

ANNEX A

Guidelines for Holdover Times

Recommendations for
De-icing / Anti-icing
Aeroplanes on the Ground

30th Edition
July 2015



Holdover Time Tables

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Table 1 - Guidelines for holdover times anticipated for Type I, II, III and IV fluid mixtures in Active Frost Conditions as a function of OAT
(Valid for metallic and composite surfaces)

Approximate Holdover Time (hours:minutes) Active Frost	OAT		Type II, III, and IV Fluid Concentration Neat Fluid/Water Vol %/Vol %	Approximate Holdover Times (hours:minutes) Active Frost		
	°C	°F		Type II ⁽³⁾	Type III ^{(3) (4)}	Type IV ⁽³⁾
0:35	-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	100/00	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

⁽¹⁾ Type I fluid/water mixture is selected so that the freezing point of the mixture is at least 10 °C (18 °F) below the OAT.

⁽²⁾ May be used below -25 °C (-13 °F) provided the LOU of the fluid is respected.

⁽³⁾ These fluids may not be used below -25 °C (-13 °F) in active frost conditions.

⁽⁴⁾ To use the Type III fluid frost holdover times, the name of the fluid used must be known as the holdover times for Type III fluids are fluid application specific (heated or unheated).

De-icing/anti-icing fluids used during ground de-icing/anti-icing are not intended for - and do not provide - protection during flight.

Holdover times in the table above can only be used when de-icing/anti-icing has been done with flaps/slats retracted.

Table 2 - Guidelines for holdover times anticipated for Type I fluid mixtures as a function of weather conditions and OAT
(Valid for metallic and composite surfaces)

OAT ⁽¹⁾		Approximate Holdover Times under various weather conditions (hours:minutes)					
°C	°F	Freezing Fog	Snow/ Snow Grains/ Snow Pellets (2)	Freezing Drizzle (3)	Light Freezing Rain	Rain on Cold Soaked Wing	Other (4) (5)
-3 and above	27 and above	00:09 - 0:16	0:03 - 0:06	0:08 - 0:13	0:02 - 0:05	0:01 - 0:05 ⁽⁶⁾	CAUTION: No Holdover Time Guidelines exist
below -3 to -6	below 27 to 21	0:06 - 0:08	0:02 - 0:05	0:05 - 0:09	0:02 - 0:05		
below -6 to -10	below 21 to 14	0:04 - 0:08	0:02 - 0:05	0:04 - 0:07	0:02 - 0:05		
below -10	below 14	0:04 - 0:07	0:02 - 0:04				

(1) Ensure that the LOUT is respected.

(2) In light "Rain and Snow" conditions use "Light Freezing Rain" holdover times

(3) If positive identification of "Freezing Drizzle" is not possible use "Light Freezing Rain" holdover times

(4) Other conditions are: Heavy snow, ice pellets, hail, moderate freezing rain and heavy freezing rain

(5) For holdover times under active frost conditions see the separate frost table (Table 1)

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

Type I Fluid/water Mixture is selected so that the Freezing Point of the mixture is at least 10 °C (18 °F) below actual OAT

CAUTION: 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 also be reduced when the aeroplane skin temperature is lower than OAT. Therefore, the indicated times should be used only in conjunction with a pre-takeoff check.

De-icing/anti-icing fluids used during ground de-icing/anti-icing are not intended for - and do not provide - protection during flight.

Holdover times in the table above can only be used when de-icing/anti-icing has been done with flaps/slats retracted.

Table 3 - Guidelines for holdover times anticipated for Type II fluid mixtures as a function of weather conditions and OAT
(Valid for metallic and composite surfaces)

