

FAA HOLDOVER TIME REGRESSION INFORMATION



WINTER 2016-2017 ADDENDUM 1: Sept. 30, 2016

The information contained in this document provides supplemental information to the official FAA Holdover Time Regression Information for the 2016-2017 winter season. The information in this document must be used in conjunction with the official FAA Holdover Time Regression Information Original Issue document.

Questions concerning FAA aircraft ground de/anti-icing requirements or Flight Standards policies should be addressed to charles.j.enders@faa.gov or 202-267-4557.

Questions on the technical content of the holdover time tables should be addressed to warren.underwood@faa.gov or 404-305-6652.

Questions regarding editorial content or web access issues should be addressed to sung.shin@faa.gov or 202-267-8086.

ADDENDUM 1

SAE TYPE II AND TYPE IV SNOW REGRESSION COEFFICIENTS BELOW -14 °C (7 °F)

PURPOSE

- This addendum has been created to communicate changes to the SAE Type II and Type IV snow, snow grain and snow pellet regression coefficients at outside air temperatures below -14 °C (7 °F). These changes are optional; the regression coefficients published in the Original Issue document are more conservative and can continue to be used if preferred by the operator.

BACKGROUND

- Preliminary research conducted in the winter of 2014-2015 indicated that some SAE Type II and Type IV fluids do not meet the published holdover times (HOTs) for temperatures below -14 °C (7 °F) in snow conditions. Further research was required to confirm and assess the magnitude of the associated potential safety risk.
- Additional research was carried out in the winter of 2015-2016. The additional research confirmed that many SAE Type II and Type IV fluids do not meet the published HOTs in these conditions. Consequently, as a safety measure, FAA published the 2016-2017 HOT Guidelines and Regression Information documents with reduced HOTs and associated regression coefficients for all SAE Type II and IV fluids.

SUBSEQUENT DEVELOPMENTS

- Feedback from operators has indicated the new HOTs will have a significant impact on certain operations. As a result, further analysis was carried out. This analysis examined the performance of ethylene glycol (EG) vs. propylene glycol (PG) based fluids and the theoretical performance of fluids at -18 °C (0 °F).
- The analysis determined that the historic snow HOTs (those published in the 2015-2016 HOT Guidelines) can be retained for:
 - SAE Type IV EG based fluids in the below -14 °C (7 °F) to lowest operational use temperature (LOUT) temperature band; and
 - SAE Type II and Type IV PG based fluids in the below -14 to -18 °C (below 7 to 0 °F) temperature band.
- These changes are interim. Additional analysis and/or research will be carried out to determine appropriate long term solutions.

GUIDANCE

- The tables on the following pages provide the regression coefficients corresponding to the updated HOTs for the conditions described above. The tables include:
 - Table RC-EG: Updated regression coefficients for Type IV EG fluids for snow in temperatures below -14 °C (7 °F).
 - Table RC-PG: Updated regression coefficients for Type II and Type IV PG fluids for snow in temperatures below -14 to -18 °C (below 7 to 0 °F).
- Note: To use the regression information provided in this document to obtain holdover times that are valid for operations in which flaps/slats are deployed prior to de/anti-icing: use the regression information applicable to the fluid and weather condition and multiply the result obtained by 90%.
- Note: Refer to the fluid-specific HOT Table in the document *FAA Holdover Time Guidelines Winter 2016-2017 Original Issue: August 5, 2016* for the LOUT of each fluid. This information is also provided in Table 8 of the same document.
- Note: Table 8 in the document *FAA Holdover Time Guidelines Winter 2016-2017 Original Issue: August 5, 2016* provides the glycol base information for each fluid. If the fluid base is unknown, assume it is propylene glycol for the purpose of determining HOTs.

