Transport Canada
Holdover Time (HOT) Guidelines
Winter 2016-2017

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Original Issue: Aug. 5, 2016

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
Telephone 1-800-305-2059 Facsimile 613-957-4208 E-mail services@tc.gc.ca

To receive notification of HOT Guideline updates, subscribe to or update your e-news subscription at the following Transport Canada Web site:
http://wwwapps.tc.gc.ca/Comm/5/ListServ/menu.aspx
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CHANGE CONTROL RECORDS

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

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

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

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SUMMARY OF CHANGES FROM PREVIOUS YEAR

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

Active Frost

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

Type I Fluid

- The Type I HOT guidelines are unchanged.

Type II Fluid

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

Type III Fluid

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

Type IV Fluid

- Fluid-specific HOT guidelines have been created for three new Type IV fluids: Clariant Max Flight AVIA, Clariant Safewing EG IV NORTH and Shaanxi Cleanway Aviation Cleansurface IV.
- Cryotech Polar Guard and Dow Chemical UCAR™ FlightGuard AD-480 have been removed from the Type IV guidelines as per the protocol for removing obsolete fluids.
- Supplemental testing with Deicing Solutions ECO-SHIELD® resulted in changes to most of its holdover times for winter 2016-2017. Its lowest operational use temperature (LOUT) and lowest on-wing viscosity (LOWV) have also changed.
- Significant changes (both increases and decreases) have been made to the Type IV generic holdover times as a result of the new and removed Type IV fluids. In addition, the Type IV generic HOT table has been expanded to include holdover times for three snowfall intensities: very light, light and moderate. This was possible as, for the first time, all fluid-specific Type IV holdover time tables include light, very light and moderate snow holdover times.
- The holdover times for snow in the “below -14°C to LOUT” row have been reduced for all Type II and Type IV fluids. This is the result of a two-year research program showing the new holdover times are more appropriate.

Ice Pellet and Small Hail Allowance Times

- The rows in both the Type III and Type IV allowance time tables, each containing a specific precipitation condition, have been reordered for ease of use.
- A note has been added to both the Type III and Type IV allowance time tables indicating they are for use with aircraft with rotation speeds of 100 knots or greater only.

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- A review of existing data resulted in a change to the Type III allowance time for “Light Ice Pellets Mixed with Moderate Snow” in the “Below -5 to -10°C” cell (from 10 to 5 minutes).
- Allowance times have been added to the Type IV table for “Light Ice Pellets Mixed with Light Snow” and “Light Ice Pellets Mixed with Moderate Snow” in the “Below -10 to -16°C” temperature band.
- New rows / allowance times have been added to the Type IV table for two new precipitation conditions: “Moderate Ice Pellets (or Small Hail) Mixed with Moderate Freezing Drizzle” and “Moderate Ice Pellets (or Small Hail) Mixed with Moderate Rain”.
- The coldest temperature band in the Type IV table has been divided into two temperature bands: “Below -10 to -16°C” and “Below -16 to -22°C”.

Fluid Application Tables

- Guidance for the application of Type III fluid was previously provided in the same table as the guidance provided for the application of Type II/IV fluid. For the winter of 2016-1207, this guidance is provided in two separate Type III fluid application tables. Table 11-H provides guidance for the application of heated Type III fluid and Table 11-U provides guidance for the application of unheated Type III fluid.
- Changes have been made to the Type I and Type II/IV fluid application tables to improve harmonization with the FAA and SAE fluid application tables.

Changes to TP14052 Guidelines for Aircraft Ground-Icing Operations

- Guidance has been added, as Section 10.11.1, on applying anti-icing fluid in a hangar with t-tail aircraft.
- The guidance on wingtip devices identified as critical surfaces, provided in Section 11.2.3.5, has been modified.
- The guidance on determining appropriate allowance times for small hail, provided in Section 12.1.10 c), has been expanded.
- Guidance has been added, as Section 12.9, on freezing or thickening of residual fluid in flight.
- A note has been added to the section on holdover times for active frost conditions (Section 12.1.7.7) to provide guidance on selecting an appropriate outside air temperature in changing conditions.

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

- Research into holdover times on deployed flaps/slats has been ongoing for several years. There is a substantive amount of evidence that demonstrates extended flaps and slats accelerate anti-icing fluid degradation off aircraft wings and so exists a potential safety risk. To mitigate this safety risk, Transport Canada is publishing adjusted sets of holdover time and allowance time tables with values adjusted for aircraft with flaps/slats deployed when anti-icing. These adjusted tables will have values which have been decreased by 10%. This is an interim measure which will be in place until data collection and analysis have been completed.
- The 90% adjusted tables appear at the end of this document. These tables provide the holdover / allowance times that must be used when flaps and slats are deployed prior to de/anti-icing. Standard holdover / allowance times can be used if flaps and slats are deployed as close to departure as safety allows.

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CHANGES TO *Guidelines for Aircraft Ground-Icing Operations* (TP 14052E, SECOND ED., APRIL 2005)

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

Replace Sub-Paragraph 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.

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Add the following Paragraph to 10.6.2.4, "Areas to be Sprayed", 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.

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 more than 3°C above ambient temperature. The freezing point of an SAE Type I fluid used for a one-step process, or as the second step of a two-step operation, must be at least 10°C below the ambient temperature. The second step 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 Sub-Paragraph 10.8.1, "De/Anti-icing Fluid Compatibility with Runway Deicer", as follows:

Recent research showed that when thickened aircraft anti-icing fluid came in contact with minimal amounts of runway deicing fluids (formate or acetate based), anti-icing protection provided by the aircraft anti-icing fluid could be diminished. The separation of the thickening agents in this fluid consequently reduce 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-ice 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 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.

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

Hot water may be used to remove large amounts of contamination (such as ice) from an aircraft, provided that the Outside Air Temperature is -3°C and above as per the application procedures for SAE Type I, II, III and IV fluids described in tables 9, 10, 11-H and 11-U 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 2-Generic, Table 4-Generic) 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.

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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 TP14151E. The relevant information from TP14151E 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 over estimate 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.

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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

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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 brand-specific fluids, protection is increased in some cells when fluid concentration is reduced. The addition of certain quantities of water to some neat fluids can enhance their performance up to a certain point. Without knowing about this particular fluid mix phenomenon, an operator may think that the data presented in the tables are 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.

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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.

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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

OBSOLETE

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 fuelling. 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.

OBSOLETE

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 light snow is reported, use the "light ice pellets mixed with light 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"

OBSOLETE

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 Light Rain, you can use the “Light Ice Pellets mixed with Light 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, the holdover time and allowance time will be reduced due to the steeper angles of the slat/flap in the deployed configuration.

Delaying the slat/flap deployment may be the preferred option for optimum protection from ice buildup. If it is necessary to remove contamination from the slats/flaps, it may be best to deploy the slats/flaps for deicing and 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 aerodynamically quiet areas 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.

OBSOLETE

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.

HOLDOVER TIME (HOT) GUIDELINES FOR WINTER 2016-2017

Standard HOT Guidelines and Allowance Times

Table 0	SAE Type I, Type II, Type III, and Type IV Fluid Active Frost HOT Guidelines
Table 1-A	SAE Type I Fluid HOT Guidelines on Critical Aircraft Surfaces Composed Predominantly of Aluminum
Table 1-C	SAE Type I Fluid HOT Guidelines on Critical Aircraft Surfaces Composed Predominantly of Composites
Table 2-Generic	SAE Type II Fluid HOT Guidelines
Table 2-A-E26	Type II Fluid HOT Guidelines - ABAX Ecowing 26
Table 2-AS-CWII	Type II Fluid HOT Guidelines - Aviation Shaanxi Hi-Tech Cleanwing II
Table 2-BY-YDII	Type II Fluid HOT Guidelines - Beijing Yadilite Aviation YD-102 Type II
Table 2-C-F	Type II Fluid HOT Guidelines - Clariant Safewing MP II FLIGHT
Table 2-C-F+	Type II Fluid HOT Guidelines - Clariant Safewing MP II FLIGHT PLUS
Table 2-CR-PGII	Type II Fluid HOT Guidelines - Cryotech Polar Guard® II
Table 2-K-ABC-IC	Type II Fluid HOT Guidelines - Kilfrost ABC-Ice Clear II
Table 2-K-ABC-K+	Type II Fluid HOT Guidelines - Kilfrost ABC-K Plus
Table 2-N-FCY-2	Type II Fluid HOT Guidelines - Newave Aerochemical FCY-2
Table 2-N-FCY-2B+	Type II Fluid HOT Guidelines - Newave Aerochemical FCY-2 Bio+
Table 3LS-A-ACM	Low Speed Type III Fluid HOT Guidelines - AllClear AeroClear MAX
Table 3HS-A-ACM	High Speed Type III Fluid HOT Guidelines - AllClear AeroClear MAX
Table 3LS-C-2031	Low Speed Type III Fluid HOT Guidelines - Clariant Safewing MP III 2031 ECO
Table 3HS-C-2031	High Speed Type III Fluid HOT Guidelines - Clariant Safewing MP III 2031 ECO
Table 4-Generic	SAE Type IV Fluid HOT Guidelines
Table 4-A-E-AD49	Type IV Fluid HOT Guidelines - ABAX Ecowing AD-49
Table 4-C-MF04	Type IV Fluid HOT Guidelines - Clariant Max Flight 04
Table 4-C-MFA	Type IV Fluid HOT Guidelines - Clariant Max Flight AVIA
Table 4-C-MFS	Type IV Fluid HOT Guidelines - Clariant Max Flight SNEG
Table 4-C-N	Type IV Fluid HOT Guidelines - Clariant Safewing EG IV NORTH
Table 4-C-L	Type IV Fluid HOT Guidelines - Clariant Safewing MP IV LAUNCH
Table 4-C-L+	Type IV Fluid HOT Guidelines - Clariant Safewing MP IV LAUNCH PLUS
Table 4-CR-PGA	Type IV Fluid HOT Guidelines - Cryotech Polar Guard® Advance
Table 4-DS-ES	Type IV Fluid HOT Guidelines - Deicing Solutions ECO-SHIELD®
Table 4-D-E106	Type IV Fluid HOT Guidelines - Dow Chemical UCAR™ Endurance EG106
Table 4-D-AD49	Type IV Fluid HOT Guidelines - Dow Chemical UCAR™ FlightGuard AD-49
Table 4-K-ABC-S+	Type IV Fluid HOT Guidelines - Kilfrost ABC-S Plus
Table 4-L-E450	Type IV Fluid HOT Guidelines - LNT Solutions E450
Table 4-N-F-9311	Type IV Fluid HOT Guidelines - Newave Aerochemical FCY 9311
Table 4-SC-CSIV	Type IV Fluid HOT Guidelines - Shaanxi Cleanway Aviation Cleansurface IV
Table 5	SAE Type III Fluid Ice Pellet and Small Hail Allowance Times
Table 6	SAE Type IV Fluid Ice Pellet and Small Hail Allowance Times

