light Freezing Rain | Rain on Cold Soaked Wing ⁶ | Other ⁷ | | |
|---|---|------------------------------|---|--|---|-------------------------------|---------------------|---|--------------------|--|--|
| -3°C and above (27°F and above) | 100/0 | 0:34 - 1:27 | 1:01 | 0:30 - 1:01 | 0:14 - 0:30 | 0:19 - 0:38 | 0:11 - 0:19 | 0:04 - 0:30 | | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| below -3 to -10°C (below 27 to 14°F) | 100/0 | 0:38 - 1:16 | 1:01 | 0:30 - 1:01 | 0:14 - 0:30 | 0:19 - 0:34 | 0:11 - 0:19 | CAUTION: No holdover time guidelines exist | | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | | | | |
| below -10 to -25°C (below 14 to -13°F) | 100/0 | 0:30 - 1:20 | 1:01 | 0:30 - 1:01 | 0:14 - 0:30 | | | | | | |
| below -25 to -35°C (below -13 to -31°F) | 100/0 | 0:19 - 0:46 | 0:34 | 0:15 - 0:34 | 0:08 - 0:15 | | | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 These holdover times are for aircraft conforming to the SAE AS5900 low speed aerodynamic test criterion. Fluid must be applied unheated to use these holdover times. No holdover times exist for this fluid applied heated.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type III fluid cannot be used.
- 3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 5 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 6 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-38 provides allowance times for ice pellets and small hail).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-18: ADJUSTED TYPE III HOLDOVER TIMES FOR CLARIANT SAFEWING MP III 2031 ECO
APPLIED HEATED ON LOW SPEED AIRCRAFT¹**

| Outside Air Temperature ² | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{3,4} | Light Snow, Snow Grains or Snow Pellets ^{3,4} | Moderate Snow, Snow Grains or Snow Pellets ³ | Freezing Drizzle ⁵ | Light Freezing Rain | Rain on Cold Soaked Wing ⁶ | Other ⁷ |
|--|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:19 - 0:38 | 0:30 | 0:15 - 0:30 | 0:08 - 0:15 | 0:13 - 0:23 | 0:08 - 0:11 | 0:04 - 0:23 | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:14 - 0:30 | 0:27 | 0:12 - 0:27 | 0:05 - 0:12 | 0:10 - 0:15 | 0:06 - 0:07 | 0:02 - 0:14 | |
| | 50/50 | 0:10 - 0:14 | 0:19 | 0:10 - 0:19 | 0:05 - 0:10 | 0:10 - 0:11 | 0:05 - 0:05 | | |
| below -3 to -10°C (below 27 to 14°F) | 100/0 | 0:27 - 0:57 | 0:30 | 0:15 - 0:30 | 0:08 - 0:15 | 0:11 - 0:23 | 0:07 - 0:10 | | |
| | 75/25 | 0:14 - 0:34 ⁸ | 0:19 ⁸ | 0:09 - 0:19 ⁸ | 0:04 - 0:09 ⁸ | 0:07 - 0:12 ⁸ | 0:05 - 0:06 ⁸ | | |
| below -10 to -16.5°C (below 14 to 2.3°F) | 100/0 | 0:19 - 0:34 | 0:30 | 0:14 - 0:30 | 0:07 - 0:14 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 These holdover times are for aircraft conforming to the SAE AS5900 low speed aerodynamic test criterion. Fluid must be applied heated to use these holdover times. No holdover times exist for this fluid applied unheated.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type III fluid cannot be used.
- 3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 5 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 6 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
- 8 No holdover time guidelines exist for 75/25 fluid below -9°C (15.8°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-19: ADJUSTED TYPE III HOLDOVER TIMES FOR CLARIANT SAFEWING MP III 2031 ECO
APPLIED HEATED ON HIGH SPEED AIRCRAFT¹**

| Outside Air Temperature ² | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{3,4} | Light Snow, Snow Grains or Snow Pellets ^{3,4} | Moderate Snow, Snow Grains or Snow Pellets ³ | Freezing Drizzle ⁵ | Light Freezing Rain | Rain on Cold Soaked Wing ⁶ | Other ⁷ |
|---|---|------------------------------|---|--|---|-------------------------------|---------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:19 - 0:38 | 0:30 | 0:15 - 0:30 | 0:08 - 0:15 | 0:13 - 0:23 | 0:08 - 0:11 | 0:04 - 0:23 | |
| | 75/25 | 0:14 - 0:30 | 0:27 | 0:12 - 0:27 | 0:05 - 0:12 | 0:10 - 0:15 | 0:06 - 0:07 | 0:02 - 0:14 | |
| | 50/50 | 0:10 - 0:14 | 0:19 | 0:10 - 0:19 | 0:05 - 0:10 | 0:10 - 0:11 | 0:05 - 0:05 | | |
| below -3 to -10°C (below 27 to 14°F) | 100/0 | 0:27 - 0:57 | 0:30 | 0:15 - 0:30 | 0:08 - 0:15 | 0:11 - 0:23 | 0:07 - 0:10 | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:14 - 0:34 | 0:19 | 0:09 - 0:19 | 0:04 - 0:09 | 0:07 - 0:12 | 0:05 - 0:06 | | |
| below -10 to -25°C (below 14 to -13°F) | 100/0 | 0:19 - 0:34 | 0:30 | 0:14 - 0:30 | 0:07 - 0:14 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:19 - 0:34 | 0:30 | 0:14 - 0:30 | 0:07 - 0:14 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 These holdover times are for aircraft conforming to the SAE AS5900 low speed aerodynamic test criterion. Fluid must be applied heated to use these holdover times. No holdover times exist for this fluid applied unheated.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type III fluid cannot be used.
- 3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 5 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 6 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-38 provides allowance times for ice pellets and small hail).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE ADJ-20: ADJUSTED GENERIC HOLDOVER TIMES FOR SAE TYPE IV FLUIDS

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 0:57 - 2:02 | 1:46 | 0:53 - 1:46 | 0:27 - 0:53 | 0:30 - 1:08 | 0:19 - 0:30 | 0:06 - 0:53 | |
| | 75/25 | 1:05 - 2:02 | 1:35 | 0:57 - 1:35 | 0:30 - 0:57 | 0:38 - 1:01 | 0:23 - 0:34 | 0:07 - 0:57 | |
| | 50/50 | 0:19 - 0:38 | 0:30 | 0:19 - 0:30 | 0:08 - 0:19 | 0:11 - 0:23 | 0:07 - 0:11 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:15 - 1:12 | 1:01 | 0:34 - 1:01 | 0:19 - 0:34 | 0:19 - 1:01 ⁷ | 0:15 - 0:19 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:23 - 0:53 | 1:16 | 0:34 - 1:16 | 0:15 - 0:34 | 0:11 - 0:49 ⁷ | 0:11 - 0:19 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:15 - 0:30 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:15 - 0:30 ⁸ | 0:15 ⁸ | 0:07 - 0:15 ⁸ | 0:02 - 0:07 ⁸ | | | | |
| below -25°C to LOUT (below -13°F to LOUT) | 100/0 | 0:15 - 0:30 ⁸ | 0:15 ⁸ | 0:05 - 0:15 ⁸ | 0:01 - 0:05 ⁸ | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).
- 8 If the LOUT is unknown, no holdover time guidelines exist below -22.5°C (-8.5°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-21: ADJUSTED TYPE IV HOLDOVER TIMES FOR
ABAX ECOWING AD-49**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:32 - 3:02 | 2:00 | 1:27 - 2:00 | 0:46 - 1:27 | 1:05 - 1:31 | 0:46 - 1:05 | 0:08 - 1:27 | |
| | 75/25 | 1:50 - 3:02 | 2:00 | 1:12 - 2:00 | 0:34 - 1:12 | 1:27 - 1:31 | 0:38 - 1:08 | 0:08 - 1:16 | |
| | 50/50 | 0:19 - 0:38 | 0:30 | 0:19 - 0:30 | 0:11 - 0:19 | 0:11 - 0:23 | 0:08 - 0:11 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:15 - 1:12 | 1:50 | 0:57 - 1:50 | 0:30 - 0:57 | 0:19 - 1:05 ⁷ | 0:15 - 0:19 ⁷ | | |
| | 75/25 | 0:23 - 0:53 | 1:46 | 0:49 - 1:46 | 0:23 - 0:49 | 0:11 - 0:49 ⁷ | 0:11 - 0:19 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:19 - 0:30 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:19 - 0:30 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | |
| below -25 to -26°C (below -13 to -14.8°F) | 100/0 | 0:19 - 0:30 | 0:15 | 0:05 - 0:15 | 0:01 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-22: ADJUSTED TYPE IV HOLDOVER TIMES FOR
CHEMCO CHEMR EG IV**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:35 - 2:43 | 2:00 | 0:57 - 2:00 | 0:27 - 0:57 | 0:34 - 1:16 | 0:19 - 0:30 | 0:07 - 1:20 | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 1:05 - 2:47 | 2:00 | 0:57 - 2:00 | 0:27 - 0:57 | 0:46 - 1:12 ⁷ | 0:27 - 0:38 ⁷ | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:30 - 1:05 | 0:30 | 0:23 - 0:30 | 0:11 - 0:23 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:30 - 1:05 | 0:30 | 0:23 - 0:30 | 0:11 - 0:23 | | | | |
| below -25 to -27°C (below -13 to -16.6°F) | 100/0 | 0:30 - 1:05 | 0:30 | 0:23 - 0:30 | 0:11 - 0:23 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-23: ADJUSTED TYPE IV HOLDOVER TIMES FOR
CLARIANT MAX FLIGHT 04**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:02 - 3:02 | 2:00 | 2:00 - 2:00 | 1:05 - 2:00 | 1:31 - 1:31 | 0:53 - 1:08 | 0:15 - 1:31 | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:38 - 1:54 | 1:46 | 0:53 - 1:46 | 0:27 - 0:53 | 0:19 - 1:08 ⁷ | 0:15 - 0:30 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:15 - 0:34 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | |
| below -18 to -23.5°C (below 0 to -10.3°F) | 100/0 | 0:15 - 0:34 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE ADJ-24: ADJUSTED TYPE IV HOLDOVER TIMES FOR CLARIANT MAX FLIGHT AVIA