TABLE RC-EG

**SAE TYPE IV ETHYLENE GLYCOL BASED FLUID⁴
(SNOW, SNOW GRAINS OR SNOW PELLETS BELOW -14 °C TO LOUT)**

REGRESSION COEFFICIENTS TABLE AND VERIFICATION TABLE

| Outside Air Temperature | | Fluid Dilution | Regression Coefficients for Calculating Holdover Times Under Various Weather Conditions | | | | | | | |
|-------------------------------|-----------------------------|----------------|--|--|---|---------------------------|-------------------------------|----------------------------------|---------------------------------------|-------|
| Degrees Celsius | Degrees Fahrenheit | | Freezing Fog or Ice Crystals ¹ | Snow, Snow Grains or Snow Pellets ^{2,3} | | | Freezing Drizzle ¹ | Light Freezing Rain ¹ | Rain on Cold Soaked Wing ¹ | Other |
| | | | | < 4 g/dm ² /h | 4 to <10 g/dm ² /h | ≥ 10 g/dm ² /h | | | | |
| -3 and above | 27 and above | 100/0 | Refer to the regression coefficients provided in the appropriate fluid-specific regression coefficients table published in the document <i>FAA Holdover Time Guidelines Regression Information Winter 2016-2017, Original Issue: August 5, 2016</i> | | | | | | | |
| | | 75/25 | | | | | | | | |
| | | 50/50 | | | | | | | | |
| below -3 to -14 | below 27 to 7 | 100/0 | CAUTION: No holdover time guidelines exist | | | | | | | |
| | | 75/25 | | | | | | | | |
| below -14 to LOU ⁵ | below 7 to LOU ⁵ | 100/0 | I = 2.0691 A = -0.7757 B = 0.0000 | I = 1.7911 A = -0.3140 B = 0.0000 | I = 2.2336 A = -0.7565 B = 0.0000 | | | | | |

- 1 Regression Equation: $t = 10^I R^A$, where R = precipitation rate (g/dm²/h)
- 2 Regression Equation: $t = 10^I R^A (2-T)^B$, where R = precipitation rate (g/dm²/h) and T = temperature (in °C)
- 3 CAUTION: Use of these coefficients is limited by the lowest usable precipitation rates provided in Table 5 in the document *FAA Holdover Time Regression Information Winter 2016-2017, Original Issue: August 5, 2016*.
- 4 Table 8 in the document *FAA Holdover Time Guidelines Winter 2016-2017, Original Issue: August 5, 2016* provides the glycol base information for each fluid. If the fluid base is unknown, assume it is propylene glycol for the purpose of determining regression coefficients.
- 5 Table 8 in the document *FAA Holdover Time Guidelines Winter 2016-2017, Original Issue: August 5, 2016* provides the LOU⁵ of each fluid. If the LOU⁵ is unknown, no holdover times can be provided below -22.5 °C (-8.5 °F).

| Outside Air Temp. (°C) | Fluid Dilution | HOTDS Verification Times Under Various Weather Conditions (minutes) As Calculated from Regression Coefficients | | | | | | | | | | |
|------------------------|----------------|--|------|---|----|---|---|---|--|----|---|---|
| | | Freezing Fog or Ice Crystals (g/dm ² /h) | | Snow, Snow Grains or Snow Pellets* (g/dm ² /h) | | | Freezing Drizzle (g/dm ² /h) | | Light Freezing Rain (g/dm ² /h) | | Rain on Cold Soaked Wing (g/dm ² /h) | |
| | | 5 | 2 | 25 | 10 | 3 | 13 | 5 | 25 | 13 | 75 | 5 |
| +1 / -3 ** | 100/0 | Refer to the verification times provided in the appropriate fluid-specific regression coefficients table published in the document <i>FAA Holdover Time Regression Information Winter 2016-2017, Original Issue: August 5, 2016</i> | | | | | | | | | | |
| | 75/25 | | | | | | | | | | | |
| | 50/50 | | | | | | | | | | | |
| -10 / -14 *** | 100/0 | CAUTION: No holdover time guidelines exist | | | | | | | | | | |
| | 75/25 | | | | | | | | | | | |
| -25 | 100/0 | 15.0 | 30.0 | 50.0 | | | | | | | | |

* Refer to Table 5 in *FAA Holdover Time Regression Information Winter 2016-2017, Original Issue: August 5, 2016* for the lowest usable precipitation rates in snow
 ** Rain on cold soaked wing calculated at +1 °C; all other conditions calculated at -3 °C
 *** Freezing fog and snow calculated at -14 °C; freezing drizzle and light freezing rain calculated at -10 °C