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Supplemental Guidance

Table 7	Snowfall Intensities as a Function of Prevailing Visibility
Table 8	List of Fluids Tested for Anti-Icing Performance and Aerodynamic Acceptance
Table 9	Guidelines for the Application of SAE Type I Fluid
Table 10	Guidelines for the Application of SAE Type II and IV Fluid
Table 11-H	Guidelines for the Application of Heated SAE Type III Fluid
Table 11-U	Guidelines for the Application of Unheated SAE Type III Fluid

90% Adjusted HOT Guidelines and Allowance Times

Table 0-90%	SAE Type I, Type II, Type III, and Type IV Fluid Active Frost 90% Adjusted HOT Guidelines
Table 1-90%-A	SAE Type I Fluid 90% Adjusted HOT Guidelines on Critical Aircraft Surfaces Composed Predominantly of Aluminum
Table 1-90%-C	SAE Type I Fluid 90% Adjusted HOT Guidelines on Critical Aircraft Surfaces Composed Predominantly of Composite
Table 2-90%-Generic	SAE Type II Fluid 90% Adjusted HOT Guidelines
Table 2-90%-A-E26	Type II Fluid 90% Adjusted HOT Guidelines - ABAX Ecowing 26
Table 2-90%-AS-CWII	Type II Fluid 90% Adjusted HOT Guidelines - Aviation Shaanxi Hi-Tech Cleanwing II
Table 2-90%-BY-YDII	Type II Fluid 90% Adjusted HOT Guidelines - Beijing Yadilite Aviation YD-102 Type II
Table 2-90%-C-F	Type II Fluid 90% Adjusted HOT Guidelines - Clariant Safewing MP II FLIGHT
Table 2-90%-C-F+	Type II Fluid 90% Adjusted HOT Guidelines - Clariant Safewing MP II FLIGHT PLUS
Table 2-90%-CR-PGII	Type II Fluid 90% Adjusted HOT Guidelines - Cryotech Polar Guard® II
Table 2-90%-K-ABC-IC	Type II Fluid 90% Adjusted HOT Guidelines - Kilfrost ABC-Ice Clear II
Table 2-90%-K-ABC-K+	Type II Fluid 90% Adjusted HOT Guidelines - Kilfrost ABC-K Plus
Table 2-90%-N-FCY-2	Type II Fluid 90% Adjusted HOT Guidelines - Newave Aerochemical FCY-2
Table 2-90%-N-FCY-2B+	Type II Fluid 90% Adjusted HOT Guidelines - Newave Aerochemical FCY-2 Bio+
Table 3LS-90%-A-ACM	Low Speed Type III Fluid 90% Adjusted HOT Guidelines - AllClear AeroClear MAX
Table 3HS-90%-A-ACM	High Speed Type III Fluid 90% Adjusted HOT Guidelines - AllClear AeroClear MAX
Table 3LS-90%-C-2031	Low Speed Type III Fluid 90% Adjusted HOT Guidelines - Clariant Safewing MP III 2031 ECO
Table 3HS-90%-C-2031	High Speed Type III Fluid 90% Adjusted HOT Guidelines - Clariant Safewing MP III 2031 ECO
Table 4-90%-Generic	SAE Type IV Fluid 90% Adjusted HOT Guidelines
Table 4-90%-A-E-AD49	Type IV Fluid 90% Adjusted HOT Guidelines - ABAX Ecowing AD-49
Table 4-90%-C-MF04	Type IV Fluid 90% Adjusted HOT Guidelines - Clariant Max Flight 04
Table 4-90%-C-MFA	Type IV Fluid 90% Adjusted HOT Guidelines - Clariant Max Flight AVIA
Table 4-90%-C-MFS	Type IV Fluid 90% Adjusted HOT Guidelines - Clariant Max Flight SNEG
Table 4-90%-C-N	Type IV Fluid 90% Adjusted HOT Guidelines - Clariant Safewing EG IV NORTH
Table 4-90%-C-L	Type IV Fluid 90% Adjusted HOT Guidelines - Clariant Safewing MP IV LAUNCH
Table 4-90%-C-L+	Type IV Fluid 90% Adjusted HOT Guidelines - Clariant Safewing MP IV LAUNCH PLUS
Table 4-90%-CR-PGA	Type IV Fluid 90% Adjusted HOT Guidelines - Cryotech Polar Guard® Advance

OBSOLETE

Table 4-90%-DS-ES	Type IV Fluid 90% Adjusted HOT Guidelines - Deicing Solutions ECO-SHIELD®
Table 4-90%-D-E106	Type IV Fluid 90% Adjusted HOT Guidelines - Dow Chemical UCAR™ Endurance EG106
Table 4-90%-D-AD49	Type IV Fluid 90% Adjusted HOT Guidelines - Dow Chemical UCAR™ FlightGuard AD-49
Table 4-90%-K-ABC-S+	Type IV Fluid 90% Adjusted HOT Guidelines - Kilfrost ABC-S Plus
Table 4-90%-L-E450	Type IV Fluid 90% Adjusted HOT Guidelines - LNT Solutions E450
Table 4-90%-N-F-9311	Type IV Fluid 90% Adjusted HOT Guidelines - Newave Aerochemical FCY 9311
Table 4-90%-SC-CSIV	Type IV Fluid 90% Adjusted HOT Guidelines - Shaanxi Cleanway Aviation Cleansurface IV
Table 5-90%	SAE Type III Fluid 90% Adjusted Ice Pellet and Small Hail Allowance Times
Table 6-90%	SAE Type IV Fluid 90% Adjusted Ice Pellet and Small Hail Allowance Times

OBSOLETE

TABLE 0

SAE TYPE I, TYPE II, TYPE III, AND TYPE IV FLUID ACTIVE FROST HOLDOVER TIME GUIDELINES

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

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

Outside Air Temperature[2,3]		Concentration Neat Fluid/Water (Volume %/ Volume %)	Approximate Holdover Times (hours:minutes)		
Degrees Celsius	Degrees Fahrenheit		Active Frost		
			Type II	Type III[4]	Type IV
-1 and above	30 and above	100/0	8:00	2:00	12:00
		75/25	5:00	1:00	5:00
		50/50	3:00	0:30	3:00
below -1 to -3	below 30 to 27	100/0	8:00	2:00	12:00
		75/25	5:00	1:00	5:00
		50/50	1:30	0:30	3:00
below -3 to -10	below 27 to 14	100/0	8:00	2:00	10:00
		75/25	5:00	1:00	5:00
below -10 to -14	below 14 to 7	100/0	6:00	2:00	6:00
		75/25	1:00	1:00	1:00
below -14 to -21	below 7 to -6	100/0	6:00	2:00	6:00
below -21 to -25	below -6 to -13	100/0	2:00	2:00	4:00
Below -25	below -13	100/0	No Holdover Time Guidelines Exist		

OBSOLETE

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

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

TABLE 1-A

SAE TYPE I FLUID HOLDOVER TIME GUIDELINES ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF ALUMINUM[1]

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

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

OBSOLETE

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 7) 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 1-C

SAE TYPE I FLUID HOLDOVER TIME GUIDELINES ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF COMPOSITES[1]

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

Outside Air Temperature[2]		Approximate Holdover Times Under Various Weather Conditions (minutes)							
Degrees Celsius	Degrees Fahrenheit	Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[3]			Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold Soaked Wing[6]	Other[7]
			Very Light[4]	Light[4]	Moderate				
-3 and above	27 and above	9 – 16	12	6 – 12	3 – 6	8 – 13	4 – 6	1 – 5	
below -3 to -6	below 27 to 21	6 – 8	11	5 – 11	2 – 5	5 – 9	4 – 6	CAUTION: No holdover time guidelines exist	
below -6 to -10	below 21 to 14	4 – 8	9	5 – 9	2 – 5	4 – 7	2 – 5		
below -10	below 14	4 – 7	7	4 – 7	2 – 4				

OBSOLETE

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 7) 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 2-Generic

SAE TYPE II FLUID HOLDOVER TIME GUIDELINES

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2,3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	0:35 – 1:30	0:20 – 0:45	0:30 – 1:00	0:15 – 0:30	0:07 – 0:40	
		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	0:05 – 0:09	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:20 – 1:05	0:15 – 0:30	0:20 – 0:45[7]	0:10 – 0:20[7]		
		75/25	0:25 – 0:50	0:08 – 0:20	0:15 – 0:25[7]	0:08 – 0:15[7]		
below -14 to LOUT	below 7 to LOUT	100/0	0:20 – 0:35[8]	0:08 – 0:10[8]				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 2-A-E26

TYPE II FLUID HOLDOVER TIME GUIDELINES
ABAX ECOWING 26

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:25 – 2:35	1:35	1:00 – 1:35	0:40 – 1:00	0:50 – 1:35	0:40 – 0:50	0:20 – 1:25	
		75/25	1:05 – 1:55	1:15	0:45 – 1:15	0:25 – 0:45	0:45 – 1:05	0:25 – 0:35	0:10 – 1:00	
		50/50	0:30 – 0:45	0:40	0:20 – 0:40	0:10 – 0:20	0:15 – 0:25	0:08 – 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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]		
		75/25	0:35 – 1:15	0:55	0:40 – 0:55	0:25 – 0:40	0:20 – 0:50[7]	0:15 – 0:25[7]		
below -14 to -25	below 7 to -13	100/0	0:25 – 0:45	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 2-AS-CWII

TYPE II FLUID HOLDOVER TIME GUIDELINES
AVIATION SHAANXI HI-TECH CLEANWING II

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2,3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	0:55 – 1:50	0:30 – 0:55	0:35 – 1:05	0:25 – 0:35	0:10 – 0:55	
		75/25	0:50 – 1:20	0:25 – 0:45	0:35 – 1:00	0:20 – 0:30	0:07 – 0:50	
		50/50	0:35 – 1:00	0:15 – 0:30	0:20 – 0:40	0:10 – 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:45 – 1:50	0:30 – 0:55	0:30 – 0:55[7]	0:20 – 0:25[7]		
		75/25	0:40 – 1:45	0:25 – 0:45	0:35 – 0:40[7]	0:20 – 0:25[7]		
below -14 to -29	below 7 to -20.2	100/0	0:20 – 0:50	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 2-BY-YDII

TYPE II FLUID HOLDOVER TIME GUIDELINES
BEIJING YADILITE AVIATION YD-102 TYPE II

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:10 – 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	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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]		
		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 -29	below 7 to -20.2	100/0	0:20 – 0:45	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 2-C-F