OAT ⁽¹⁾		Type II Fluid Concentration Neat-Fluid/ Water (Vol %/Vol %)	Approximate Holdover Times under various weather conditions (hours:minutes)					
°C	°F		Freezing Fog	Snow/ Snow Grains/ Snow Pellets ⁽²⁾	Freezing Drizzle ⁽³⁾	Light Freezing Rain	Rain on Cold Soaked Wing	Other ^{(4) (5)}
-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 ⁽⁶⁾	CAUTION: No Holdover Time Guidelines exist
		75/25	0:25 - 1:00	0:15 - 0:30	0:20 - 0:45	0:10 - 0:25	0:05 - 0:25 ⁽⁶⁾	
		50/50	0:15 - 0:30	0:05 - 0:15	0:10 - 0:20	0:05 - 0:10		
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 - 0:30 ⁽⁷⁾	0:08 - 0:15 ⁽⁷⁾		
below -14 to -23 or LOU	below 7 to -9 or LOU	100/0	0:15 - 0:35	0:15 - 0:30				

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

⁽²⁾ In light "Rain and Snow" conditions use "Light Freezing Rain" holdover times

⁽³⁾ If positive identification of "Freezing Drizzle" is not possible use "Light Freezing Rain" holdover times

⁽⁴⁾ Other conditions are: Heavy snow, ice pellets, moderate and heavy freezing rain, hail

⁽⁵⁾ For holdover times under Active Frost conditions see the separate frost table (Table 1)

⁽⁶⁾ No holdover time guidelines exist for this condition for 0 °C (32 °F) and below

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

CAUTION: 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 also be reduced when the aeroplane skin temperature is lower than OAT. Therefore, the indicated times should be used only in conjunction with a pre-takeoff check.

De-icing/anti-icing fluids used during ground de-icing/anti-icing are not intended for - and do not provide - protection during flight.

Holdover times in the table above can only be used when de-icing/anti-icing has been done with flaps/slats retracted.

Table 4 - Guidelines for holdover times anticipated for Type IV fluid mixtures as a function of weather conditions and OAT
(Valid for metallic and composite surfaces)

OAT ⁽¹⁾		Type IV Fluid Concentration Neat Fluid/ Water (Vol %/Vol %)	Approximate Holdover Times under various weather conditions (hours:minutes)					
°C	°F		Freezing Fog	Snow/ Snow Grains/ Snow Pellets ⁽²⁾	Freezing Drizzle ⁽³⁾	Light Freezing Rain	Rain on Cold Soaked Wing	Other ^{(4) (5)}
-3 and above	27 and above	100/0	1:30 - 2:25	0:35 - 1:10	0:50 – 1:30	0:35 - 0:50	0:10 - 1:25 ⁽⁶⁾	CAUTION: No Holdover Time Guidelines exist
		75/25	1:25 - 2:40	0:30 - 1:05	0:50 – 1:15	0:30 – 0:45	0:09 - 1:15 ⁽⁶⁾	
		50/50	0:25 - 0:40	0:09 - 0:15	0:15 - 0:25	0:09 - 0:15		
below -3 to -14	below 27 to 7	100/0	0:20 - 1:20	0:25 - 0:50	0:25 - 1:10 ⁽⁷⁾	0:15 - 0:25 ⁽⁷⁾		
		75/25	0:25 - 0:50	0:20 - 0:40	0:15 – 1:05 ⁽⁷⁾	0:15 - 0:25 ⁽⁷⁾		
below -14 to -23 or LOU	below 7 to -9 or LOU	100/0	0:15 - 0:40	0:15 - 0:30				

⁽¹⁾ Ensure that the LOU is respected. Consider the use of Type I fluid when Type IV fluid cannot be used.

⁽²⁾ In light "Rain and Snow" conditions use "Light Freezing Rain" holdover times

⁽³⁾ If positive identification of "Freezing Drizzle" is not possible use "Light Freezing Rain" holdover times

⁽⁴⁾ Other conditions are: Heavy snow, ice pellets, moderate and heavy freezing rain, hail

⁽⁵⁾ For holdover times under Active Frost conditions see the separate frost table (Table 1)

⁽⁶⁾ No holdover time guidelines exist for this condition for 0 °C (32 °F) and below

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

CAUTION: 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 also be reduced when the aeroplane skin temperature is lower than OAT.
Therefore, the indicated times should be used only in conjunction with a pre-takeoff check.

De-icing/anti-icing fluids used during ground de-icing/anti-icing are not intended for - and do not provide - protection during flight.

Holdover times in the table above can only be used when de-icing/anti-icing has been done with flaps/slats retracted.