TABLE RC-PG

**SAE TYPE II AND TYPE IV PROPYLENE GLYCOL BASED FLUID⁴
(SNOW, SNOW GRAINS OR SNOW PELLETS BELOW -14 °C TO LOU)⁵**

REGRESSION COEFFICIENTS TABLE AND VERIFICATION TABLE

| Outside Air Temperature | | Fluid Dilution | Regression Coefficients for Calculating Holdover Times Under Various Weather Conditions | | | | | | | |
|-------------------------------|-----------------------------|----------------|--|--|---|---------------------------|-------------------------------|----------------------------------|---------------------------------------|-------|
| Degrees Celsius | Degrees Fahrenheit | | Freezing Fog or Ice Crystals ¹ | Snow, Snow Grains or Snow Pellets ^{2,3} | | | Freezing Drizzle ¹ | Light Freezing Rain ¹ | Rain on Cold Soaked Wing ¹ | Other |
| | | | | < 4 g/dm ² /h | 4 to <10 g/dm ² /h | ≥ 10 g/dm ² /h | | | | |
| -3 and above | 27 and above | 100/0 | Refer to the regression coefficients provided in the appropriate fluid-specific regression coefficients table published in the document <i>FAA Holdover Time Guidelines Regression Information Winter 2016-2017, Original Issue: August 5, 2016</i> | | | | | | | |
| | | 75/25 | | | | | | | | |
| | | 50/50 | | | | | | | | |
| below -3 to -14 | below 27 to 7 | 100/0 | CAUTION: No holdover time guidelines exist | | | | | | | |
| | | 75/25 | | | | | | | | |
| below -14 to -18 | below 7 to 0 | 100/0 | I = 2.0691 A = -0.7757 B = 0.0000 | I = 1.7911 A = -0.3140 B = 0.0000 | I = 2.2336 A = -0.7565 B = 0.0000 | | | | | |
| below -18 to LOU ⁵ | below 0 to LOU ⁵ | 100/0 | I = 1.7680 A = -0.7757 B = 0.0000 | I = 1.7565 A = -0.7565 B = 0.0000 | I = 1.2435 A = -0.2435 B = 0.0000 | | | | | |

- 1 Regression Equation: $t = 10^I R^A$, where R = precipitation rate (g/dm²/h)
- 2 Regression Equation: $t = 10^I R^A (2-T)^B$, where R = precipitation rate (g/dm²/h) and T = temperature (in °C)
- 3 CAUTION: Use of these coefficients is limited by the lowest usable precipitation rates provided in Table 5 in the document *FAA Holdover Time Regression Information Winter 2016-2017, Original Issue: August 5, 2016*.
- 4 Table 8 in the document *FAA Holdover Time Guidelines Winter 2016-2017, Original Issue: August 5, 2016* provides the glycol base information for each fluid. If the fluid base is unknown, assume it is propylene glycol for the purpose of determining regression coefficients.
- 5 Table 8 in the document *FAA Holdover Time Guidelines Winter 2016-2017, Original Issue: August 5, 2016* provides the LOU of each fluid. If the LOU is unknown, no holdover times can be provided below -22.5 °C (-8.5 °F).

| Outside Air Temp. (°C) | Fluid Dilution | HOTDS Verification Times Under Various Weather Conditions (minutes) As Calculated from Regression Coefficients | | | | | | | | | | |
|------------------------|----------------|--|------|---|----|---|---|---|--|----|---|---|
| | | Freezing Fog or Ice Crystals (g/dm ² /h) | | Snow, Snow Grains or Snow Pellets* (g/dm ² /h) | | | Freezing Drizzle (g/dm ² /h) | | Light Freezing Rain (g/dm ² /h) | | Rain on Cold Soaked Wing (g/dm ² /h) | |
| | | 5 | 2 | 25 | 10 | 3 | 13 | 5 | 25 | 13 | 75 | 5 |
| +1 / -3 ** | 100/0 | Refer to the verification times provided in the appropriate fluid-specific regression coefficients table published in the document <i>FAA Holdover Time Regression Information Winter 2016-2017, Original Issue: August 5, 2016</i> | | | | | | | | | | |
| | 75/25 | | | | | | | | | | | |
| | 50/50 | | | | | | | | | | | |
| -10 / -14 *** | 100/0 | CAUTION: No holdover time guidelines exist | | | | | | | | | | |
| | 75/25 | | | | | | | | | | | |
| -18 | 100/0 | 15.0 | 30.0 | 50.0 | | | | | | | | |
| -25 | 100/0 | 8.0 | 10.0 | 25.0 | | | | | | | | |

* Refer to Table 5 in *FAA Holdover Time Regression Information Winter 2016-2017, Original Issue: August 5, 2016* for the lowest usable precipitation rates in snow
 ** Rain on cold soaked wing calculated at +1 °C; all other conditions calculated at -3 °C
 *** Freezing fog and snow calculated at -14 °C; freezing drizzle and light freezing rain calculated at -10 °C