TYPE II FLUID HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING MP II FLIGHT

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	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	CAUTION: No holdover time guidelines exist
		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	below 27 to 7	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]		
		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 -29	below 7 to -20.2	100/0	0:30 – 0:50	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 2-C-F+

TYPE II FLUID HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING MP II FLIGHT PLUS

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2,3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:40 – 4:00	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	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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 -29	below 7 to -20.2	100/0	0:20 – 0:40	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 2-CR-PGII

TYPE II FLUID HOLDOVER TIME GUIDELINES
CRYOTECH POLAR GUARD® II

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

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

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 2-K-ABC-IC

TYPE II FLUID HOLDOVER TIME GUIDELINES
KILFROST ABC-ICE CLEAR II

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:00 – 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	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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]		
		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 -29.5	below 7 to -21.1	100/0	0:20 – 0:40	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 2-K-ABC-K+

TYPE II FLUID HOLDOVER TIME GUIDELINES
KILFROST ABC-K PLUS

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2,3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:15 – 3:45	1:00 – 1:40	1:50 – 2:00	1:00 – 1:25	0:20 – 2:00	
		75/25	1:40 – 2:30	0:35 – 1:10	1:25 – 2:00	0:50 – 1:10	0:15 – 2:00	
		50/50	0:35 – 1:05	0:07 – 0:15	0:20 – 0:30	0:10 – 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:30 – 1:05	0:50 – 1:25	0:25 – 1:00[7]	0:15 – 0:35[7]		
		75/25	0:25 – 1:25	0:35 – 1:05	0:20 – 0:55[7]	0:09 – 0:30[7]		
below -14 to -29	below 7 to -20.2	100/0	0:30 – 0:55	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 2-N-FCY-2

TYPE II FLUID HOLDOVER TIME GUIDELINES
NEWAVE AEROCHEMICAL FCY-2

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2,3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	1:15 – 2:25	0:30 – 0:55	0:35 – 1:05	0:25 – 0:35	0:08 – 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	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:45 – 1:30	0:15 – 0:30	0:20 – 0:45[7]	0:15 – 0:20[7]		
		75/25	0:30 – 1:05	0:10 – 0:20	0:15 – 0:30[7]	0:08 – 0:15[7]		
below -14 to -28	below 7 to -18.4	100/0	0:25 – 0:35	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 2-N-FCY-2B+

TYPE II FLUID HOLDOVER TIME GUIDELINES
NEWAVE AEROCHEMICAL FCY-2 BIO+

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:25 – 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	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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]		
		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 -28.5	below 7 to -19.3	100/0	0:20 – 1:00	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 3LS-A-ACM

LOW SPEED TYPE III FLUID HOLDOVER TIME GUIDELINES
ALLCLEAR AEROCLEAR MAX, APPLIED UNHEATED[1]

FOR AIRCRAFT CONFORMING TO THE SAE AS5900 LOW SPEED AERODYNAMIC TEST CRITERION

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

Outside Air Temperature[2]		Type III Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[3]			Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold Soaked Wing[6]	Other[7]
				Very Light[4]	Light[4]	Moderate				
-3 and above	27 and above	100/0	0:45 – 1:10	1:00	0:30 – 1:00	0:14 – 0:30	0:20 – 0:45	0:14 – 0:20	0:06 – 0:40	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -10	below 27 to 14	100/0	0:45 – 1:25	1:00	0:30 – 1:00	0:14 – 0:30	0:20 – 0:40	0:15 – 0:25		
		75/25								
below -10 to -16	below 14 to 3.2	100/0	0:30 – 1:05	1:00	0:30 – 1:00	0:14 – 0:30				

OBSOLETE

NOTES

1 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 7) 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 3HS-A-ACM

HIGH SPEED TYPE III FLUID HOLDOVER TIME GUIDELINES
ALLCLEAR AEROCLEAR MAX, APPLIED UNHEATED[1]

FOR AIRCRAFT CONFORMING TO THE SAE AS5900 HIGH SPEED AERODYNAMIC TEST CRITERION

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

Outside Air Temperature[2]		Type III Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[3]			Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold Soaked Wing[6]	Other[7]
				Very Light[4]	Light[4]	Moderate				
-3 and above	27 and above	100/0	0:45 – 1:10	1:00	0:30 – 1:00	0:14 – 0:30	0:20 – 0:45	0:14 – 0:20	0:06 – 0:40	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -10	below 27 to 14	100/0	0:45 –1:25	1:00	0:30 – 1:00	0:14 – 0:30	0:20 – 0:40	0:15 – 0:25		
		75/25								
below -10 to -25	below 14 to -13	100/0	0:30 – 1:05	1:00	0:30 – 1:00	0:14 – 0:30				
below -25 to -35	below -13 to -31	100/0	0:15 – 0:40	0:40	0:19 – 0:40	0:09 – 0:19				

OBSOLETE

NOTES

1 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 7) 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 5 provides allowance times for ice pellets and small hail).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 3LS-C-2031

LOW SPEED TYPE III FLUID HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING MP III 2031 ECO, APPLIED HEATED[1]

FOR AIRCRAFT CONFORMING TO THE SAE AS5900 LOW SPEED AERODYNAMIC TEST CRITERION

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

Outside Air Temperature[2]		Type III Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[3]			Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold Soaked Wing[6]	Other[7]
				Very Light[4]	Light[4]	Moderate				
-3 and above	27 and above	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	
		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	CAUTION: No holdover time guidelines exist	
below -3 to -10	below 27 to 14	100/0	0:35 – 1:15	0:40	0:20 – 0:40	0:10 – 0:20	0:14 – 0:30	0:09 – 0:13		
		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	below 14 to 2.3	100/0	0:25 – 0:45	0:40	0:19 – 0:40	0:09 – 0:19				

OBSOLETE

NOTES

1 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 7) 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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 3HS-C-2031

HIGH SPEED TYPE III FLUID HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING MP III 2031 ECO, APPLIED HEATED[1]

FOR AIRCRAFT CONFORMING TO THE SAE AS5900 HIGH SPEED AERODYNAMIC TEST CRITERION

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

Outside Air Temperature[2]		Type III Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[3]			Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold Soaked Wing[6]	Other[7]
				Very Light[4]	Light[4]	Moderate				
-3 and above	27 and above	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	
		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	CAUTION: No holdover time guidelines exist	
below -3 to -10	below 27 to 14	100/0	0:35 – 1:15	0:40	0:20 – 0:40	0:10 – 0:20	0:14 – 0:30	0:09 – 0:13		
		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	below 14 to -13	100/0	0:25 – 0:45	0:40	0:19 – 0:40	0:09 – 0:19				
below -25 to -29	below -13 to -20.2	100/0	0:25 – 0:45	0:40	0:19 – 0:40	0:09 – 0:19				

OBSOLETE

NOTES

1 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 7) 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 5 provides allowance times for ice pellets and small hail).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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

SAE TYPE IV FLUID HOLDOVER TIME GUIDELINES

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:15 – 2:40	2:00	1:10 – 2:00	0:35 – 1:10	0:40 – 1:30	0:35 – 0:40	0:08 – 1:25	CAUTION: No holdover time guidelines exist
		75/25	1:25 – 2:40	2:00	1:15 – 2:00	0:45 – 1:15	0:50 – 1:20	0:30 – 0:45	0:09 – 1:15	
		50/50	0:25 – 0:50	0:40	0:25 – 0:40	0:15 – 0:25	0:15 – 0:30	0:09 – 0:15		
below -3 to -14	below 27 to 7	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]		
		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 LOUT	below 7 to LOUT	100/0	0:20 – 0:40[8]	0:20[8]	0:10 – 0:20[8]	0:08 – 0:10[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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).
8 If the LOUT is unknown, no holdover time guidelines exist below -22.5°C (-8.5°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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.**

OBSOLETE

TABLE 4-A-E-AD49

TYPE IV FLUID HOLDOVER TIME GUIDELINES
ABAX ECOWING AD-49

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	3:20 – 4:00	2:00	1:50 – 2:00	1:10 – 1:50	1:25 – 2:00	1:00 – 1:25	0:10 – 1:55	
		75/25	2:25 – 4:00	2:00	1:40 – 2:00	1:20 – 1:40	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	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:20 – 1:35	2:00	1:50 – 2:00	1:10 – 1:50	0:25 – 1:25[7]	0:20 – 0:25[7]		
		75/25	0:30 – 1:10	2:00	1:40 – 2:00	1:20 – 1:40	0:15 – 1:05[7]	0:15 – 0:25[7]		
below -14 to -26	below 7 to -14.8	100/0	0:25 – 0:40	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-C-MF04

TYPE IV FLUID HOLDOVER TIME GUIDELINES
CLARIANT MAX FLIGHT 04

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:40 – 4:00	2:00	2:00 – 2:00	1:25 – 2:00	2:00 – 2:00	1:10 – 1:30	0:20 – 2:00	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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]		
		75/25								
below -14 to -23.5	below 7 to -10.3	100/0	0:20 – 0:45	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-C-MFA

TYPE IV FLUID HOLDOVER TIME GUIDELINES
CLARIANT MAX FLIGHT AVIA

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	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								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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]		
		75/25								
below -14 to -28.5	below 7 to -19.3	100/0	0:35 – 1:25	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-C-MFS

TYPE IV FLUID HOLDOVER TIME GUIDELINES
CLARIANT MAX FLIGHT SNEG

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:25 – 4:00	2:00	1:40 – 2:00	1:05 – 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	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:45 – 2:20	2:00	1:15 – 2:00	0:45 – 1:15	0:30 – 1:25[7]	0:25 – 0:40[7]		
		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 -29	below 7 to -20.2	100/0	0:20 – 0:50	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-C-N

TYPE IV FLUID HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING EG IV NORTH

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:20 – 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								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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]		
		75/25								
below -14 to -30	below 7 to -22	100/0	0:40 – 1:20	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-C-L

TYPE IV FLUID HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING MP IV LAUNCH

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	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	CAUTION: No holdover time guidelines exist
		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	below 27 to 7	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]		
		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 -28.5	below 7 to -19.3	100/0	0:30 – 0:50	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-C-L+

TYPE IV FLUID HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING MP IV LAUNCH PLUS

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	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		
below -3 to -14	below 27 to 7	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]		
		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]		
below -14 to -29	below 7 to -20.2	100/0	0:25 – 0:50	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-CR-PGA