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ | | |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|--|--|
| -3°C and above (27°F and above) | 100/0 | 2:21 - 3:02 | 2:00 | 1:20 - 2:00 | 0:46 - 1:20 | 1:05 - 1:31 | 0:42 - 0:53 | 0:07 - 1:31 | | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 1:20 - 2:59 | 1:39 | 0:57 - 1:39 | 0:30 - 0:57 | 0:53 - 1:31 ⁷ | 0:42 - 1:08 ⁷ | | CAUTION: No holdover time guidelines exist | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | | | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:27 - 1:05 | 0:30 | 0:23 - 0:30 | 0:11 - 0:23 | | | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:27 - 1:05 | 0:30 | 0:23 - 0:30 | 0:11 - 0:23 | | | | | | |
| below -25 to -28.5°C (below -13 to -19.3°F) | 100/0 | 0:27 - 1:05 | 0:30 | 0:23 - 0:30 | 0:11 - 0:23 | | | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-25: ADJUSTED TYPE IV HOLDOVER TIMES FOR
CLARIANT MAX FLIGHT SNEG**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:50 - 3:02 | 2:00 | 1:16 - 2:00 | 0:42 - 1:16 | 1:31 - 1:31 | 0:38 - 1:16 | 0:15 - 1:08 | |
| | 75/25 | 3:02 - 3:02 | 1:50 | 1:08 - 1:50 | 0:42 - 1:08 | 1:08 - 1:31 | 0:49 - 1:01 | 0:11 - 1:20 | |
| | 50/50 | 1:08 - 2:40 | 1:20 | 0:34 - 1:20 | 0:15 - 0:34 | 0:27 - 0:53 | 0:11 - 0:23 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:34 - 1:46 | 1:35 | 0:53 - 1:35 | 0:30 - 0:53 | 0:23 - 1:05 ⁷ | 0:19 - 0:30 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:23 - 1:05 | 1:16 | 0:46 - 1:16 | 0:30 - 0:46 | 0:15 - 0:49 ⁷ | 0:15 - 0:30 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:15 - 0:38 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:15 - 0:38 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:15 - 0:38 | 0:15 | 0:05 - 0:15 | 0:01 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-26: ADJUSTED TYPE IV HOLDOVER TIMES FOR
CLARIANT SAFEWING EG IV NORTH**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:46 - 2:59 | 2:00 | 1:16 - 2:00 | 0:38 - 1:16 | 1:08 - 1:31 | 0:38 - 0:42 | 0:06 - 1:31 | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 1:20 - 3:02 | 2:00 | 1:08 - 2:00 | 0:38 - 1:08 | 0:49 - 1:24 ⁷ | 0:42 - 1:05 ⁷ | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:30 - 1:01 | 0:30 | 0:23 - 0:30 | 0:11 - 0:23 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:30 - 1:01 | 0:30 | 0:23 - 0:30 | 0:11 - 0:23 | | | | |
| below -25 to -30°C (below -13 to -22°F) | 100/0 | 0:30 - 1:01 | 0:30 | 0:23 - 0:30 | 0:11 - 0:23 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-27: ADJUSTED TYPE IV HOLDOVER TIMES FOR
CLARIANT SAFEWING MP IV LAUNCH**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 3:02 - 3:02 | 2:00 | 1:20 - 2:00 | 0:49 - 1:20 | 1:08 - 1:31 | 0:46 - 1:16 | 0:11 - 1:16 | |
| | 75/25 | 2:47 - 3:02 | 2:00 | 1:20 - 2:00 | 0:46 - 1:20 | 1:16 - 1:31 | 0:34 - 0:57 | 0:08 - 1:20 | |
| | 50/50 | 1:05 - 2:05 | 1:05 | 0:34 - 1:05 | 0:19 - 0:34 | 0:23 - 0:38 | 0:15 - 0:19 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:46 - 1:27 | 1:39 | 1:01 - 1:39 | 0:38 - 1:01 | 0:27 - 1:16 ⁷ | 0:19 - 0:34 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | 0:30 - 1:01 | 1:50 | 1:05 - 1:50 | 0:34 - 1:05 | 0:19 - 0:53 ⁷ | 0:19 - 0:34 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:23 - 0:38 | 0:57 | 0:15 - 0:57 | 0:05 - 0:15 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:23 - 0:38 | 0:23 | 0:07 - 0:23 | 0:02 - 0:07 | | | | |
| below -25 to -28.5°C (below -13 to -19.3°F) | 100/0 | 0:23 - 0:38 | 0:15 | 0:05 - 0:15 | 0:01 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-28: ADJUSTED TYPE IV HOLDOVER TIMES FOR
CLARIANT SAFEWING MP IV LAUNCH PLUS**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:59 - 3:02 | 2:00 | 1:35 - 2:00 | 0:42 - 1:35 | 1:31 - 1:31 | 0:46 - 1:31 | 0:15 - 1:31 | |
| | 75/25 | 2:59 - 3:02 | 2:00 | 1:27 - 2:00 | 0:38 - 1:27 | 1:31 - 1:31 | 1:01 - 1:05 | 0:15 - 1:24 | |
| | 50/50 | 0:57 - 1:24 | 1:12 | 0:34 - 1:12 | 0:15 - 0:34 | 0:19 - 0:46 | 0:11 - 0:15 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:42 - 1:43 | 2:00 | 1:05 - 2:00 | 0:30 - 1:05 | 0:19 - 1:12 ⁷ | 0:19 - 0:30 ⁷ | | |
| | 75/25 | 0:30 - 1:31 | 2:00 | 0:57 - 2:00 | 0:23 - 0:57 | 0:15 - 0:49 ⁷ | 0:15 - 0:23 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:19 - 0:38 | 0:57 | 0:19 - 0:57 | 0:05 - 0:19 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:19 - 0:38 | 0:23 | 0:07 - 0:23 | 0:02 - 0:07 | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:19 - 0:38 | 0:15 | 0:05 - 0:15 | 0:02 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-29: ADJUSTED TYPE IV HOLDOVER TIMES FOR
CRYOTECH POLAR GUARD® ADVANCE**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:09 - 3:02 | 2:00 | 1:27 - 2:00 | 0:49 - 1:27 | 1:12 - 1:31 | 0:57 - 1:08 | 0:11 - 1:31 | |
| | 75/25 | 1:54 - 3:02 | 2:00 | 1:05 - 2:00 | 0:30 - 1:05 | 1:16 - 1:31 | 0:30 - 0:53 | 0:07 - 1:16 | |
| | 50/50 | 0:38 - 1:05 | 0:53 | 0:19 - 0:53 | 0:08 - 0:19 | 0:15 - 0:34 | 0:07 - 0:15 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:42 - 1:54 | 1:31 | 0:53 - 1:31 | 0:30 - 0:53 | 0:27 - 1:12 ⁷ | 0:27 - 0:34 ⁷ | | |
| | 75/25 | 0:30 - 1:08 | 1:31 | 0:42 - 1:31 | 0:19 - 0:42 | 0:19 - 0:49 ⁷ | 0:27 - 0:34 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:19 - 0:38 | 1:12 | 0:27 - 1:12 | 0:08 - 0:27 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:19 - 0:38 | 0:30 | 0:11 - 0:30 | 0:03 - 0:11 | | | | |
| below -25 to -30.5°C (below -13 to -22.9°F) | 100/0 | 0:19 - 0:38 | 0:19 | 0:06 - 0:19 | 0:02 - 0:06 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-30: ADJUSTED TYPE IV HOLDOVER TIMES FOR
DOW CHEMICAL UCAR™ ENDURANCE EG106**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ | | |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|--|--|
| -3°C and above (27°F and above) | 100/0 | 1:35 - 2:24 | 2:00 | 1:01 - 2:00 | 0:30 - 1:01 | 0:53 - 1:31 | 0:38 - 0:57 | 0:15 - 1:31 | | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 1:24 - 2:32 | 1:39 | 0:49 - 1:39 | 0:23 - 0:49 | 0:42 - 1:24 ⁷ | 0:34 - 0:53 ⁷ | | CAUTION: No holdover time guidelines exist | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | | | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:23 - 0:49 | 1:20 | 0:38 - 1:20 | 0:19 - 0:38 | | | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:23 - 0:49 | 1:08 | 0:30 - 1:08 | 0:15 - 0:30 | | | | | | |
| below -25 to -29°C (below -13 to -20.2°F) | 100/0 | 0:23 - 0:49 | 1:01 | 0:30 - 1:01 | 0:15 - 0:30 | | | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-31: ADJUSTED TYPE IV HOLDOVER TIMES FOR
DOW CHEMICAL UCAR™ FLIGHTGUARD AD-49**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:32 - 3:02 | 2:00 | 1:27 - 2:00 | 0:46 - 1:27 | 1:05 - 1:31 | 0:46 - 1:05 | 0:08 - 1:27 | |
| | 75/25 | 1:50 - 3:02 | 2:00 | 1:12 - 2:00 | 0:34 - 1:12 | 1:27 - 1:31 | 0:38 - 1:08 | 0:08 - 1:16 | |
| | 50/50 | 0:19 - 0:38 | 0:30 | 0:19 - 0:30 | 0:11 - 0:19 | 0:11 - 0:23 | 0:08 - 0:11 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:15 - 1:12 | 1:50 | 0:57 - 1:50 | 0:30 - 0:57 | 0:19 - 1:05 ⁷ | 0:15 - 0:19 ⁷ | | |
| | 75/25 | 0:23 - 0:53 | 1:46 | 0:49 - 1:46 | 0:23 - 0:49 | 0:11 - 0:49 ⁷ | 0:11 - 0:19 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:19 - 0:30 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:19 - 0:30 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | |
| below -25 to -26°C (below -13 to -14.8°F) | 100/0 | 0:19 - 0:30 | 0:15 | 0:05 - 0:15 | 0:01 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-32: ADJUSTED TYPE IV HOLDOVER TIMES FOR
INLAND TECHNOLOGIES ECO-SHIELD®**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ | | |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|--|--|
| -3°C and above (27°F and above) | 100/0 | 0:57 - 2:02 | 1:50 | 1:01 - 1:50 | 0:34 - 1:01 | 0:30 - 1:08 | 0:27 - 0:30 | 0:11 - 1:12 | | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:53 - 1:58 | 1:27 | 0:49 - 1:27 | 0:27 - 0:49 | 0:38 - 1:05 ⁷ | 0:23 - 0:30 ⁷ | | CAUTION: No holdover time guidelines exist | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | | | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:23 - 0:46 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:23 - 0:46 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | | | |
| below -25 to -25.5°C (below -13 to -13.9°F) | 100/0 | 0:23 - 0:46 | 0:15 | 0:05 - 0:15 | 0:01 - 0:05 | | | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-33: ADJUSTED TYPE IV HOLDOVER TIMES FOR
KILFROST ABC-S PLUS**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 1:39 - 3:02 | 2:00 | 1:35 - 2:00 | 0:57 - 1:35 | 1:24 - 1:31 | 0:49 - 1:31 | 0:19 - 1:31 | |
| | 75/25 | 1:05 - 2:02 | 1:35 | 0:57 - 1:35 | 0:34 - 0:57 | 0:46 - 1:01 | 0:23 - 0:38 | 0:08 - 1:01 | |
| | 50/50 | 0:23 - 0:42 | 0:46 | 0:23 - 0:46 | 0:11 - 0:23 | 0:11 - 0:30 | 0:11 - 0:15 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:42 - 2:40 | 2:00 | 1:20 - 2:00 | 0:46 - 1:20 | 0:19 - 1:12 ⁷ | 0:15 - 0:23 ⁷ | | |
| | 75/25 | 0:34 - 1:24 | 1:20 | 0:46 - 1:20 | 0:27 - 0:46 | 0:15 - 0:53 ⁷ | 0:11 - 0:19 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:30 - 0:46 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:30 - 0:46 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | |
| below -25 to -28°C (below -13 to -18.4°F) | 100/0 | 0:30 - 0:46 | 0:15 | 0:05 - 0:15 | 0:01 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-34: ADJUSTED TYPE IV HOLDOVER TIMES FOR
LNT SOLUTIONS E450**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|--|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|--|
| -3°C and above (27°F and above) | 100/0 | 1:24 - 2:13 | 1:50 | 1:12 - 1:50 | 0:46 - 1:12 | 1:12 - 1:31 | 0:42 - 1:01 | 0:19 - 1:31 | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 1:08 - 2:59 | 1:24 | 0:53 - 1:24 | 0:34 - 0:53 | 1:20 - 1:31 ⁷ | 0:49 - 1:16 ⁷ | | CAUTION: No holdover time guidelines exist |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:27 - 0:49 | 2:00 | 0:49 - 2:00 | 0:15 - 0:49 | | | | |
| below -18 to -22.5°C (below 0 to -8.5°F) | 100/0 | 0:27 - 0:49 | 1:31 | 0:30 - 1:31 | 0:11 - 0:30 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-35: ADJUSTED TYPE IV HOLDOVER TIMES FOR
NEWAVE AEROCHEMICAL FCY 9311**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ | | |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|--|--|
| -3°C and above (27°F and above) | 100/0 | 1:27 - 3:02 | 1:46 | 0:53 - 1:46 | 0:27 - 0:53 | 0:53 - 1:31 | 0:30 - 0:49 | 0:11 - 1:05 | | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:27 - 1:35 | 1:12 | 0:38 - 1:12 | 0:19 - 0:38 | 0:27 - 1:01 ⁷ | 0:15 - 0:27 ⁷ | | CAUTION: No holdover time guidelines exist | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | | | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:23 - 0:42 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:23 - 0:42 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | | | |
| below -25 to -29.5°C (below -13 to -21.1°F) | 100/0 | 0:23 - 0:42 | 0:15 | 0:05 - 0:15 | 0:01 - 0:05 | | | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-36: ADJUSTED TYPE IV HOLDOVER TIMES FOR
OKSAYD DEFROST ECO 4**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ | | |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|--|--|
| -3°C and above (27°F and above) | 100/0 | 1:08 - 2:02 | 1:54 | 0:57 - 1:54 | 0:27 - 0:57 | 0:49 - 1:08 | 0:30 - 0:49 | 0:11 - 0:53 | | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| | 50/50 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:42 - 1:58 | 1:35 | 0:46 - 1:35 | 0:23 - 0:46 | 0:38 - 1:01 ⁷ | 0:27 - 0:38 ⁷ | | CAUTION: No holdover time guidelines exist | | |
| | 75/25 | N/A | N/A | N/A | N/A | N/A | N/A | | | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:23 - 0:38 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:23 - 0:38 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | | | |
| below -25 to -25.5°C (below -13 to -13.9°F) | 100/0 | 0:23 - 0:38 | 0:15 | 0:05 - 0:15 | 0:01 - 0:05 | | | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

