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TBM AIRCRAFT**SERVICE LETTER****SL 70-053****AMENDMENT 1****30**

ATA No.

SUBJECT : DE-ICING / ANTI-ICING PROCEDURE ON GROUND

EFFECTIVITY : TBM 700 aircraft

REASON : To relay information received from EASA and FAA to TBM operators through ref. (3), (4) and (5) hereunder, on precautions for use of de-icing/anti-icing fluids on ground.
To provide the appropriate recommendations to assist the TBM operator in checking proper implementation of on ground de-icing or anti-icing procedures on TBM.

REFERENCES :

- (1) OACI DOC 9640 edition 2
- (2) Official FAA Holdover Time Tables – Winter 2010–2011
- (3) EASA SIB 2010–28 – Possible effects of Thickened Anti-Icing fluids on take off rotation for airplanes with unpowered elevator controls
- (4) FAA SAFO 01001 – Possible effects of Thickened Anti-Icing fluids on take off rotation for airplanes with unpowered elevator controls
- (5) EASA SIB 2008–29
- (6) Official FAA Holdover Time Tables – Winter 2011–2012
- (7) EASA SIB 2010–26 R1

GENERAL :

CAUTION**FLUIDS USED DURING GROUND DE-ICING/ANTI-ICING DO NOT PROVIDE
IN-FLIGHT ICING PROTECTION**

Exposure to weather conditions on the ground, that are conducive to ice formation, can cause accumulation of frost, snow, slush, or ice on aircraft surfaces and components. These accumulations can adversely affect aircraft performance, stability, and control and operation of mechanical devices such as control surfaces, sensors, flaps and landing gear.

Only the experience of the de-icing operator will direct the choice of appropriate method and fluids used according to the prevailing weather :

- Mechanical removal of loose contamination
- One-Step de-icing/anti-icing
- Two-Step de-icing/anti-icing

Refer to OACI (doc 9460) chapter 11.3 for definitions of one-step and two-step de/anti-icing process.

The person technically releasing the aircraft is responsible for the performance and verification of the results of the de-/anti-icing treatment. The responsibility of accepting the performed treatment lies, however, with the pilot.

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DEFINITIONS :

Clean aircraft concept :

During conditions conducive to aeroplane icing during ground operations, take-off shall not be attempted when ice, snow, slush or frost is present or adhering to the wings, propellers, control surfaces, engine inlets or other critical surfaces.

This is known as the "Clean Aircraft Concept". Any deposit of ice, snow or frost on the external surfaces may drastically affect its performance due to reduced aerodynamic lift and increased drag resulting from the disturbed airflow.

Furthermore it may cause moving parts to jam thus creating hazardous situation.

De-icing :

De-icing is a procedure by which snow, frost, ice and slush are removed from aircraft in order to provide clean surfaces. De-icing can be accomplished by use of fluids, by mechanical means or by heating the aircraft.

Anti-icing :

Anti-icing is a precautionary procedure which provides protection against formation of frost or ice and accumulation of snow on treated surfaces of the aircraft for a limited period of time (**holdover time**).

Holdover time :

The holdover time is the estimated time the fluid will prevent the formation of ice and frost and the accumulation of snow on the protected (treated) surface of an aeroplane.

Fluid Type I :

Its main characteristics are :

- No thickener system
- Minimum 80% glycol content
- Relatively short holdover time

Except for the case of frost or freezing fog, the duration of anti-icing protection provided by Type I fluid is inadequate unless takeoff can be made almost immediately after de-icing.

Fluid Type II and IV :

CAUTION

WITH REFERENCE TO EASA SIB2010-28/FAA SAFO 01001, FLUIDS TYPE II-IV ARE NOT ADEQUATE FOR AIRCRAFT WITH LOW ROTATION SPEED (BELOW 100 KNOTS) AND THEREFORE THEY SHOULD NOT BE USED ON TBM700.

Its main characteristics are :

- With thickener system
- Minimum 50% glycol content
- Relatively long holdover time

Their high viscosity permits the application of a layer of fluid that is effective in anti-icing and persists for a significant holdover time.

During takeoff, the slipstream imparts a shear stress to the fluid layer causing it to flow off the surface to which it was applied.

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Fluid Type III :

Type III is a thickened fluid intended especially for use on aeroplanes with low rotation speeds (below 100 knots). Its properties lie between Type I and II, therefore it provides a longer holdover time than Type I but less than Type II.

RECOMMENDATIONS FOR TBM :

Equipment and material for de/anti-icing :

- Hot air [maximum temperature at 140° F (60° C)]
- Heated water [maximum temperature at 140° F (60° C)]
- Type I de-icing fluids (in accordance with ISO, SAE or AEA standards)
- Type III anti-icing fluids (in accordance with ISO, SAE or AEA standards)

CURRENT PRACTICES PRESCRIBE THE FOLLOWING METHODS FOR DE-ICING/ANTI-ICING APPLICATION :

Aircraft preparation :

- Check that all doors are closed.
- The aircraft shall be placed facing into the wind (if possible), engine not running.
- Apply parking brake and install wheel chocks.
- Install blanking devices and protective equipment on the following components : Naca ports, static ports, pitot probes, propeller and engine intake.