TYPE IV FLUID HOLDOVER TIME GUIDELINES
CRYOTECH POLAR GUARD® ADVANCE

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

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

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-DS-ES

TYPE IV FLUID HOLDOVER TIME GUIDELINES
DEICING SOLUTIONS ECO-SHIELD®

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:15 – 2:40	2:00	1:20 – 2:00	0:45 – 1:20	0:40 – 1:30	0:35 – 0:40	0:15 – 1:35	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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]		
		75/25								
below -14 to -25.5	below 7 to -13.9	100/0	0:30 – 1:00	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-D-E106

TYPE IV FLUID HOLDOVER TIME GUIDELINES
DOW CHEMICAL UCAR™ ENDURANCE EG106

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:05 – 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								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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]		
		75/25								
below -14 to -27	below 7 to -16.6	100/0	0:30 – 1:05	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-D-AD49

TYPE IV FLUID HOLDOVER TIME GUIDELINES
DOW CHEMICAL UCAR™ FLIGHTGUARD AD-49

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	3:20 – 4:00	2:00	1:50 – 2:00	1:10 – 1:50	1:25 – 2:00	1:00 – 1:25	0:10 – 1:55	
		75/25	2:25 – 4:00	2:00	1:40 – 2:00	1:20 – 1:40	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	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:20 – 1:35	2:00	1:50 – 2:00	1:10 – 1:50	0:25 – 1:25[7]	0:20 – 0:25[7]		
		75/25	0:30 – 1:10	2:00	1:40 – 2:00	1:20 – 1:40	0:15 – 1:05[7]	0:15 – 0:25[7]		
below -14 to -26	below 7 to -14.8	100/0	0:25 – 0:40	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-K-ABC-S+

TYPE IV FLUID HOLDOVER TIME GUIDELINES
KILFROST ABC-S PLUS

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:10 – 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	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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]		
		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 -28	below 7 to -18.4	100/0	0:40 – 1:00	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-L-E450

TYPE IV FLUID HOLDOVER TIME GUIDELINES
LNT SOLUTIONS E450

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:50 – 2:55	2:00	1:35 – 2:00	1:00 – 1:35	1:35 – 2:00	0:55 – 1:20	0:25 – 2:00	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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]		
		75/25								
below -14 to -22.5	below 7 to -8.5	100/0	0:35 – 1:05	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-N-F-9311

TYPE IV FLUID HOLDOVER TIME GUIDELINES
NEWAVE AEROCHEMICAL FCY 9311

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:55 – 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								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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]		
		75/25								
below -14 to -29.5	below 7 to -21.1	100/0	0:30 – 0:55	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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-SC-CSIV

TYPE IV FLUID HOLDOVER TIME GUIDELINES
SHAANXI CLEANWAY AVIATION CLEANSURFACE IV

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:50 – 4:00	2:00	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	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	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]		
		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 -28.5	below 7 to -19.3	100/0	0:30 – 0:50	0:20	0:10 – 0:20	0:08 – 0:10				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time 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.**

ICE PELLET AND SMALL HAIL ALLOWANCE TIMES

1. Background

During the winter of 2006-2007, operations in ice pellets were approved by the FAA (Transport Canada opted not to publish guidance that winter) for “light ice pellets” with an allowance time of 25 minutes. That time was based on limited research conducted late in the winter of 2005-2006 at the request of various industry groups. Additional and more comprehensive ice pellet research was conducted jointly by the research teams of the FAA and Transport Canada the following winter.

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 more comprehensive allowance times for operations in light ice pellets, as well as allowance times for operations in moderate ice pellets and light ice pellets mixed with other forms of precipitation.

Additional ice pellet research was conducted during the winter season of 2008-2009 which further expanded the ice pellet allowance times under specified conditions. Guidance was also provided for Type IV anti-icing fluid with embedded ice pellets “aged” beyond its allowance time when the precipitation stops at or prior to the expiration of the allowance time. This research demonstrated that provided the precipitation has stopped within the respective allowance time, the fluid remains effective up to 90 minutes after the start of the application time of the anti-icing fluid.

During the winter of 2009-2010, wind tunnel research conducted with a newer generation type airfoil showed that Type IV Propylene Glycol (PG) and Type IV Ethylene Glycol (EG) fluids behave differently under certain temperature and ice pellet conditions. Specifically, higher aircraft rotation speeds are required to effectively remove Type IV PG fluid contaminated with light or moderate ice pellets at temperatures less than -10°C. Therefore, there are no allowance times associated with the use of Type IV PG fluids on aircraft with rotation speeds of less than 115 knots in conditions of light or moderate ice pellets at temperatures below -10°C.

Furthermore, research with this newer generation type airfoil has shown that the allowance times are shorter when using Type IV PG fluids under certain conditions for all aircraft regardless of the rotation speed. This research resulted in the allowance time when using Type IV PG fluids at temperatures of 5°C and above being limited to 15 minutes in moderate ice pellets.

Research has also indicated that Type IV PG fluids are removed less effectively when contaminated with moderate ice pellets at temperatures below -16°C; operations in these conditions are not recommended. Therefore, there are no allowance times associated with the use of PG fluids in conditions of moderate ice pellets at temperatures below -16°C, irrespective of aircraft rotation speed.

Type IV allowance times do not currently exist below -22°C as existing cold temperature data is limited or not available below -22°C and therefore allowance times cannot be provided.

Allowance times are also published for undiluted (100/0) Type III fluid applied unheated in select conditions. Further testing is required to expand Type III allowance times in other conditions, such as temperatures below -10°C.

Allowance times for small hail are also published, as it was determined small hail is meteorologically equivalent to ice pellets.

The current allowance times, which were developed based on the aerodynamic testing described above, are provided in the Type III (Table 5) and Type IV (Table 6) allowance time tables.

2. Operational Guidance

(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.

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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 time 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 light or moderate freezing drizzle;
- light ice pellets mixed with light freezing rain;
- light ice pellets mixed with light rain; and
- light ice pellets mixed with moderate 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 5 and 6, 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 time 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.

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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 light snow is reported, use the “light ice pellets mixed with light snow” allowance times.

OBSOLETE

TABLE 5

SAE TYPE III FLUID ICE PELLET AND SMALL HAIL ALLOWANCE TIMES[1]

This table is for use with SAE Type III undiluted (100/0) fluids applied unheated only

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

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 Light Snow	10 minutes	10 minutes	
Light Ice Pellets Mixed with Moderate Snow	10 minutes	5 minutes	
Light Ice Pellets Mixed with Light or Moderate Freezing Drizzle	7 minutes	5 minutes	
Light Ice Pellets Mixed with Light Freezing Rain	7 minutes	5 minutes	
Light Ice Pellets Mixed with Light Rain	7 minutes[3]		
Light Ice Pellets Mixed with Moderate Rain			
Moderate Ice Pellets (or Small Hail)[4]	5 minutes	5 minutes	

OBSOLETE

NOTES

1 These allowance times are for use with 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 light 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 light snow is reported, use the “light ice pellets mixed with light snow” allowance times.

CAUTIONS

- **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: light or moderate freezing drizzle, light freezing rain, or light rain.**

TABLE 6

SAE TYPE IV FLUID ICE PELLET AND SMALL HAIL ALLOWANCE TIMES[1]

This table is for use with SAE Type IV undiluted (100/0) fluids only. All Type IV fluids are propylene glycol based with the exception of Clariant Max Flight AVIA, Clariant Safewing EG IV NORTH, Dow EG106 and LNT Solutions E450 which are ethylene glycol based.

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

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 Light Snow	40 minutes	15 minutes	15 minutes[3]	**Caution: No allowance times currently exist**
Light Ice Pellets Mixed with Moderate Snow	20 minutes	7 minutes	5 minutes[3]	
Light Ice Pellets Mixed with Light or Moderate Freezing Drizzle	25 minutes	10 minutes		
Light Ice Pellets Mixed with Light Freezing Rain	25 minutes	10 minutes		
Light Ice Pellets Mixed with Light Rain	25 minutes[4]			
Light Ice Pellets Mixed with Moderate Rain	25 minutes[5]			
Moderate Ice Pellets (or Small Hail)[6]	25 minutes[7]	10 minutes	10 minutes[3]	10 minutes[8]
Moderate Ice Pellets (or Small Hail)[6] Mixed with Moderate Freezing Drizzle	10 minutes	7 minutes	**Caution: No allowance times currently exist**	
Moderate Ice Pellets (or Small Hail)[6] Mixed with Moderate Rain	10 minutes[5]			

OBSOLETE

NOTES

1 These allowance times are for use with 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 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 light freezing rain.
5 No allowance times exist in this condition for temperatures below 0°C.
6 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 light snow is reported, use the “light ice pellets mixed with light snow” allowance times.
7 Allowance time is 15 minutes for propylene glycol (PG) fluids or when the fluid type is unknown.
8 No allowance times exist for propylene glycol (PG) fluids in this condition for temperatures below -16°C.

CAUTIONS

- **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: light or moderate freezing drizzle, light freezing rain, light rain, or moderate rain.**

TABLE 7

SNOWFALL INTENSITIES AS A FUNCTION OF PREVAILING VISIBILITY[1]

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)

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.

OBSOLETE

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 8-1

LIST OF TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on page 67)

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	17-05-20	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	75/25	*-25[14]*	*-13[14]*	-25	-13
AVIAFLUID International Ltd.[11]	AVIAFLO EG	EG	16-11-28	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
Baltic Ground Services[11]	*DEFROSOL ADF*	*NCG*	*15-03-18[9]*	*65/35*	*-25*	*-13*	*-30*	*-22*
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 Yadilite Aviation Advanced Materials Corporation	YD-101 Type I	PG	17-05-27	60/40	Not tested[10]	Not tested[10]	-30	-22
Beijing Yadilite Aviation Advanced Materials Corporation	YD-101A Type I	EG	17-11-01	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	*EcoFlo Concentrate*	*NCG*	*13-07-06[9]*	*65/35*	*Not tested[10]*	*Not tested[10]*	*-30.5*	*-22.9*
Clariant Produkte (Deutschland) GmbH	*EcoFlo 2 Concentrate*	*NCG*	*13-07-25[9]*	*65/35*	*Not tested[10]*	*Not tested[10]*	*-29*	*-20.2*
Clariant Produkte (Deutschland) GmbH	Octaflo EF Concentrate	PG	18-03-20	65/35	-25	-13	-33	-27.4
Clariant Produkte (Deutschland) GmbH	*Octaflo EF-80*	*PG*	*13-12-21[9]*	*70/30*	*-25*	*-13*	*-33*	*-27.4*
Clariant Produkte (Deutschland) GmbH	Octaflo EG Concentrate	EG	17-07-23	70/30	-40.5	-40.9	-44	-47.2
Clariant Produkte (Deutschland) GmbH	Octaflo 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

OBSOLETE

TABLE 8-1 (cont'd)

LIST OF TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on page 67)