**TABLE ADJ-37: ADJUSTED TYPE IV HOLDOVER TIMES FOR
SHAANXI CLEANWAY AVIATION CLEANSURFACE IV**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|---|
| -3°C and above (27°F and above) | 100/0 | 2:09 - 3:02 | 2:00 | 1:27 - 2:00 | 0:46 - 1:27 | 1:31 - 1:31 | 1:05 - 1:08 | 0:11 - 1:31 | |
| | 75/25 | 1:58 - 3:02 | 2:00 | 1:12 - 2:00 | 0:34 - 1:12 | 0:38 - 1:31 | 0:27 - 0:34 | 0:07 - 0:57 | |
| | 50/50 | 0:49 - 1:50 | 1:16 | 0:30 - 1:16 | 0:11 - 0:30 | 0:19 - 0:38 | 0:11 - 0:15 | | |
| below -3 to -14°C (below 27 to 7°F) | 100/0 | 0:46 - 2:21 | 1:01 | 0:34 - 1:01 | 0:19 - 0:34 | 0:27 - 1:20 ⁷ | 0:15 - 0:27 ⁷ | | |
| | 75/25 | 0:38 - 1:27 | 1:16 | 0:34 - 1:16 | 0:15 - 0:34 | 0:23 - 1:01 ⁷ | 0:19 - 0:30 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:23 - 0:38 | 0:30 | 0:15 - 0:30 | 0:05 - 0:15 | | | | CAUTION: No holdover time guidelines exist |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:23 - 0:38 | 0:15 | 0:07 - 0:15 | 0:02 - 0:07 | | | | |
| below -25 to -28.5°C (below -13 to -19.3°F) | 100/0 | 0:23 - 0:38 | 0:15 | 0:05 - 0:15 | 0:01 - 0:05 | | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table ADJ-39 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE ADJ-38: ADJUSTED ALLOWANCE TIMES FOR SAE TYPE III FLUIDS¹

| Precipitation Type | Outside Air Temperature | | |
|---|-------------------------|-------------------|--|
| | -5°C and above | Below -5 to -10°C | Below -10°C ² |
| Light Ice Pellets | 8 minutes | 8 minutes | Caution: No allowance times currently exist |
| Light Ice Pellets Mixed with Snow | 8 minutes | 8 minutes | |
| Light Ice Pellets Mixed with Freezing Drizzle | 5 minutes | 4 minutes | |
| Light Ice Pellets Mixed with Freezing Rain | 5 minutes | 4 minutes | |
| Light Ice Pellets Mixed with Rain | 5 minutes ³ | | |
| Moderate Ice Pellets (or Small Hail) ⁴ | 4 minutes | 4 minutes | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. ALLOWANCE TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 These allowance times are for use with undiluted (100/0) fluids applied unheated on aircraft with rotation speeds of 100 knots or greater.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected.
- 3 No allowance times exist in this condition for temperatures below 0°C; consider use of light ice pellets mixed with freezing rain.
- 4 If no intensity is reported with small hail, use the "moderate ice pellets or small hail" allowance times. If an intensity is reported with small hail, the ice pellet condition with the equivalent intensity can be used, e.g. if light small hail is reported, the "light ice pellets" allowance times can be used. This also applies in mixed conditions, e.g. if light small hail mixed with snow is reported, use the "light ice pellets mixed with snow" allowance times.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- Allowance time cannot be extended by an inspection of the aircraft critical surfaces.
- Takeoff is allowed up to 90 minutes after start of fluid application if the precipitation stops at or before the allowance time expires and does not restart. The OAT must not decrease during the 90 minutes to use this guidance in conditions of light ice pellets mixed with either: freezing drizzle, freezing rain or rain.

TABLE ADJ-39: ADJUSTED ALLOWANCE TIMES FOR SAE TYPE IV FLUIDS¹

| Precipitation Type | Outside Air Temperature | | | |
|---|-------------------------|-------------------|-------------------------|--|
| | -5°C and above | Below -5 to -10°C | Below -10 to -16°C | Below -16 to -22°C ² |
| Light Ice Pellets | 38 minutes | 23 minutes | 23 minutes ³ | 23 minutes ³ |
| Light Ice Pellets Mixed with Snow | 30 minutes | 11 minutes | 11 minutes ³ | |
| Light Ice Pellets Mixed with Freezing Drizzle | 19 minutes | 8 minutes | | Caution: No allowance times currently exist |
| Light Ice Pellets Mixed with Freezing Rain | 19 minutes | 8 minutes | | |
| Light Ice Pellets Mixed with Rain | 19 minutes ⁴ | | | |
| Moderate Ice Pellets (or Small Hail) ⁵ | 19 minutes ⁶ | 8 minutes | 8 minutes ³ | 8 minutes ⁷ |
| Moderate Ice Pellets (or Small Hail) ⁵ Mixed with Freezing Drizzle | 8 minutes | 5 minutes | | Caution: No allowance times currently exist |
| Moderate Ice Pellets (or Small Hail) ⁵ Mixed with Rain | 8 minutes ⁸ | | | |

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. ALLOWANCE TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

- 1 These allowance times are for use with undiluted (100/0) fluids applied on aircraft with rotation speeds of 100 knots or greater. All Type IV fluids are propylene glycol based with the exception of CHEMCO ChemR EG IV, Clariant Max Flight AVIA, Clariant Safewing EG IV NORTH, Dow EG106 and LNT Solutions E450 which are ethylene glycol based.
- 2 Ensure that the lowest operational use temperature (LOUT) is respected.
- 3 No allowance times exist for propylene glycol (PG) fluids when used on aircraft with rotation speeds less than 115 knots. (For these aircraft, if the fluid type is not known, assume zero allowance time.)
- 4 No allowance times exist in this condition for temperatures below 0°C; consider use of light ice pellets mixed with freezing rain.
- 5 If no intensity is reported with small hail, use the "moderate ice pellets or small hail" allowance times. If an intensity is reported with small hail, the ice pellet condition with the equivalent intensity can be used, e.g. if light small hail is reported, the "light ice pellets" allowance times can be used. This also applies in mixed conditions, e.g. if light small hail mixed with snow is reported, use the "light ice pellets mixed with snow" allowance times.
- 6 Allowance time is 14 minutes for propylene glycol (PG) fluids or when the fluid type is unknown.
- 7 No allowance times exist for propylene glycol (PG) fluids in this condition for temperatures below -16°C.
- 8 No allowance times exist in this condition for temperatures below 0°C.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- Allowance time cannot be extended by an inspection of the aircraft critical surfaces.
- Takeoff is allowed up to 90 minutes after start of fluid application if the precipitation stops at or before the allowance time expires and does not restart. The OAT must not decrease during the 90 minutes to use this guidance in conditions of light ice pellets mixed with either: freezing drizzle, freezing rain or rain.

APPENDIX B:
CHANGES TO *GUIDELINES FOR AIRCRAFT GROUND ICING*
OPERATIONS (TP 14052E, SECOND EDITION, 04/2005)

The changes in this Appendix 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.

CHANGES TO *GUIDELINES FOR AIRCRAFT GROUND ICING OPERATIONS* (TP 14052E, SECOND EDITION, 04/2005)

Replace Sub-Paragraph 8.1.2 (2nd paragraph), “Fluid Description”, with the following:

Anti-icing fluids are similar in composition except that they also contain polymeric thickeners. They are formulated to prevent formation of unabsorbed frozen contamination for a longer period of time than deicing fluids; however, the protection is still for a limited period of time. Although Type I fluids may be used for anti-icing, Type II, III and IV fluids are typically used in the anti-icing role because they can last for a significantly longer period of time than the Type I fluids.

Replace entire contents of Sub-Paragraph 8.1.4, “Certification Applicable to Qualified Fluids”, with the following:

8.1.4 Acceptable Fluids

Transport Canada does not approve or qualify de/anti-icing fluids.

The aircraft manufacturer will generally indicate in the Aircraft Maintenance Manual the applicable industry specification for aircraft consumable materials. The industry fluid specifications for de/anti-icing fluids was discussed in Section 8.1.3.

The SAE specifications require numerous chemical and physical tests at a specialized laboratory. These tests are principally for measuring the compatibility of materials used in aircraft construction and the physical properties of the fluid against the appropriate SAE specification.

Also, the SAE specifications require a series of anti-icing and aerodynamic performance tests. The aerodynamic performance tests are conducted in a calibrated wind tunnel, in a specialized laboratory, for the purpose of measuring the aerodynamic and “flow off” characteristics of the fluid against the appropriate SAE specification.

Further, fluids undergo HOT evaluation to assess their HOT characteristics and establish the values for the HOT guidelines for that particular fluid.

8.1.4.1 Testing Laboratories

The following laboratories are known to provide testing for de/anti-icing fluids given they verifiably adhere to internationally accepted standards and recommended practices that are associated to the holdover times published by Transport Canada.

Please enquire directly with the laboratories for a full list of testing available.

- a) Anti-icing Materials International Laboratory (AMIL): 555, boulevard de l'Université, Chicoutimi, Québec, G7H 2B1, Canada, 418-545-5011 ext. 2406, www.uqac.ca/amil. Provides testing for anti-icing performance (3.2.4 of AMS1428 and AS5901), aerodynamic acceptance (3.2.5 of AMS1428 and AS5900), physical properties including fluid stability (3.2 of AMS1428), environmental information (3.1.6 of AMS1428) and most of tests to evaluate materials compatibility (3.3 of AMS1428).
- b) APS Aviation Inc.: 6700, chemin de la Côte-de-Liesse, Suite 105, Saint-Laurent, Quebec, H4T 2B5, Canada, 514-878-4388, www.apsaviation.ca. Provides endurance time testing described in ARP5485 and ARP5945.
- c) Scientific Material International (SMI): 12219 SW 131st Avenue, Miami, Florida, USA 33186-6401; 305-971-7047, www.smiinc.com. Provides testing to generate most environmental information (3.1.6 of AMS1428), several of the tests described under 3.2.1 of AMS1428, and effect on materials testing (3.3.2, 3.3.3, 3.3.4, 3.3.5 of AMS1428).

Replace Sub-Paragraph 10.4 (1st paragraph), “Procedure Selection”, with the following:

Guidelines for appropriate application of de/anti-icing fluids are provided in the Transport Canada HOT Guidelines, which includes separate tables for the application of Type I fluid, Type II/IV Fluid, Type III Heated Fluid and Type III Unheated Fluid. These tables are updated annually as required.

Note: Fluid application tables published by other entities may not provide equivalent information to those published by Transport Canada. Therefore, the Transport Canada holdover / allowance times are not applicable unless the guidance in the Transport Canada fluid application tables is used.

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

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

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

If a two-step procedure is used, the first step is typically performed using a deicing fluid; however, alternate deicing technology or mechanical methods may be used depending on the circumstances. The selection of fluid type and concentration depends on the ambient temperature, the weather conditions and the desired holdover time. When performing a two-step process, the freezing point of a fluid used for the first step must not be above the ambient temperature. The freezing point of an SAE Type I fluid used for a one-step process, or as the second step of a two-step operation, must be at least 10°C below the ambient temperature. The second step is to be performed before the first step freezes, typically within 3 minutes. This time may be higher than 3 minutes in some conditions, but potentially lower in heavy precipitation, colder temperatures, or for critical surfaces constructed of composite materials. If necessary, the second step shall be applied area by area. When deicing fluid is used in step 1, the application of the second step fluid will flush away the first step fluid and leave a film of anti-icing fluid, which is designed to be of adequate thickness. If freezing of the deicing fluid has occurred, step 1 must be repeated. Refer to the SAE ARP 4737 document for additional details.

Add the following Paragraph to 10.6.2.4, “Areas to be Covered”, between item (e) and paragraph beginning “Care must be taken...”:

Wingtip devices have various names including winglets, strakes, sharklets, or raked wingtips; these devices are considered critical surfaces given they are part of the wing surface. A new wingtip device element, the strake has been introduced and is part of the split scimitar. The strake is installed outboard of the vertical component of the wingtip device and extends downward and therefore cannot be observed from inside the aircraft.

Add Sub-Paragraph 10.8.1, “Non-Glycol Deicing Fluids Containing Alkali Organic Salts”, as follows:

There has been evidence that some non-glycol based Type I fluids may pose a significant safety hazard when given their impact on anti-icing fluid. Specifically, Type I fluids containing alkali organic salts (AOS) have been shown to significantly degrade thickening agents contained in anti-icing fluids potentially resulting in a reduction of the fluid's viscosity and holdover time. It is preferable that operators avoid the use of any de-icing fluid containing AOS. In operational situations where this may not be possible, special attention should be given to ensure that a sufficient amount of anti-icing fluid has been applied to ensure complete removal of this deicing fluid so that the anti-icing fluid will have the appropriate holdover time.

Add Sub-Paragraph 10.8.2, “De/Anti-icing Fluid Compatibility with Runway Deicer”, as follows:

Recent research has showed that when thickened aircraft anti-icing fluid comes in contact with minimal amounts of runway deicing fluids (alkali organic salt based), anti-icing protection provided by the aircraft anti-icing fluid could be diminished. The separation of the thickening agents in this fluid consequently reduces holdover time.

This can occur when fluids from the runway are splashed onto the wing by the nose gear wheels or from the use of engine thrust reversers at landing prior to when the aircraft is anti-iced using a one-step process as protection for the next flight. Additional tests also showed that when using a two-step de/anti-icing process, the application of the first step cleans off the contamination from the runway deicing fluid so that the anti-icing protection provided with the second step is not affected by the runway deicing fluids. Therefore, it is recommended that de/anti-icing applications be performed using a two-step process.

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

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

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

Add Sub-Paragraph 10.11.1, “Applying Anti-Icing Fluid in a Hangar – T-tail Aircraft”, as follows:

When anti-icing T-tail aircraft in a hangar, care must be taken to ensure that the horizontal stabilizer/elevator of the aircraft is not in close proximity to the ceiling heating system. Excessive heating of these critical surfaces during and after anti-icing can reduce applied anti-icing fluid thickness below what is required to achieve the holdover time.

If it is impossible to position the aircraft in such a way that the tail section is not below a heating element, consider disabling the heating element before, during and after anti-icing. Alternately, consider opening the hangar doors to cool all surfaces if this can be done without exposing the aircraft to additional contamination.

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

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

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

Hot water may be used to remove large amounts of contamination (such as ice) from an aircraft, provided that the Outside Air Temperature is 0°C and above as per the application procedures for SAE Type I, II, III and IV fluids described in tables 45, 46, 47 and 48 of the Transport Canada HOT Guidelines document.

Delete Sub-Paragraph 10.13.3.1 Item g) only.**Replace entire contents of 10.13.5 to 10.13.5.4 with the following:****10.13.5 Ground Ice Detection Systems (GIDS)**

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

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

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

<https://www.tc.gc.ca/eng/civilaviation/opssvs/managementservices-referencecentre-acs-600-602-001-492.htm>

Add the following paragraph to the end of Sub-Paragraph 11.1.1:

The values in the Type II and Type IV generic holdover time guidelines (Table 4, Table 20) are the shortest (worst case) holdover times of all Type II or all Type IV fluids included on the Transport Canada List of Fluids. These

values are specific to precipitation condition, temperature range, fluid concentration, and precipitation rate. An analysis of all available Type II and Type IV fluids is done annually to determine these values. The generic holdover times must be used if the specific Type II or Type IV fluid being used cannot be positively determined. Note: The lowest on-wing viscosity (LOWV) of the fluid being used must always be respected, even when the generic Type II or Type IV holdover times are used.

Replace Sub-Paragraph 11.1.2, “Current Holdover Time Guidelines”, with the following:

Current HOT Guidelines can be found at the following website:

<http://www.tc.gc.ca/eng/civilaviation/standards/commerce-holdovertime-menu-1877.htm>

The following information can be found at the above website:

- a) Active Frost HOT Guidelines;
- b) Type I Fluid Generic HOT Guidelines;
- c) Type II Fluid HOT Guidelines;
- d) Type III Fluid HOT Guidelines;
- e) Type IV Fluid HOT Guidelines;
- f) Ice Pellet and Small Hail Allowance Times;
- g) Snowfall Intensities as a Function of Prevailing Visibility;
- h) List of Fluids Tested for Anti-Icing Performance and Aerodynamic Acceptance; and
- i) De/Anti-Icing Fluid Application Procedures.