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	PG	20-05-11	65/35	-25.5	-13.9	-32	-25.6
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	17-03-13	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
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
Deicing Solutions LLC	Safetemp® ES Plus (Multiple Location)	PG	18-08-29	65/35	-25.5	-13.9	-31	-23.8
Dow Chemical Company	UCAR™ ADF Concentrate	EG	19-05-11	75/25	-36	-32.8	-45	-49
Dow Chemical Company	UCAR™ ADF XL54[17]	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[18]	PG	19-05-11	as supplied	-24	-11.2	-25	-13
DR Energy Group LTD.	Northern Guard I	EG	17-06-16	65/35	Not tested[10]	Not tested[10]	-39.5	-39.1
Heilongjiang Hangjie Aero-chemical Technology Co. Ltd.	HJF-1	EG	17-10-02	65/35	Not tested[10]	Not tested[10]	-42	-43.6
Heilongjiang Hangjie Aero-chemical Technology Co. Ltd.	HJF-1A	EG	16-09-02	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 CANADA Inc.	DuraGly-E Type I ADF Concentrate	EG	19-01-13	60/40	-33	-27.4	-33	-27.4
Inland Technologies CANADA Inc.	*DuraGly-P Type I ADF Concentrate*	*PG*	*15-02-04[9]*	*60/40*	*-25*	*-13*	*-25*	*-13*
Inland Technologies CANADA Inc.	Inland ADF Concentrate[12] (Multiple Location)	EG	Y-M-D[12]	75/25	-36	-32.8	-42.5	-44.5
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
Kilfrost Limited	Kilfrost DF^{Sustain}	NCG	19-08-06	68/32	-34	-29.2	-41	-41.8

OBSOLETE

TABLE 8-1 (cont'd)

LIST OF TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on page 67)

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
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*	*16-07-08[13]*	*75/25*	*Not tested[10]*	*Not tested[10]*	*-40.5*	*-40.9*
Oksayd Co. Ltd.	DEFROST EG 88.1	EG	17-09-02	70/30	Not tested[10]	Not tested[10]	-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.	AIRVEL OK 1	PG	17-01-28	70/30	-26	-14.8	-30	-22

OBSOLETE

TABLE 8-2

LIST OF TYPE II FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on page 67)

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	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)
Aviation Shaanxi Hi-Tech Physical Chemical Co. Ltd.	Cleanwing II	PG	17-05-20	100/0	-29	-20.2	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	17-03-11	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-3	PG	16-10-08	100/0	-27	-16.6	2 500 (d)	2 500 (a)
				75/25	-14	7	2 000 (d)	2 000 (a)
				50/50	-3	27	400 (d)	400 (a)
Kilfrost Limited	ABC-Ice Clear II	PG	17-05-13	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	16-11-24	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	17-02-20	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)

OBSOLETE

TABLE 8-2 (cont'd)

LIST OF TYPE II FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on page 67)

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	17-05-06	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)

OBSOLETE

TABLE 8-3

LIST OF TYPE III FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on page 67)

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	16-12-22[15]	100/0	-16	3.2	-35	-31	7 300 (j)	Not Available[16]
				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)*

OBSOLETE

TABLE 8-4

LIST OF TYPE IV FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on page 67)

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)
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	17-03-24	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	17-03-11	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)
Deicing Solutions LLC	ECO-SHIELD®	PG	18-02-22	100/0	-25.5	-13.9	11 050 (a)	11 050 (a)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
Dow Chemical Company	UCAR™ Endurance EG106 De/Anti-Icing Fluid	EG	17-05-20	100/0	-27	-16.6	24 850 (h)	2 230 (a)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	

OBSOLETE

TABLE 8-4 (cont'd)

LIST OF TYPE IV FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on page 67)

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	17-05-20	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)
Kilfrost Limited	ABC-S Plus	PG	17-06-16	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	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	
Shaanxi Cleanway Aviation Chemical Co., Ltd	Cleansurface IV	PG	17-05-25	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)

OBSOLETE

CAUTIONS AND NOTES FOR TABLES 8-1, 8-2, 8-3, 8-4

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.uqac.ca/amil. 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	30.0 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 Fluid did not meet the minimum Water Spray Endurance Test requirement for a Type III fluid in AMS1428G; Transport Canada and the FAA have proposed a change to the SAE G-12 for this requirement.

16 Measurements using the SAE AS9968 method do not provide stable, reliable results. Use the manufacturer method to evaluate viscosity.

17 For UCAR™ ADF XL54, refer to primary site qualification of UCAR™ ADF Concentrate.

18 For UCAR™ PG ADF Dilute 55/45, refer to primary site qualification of UCAR™ PG ADF Concentrate.

OBSOLETE

TABLE 9

GUIDELINES FOR THE APPLICATION OF SAE TYPE I FLUID

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

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.)

NOTES

- This table is applicable for the use of Type I holdover time guidelines in all conditions including active frost. If holdover times are not required, a temperature of 60°C (140°F) at the nozzle is desirable.
- If holdover times are required, the temperature of water or fluid/water mixtures shall be at least 60°C (140°F) at the nozzle. Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.
- To use Type I Holdover Times Guidelines in all conditions including active frost, an additional minimum of 1 litre/m^2 (~2 gal./100 sq. ft.) of heated Type I fluid mixture must be applied to the surfaces after all frozen contamination is removed. This application is necessary to heat the surfaces, as heat contributes significantly to the Type I fluid holdover times. The required protection can be provided using a 1-step method by applying more fluid than is strictly needed to just remove all of the frozen contamination (the same additional amount stated above is required).
- The lowest operational use temperature (LOUT) for a given Type I fluid is the higher (warmer) of:
  a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
  b) The actual freezing point of the fluid plus its freezing point buffer of 10°C (18°F).

CAUTION

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

OBSOLETE

TABLE 10

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 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 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 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 Type II or IV fluid/water mixture

1 Fluids must not be used at temperatures below their lowest operational use temperature (LOUT). 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 9, 11-U, 11-H). The LOUT for a given Type II/IV 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 II/IV fluids, 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 Clean aircraft may be anti-iced with unheated fluid.

OBSOLETE

NOTES

- For heated fluids, a fluid temperature not less than 60°C (140°F) at the nozzle is desirable.
- Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.

CAUTIONS

- **Wing skin temperatures may differ and in some cases may be lower than outside air temperatures; a stronger mix (more glycol) may be needed under these conditions.**
- **Whenever frost or ice occurs on the lower surface of the wing in the area of the fuel tank, indicating a cold soaked wing, the 50/50 dilutions of Type II 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 11-H

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

1 Fluids must not be used at temperatures below their lowest operational use temperature (LOUT). Consider the use of Type I when Type III fluid cannot be used (see Table 9). 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.

OBSOLETE

NOTES

- To use Type III Holdover Times Guidelines in all conditions including active frost, an additional minimum of 1 litre/m^2 (~2 gal./100 sq. ft.) of heated Type 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.

CAUTIONS

- **Wing skin temperatures may differ and in some cases may be lower than outside air temperatures; a stronger mix (more glycol) may be needed under these conditions.**
- **Whenever frost or ice occurs on the lower surface of the wing in the area of the fuel tank, indicating a cold soaked wing, the 50/50 dilutions of Type 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 11-U

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

OBSOLETE

1 Fluids must not be used at temperatures below their lowest operational use temperature (LOUT). Consider the use of Type I when Type III fluid cannot be used (see Table 9). 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.

4 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.

NOTES

- Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.

CAUTIONS

- **Wing skin temperatures may differ and in some cases may be lower than outside air temperatures; a stronger mix (more glycol) may be needed under these conditions.**
- **Whenever frost or ice occurs on the lower surface of the wing in the area of the fuel tank, indicating a cold soaked wing, the 50/50 dilutions of Type 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.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 0-90%

SAE TYPE I, TYPE II, TYPE III, AND TYPE IV FLUID ACTIVE FROST
90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES

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

Outside Air Temperature[1,2]		Approximate Holdover Times (hours:minutes)
Degrees Celsius	Degrees Fahrenheit	Active Frost
		Type I
-1 and above	30 and above	0:40 *(0:31)*[4]
below -1 to -3	below 30 to 27	
below -3 to -10	below 27 to 14	
below -10 to -14	below 14 to 7	
below -14 to -21	below 7 to -6	
below -21 to LOUT	below -6 to LOUT	

Outside Air Temperature[2]		Concentration Neat Fluid/Water (Volume %/ Volume %)	Approximate Holdover Times (hours:minutes)		
Degrees Celsius	Degrees Fahrenheit		Active Frost		
			Type II	Type III[3]	Type IV
-1 and above	30 and above	100/0	7:12	1:48	10:48
		75/25	4:30	0:54	4:30
		50/50	2:42	0:27	2:42
below -1 to -3	below 30 to 27	100/0	7:12	1:48	10:48
		75/25	4:30	0:54	4:30
		50/50	1:21	0:27	2:42
below -3 to -10	below 27 to 14	100/0	7:12	1:48	9:00
		75/25	4:30	0:54	4:30
below -10 to -14	below 14 to 7	100/0	5:24	1:48	5:24
		75/25	0:54	0:54	0:54
below -14 to -21	below 7 to -6	100/0	5:24	1:48	5:24
below -21 to -25	below -6 to -13	100/0	1:48	1:48	3:36
Below -25	below -13	100/0	No Holdover Time Guidelines Exist		

OBSOLETE

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 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.
4 Value in parentheses is for aircraft with critical surfaces that are predominantly or entirely constructed of composite materials.

CAUTIONS

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

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 1-90%-A

SAE TYPE I FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF ALUMINUM[1]

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

Outside Air Temperature[2]		Approximate Holdover Times Under Various Weather Conditions (minutes)							
Degrees Celsius	Degrees Fahrenheit	Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[3]			Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold Soaked Wing[6]	Other[7]
			Very Light[4]	Light[4]	Moderate				
-3 and above	27 and above	10 – 15	16	10 – 16	5 – 10	8 – 12	4 – 5	2 – 5	
below -3 to -6	below 27 to 21	7 – 12	13	7 – 13	5 – 7	5 – 8	4 – 5	CAUTION: No holdover time guidelines exist	
below -6 to -10	below 21 to 14	5 – 9	10	5 – 10	4 – 5	4 – 6	2 – 5		
below -10	below 14	5 – 8	6	4 – 6	2 – 4				

OBSOLETE

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 7) 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 1-90%-C

SAE TYPE I FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF COMPOSITES[1]

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

Outside Air Temperature[2]		Approximate Holdover Times Under Various Weather Conditions (minutes)							
Degrees Celsius	Degrees Fahrenheit	Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[3]			Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold Soaked Wing[6]	Other[7]
			Very Light[4]	Light[4]	Moderate				
-3 and above	27 and above	8 – 14	11	5 – 11	3 – 5	7 – 12	4 – 5	1 – 5	
below -3 to -6	below 27 to 21	5 –7	10	5 – 10	2 – 5	5 – 8	4 – 5	CAUTION: No holdover time guidelines exist	
below -6 to -10	below 21 to 14	4 – 7	8	5 – 8	2 – 5	4 – 6	2 – 5		
below -10	below 14	4 – 6	6	4 – 6	2 – 4				

OBSOLETE

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 7) 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 2-90%-Generic

SAE TYPE II FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2,3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	0:32 – 1:21	0:18 – 0:41	0:27 – 0:54	0:14 – 0:27	0:06 – 0:36	
		75/25	0:23 – 0:50	0:14 – 0:23	0:14 – 0:36	0:09 – 0:18	0:04 – 0:23	
		50/50	0:14 – 0:23	0:05 – 0:09	0:07 – 0:14	0:05 – 0:08	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:18 – 0:59	0:14 – 0:27	0:18 – 0:41[7]	0:09 – 0:18[7]		
		75/25	0:23 – 0:45	0:07 – 0:18	0:14 – 0:23[7]	0:07 – 0:14[7]		
below -14 to LOUT	below 7 to LOUT	100/0	0:18 – 0:32[8]	0:07 – 0:09[8]				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 2-90%-A-E26

TYPE II FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
ABAX ECOWING 26

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:17 – 2:20	1:26	0:54 – 1:26	0:36 – 0:54	0:45 – 1:26	0:36 – 0:45	0:18 – 1:17	
		75/25	0:59 – 1:44	1:08	0:41 – 1:08	0:23 – 0:41	0:41 – 0:59	0:23 – 0:32	0:09 – 0:54	
		50/50	0:27 – 0:41	0:36	0:18 – 0:36	0:09 – 0:18	0:14 – 0:23	0:07 – 0:09	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:41 – 2:02	1:17	0:50 – 1:17	0:32 – 0:50	0:27 – 1:03[7]	0:14 – 0:32[7]		
		75/25	0:32 – 1:08	0:50	0:36 – 0:50	0:23 – 0:36	0:18 – 0:45[7]	0:14 – 0:23[7]		
below -14 to -25	below 7 to -13	100/0	0:23 – 0:41	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 2-90%-AS-CWII

TYPE II FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
AVIATION SHAANXI HI-TECH CLEANWING II

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2,3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	0:50 – 1:39	0:27 – 0:50	0:32 – 0:59	0:23 – 0:32	0:09 – 0:50	
		75/25	0:45 – 1:12	0:23 – 0:41	0:32 – 0:54	0:18 – 0:27	0:06 – 0:45	
		50/50	0:32 – 0:54	0:14 – 0:27	0:18 – 0:36	0:09 – 0:18	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:41 – 1:39	0:27 – 0:50	0:27 – 0:50[7]	0:18 – 0:23[7]		
		75/25	0:36 – 1:35	0:23 – 0:41	0:32 – 0:36[7]	0:18 – 0:23[7]		
below -14 to -29	below 7 to -20.2	100/0	0:18 – 0:45	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 2-90%-BY-YDII

TYPE II FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
BEIJING YADILITE AVIATION YD-102 TYPE II

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:03 – 1:48	1:30	0:45 – 1:30	0:23 – 0:45	0:36 – 1:08	0:32 – 0:36	0:09 – 0:54	
		75/25	0:23 – 0:50	0:45	0:23 – 0:45	0:14 – 0:23	0:14 – 0:36	0:09 – 0:18	0:04 – 0:23	
		50/50	0:14 – 0:23	0:23	0:09 – 0:23	0:05 – 0:09	0:07 – 0:14	0:06 – 0:08	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:41 – 1:21	0:54	0:27 – 0:54	0:14 – 0:27	0:32 – 0:45[7]	0:23 – 0:23[7]		
		75/25	0:27 – 0:45	0:32	0:18 – 0:32	0:07 – 0:18	0:14 – 0:23[7]	0:08 – 0:14[7]		
below -14 to -29	below 7 to -20.2	100/0	0:18 – 0:41	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 2-90%-C-F

TYPE II FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING MP II FLIGHT

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	3:09 – 3:36	2:00	1:26 – 2:00	0:54 – 1:26	1:12 – 1:48	0:41 – 1:17	0:09 – 1:21	
		75/25	1:39 – 2:29	2:00	1:12 – 2:00	0:36 – 1:12	1:03 – 1:21	0:27 – 0:50	0:05 – 0:45	
		50/50	0:50 – 1:35	0:41	0:23 – 0:41	0:09 – 0:23	0:18 – 0:27	0:09 – 0:14	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:50 – 1:35	1:39	0:59 – 1:39	0:36 – 0:59	0:32 – 1:21[7]	0:23 – 0:41[7]		
		75/25	0:23 – 0:59	1:12	0:36 – 1:12	0:18 – 0:36	0:23 – 1:03[7]	0:18 – 0:32[7]		
below -14 to -29	below 7 to -20.2	100/0	0:27 – 0:45	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 2-90%-C-F+

TYPE II FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING MP II FLIGHT PLUS

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2,3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:24 – 3:36	0:45 – 1:39	1:17 – 1:48	0:41 – 0:54	0:14 – 1:48	
		75/25	2:20 – 3:36	0:54 – 1:35	1:26 – 1:48	0:45 – 1:08	0:14 – 1:08	
		50/50	0:59 – 2:06	0:14 – 0:23	0:27 – 0:59	0:14 – 0:18	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:36 – 2:06	0:32 – 1:08	0:32 – 1:17[7]	0:32 – 0:50[7]		
		75/25	0:27 – 1:35	0:50 – 1:30	0:23 – 1:03[7]	0:27 – 0:41[7]		
below -14 to -29	below 7 to -20.2	100/0	0:18 – 0:36	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 2-90%-CR-PGII

TYPE II FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
CRYOTECH POLAR GUARD® II

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:33 – 3:36	2:00	1:39 – 2:00	1:12 – 1:39	1:26 – 1:48	1:08 – 1:21	0:14 – 1:48	
		75/25	2:15 – 3:36	2:00	1:12 – 2:00	0:41 – 1:12	1:30 – 1:48	0:36 – 1:03	0:08 – 1:30	
		50/50	0:45 – 1:17	1:12	0:32 – 1:12	0:14 – 0:32	0:18 – 0:41	0:08 – 0:18	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:50 – 2:15	1:35	1:08 – 1:35	0:50 – 1:08	0:32 – 1:26[7]	0:32 – 0:41[7]		
		75/25	0:36 – 1:21	1:35	0:54 – 1:35	0:32 – 0:54	0:23 – 0:59[7]	0:32 – 0:41[7]		
below -14 to -30.5	below 7 to -22.9	100/0	0:23 – 0:45	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 2-90%-K-ABC-IC

TYPE II FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
KILFROST ABC-ICE CLEAR II

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	0:54 – 1:35	1:35	0:45 – 1:35	0:23 – 0:45	0:36 – 0:59	0:23 – 0:32	0:06 – 0:41	
		75/25	0:45 – 1:03	1:12	0:36 – 1:12	0:18 – 0:36	0:27 – 0:41	0:18 – 0:27	0:05 – 0:32	
		50/50	0:14 – 0:27	0:18	0:14 – 0:18	0:07 – 0:14	0:09 – 0:18	0:06 – 0:09	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:36 – 1:26	1:08	0:32 – 1:08	0:18 – 0:32	0:23 – 0:54[7]	0:14 – 0:27[7]		
		75/25	0:36 – 1:12	0:50	0:23 – 0:50	0:14 – 0:23	0:23 – 0:41[7]	0:14 – 0:18[7]		
below -14 to -29.5	below 7 to -21.1	100/0	0:18 – 0:36	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 2-90%-K-ABC-K+

TYPE II FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
KILFROST ABC-K PLUS

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2,3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	2:02 – 3:23	0:54 – 1:30	1:39 – 1:48	0:54 – 1:17	0:18 – 1:48	
		75/25	1:30 – 2:15	0:32 – 1:03	1:17 – 1:48	0:45 – 1:03	0:14 – 1:48	
		50/50	0:32 – 0:59	0:06 – 0:14	0:18 – 0:27	0:09 – 0:14	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:27 – 0:59	0:45 – 1:17	0:23 – 0:54[7]	0:14 – 0:32[7]		
		75/25	0:23 – 1:17	0:32 – 0:59	0:18 – 0:50[7]	0:08 – 0:27[7]		
below -14 to -29	below 7 to -20.2	100/0	0:27 – 0:50	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 2-90%-N-FCY-2

TYPE II FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
NEWAVE AEROCHEMICAL FCY-2

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2,3]	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
-3 and above	27 and above	100/0	1:08 – 2:11	0:27 – 0:50	0:32 – 0:59	0:23 – 0:32	0:07 – 0:41	
		75/25	0:45 – 1:21	0:18 – 0:36	0:23 – 0:41	0:14 – 0:23	0:05 – 0:23	
		50/50	0:23 – 0:32	0:14 – 0:23	0:09 – 0:18	0:06 – 0:09	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:41 – 1:21	0:14 – 0:27	0:18 – 0:41[7]	0:14 – 0:18[7]		
		75/25	0:27 – 0:59	0:09 – 0:18	0:14 – 0:27[7]	0:07 – 0:14[7]		
below -14 to -28	below 7 to -18.4	100/0	0:23 – 0:32	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 2-90%-N-FCY-2B+

TYPE II FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
NEWAVE AEROCHEMICAL FCY-2 BIO+

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

Outside Air Temperature[1]		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:17 – 2:15	2:00	0:59 – 2:00	0:27 – 0:59	0:45 – 1:12	0:23 – 0:41	0:07 – 1:08	
		75/25	0:41 – 1:12	1:12	0:36 – 1:12	0:18 – 0:36	0:23 – 0:45	0:14 – 0:23	0:05 – 0:32	
		50/50	0:14 – 0:27	0:23	0:14 – 0:23	0:07 – 0:14	0:09 – 0:18	0:07 – 0:09	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:36 – 1:21	0:54	0:27 – 0:54	0:14 – 0:27	0:32 – 0:59[7]	0:14 – 0:27[7]		
		75/25	0:27 – 0:59	0:32	0:18 – 0:32	0:07 – 0:18	0:18 – 0:32[7]	0:14 – 0:18[7]		
below -14 to -28.5	below 7 to -19.3	100/0	0:18 – 0:54	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
7 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 3LS-90%-A-ACM

LOW SPEED TYPE III FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
ALLCLEAR AEROCLEAR MAX, APPLIED UNHEATED[1]