Replace Sub-Paragraph 11.1.4.1 a) “Estimating the Precipitation Rate” with the following:

The METAR/SPECI reported snowfall intensity is based only on observed visibility in accordance with the Environment Canada MANOBS. Scientific research has demonstrated that the use of observed visibility in snow as the sole criteria in the MANOBS, for establishing snow intensity is not accurate enough for use with the holdover time guidelines. The evidence indicates that a visibility and temperature pair needs to be used for establishing the more accurate snowfall intensity required for use with the holdover time guidelines.

The highest snowfall intensities occur near 0°C. It has also been determined that during night time snowfall conditions, for the same snowfall intensity, visibility is about twice as good as it is during the day (i.e. one can see further at night than during the day for the same snowfall intensity). This factor must be considered in estimating the snowfall intensity.

The relationship between visibility and snowfall intensity was analyzed and is documented in TP 14151E. The relevant information from TP 14151E is contained in the Transport Canada “Snowfall Intensities as a Function of Prevailing Visibility” table contained in the holdover time guidelines.

The METAR/SPECI reported visibility or flight crew observed visibility will be used with the “Snowfall Intensities as a Function of Prevailing Visibility” table to establish snowfall intensity for Type I, II, III and IV holdover time guidelines, during snow, snow grain, or snow pellet precipitation conditions.

The “Snowfall Intensities as a Function of Prevailing Visibility” table, should also be used when snow, snow grains or snow pellets are accompanied by blowing or drifting snow in the METAR/SPECI.

Examples:

CYUY 161300Z 26005KT 1SM -SN OVC015 M01/M05 A2964

In the above METAR the snowfall intensity is reported as light. However, based upon the Transport Canada “Snowfall Intensities as a Function of Prevailing Visibility” table, with a visibility of 1 statute mile, in daylight and a temperature of -1°C, the snowfall intensity is classified as moderate. The snowfall intensity of moderate – not the METAR reported intensity of light – will be used to determine which HOT Guideline value is appropriate for the fluid in use.

CYVO 160200Z 15011G17KT 1SM -SN DRSN OVC009 M06/M08 A2948

In the above METAR the snowfall intensity is reported as light. However, based upon the Transport Canada “Snowfall Intensities as a Function of Prevailing Visibility” table, with a visibility

of 1 statute mile, in darkness and a temperature of -6°C, the snowfall intensity is classified as moderate. The snowfall intensity of moderate – not the METAR reported intensity of light – will be used to determine which HOT Guideline value is appropriate for the fluid in use.

Rarely, there may be circumstances where the METAR/SPECI reported visibility or flight crew observed visibility is substantially reduced due to obscuration conditions such as fog, mist, freezing fog, dust, haze, or smoke. These obscuration conditions contribute very little to the overall catch rate at the wing surface and using the “Snowfall Intensities as a Function of Prevailing Visibility” table, would likely overestimate the snow fall intensity.

Under these conditions and with a careful assessment by the flight crew to ensure that the obscuration conditions are not concealing significant snowfall intensities, the METAR/SPECI reported snowfall intensity can be used.

Example:

CYTS 231000Z 21003KT ½ SM SN FZFG OVC003 M03/M03 A2969

In the above METAR, the snowfall intensity is reported as moderate. Based on the Transport Canada “Snowfall Intensities as a Function of Prevailing Visibility” table, with a visibility of ½ statute mile, in darkness and a temperature of -3°C, the snowfall intensity is classified as heavy. However, since freezing fog is present as an obscuring condition, a moderate snowfall intensity (as reported in the METAR) can be used to determine which HOT Guideline value is appropriate for the fluid in use, provided the crew can ensure that the obscuration is not concealing significant snowfall intensities.

Note: The Transport Canada “Snowfall Intensities as a Function of Prevailing Visibility” table can be found along with the current HOT Guidelines through the Transport Canada website: www.tc.gc.ca.

Use of Runway Visual Range (RVR) with the Snowfall Intensities as a Function of Prevailing Visibility Table

There has been some confusion regarding the values indicated below the visibility (in parentheses) in the Snowfall Intensity table. The values indicated in parentheses refer to the visibility in metres and not an RVR.

RVR should not be used to determine visibility for the following reasons:

- a) RVR transmissometers were never intended to measure visibility with respect to snowfall intensity for use with holdover time guidelines.
- b) The RVR equipment is designed to provide pilots with an expected visual range along the runway, based on an associated runway edge and centerline lighting intensity. For a given obscuration phenomenon and precipitation intensity (fog, snow, etc.) the RVR will vary based on the selected runway lighting level. Therefore multiple RVR are possible for a given condition even though the meteorological conditions remain the same.
- c) Furthermore RVR's in excess of 6000 ft are simply reported as 6000+. This level of resolution, only allows limited use of the Snowfall Intensity table (for example in darkness and at a temperature of -1°C and an RVR of 6000+, the only conclusion that can be drawn from the Snowfall Intensity table is that we are not in heavy snow, and that we could be in Moderate, Light or Very Light Snow conditions).

Varying Weather Conditions After Completion of Anti-Icing Procedure

During periods when the weather conditions are varying after completion of the anti-icing procedure, crews should reassess the previously selected holdover time. When doing so crews need to consider the following:

- 1) Improving weather conditions – if the snowfall intensity decreases, the original HOT should be retained;
- 2) Worsening weather conditions – if the snowfall intensity increases, a new lower HOT should be established and used.

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

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

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

- a) The conditions present are NOT in excess of those conditions represented by the table (e.g. for snow, it would be a moderate snow condition); and
- b) The impact of other factors (e.g. jet blast) has been considered and deemed not to affect the HOT.

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

Replace Sub-Paragraph 11.1.8, “Meteorological Conditions for which the HOT Guidelines are not applicable”, with the following:

The HOT Guidelines do not include guidelines for all meteorological conditions. Holdover time guidelines have not been assessed for the following conditions: a) Hail; b) Moderate and Heavy Freezing Rain; and c) Heavy Snow.

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

Additionally, holdover time guidelines have not been assessed for Ice Pellets or Small Hail, since a formal protocol for this testing has not yet been developed and included in standard SAE testing methodologies and no visual failure criteria have yet been identified for these conditions. Instead, allowance times have been developed for operations during ice pellet conditions as a result of research carried out by Transport Canada and the FAA. As it has been determined small hail is equivalent to ice pellets, allowance times are also provided for small hail conditions.

Replace entire contents of Sub-Paragraph 11.1.9, “Use of approved fluids”, with the following:

11.1.9 Use of De/Anti-icing Fluids

The operator is ultimately responsible for ensuring that only fluids tested to SAE AMS1424 or SAE AMS1428 are applied when the HOT Guidelines will be utilized operationally.

The Transport Canada Holdover Time Guidelines document, published on an annual basis, contains lists of fluids that have been tested with respect to anti-icing performance (SAE AMS1424 or SAE AMS1428) and aerodynamic acceptance (SAE AMS1424 or SAE AMS1428) only.

Therefore, the end user is cautioned that they must confirm that other SAE AMS1424 or SAE AMS1428 technical requirement tests such as fluid stability, toxicity, materials compatibility, etc. have been conducted. The fluid manufacturer will supply all samples for testing and, is responsible for obtaining independent laboratory confirmation of conformance to these requirements of AMS1424 or AMS1428. The fluid manufacturer should provide certificates of conformance upon request.

Add Sub-Paragraph 11.1.12, “Type I HOT Guidelines for Aircraft with Critical Surfaces Constructed Using Composite Materials”, as follows:

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

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

Add Sub-Paragraph 11.1.13, “Longer Holdover Times for 75/25 Dilutions”, as follows:

For some fluids in some conditions, holdover time increases when fluid concentration is reduced. This counter-intuitive phenomenon, which occurs rarely, happens when certain quantities of water added to fluids results in an increase in fluid viscosity and an enhancement in holdover time performance (up to a certain point). Without knowing about this phenomenon, an operator may think that the data presented in the related holdover time table is in error.

Add Sub-Paragraph 11.1.14, “Holdover Times for Non-Standard Dilutions of Type II, III and IV fluids”, as follows:

When a Type II, III, or IV fluid is diluted to other than the published 100/0, 75/25 or 50/50 dilutions, the more conservative holdover time and LOUT associated with either the dilution above or below the selected dilution are applicable.

For example:

- 1) The holdover time and LOUT of a 80/20 dilution would be the more conservative holdover time and LOUT of either the 100/0 or 75/25 dilutions;
- 2) The holdover time and LOUT of a 60/40 dilution would be the more conservative holdover time and LOUT of either the 75/25 or 50/50 dilutions.

Add subparagraph 11.1.15, “Holdover Times vs. Allowance Times”, as follows:

Holdover times are developed using testing protocols described in SAE Aerospace Recommended Practices (ARP) 5485 and 5945. These protocols rely predominantly on the visual inspection of test surfaces to determine fluid failure, which occurs when the fluid is no longer able to absorb actively occurring frozen or freezing precipitation (e.g. snow, freezing drizzle). Holdover times are applicable to most forms of precipitation with the exception of ice pellets. Due to their physical characteristics, ice pellets tend to become partially embedded in fluids and can take longer to melt compared to snow or other forms of precipitation. For this reason, the visual indicators conventionally used in developing holdover times cannot be applied to ice pellets.

As a means to address ice pellet precipitation, a test protocol was developed that uses a combination of aerodynamic fluid flow off performance of ice pellet-contaminated fluids in combination with visual inspection and evaluation of a wing model test surface. Since 2005, guidance has been derived from this testing protocol and is known as “Allowance Times”. This guidance is also applicable to small hail due to inherent similarities to ice pellets.

Operationally, both holdover times and allowance times provide the times for an aircraft to safely depart following proper de/anti-icing. The main difference between the two is the applicability of the pre takeoff contamination inspection (check) to holdover times, which cannot be used with allowance times. The only scenario for which an allowance time can be extended is if the precipitation stops and does not restart while still within the allowance time and the allowable 90-minute extension time.