FOR AIRCRAFT CONFORMING TO THE SAE AS5900 LOW SPEED AERODYNAMIC TEST CRITERION

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

OBSOLETE

Outside Air Temperature[2]		Type III Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[3]			Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold Soaked Wing[6]	Other[7]
				Very Light[4]	Light[4]	Moderate				
-3 and above	27 and above	100/0	0:41 – 1:03	0:54	0:27 – 0:54	0:13 – 0:27	0:18 – 0:41	0:13 – 0:18	0:05 – 0:36	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -10	below 27 to 14	100/0	0:41 – 1:17	0:54	0:27 – 0:54	0:13 – 0:27	0:18 – 0:36	0:14 – 0:23		
		75/25								
below -10 to -16	below 14 to 3.2	100/0	0:27 – 0:59	0:54	0:27 – 0:54	0:13 – 0:27				

NOTES

1 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 7) 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 3HS-90%-A-ACM

HIGH SPEED TYPE III FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
ALLCLEAR AEROCLEAR MAX, APPLIED UNHEATED[1]

FOR AIRCRAFT CONFORMING TO THE SAE AS5900 HIGH SPEED AERODYNAMIC TEST CRITERION

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

Outside Air Temperature[2]		Type III Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[3]			Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold Soaked Wing[6]	Other[7]
				Very Light[4]	Light[4]	Moderate				
-3 and above	27 and above	100/0	0:41 – 1:03	0:54	0:27 – 0:54	0:13 – 0:27	0:18 – 0:41	0:13 – 0:18	0:05 – 0:36	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -10	below 27 to 14	100/0	0:41 – 1:17	0:54	0:27 – 0:54	0:13 – 0:27	0:18 – 0:36	0:14 – 0:23		
		75/25								
below -10 to -25	below 14 to -13	100/0	0:27 – 0:59	0:54	0:27 – 0:54	0:13 – 0:27				
below -25 to -35	below -13 to -31	100/0	0:14 – 0:36	0:36	0:17 – 0:36	0:08 – 0:17				

OBSOLETE

NOTES

1 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 7) 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 5-90% provides allowance times for ice pellets and small hail).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 3LS-90%-C-2031

LOW SPEED TYPE III FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING MP III 2031 ECO, APPLIED HEATED[1]

FOR AIRCRAFT CONFORMING TO THE SAE AS5900 LOW SPEED AERODYNAMIC TEST CRITERION

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

OBSOLETE

Outside Air Temperature[2]		Type III Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[3]			Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold Soaked Wing[6]	Other[7]
				Very Light[4]	Light[4]	Moderate				
-3 and above	27 and above	100/0	0:23 – 0:45	0:36	0:18 – 0:36	0:09 – 0:18	0:15 – 0:27	0:09 – 0:13	0:05 – 0:27	
		75/25	0:17 – 0:36	0:32	0:14 – 0:32	0:06 – 0:14	0:12 – 0:18	0:07 – 0:08	0:03 – 0:16	
		50/50	0:12 – 0:16	0:23	0:12 – 0:23	0:06 – 0:12	0:12 – 0:13	0:06 – 0:06	CAUTION: No holdover time guidelines exist	
below -3 to -10	below 27 to 14	100/0	0:32 – 1:08	0:36	0:18 – 0:36	0:09 – 0:18	0:13 – 0:27	0:08 – 0:12		
		75/25	0:17 – 0:41[8]	0:23[8]	0:11 – 0:23[8]	0:05 – 0:11[8]	0:08 – 0:14[8]	0:05 – 0:07[8]		
below -10 to -16.5	below 14 to 2.3	100/0	0:23 – 0:41	0:36	0:17 – 0:36	0:08 – 0:17				

NOTES

1 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 7) 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 3HS-90%-C-2031

HIGH SPEED TYPE III FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING MP III 2031 ECO, APPLIED HEATED[1]

FOR AIRCRAFT CONFORMING TO THE SAE AS5900 HIGH SPEED AERODYNAMIC TEST CRITERION

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

Outside Air Temperature[2]		Type III Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[3]			Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold Soaked Wing[6]	Other[7]
				Very Light[4]	Light[4]	Moderate				
-3 and above	27 and above	100/0	0:23 – 0:45	0:36	0:18 – 0:36	0:09 – 0:18	0:15 – 0:27	0:09 – 0:13	0:05 – 0:27	
		75/25	0:17 – 0:36	0:32	0:14 – 0:32	0:06 – 0:14	0:12 – 0:18	0:07 – 0:08	0:03 – 0:16	
		50/50	0:12 – 0:16	0:23	0:12 – 0:23	0:06 – 0:12	0:12 – 0:13	0:06 – 0:06	CAUTION: No holdover time guidelines exist	
below -3 to -10	below 27 to 14	100/0	0:32 – 1:08	0:36	0:18 – 0:36	0:09 – 0:18	0:13 – 0:27	0:08 – 0:12		
		75/25	0:17 – 0:41	0:23	0:11 – 0:23	0:05 – 0:11	0:08 – 0:14	0:05 – 0:07		
below -10 to -25	below 14 to -13	100/0	0:23 – 0:41	0:36	0:17 – 0:36	0:08 – 0:17				
below -25 to -29	below -13 to -20.2	100/0	0:23 – 0:41	0:36	0:17 – 0:36	0:08 – 0:17				

OBSOLETE

NOTES

1 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 7) 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 5-90% provides allowance times for ice pellets and small hail).

CAUTIONS

- **The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-Generic

SAE TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:08 – 2:24	2:00	1:03 – 2:00	0:32 – 1:03	0:36 – 1:21	0:32 – 0:36	0:07 – 1:17	
		75/25	1:17 – 2:24	1:53	1:08 – 1:53	0:41 – 1:08	0:45 – 1:12	0:27 – 0:41	0:08 – 1:08	
		50/50	0:23 – 0:45	0:36	0:23 – 0:36	0:14 – 0:23	0:14 – 0:27	0:08 – 0:14	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:18 – 1:26	1:12	0:41 – 1:12	0:23 – 0:41	0:23 – 1:12[7]	0:18 – 0:23[7]		
		75/25	0:27 – 1:03	1:30	0:41 – 1:30	0:18 – 0:41	0:14 – 0:59[7]	0:14 – 0:23[7]		
below -14 to LOUT	below 7 to LOUT	100/0	0:18 – 0:36[8]	0:18[8]	0:09 – 0:18[8]	0:07 – 0:09[8]				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-A-E-AD49

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
ABAX ECOWING AD-49

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	3:00 – 3:36	2:00	1:39 – 2:00	1:03 – 1:39	1:17 – 1:48	0:54 – 1:17	0:09 – 1:44	
		75/25	2:11 – 3:36	1:53	1:30 – 1:53	1:12 – 1:30	1:44 – 1:48	0:45 – 1:21	0:09 – 1:30	
		50/50	0:23 – 0:45	0:36	0:23 – 0:36	0:14 – 0:23	0:14 – 0:27	0:09 – 0:14	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:18 – 1:26	2:00	1:39 – 2:00	1:03 – 1:39	0:23 – 1:17[7]	0:18 – 0:23[7]		
		75/25	0:27 – 1:03	1:53	1:30 – 1:53	1:12 – 1:30	0:14 – 0:59[7]	0:14 – 0:23[7]		
below -14 to -26	below 7 to -14.8	100/0	0:23 – 0:36	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-C-MF04

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
CLARIANT MAX FLIGHT 04

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:24 – 3:36	2:00	2:00 – 2:00	1:17 – 2:00	1:48 – 1:48	1:03 – 1:21	0:18 – 1:48	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:45 – 2:15	2:00	1:03 – 2:00	0:32 – 1:03	0:23 – 1:21[7]	0:18 – 0:36[7]		
		75/25								
below -14 to -23.5	below 7 to -10.3	100/0	0:18 – 0:41	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-C-MFA

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
CLARIANT MAX FLIGHT AVIA

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:47 – 3:36	2:00	1:35 – 2:00	0:54 – 1:35	1:17 – 1:48	0:50 – 1:03	0:08 – 1:48	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	1:35 – 3:32	1:57	1:08 – 1:57	0:36 – 1:08	1:03 – 1:48[7]	0:50 – 1:21[7]		
		75/25								
below -14 to -28.5	below 7 to -19.3	100/0	0:32 – 1:17	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-C-MFS

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
CLARIANT MAX FLIGHT SNEG

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:11 – 3:36	2:00	1:30 – 2:00	0:59 – 1:30	1:48 – 1:48	0:45 – 1:30	0:18 – 1:21	
		75/25	3:36 – 3:36	2:00	1:21 – 2:00	0:50 – 1:21	1:21 – 1:48	0:59 – 1:12	0:14 – 1:35	
		50/50	1:21 – 3:09	1:35	0:41 – 1:35	0:18 – 0:41	0:32 – 1:03	0:14 – 0:27	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:41 – 2:06	1:48	1:08 – 1:48	0:41 – 1:08	0:27 – 1:17[7]	0:23 – 0:36[7]		
		75/25	0:27 – 1:17	1:30	0:54 – 1:30	0:36 – 0:54	0:18 – 0:59[7]	0:18 – 0:36[7]		
below -14 to -29	below 7 to -20.2	100/0	0:18 – 0:45	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-C-N

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING EG IV NORTH

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

OBSOLETE

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:06 – 3:32	2:00	1:30 – 2:00	0:45 – 1:30	1:21 – 1:48	0:45 – 0:50	0:07 – 1:48	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	1:35 – 3:36	2:00	1:21 – 2:00	0:45 – 1:21	0:59 – 1:39[7]	0:50 – 1:17[7]		
		75/25								
below -14 to -30	below 7 to -22	100/0	0:36 – 1:12	0:18	0:09 – 0:18	0:07 – 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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-C-L

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING MP IV LAUNCH

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	3:36 – 3:36	2:00	1:35 – 2:00	0:59 – 1:35	1:21 – 1:48	0:54 – 1:30	0:14 – 1:30	
		75/25	3:18 – 3:36	2:00	1:35 – 2:00	0:54 – 1:35	1:30 – 1:48	0:41 – 1:08	0:09 – 1:35	
		50/50	1:17 – 2:29	1:17	0:41 – 1:17	0:23 – 0:41	0:27 – 0:45	0:18 – 0:23	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:54 – 1:44	1:57	1:12 – 1:57	0:45 – 1:12	0:32 – 1:30[7]	0:23 – 0:41[7]		
		75/25	0:36 – 1:12	2:00	1:17 – 2:00	0:41 – 1:17	0:23 – 1:03[7]	0:23 – 0:41[7]		
below -14 to -28.5	below 7 to -19.3	100/0	0:27 – 0:45	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-C-L+

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
CLARIANT SAFEWING MP IV LAUNCH PLUS