Add subparagraph 11.1.16, “Ice Pellet and Small Hail Allowance Times Operational Guidance”, as follows:

- (a) Tests have shown that ice pellets generally remain in the frozen state imbedded in Type III and Type IV anti-icing fluid, and are not absorbed and 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 absorbed by the fluid (remaining imbedded) would be an indication that the fluid has failed. These imbedded ice pellets are generally not readily detectable by the human eye during pre-takeoff contamination inspection procedures. Therefore, a visual pre-takeoff contamination inspection in ice pellet conditions may not be of value and is not required.
- (b) The research data have also shown that after proper deicing and anti-icing, the accumulation of light ice pellets, moderate ice pellets, and ice pellets mixed with other forms of precipitation in Type III and Type IV fluid will not prevent the fluid from flowing off the aerodynamic surfaces during takeoff. This flow-off, due to the shearing forces, occurs with rotation speeds consistent with Type III or Type IV anti-icing fluid recommended applications, and up to the applicable allowance time listed in the allowance times tables. These allowance times are from the start of the anti-icing fluid application. Additionally, if the ice pellet condition stops, and the allowance time has not been exceeded, the operator is permitted to consider the anti-

icing fluid effective without any further action up to 90 minutes after the start of the application time of the anti-icing fluid. To use this guidance in the following conditions, the outside air temperature (OAT) must remain constant or increase during the 90-minute period:

- light ice pellets mixed with freezing drizzle;
- light ice pellets mixed with freezing rain; and
- light ice pellets mixed with rain.

Examples:

- 1) 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.
- 2) 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 that the OAT remains constant or increases and that no precipitation restarts after the allowance time of 10:25, the aircraft may takeoff without any further action up to 11:30.
- 3) 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.

(c) Operators with a deicing program updated to include the allowance time information contained herein will be allowed, in the specified ice pellet and small hail conditions listed in Tables 38 and 39, up to the specific allowance time, to commence the takeoff with the following restrictions:

- 1) The aircraft critical surfaces must be free of contaminants before applying anti icing fluid. If not, the aircraft must be properly deiced and checked to be free of contaminants before the application of anti-icing fluid.
- 2) The allowance time is valid only if the aircraft is anti-iced with undiluted Type III or Type IV fluid.
- 3) The Type III allowance times are only applicable for unheated anti-icing fluid applications.
- 4) Due to the shearing qualities of Type III and Type IV fluids with imbedded ice pellets, allowance times are limited to aircraft with a rotation speed of 100 knots or greater, or 115 knots or greater as indicated in the allowance times tables.
- 5) If the takeoff is not accomplished within the applicable allowance time, the aircraft must be completely deiced, and if precipitation is still present, anti-iced again prior to a subsequent takeoff. If the precipitation stops at or before the time limits of the applicable allowance time and does not restart, the aircraft may takeoff up to 90 minutes after the start of the application of the Type III or Type IV anti-icing fluid, subject to the restrictions in 2(b) above.
- 6) A pre-takeoff contamination inspection is not required. The allowance time cannot be extended by an internal or external inspection of the aircraft critical surfaces.
- 7) 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.
- 8) If the temperature decreases below the temperature on which the allowance time was based,
 - a) and 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.
 - b) and the allowance time has expired (within the 90 minute post anti-icing window if the precipitation has stopped within the allowance time), the aircraft may not takeoff and must be completely deiced and, if applicable, anti-iced before a subsequent takeoff.

- 9) If an intensity is reported with small hail, the ice pellet condition with the equivalent intensity can be used, e.g. if light small hail is reported, the “light ice pellets” allowance times can be used. This also applies in mixed conditions, e.g. if light small hail mixed with snow is reported, use the “light ice pellets mixed with snow” allowance times.

Add Subparagraph 11.2.3.5, “Wingtip Devices Identified as Critical Surfaces”, as follows:

Wingtip devices have various names, including winglets, strakes, sharklets, or raked wingtips. The guidance below applies for these devices.

- a) Without Split Scimitars or Strakes (Winglets, Sharklets, etc.): These devices must be confirmed to be free of frozen contamination as part of the pre-takeoff inspection. Current practices include a visual scan or the use of an approved representative surface, as specified in the operator’s TC-approved ground deicing program.
- b) With Split Scimitars, Strakes, or Similar Devices: A new wingtip device element, the strake, has been introduced and is part of the split scimitar. The strake is installed outboard of the vertical component of the wingtip device and extends downward and therefore cannot be observed from inside the aircraft. Manufacturers may designate the upper inboard surface of the vertical element of the wingtip device as a representative surface to assure no frozen contamination is present. The anti-icing procedures specified require this inboard surface to be anti-iced first starting at the top and working downward. The strake is anti-iced after the inboard surface application is completed. A visual scan of the designated representative surface (upper inboard surface of the vertical element of both wingtips) is required prior to takeoff as part of the pre-takeoff inspection. This paragraph applies only to aircraft with split scimitar wingtip devices. This guidance will be revised when new wingtip types become available.
- c) Boeing Wingtip Devices Currently in Use on the B737 (Including Wingtip Devices with Split Scimitar Elements), B747, B757, B767, and MD11: Boeing has demonstrated that these wingtip devices do not require a visual inspection as part of the pre-takeoff inspection if a complete deicing of these wingtip device surfaces is accomplished during the aircraft deicing procedure. Following the accomplishment of the wingtip device deicing procedure no further action concerning the wingtip device is required as long as the determined HOT does not expire before departure. Upon expiration of the determined HOT prior to departure, a pre-takeoff contamination inspection must be accomplished. This inspection must include a visual inspection of the wingtip devices, and if adhering frozen contamination is detected, the aircraft must return for appropriate ground deicing/anti-icing retreatment prior to departure.

Replace Sub-Paragraph 12.1.2, “Ice Pellet Conditions”, with the following:

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

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

Replace Sub-Paragraph 12.1.6, “Cold Dry Snow Falling on a Cold Dry Wing”, with the following:**12.1.6 Cold Dry Snow (or Ice Crystals) Falling on a Cold Dry Wing**

Conditions are encountered whereby cold dry snow (or ice crystals) is falling onto the cold wing of an aircraft. The wind often causes the snow (or ice crystals) to swirl and move across the surface of the wing and it is evident that the snow (or ice crystals) is not adhering to the wing surface. Under these circumstances the application of deicing/anti-icing fluid to the wing of the aircraft would likely result in the snow (or ice crystals) sticking to the fluid. Under such operational conditions it may not be prudent to apply fluids to the wing.

However, if snow or ice crystals have accumulated at any location on the wing surface it must be removed prior to takeoff. It cannot be assumed that snow or ice crystals on a wing will “blow off” during the takeoff. For example, refueling with fuel warmer than the wing skin temperature may create a condition whereby previously non adhering contaminants may adhere to the wing surfaces.

Replace entire contents of Sub-Paragraph 12.1.7 “Frost”, with the following:

12.1.7 Frost

Frost occurs frequently during winter operating conditions. Frost due to radiation cooling is a uniform thin white deposit of fine crystalline texture, which forms on exposed surfaces that are below freezing, generally on calm cloudless nights where the air at the surface is close to saturation. When the deposit is thin enough for surface features underneath the frost, such as paint lines, markings and lettering, to be distinguished it is often referred to as hoarfrost. Frost can also form on the upper or lower surfaces of the wing due to cold soaked fuel. Frost has the appearance of being a minor contaminant and therefore does not offer the same obvious signal of danger as do other types of contamination such as snow or ice. However, frost is an insidious threat to the safety of aircraft operations because it always adheres to the aircraft surface, is rough and causes significant lift degradation and increased drag.

12.1.7.1 Active Frost

Active frost is a condition when frost is forming. During active frost conditions, frost will form on an unprotected surface or re-form on a surface protected with de/anti-icing fluid where the holdover time has expired.

Frost forms whenever the exposed surface temperature cools below OAT to, or below, the frost point (not dew point). The mechanisms for cooling include:

- 1) radiation cooling; or
- 2) conductive cooling (due to cold soaked fuel).

If the exposed surface temperature is equal to or below the frost point, frost will begin to accrete on the surface. Once formed, residual accreted frost may remain after the active frost phase if the exposed surface temperature remains below freezing.

12.1.7.2 Dew Point and Frost Point

The dew point is the temperature at a given pressure to which air must be cooled to cause saturation. The dew point can occur below or above 0°C.

The frost point is the temperature, at or below 0°C (32°F), at which moisture in the air will condense as a layer of frost on an exposed surface. The frost point occurs between the OAT and dew point.

METAR does not report frost point; however, it does report dew point. The frost point is higher (warmer) than the dew point for a given humidity in the air. The frost point and the dew point are the same at 0°C; at a dew point of -40°C, the frost point is 3.2°C warmer (-36.8°C). The following table provides further examples of the correlation between dew point and frost point.

| Dew Point Temperature (°C) | Frost Point Temperature (°C) |
|----------------------------|------------------------------|
| 0 | 0.0 |
| -5 | -4.4 |
| -10 | -8.9 |
| -15 | -13.5 |
| -20 | -18.0 |
| -25 | -22.7 |
| -30 | -27.3 |
| -35 | -32.1 |
| -40 | -36.8 |

12.1.7.3 Radiation Cooling

Radiation cooling will generally occur during clear sky (e.g. SKC, high FEW or high SCT), low wind (e.g. less than 10 knots), and low light (e.g. shade, at night or in low angle / obscured sun) conditions. These conditions will cause the exposed surface temperature to cool below the OAT. Once the exposed surface temperature cools to the frost point or below, active frost occurs.

Certain surface finishes and material compositions may be more susceptible to radiation cooling, and as a result, different areas of an aircraft may begin to accrete frost at different times. Radiation cooling can cause an exposed surface to cool several degrees below the OAT; therefore, frost can form on an exposed surface at an OAT several degrees above 0°C.

Depending on conditions, time to frost formation may range from minutes to hours. As a result, a surface that appears free of frost during an early inspection may become contaminated later. When conditions are favorable for active frost formation, a direct inspection of critical surfaces conducted as close as possible to the departure time is recommended.

12.1.7.4 Cold Soaked Fuel Cooling

Cold soaked fuel cooling results from conductive cooling due to very cold fuel on board at destination or from refueling with fuel that may be cooler than the OAT. Cold soaked fuel conditions are highly variable and therefore, only direct surface temperature readings are accurate, but not available at most stations. Fuel temperature does not accurately predict cold soaked fuel conditions but may provide an initial indication, particularly in the period after landing and prior to fueling. The presence of frost under the wing is a good indication of cold soaked fuel conditions.

In extreme cases, cold soaking may reduce the surface temperature below the fluid LOUT and cause aerodynamic performance degradation due to fluid freezing or the inability of the fluid to adequately flow off the treated surface.