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	3:32 – 3:36	2:00	1:53 – 2:00	0:50 – 1:53	1:48 – 1:48	0:54 – 1:48	0:18 – 1:48	
		75/25	3:32 – 3:36	2:00	1:44 – 2:00	0:45 – 1:44	1:48 – 1:48	1:12 – 1:17	0:18 – 1:39	
		50/50	1:08 – 1:39	1:26	0:41 – 1:26	0:18 – 0:41	0:23 – 0:54	0:14 – 0:18	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:50 – 2:02	2:00	1:17 – 2:00	0:36 – 1:17	0:23 – 1:26[7]	0:23 – 0:36[7]		
		75/25	0:36 – 1:48	2:00	1:08 – 2:00	0:27 – 1:08	0:18 – 0:59[7]	0:18 – 0:27[7]		
below -14 to -29	below 7 to -20.2	100/0	0:23 – 0:45	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-CR-PGA

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
CRYOTECH POLAR GUARD® ADVANCE

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:33 – 3:36	2:00	1:39 – 2:00	1:12 – 1:39	1:26 – 1:48	1:08 – 1:21	0:14 – 1:48	
		75/25	2:15 – 3:36	2:00	1:12 – 2:00	0:41 – 1:12	1:30 – 1:48	0:36 – 1:03	0:08 – 1:30	
		50/50	0:45 – 1:17	1:12	0:32 – 1:12	0:14 – 0:32	0:18 – 0:41	0:08 – 0:18	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:50 – 2:15	1:35	1:08 – 1:35	0:50 – 1:08	0:32 – 1:26[7]	0:32 – 0:41[7]		
		75/25	0:36 – 1:21	1:35	0:54 – 1:35	0:32 – 0:54	0:23 – 0:59[7]	0:32 – 0:41[7]		
below -14 to -30.5	below 7 to -22.9	100/0	0:23 – 0:45	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-DS-ES

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
DEICING SOLUTIONS ECO-SHIELD®

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:08 – 2:24	2:00	1:12 – 2:00	0:41 – 1:12	0:36 – 1:21	0:32 – 0:36	0:14 – 1:26	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	1:03 – 2:20	1:44	0:59 – 1:44	0:32 – 0:59	0:45 – 1:17[7]	0:27 – 0:36[7]		
		75/25								
below -14 to -25.5	below 7 to -13.9	100/0	0:27 – 0:54	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-D-E106

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
DOW CHEMICAL UCAR™ ENDURANCE EG106

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:53 – 2:51	2:00	1:12 – 2:00	0:36 – 1:12	1:03 – 1:48	0:45 – 1:08	0:18 – 1:48	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	1:39 – 3:00	1:57	0:59 – 1:57	0:27 – 0:59	0:50 – 1:39[7]	0:41 – 1:03[7]		
		75/25								
below -14 to -27	below 7 to -16.6	100/0	0:27 – 0:59	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-D-AD49

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
DOW CHEMICAL UCAR™ FLIGHTGUARD AD-49

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	3:00 – 3:36	2:00	1:39 – 2:00	1:03 – 1:39	1:17 – 1:48	0:54 – 1:17	0:09 – 1:44	
		75/25	2:11 – 3:36	1:53	1:30 – 1:53	1:12 – 1:30	1:44 – 1:48	0:45 – 1:21	0:09 – 1:30	
		50/50	0:23 – 0:45	0:36	0:23 – 0:36	0:14 – 0:23	0:14 – 0:27	0:09 – 0:14	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:18 – 1:26	2:00	1:39 – 2:00	1:03 – 1:39	0:23 – 1:17[7]	0:18 – 0:23[7]		
		75/25	0:27 – 1:03	1:53	1:30 – 1:53	1:12 – 1:30	0:14 – 0:59[7]	0:14 – 0:23[7]		
below -14 to -26	below 7 to -14.8	100/0	0:23 – 0:36	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-K-ABC-S+

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
KILFROST ABC-S PLUS

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:57 – 3:36	2:00	1:53 – 2:00	1:08 – 1:53	1:39 – 1:48	0:59 – 1:48	0:23 – 1:48	
		75/25	1:17 – 2:24	1:53	1:08 – 1:53	0:41 – 1:08	0:54 – 1:12	0:27 – 0:45	0:09 – 1:12	
		50/50	0:27 – 0:50	0:54	0:27 – 0:54	0:14 – 0:27	0:14 – 0:36	0:14 – 0:18	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:50 – 3:09	2:00	1:35 – 2:00	0:54 – 1:35	0:23 – 1:26[7]	0:18 – 0:27[7]		
		75/25	0:41 – 1:39	1:35	0:54 – 1:35	0:32 – 0:54	0:18 – 1:03[7]	0:14 – 0:23[7]		
below -14 to -28	below 7 to -18.4	100/0	0:36 – 0:54	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-L-E450

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
LNT SOLUTIONS E450

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:39 – 2:38	2:00	1:26 – 2:00	0:54 – 1:26	1:26 – 1:48	0:50 – 1:12	0:23 – 1:48	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	1:21 – 3:32	1:39	1:03 – 1:39	0:41 – 1:03	1:35 – 1:48[7]	0:59 – 1:30[7]		
		75/25								
below -14 to -22.5	below 7 to -8.5	100/0	0:32 – 0:59	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-N-F-9311

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
NEWAVE AEROCHEMICAL FCY 9311

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	1:44 – 3:36	2:00	1:03 – 2:00	0:32 – 1:03	1:03 – 1:48	0:36 – 0:59	0:14 – 1:17	
		75/25								
		50/50							CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:32 – 1:53	1:26	0:45 – 1:26	0:23 – 0:45	0:32 – 1:12[7]	0:18 – 0:32[7]		
		75/25								
below -14 to -29.5	below 7 to -21.1	100/0	0:27 – 0:50	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 4-90%-SC-CSIV

TYPE IV FLUID 90 PERCENT ADJUSTED HOLDOVER TIME GUIDELINES
SHAANXI CLEANWAY AVIATION CLEANSURFACE IV

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

Outside Air Temperature[1]		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]			Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
				Very Light[3]	Light[3]	Moderate				
-3 and above	27 and above	100/0	2:33 – 3:36	2:00	1:44 – 2:00	0:54 – 1:44	1:48 – 1:48	1:17 – 1:21	0:14 – 1:48	
		75/25	2:20 – 3:36	2:00	1:26 – 2:00	0:41 – 1:26	0:45 – 1:48	0:32 – 0:41	0:08 – 1:08	
		50/50	0:59 – 2:11	1:30	0:36 – 1:30	0:14 – 0:36	0:23 – 0:45	0:14 – 0:18	CAUTION: No holdover time guidelines exist	
below -3 to -14	below 27 to 7	100/0	0:54 – 2:47	1:12	0:41 – 1:12	0:23 – 0:41	0:32 – 1:35[7]	0:18 – 0:32[7]		
		75/25	0:45 – 1:44	1:30	0:41 – 1:30	0:18 – 0:41	0:27 – 1:12[7]	0:23 – 0:36[7]		
below -14 to -28.5	below 7 to -19.3	100/0	0:27 – 0:45	0:18	0:09 – 0:18	0:07 – 0:09				

OBSOLETE

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 7) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 6-90% 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 only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.**
- **The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 5-90%

SAE TYPE III FLUID
90 PERCENT ADJUSTED ICE PELLET AND SMALL HAIL ALLOWANCE TIMES[1]

This table is for use with SAE Type III undiluted (100/0) fluids applied unheated only

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

Precipitation Type	Outside Air Temperature		
	-5°C and above	Below -5 to -10°C	Below -10°C[2]
Light Ice Pellets	9 minutes	9 minutes	**Caution: No allowance times currently exist**
Light Ice Pellets Mixed with Light Snow	9 minutes	9 minutes	
Light Ice Pellets Mixed with Moderate Snow	9 minutes	5 minutes	
Light Ice Pellets Mixed with Light or Moderate Freezing Drizzle	6 minutes	5 minutes	
Light Ice Pellets Mixed with Light Freezing Rain	6 minutes	5 minutes	
Light Ice Pellets Mixed with Light Rain	6 minutes[3]		
Light Ice Pellets Mixed with Moderate Rain			
Moderate Ice Pellets (or Small Hail)[4]	5 minutes	5 minutes	

OBSOLETE

NOTES

1 These allowance times are for use with 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 light 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 light snow is reported, use the “light ice pellets mixed with light snow” allowance times.

CAUTIONS

- **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: light or moderate freezing drizzle, light freezing rain, or light rain.**

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING

TABLE 6-90%

SAE TYPE IV FLUID

90 PERCENT ADJUSTED ICE PELLET AND SMALL HAIL ALLOWANCE TIMES[1]

This table is for use with SAE Type IV undiluted (100/0) fluids only. All Type IV fluids are propylene glycol based with the exception of Clariant Max Flight AVIA, Clariant Safewing EG IV NORTH, Dow EG106 and LNT Solutions E450 which are ethylene glycol based.

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

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	45 minutes	27 minutes	27 minutes[3]	27 minutes[3]
Light Ice Pellets Mixed with Light Snow	36 minutes	14 minutes	14 minutes[3]	**Caution: No allowance times currently exist**
Light Ice Pellets Mixed with Moderate Snow	18 minutes	6 minutes	5 minutes[3]	
Light Ice Pellets Mixed with Light or Moderate Freezing Drizzle	23 minutes	9 minutes		
Light Ice Pellets Mixed with Light Freezing Rain	23 minutes	9 minutes		
Light Ice Pellets Mixed with Light Rain	23 minutes[4]	**Caution: No allowance times currently exist**		
Light Ice Pellets Mixed with Moderate Rain	23 minutes[5]			
Moderate Ice Pellets (or Small Hail)[6]	23 minutes[7]	9 minutes	9 minutes[3]	9 minutes[8]
Moderate Ice Pellets (or Small Hail)[6] Mixed with Moderate Freezing Drizzle	9 minutes	6 minutes	**Caution: No allowance times currently exist**	
Moderate Ice Pellets (or Small Hail)[6] Mixed with Moderate Rain	9 minutes[5]	**Caution: No allowance times currently exist**		

OBSOLETE

NOTES

1 These allowance times are for use with 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 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 light freezing rain.
5 No allowance times exist in this condition for temperatures below 0°C.
6 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 light snow is reported, use the “light ice pellets mixed with light snow” allowance times.
7 Allowance time is 14 minutes for propylene glycol (PG) fluids or when the fluid type is unknown.
8 No allowance times exist for propylene glycol (PG) fluids in this condition for temperatures below -16°C.

CAUTIONS

- **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: light or moderate freezing drizzle, light freezing rain, light rain, or moderate rain.**