12.1.7.5 Combined Radiation and Cold Soaked Fuel Cooling Effects

Cold soaked fuel cooling combined with radiation cooling effects can cause reductions in active frost holdover times. This is particularly true for Type I fluid holdover times as these are shorter in duration, and therefore use of a thickened anti-icing fluid should be considered.

12.1.7.6 De/Anti-Icing in Active Frost Conditions

Frost reforming after removal is an indication of active frost. During active frost, anti-icing protection is required and operations should be conducted in accordance with holdover time guidelines and minimum fluid quantity and temperature application procedures therein. Applications such as misting or mopping of Type I fluid may not provide adequate heat or fluid quantity to use the holdover times in active frost conditions.

In active frost conditions, deicing alone is insufficient, therefore, once the frost has been removed, a preventative anti-icing coating is required.

12.1.7.7 Fluid Holdover Times for Active Frost Conditions

Fluid holdover times in active frost conditions differ from holdover times in other conditions as they incorporate an allowance for the temperature differential (typically 6 to 8°C) between the OAT and the exposed surface temperature due to radiation cooling. As a result of this allowance, the OAT should be used to determine the appropriate active frost holdover time.

Note: Changes in OAT over the course of longer frost HOT can be significant; the appropriate HOT to use is the HOT provided for the coldest OAT that has occurred in the time between the de/anti-icing fluid application and takeoff.

Note: Active frost holdover times may be reduced in the presence of combined cooling effects or extreme surface cooling. In extreme cases, the surface temperature may be below the fluid LOUT and cause aerodynamic performance degradation due to fluid freezing or the inability of the fluid to adequately flow off the treated surface.

12.1.7.8 Frost on the Underside of the Wing

CAR 602.11(3) states: Notwithstanding subsection (12.1.7.9), a person may conduct a takeoff in an aircraft that has frost adhering to the underside of its wings that is caused by cold-soaked fuel, if the takeoff is conducted in accordance with the aircraft manufacturer's instructions for takeoff under those conditions.

12.1.7.9 Frost on the Fuselage

Despite the requirement to clean contamination from critical surfaces, it is acceptable for aircraft, including those with aft fuselage mounted engines, to take off when hoarfrost is adhering to the upper surface of the fuselage if it is the only remaining contaminant, provided all vents and ports are clear. Contact the aircraft manufacturer for further details.

Add Sub-Paragraph 12.1.9, “Hail and Small Hail”, as follows:

The meteorological conditions “Hail” and “Small Hail” are different. Hail is a more intense condition for which holdover times do not exist. Small hail is a lighter condition, meteorologically equivalent to ice pellets, for which allowance times are provided.

Add Sub-Paragraph 12.1.10, “Small Hail / Snow Pellets (METAR Codes GS/SHGS)”, as follows:

The World Meteorological Organization (WMO) states METAR code GS is used for two meteorological conditions: “snow pellets” and “small hail.” Different holdover times/allowance times apply in these two weather conditions. If the weather condition is snow pellets, the snow holdover times are applicable. If the weather condition is small hail, the ice pellet and small hail allowance times are applicable. Furthermore, the ice pellet and small hail allowance times are applicable if the prevailing weather condition between “snow pellets” and “small hail” cannot be determined given that these are more restrictive than the snow holdover times.

It has been determined that Canada does not follow the WMO standard for reporting these two weather conditions. In Canada, METAR code GS is used exclusively for snow pellets; METAR code SHGS with remarks is used to report small hail (METAR code SHGS without remarks is snow pellet showers). Therefore, different holdover times / allowance times apply when these METAR codes are reported in Canada as compared to other countries including the United States.

In addition, there are differences between countries in whether or not intensity is reported with small hail. In Canada, the United States and most other countries, no intensity is reported with small hail. In some other countries, e.g. Japan, intensity is reported with small hail.

Based on this information and Canadian air operator feedback, the following guidance must be followed.

a) When operating in Canada:

- i. When METAR code GS is reported: the condition is snow pellets and the snow holdover times should be used.
- ii. When METAR code SHGS (with or without remarks) is reported: the condition is either snow pellet showers or small hail and the appropriate ice pellet and small hail allowance times should be used.

b) When operating in the United States / International: When METAR code GS or SHGS is reported: the condition could be snow pellets or small hail; the ice pellet/small hail allowance times should be used.

c) Determining appropriate allowance times for Small Hail: If no intensity is reported with small hail, the moderate ice pellet allowance times must be used. If an intensity is reported with small hail, the allowance times for the ice pellet condition with the equivalent intensity should be used, e.g. light small hail = light ice pellets, moderate small hail = moderate ice pellets. This also applies in mixed conditions, e.g. if light small hail mixed with snow is reported, use the “light ice pellets mixed with snow” allowance times. The following examples illustrate the application of this guidance:

- i. If you get a report of “Small Hail” but no intensity is reported with it, you must use the “Moderate Ice Pellets” allowance times. This is shown in the row “Moderate Ice Pellets or Small Hail”
- ii. If you get a report of “Small Hail” and its intensity is reported as “moderate”, you must also use the “Moderate Ice Pellets or Small Hail” allowance times.

- iii. If you get a report of "Small Hail" and its intensity is reported as "light", you can use the "Light Ice Pellets" allowance times.
- iv. If you get a report of "Small Hail" and its intensity is reported as "light" and it is mixed with another condition (snow, rain, freezing rain), you can use the equivalent light ice pellets allowance times. For example, if you have Light Small Hail mixed with Rain, you can use the "Light Ice Pellets mixed with Rain" allowance times.

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

Two possible options are: delaying slat/flap deployment until just prior to takeoff or deploying the devices prior to de/anti-icing so that the surfaces under these devices are treated. With the second option, holdover time and allowance time values must be decreased by 24% due to the steeper angles of the slat/flap in the deployed configuration.

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

Replace Sub-Paragraph 12.6.7 (e), "Recommended "Clean Aircraft Concept" Practices", with the following:

- e) The general rule for ground icing procedures is that the deicing and anti-icing processes must be done symmetrically. That is, whatever final treatment (i.e. same brand name fluid) is administered on one wing must be applied to the other wing for aerodynamic symmetry reasons.

Add Sub-Paragraph 12.9 Freezing or Thickening of Residual Fluid in Flight

It is possible for anti-icing fluid to flow back to the trailing edge of aircraft wings after takeoff where the residual fluid can partially freeze or appear thickened. Research indicates that this can occur on a regular basis but poses no risk to safety.

Anti-icing fluids are designed in such a way that most of the fluid will flow off aircraft wings, particularly from the leading edge. The leading edge is the most aerodynamically critical section of the wing whereas its trailing edge can accrue some residual fluid and remain acceptable for safe operations.

Add the following definitions to Section 18 "Glossary":***Lowest On-Wing Viscosity***

Lowest viscosity of a fluid for which the applicable holdover time table can still be used.

Maximum On-Wing Viscosity

Maximum viscosity of a fluid which is still aerodynamically acceptable.

**APPENDIX C:
TESTING LABORATORIES**

TESTING LABORATORIES

The following laboratories are known to provide testing for de/anti-icing fluids given they verifiably adhere to internationally accepted standards and recommended practices that are associated with the holdover times published by Transport Canada.

Please enquire directly with the laboratories for a full list of testing available.

- **Anti-icing Materials International Laboratory (AMIL):** 555, boulevard de l'Université, Chicoutimi, Québec, G7H 2B1, Canada, 418-545-5011 ext. 2406, www.uqac.ca/amil. Provides testing for anti-icing performance (described in AMS1424, AMS1428, and AS5901), aerodynamic acceptance (described in AMS1424, AMS1428 and AS5900), physical properties including fluid stability (described in AMS1424 and AMS1428), environmental information (described in AMS1424 and AMS1428) and most of tests to evaluate materials compatibility (described in AMS1424 and AMS1428).
- **APS Aviation Inc.:** 6700, chemin de la Côte-de-Liesse, Suite 105, Saint-Laurent, Quebec, H4T 2B5, Canada, 514-878-4388, www.apsaviation.ca. Provides endurance time testing (described in ARP5485 and ARP5945).
- **Scientific Material International (SMI):** 12219 SW 131st Avenue, Miami, Florida, USA 33186-6401; 305-971-7047, www.smiinc.com. Provides testing to generate most environmental information and effect on materials testing (described in AMS1424 and AMS1428).

**APPENDIX D:
ADDITIONAL HOLDOVER TIMES FOR TYPE II/IV FLUIDS**

ADDITIONAL HOLDOVER TIMES FOR TYPE II/IV FLUIDS

Overview

This appendix provides additional holdover times for select Type II and Type IV fluids for the temperature band “below -3 to -8°C” with the objective of extending the window of aircraft winter operations exclusively in snow, snow grains and snow pellets conditions.

The additional holdover times for the snow, snow grains and snow pellets conditions are provided in two tables:

1. Table D-1: Provides additional holdover times for standard operations; and
2. Table D-2: Provides additional adjusted holdover times for operations when flaps and slats are deployed prior to de/anti-icing.

For guidance on which table to use, please refer to the section “Adjusted Holdover Times for Flaps/Slats Deployed Prior to De/Anti-Icing” on page 6 of this document.

Guidance

- (1) For winter 2017-2018, the use of the holdover times provided in this appendix is not mandatory and is at the operator’s discretion to incorporate within their ground icing program (GIP). Where applicable, operators should communicate with the principle operations inspector (POI) and other relevant third parties to advise them of their incorporation within their respective GIP.
- (2) The existing fluid-specific holdover time tables provide more conservative values; no action is required if the existing tables are used and the additional holdover times are not used.
- (3) If the operator elects to use the holdover times provided in this appendix, they are applicable only in the temperature range below -3 to -8°C. The holdover times provided in the fluid-specific holdover time tables for the temperature band “below -3 to -14°C” must be used for the temperature range below -8 to -14°C. An example of how to incorporate the additional holdover times into an existing holdover time table is provided below.
- (4) Tables D-1 and D-2 do not provide values for the following conditions:
 - Freezing Fog or Ice Crystals;
 - Freezing Drizzle;
 - Light Freezing Rain; and
 - Rain on Cold Soaked Wing.

Therefore all values from the existing fluid-specific holdover time tables must be used in these conditions.

- (5) All notes and cautions provided on the related fluid-specific holdover time table that are applicable to the cells encompassing snow, snow grains and snow pellets and the temperature band below -3 to -14°C, are applicable to the holdover times provided in Tables D-1 and D-2.
- (6) For further guidance on this topic, please use the contact information provided on the front cover of this document.

Example

The following image shows how the additional holdover times for snow, snow grains and snow pellets conditions can be incorporated into an existing holdover time table.

(1) The below -3 to -14°C row has been split into two rows: below -3 to -8°C and below -8 to -14°C.

(2) The below -3 to -8°C row has been populated as follows:

- Fluid Concentration = 100/0, Precipitation Type = Snow, Snow Grains or Snow Pellets: Populated with the additional holdover times provided in Table D-1. These values are shown in bold text and are the only actual changes to holdover time values.
- Fluid Concentration = 100/0, Precipitation Type = All except Snow: Retains the holdover time values published for below -3 to -14°C.
- Fluid Concentration = 75/25, Precipitation Type = All: Retains the holdover time values published for below -3 to -14°C.

(3) The below -8 to -14°C row retains the previously published holdover time values for below -3 to -14°C.

Sample Holdover Time Table with Additional Holdover Times Incorporated**TABLE 6: TYPE II HOLDOVER TIMES FOR ABAX ECOWING AD-2**

| Outside Air Temperature ¹ | Fluid Concentration Fluid/Water By % Volume | Freezing Fog or Ice Crystals | Very Light Snow, Snow Grains or Snow Pellets ^{2,3} | Light Snow, Snow Grains or Snow Pellets ^{2,3} | Moderate Snow, Snow Grains or Snow Pellets ² | Freezing Drizzle ⁴ | Light Freezing Rain | Rain on Cold Soaked Wing ⁵ | Other ⁶ |
|---|---|------------------------------|---|--|---|-------------------------------|--------------------------|---------------------------------------|--|
| -3°C and above (27°F and above) | 100/0 | 1:20 - 3:00 | 2:00 | 1:15 - 2:00 | 0:40 - 1:15 | 0:40 - 1:40 | 0:30 - 0:45 | 0:09 - 1:25 | CAUTION: No holdover time guidelines exist |
| | 75/25 | 1:15 - 1:25 | 1:45 | 0:55 - 1:45 | 0:25 - 0:55 | 0:35 - 1:05 | 0:20 - 0:30 | 0:04 - 0:50 | |
| | 50/50 | 0:15 - 0:30 | 0:35 | 0:15 - 0:35 | 0:07 - 0:15 | 0:09 - 0:15 | 0:06 - 0:09 | | |
| below -3 to -8°C (below 27 to 18°F) | 100/0 | 0:45 - 2:30 | 2:00 | 1:00 - 2:00 | 0:30 - 1:00 | 0:25 - 1:10 | 0:20 - 0:30 | | |
| | 75/25 | 0:35 - 1:55 | 1:35 | 0:50 - 1:35 | 0:25 - 0:50 | 0:15 - 0:55 | 0:20 - 0:35 | | |
| below -8 to -14°C (below 18 to 7°F) | 100/0 | 0:45 - 2:30 | 1:45 | 0:55 - 1:45 | 0:30 - 0:55 | 0:25 - 1:10 ⁷ | 0:20 - 0:30 ⁷ | | |
| | 75/25 | 0:35 - 1:55 | 1:35 | 0:50 - 1:35 | 0:25 - 0:50 | 0:15 - 0:55 ⁷ | 0:20 - 0:35 ⁷ | | |
| below -14 to -18°C (below 7 to 0°F) | 100/0 | 0:15 - 0:40 | 0:40 | 0:20 - 0:40 | 0:06 - 0:20 | | | | |
| below -18 to -25°C (below 0 to -13°F) | 100/0 | 0:15 - 0:40 | 0:20 | 0:09 - 0:20 | 0:02 - 0:09 | | | | |
| below -25 to -27°C (below -13 to -16.6°F) | 100/0 | 0:15 - 0:40 | 0:20 | 0:06 - 0:20 | 0:01 - 0:06 | | | | |

NOTES

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

2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 40) is required.

3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.

4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.

5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.

6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

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

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable 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 below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.

TABLE D-1: ADDITIONAL HOLDOVER TIMES FOR TYPE II/IV FLUIDS, BELOW -3 TO -8°C

| TYPE II FLUIDS – SINGLE SNOW COLUMN | | | | |
|--|------------|--|---|--|
| Fluid Name | Fluid Dil. | Snow, Snow Grains or Snow Pellets | | |
| Clariant Safewing MP II FLIGHT PLUS | 100/0 | 0:40 - 1:30 | | |
| Kilfrost ABC-K Plus | 100/0 | 0:55 - 1:30 | | |
| TYPE II FLUIDS – MULTIPLE SNOW COLUMNS | | | | |
| Fluid Name | Fluid Dil. | Very Light Snow, Snow Grains or Snow Pellets | Light Snow, Snow Grains or Snow Pellets | Moderate Snow, Snow Grains or Snow Pellets |
| ABAX ECOWING AD-2 | 100/0 | 2:00 | 1:00 - 2:00 | 0:30 - 1:00 |
| Clariant Safewing MP II FLIGHT | 100/0 | 2:00 | 1:15 - 2:00 | 0:45 - 1:15 |
| Cryotech Polar Guard® II | 100/0 | 2:00 | 1:25 - 2:00 | 0:50 - 1:25 |
| TYPE IV FLUIDS | | | | |
| Fluid Name | Fluid Dil. | Very Light Snow, Snow Grains or Snow Pellets | Light Snow, Snow Grains or Snow Pellets | Moderate Snow, Snow Grains or Snow Pellets |
| ABAX ECOWING AD-49 | 100/0 | 2:00 | 1:30 - 2:00 | 0:45 - 1:30 |
| Clariant Max Flight AVIA | 100/0 | 2:00 | 1:25 - 2:00 | 0:50 - 1:25 |
| Clariant Max Flight SNEG | 100/0 | 2:00 | 1:20 - 2:00 | 0:45 - 1:20 |
| Clariant Safewing EG IV NORTH | 100/0 | 2:00 | 1:30 - 2:00 | 0:50 - 1:30 |
| Clariant Safewing MP IV LAUNCH | 100/0 | 2:00 | 1:30 - 2:00 | 0:55 - 1:30 |
| Clariant Safewing MP IV LAUNCH PLUS | 100/0 | 2:00 | 1:40 - 2:00 | 0:45 - 1:40 |
| Cryotech Polar Guard® Advance | 100/0 | 2:00 | 1:25 - 2:00 | 0:50 - 1:25 |
| Dow Chemical UCAR™ Endurance EG106 | 100/0 | 2:00 | 1:10 - 2:00 | 0:35 - 1:10 |
| Dow Chemical UCAR™ FlightGuard AD-49 | 100/0 | 2:00 | 1:30 - 2:00 | 0:45 - 1:30 |
| Inland Technologies ECO-SHIELD® | 100/0 | 2:00 | 1:10 - 2:00 | 0:40 - 1:10 |
| Kilfrost ABC-S Plus | 100/0 | 2:00 | 1:50 - 2:00 | 1:05 - 1:50 |
| LNT Solutions E450 | 100/0 | 2:00 | 1:20 - 2:00 | 0:50 - 1:20 |
| Oksayd Defrost ECO 4 | 100/0 | 2:00 | 1:05 - 2:00 | 0:35 - 1:05 |

TABLE D-2: ADDITIONAL ADJUSTED HOLDOVER TIMES FOR TYPE II/IV FLUIDS, BELOW -3 TO -8°C

| TYPE II FLUIDS – SINGLE SNOW COLUMN | | | | |
|--|------------|--|---|--|
| Fluid Name | Fluid Dil. | Snow, Snow Grains or Snow Pellets | | |
| Clariant Safewing MP II FLIGHT PLUS | 100/0 | 0:30 - 1:08 | | |
| Kilfrost ABC-K Plus | 100/0 | 0:42 - 1:08 | | |
| TYPE II FLUIDS – MULTIPLE SNOW COLUMNS | | | | |
| Fluid Name | Fluid Dil. | Very Light Snow, Snow Grains or Snow Pellets | Light Snow, Snow Grains or Snow Pellets | Moderate Snow, Snow Grains or Snow Pellets |
| ABAX ECOWING AD-2 | 100/0 | 1:31 | 0:46 - 1:31 | 0:23 - 0:46 |
| Clariant Safewing MP II FLIGHT | 100/0 | 1:35 | 0:57 - 1:35 | 0:34 - 0:57 |
| Cryotech Polar Guard® II | 100/0 | 1:50 | 1:05 - 1:50 | 0:38 - 1:05 |
| TYPE IV FLUIDS | | | | |
| Fluid Name | Fluid Dil. | Very Light Snow, Snow Grains or Snow Pellets | Light Snow, Snow Grains or Snow Pellets | Moderate Snow, Snow Grains or Snow Pellets |
| ABAX ECOWING AD-49 | 100/0 | 2:00 | 1:08 - 2:00 | 0:34 - 1:08 |
| Clariant Max Flight AVIA | 100/0 | 1:54 | 1:05 - 1:54 | 0:38 - 1:05 |
| Clariant Max Flight SNEG | 100/0 | 1:50 | 1:01 - 1:50 | 0:34 - 1:01 |
| Clariant Safewing EG IV NORTH | 100/0 | 2:00 | 1:08 - 2:00 | 0:38 - 1:08 |
| Clariant Safewing MP IV LAUNCH | 100/0 | 1:50 | 1:08 - 1:50 | 0:42 - 1:08 |
| Clariant Safewing MP IV LAUNCH PLUS | 100/0 | 2:00 | 1:16 - 2:00 | 0:34 - 1:16 |
| Cryotech Polar Guard® Advance | 100/0 | 1:50 | 1:05 - 1:50 | 0:38 - 1:05 |
| Dow Chemical UCAR™ Endurance EG106 | 100/0 | 1:50 | 0:53 - 1:50 | 0:27 - 0:53 |
| Dow Chemical UCAR™ FlightGuard AD-49 | 100/0 | 2:00 | 1:08 - 2:00 | 0:34 - 1:08 |
| Inland Technologies ECO-SHIELD® | 100/0 | 1:35 | 0:53 - 1:35 | 0:30 - 0:53 |
| Kilfrost ABC-S Plus | 100/0 | 2:00 | 1:24 - 2:00 | 0:49 - 1:24 |
| LNT Solutions E450 | 100/0 | 1:35 | 1:01 - 1:35 | 0:38 - 1:01 |
| Oksayd Defrost ECO 4 | 100/0 | 1:43 | 0:49 - 1:43 | 0:27 - 0:49 |