De-/anti-icing operation :

CAUTION

INGESTION OF DE-ICING FLUID BY THE ENGINE WILL CONTAMINATE THE AIR-CONDITIONING SYSTEM AND CAUSE OBJECTIONABLE FUMES (CAUSING THROAT IRRITATIONS) AND ODOURS TO ENTER THE CABIN. THIS MAY ALSO CAUSE ERRATIC OPERATION. IF DIRECT SPRAYING OCCURS TO THE ENGINE, THE PILOT SHOULD REQUEST A WASH OF THE ENGINE ON THE AIRPLANE'S RETURN TO BASE.

ACCORDING TO OACI (DOC 9460) CHAPTER 4.9, UNDER NO CIRCUMSTANCE SHALL AN AEROPLANE THAT HAS PREVIOUSLY BEEN ANTI-ICED RECEIVE A FURTHER COATING OF ANTI-ICING FLUID DIRECTLY ON TOP OF THE CONTAMINATED FILM.

Only the experience of the de-icing operator will direct the choice of appropriate de-/anti-icing method according to the prevailing weather.

However a special care should be applied to following points:

- Avoid as much as possible direct spraying onto windshields and windows.
- Special care must be paid to the gaps between: wings, ailerons, tabs, horizontal and vertical stabilizers, elevator, rudder.
- Prevent fluid contact with outside temperature sensor, shock absorbers, WOW switches, landing gear actuators, landing gear seals, landing gear axles and any area with grease. Avoid de-icing or anti-icing fluids entering brake units.
- Avoid direct spraying of stall warning.

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Pre-takeoff contamination inspection :

Preflight must be performed according to POH 4.3.1 and 4.5.11

HOLDOVER TIME :

Holdover protection is achieved by anti-icing fluids remaining on and protecting aircraft surfaces for a period of time. The holdover begins at the start of :

- the operation for a one-step de/anti-icing process
- the second step for a two-step de/anti-icing process

Following table provides example of Holdover times tables as published by FAA.

CAUTION

THE HOLDOVER TIMES REPRESENTED IN THESE TABLES ARE FOR GENERAL INFORMATION PURPOSES ONLY. THEY ARE TAKEN FROM THE FAA OFFICIAL HOLDOVER TIME TABLES WINTER 2011-2012. HOWEVER LOCAL AUTHORITY REQUIREMENTS MAY DIFFER.

THE PROTECTION TIME WILL BE SHORTENED IN SEVERE CONDITIONS (HEAVY PRECIPITATION, HIGH MOISTURE, HIGH WIND, JET BLAST, ETC).

REFER TO EASA SIB 2010-26R1: MIXING AIRCRAFT ANTI-ICING FLUID WITH RUNWAY DE-ICING FLUID COULD SIGNIFICANTLY REDUCE HOLDOVER TIME.

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Outside Air Temperature		Approximate Holdover Times (hours:minutes)	Outside Air Temperature		Concentration Neat Fluid/Water (Volume%/Volume%)	Approximate Holdover Times (hours:minutes)		
Degrees Celsius	Degrees Fahrenheit	Active Frost	Degrees Celsius	Degrees Fahrenheit		Type II ³	Type III ³	Type IV ³
		Type 1, 2						
-1 and above	30 and above	0:45 (0:35) ⁴	-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		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	0:45 (0:35) ⁴	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		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		Below -14 to -21	Below 7 to -6	100/0	6:00	2:00	6:00
					100/0	2:00	2:00	4:00
Below -21 to -25	Below -6 to -13	0:45 (0:35) ⁴	Below -21 to -25	Below -6 to -13	100/0	2:00	2:00	4:00

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

FOOTNOTES :

- Type I Fluid / Water Mixture is selected so that the freezing point of the mixture is at least 10°C (18°F) below outside air temperature.
- May be used below -25°C (-13°F) provided the lowest operational use temperature (LOUT) of the fluid is not exceeded.
- These fluids may not be used below -25°C (-13°F) in active frost conditions. For Type II, III, or IV fluids with a LOUT warmer than -25°C (-13°F) undiluted or -3°C (27°F) in the 50/50 dilution, or -14°C (7°F) in the 75/25 dilution, limit usage to the actual LOUT value.
- Value in parenthesis is for composite aircraft.

NOTE : Approximate Holdover times for fluids Type I and IV are provided for information only although these fluids do not apply to TBM700 aircraft.

Table 1 -- FAA guidelines for holdover times in active frost, SAE TYPE I, TYPE II, TYPE III, and TYPE IV fluids (FOR INFORMATION ONLY)

CAUTION

THIS TABLE IS FOR DEPARTURE PLANNING ONLY AND SHOULD BE USED IN CONJUNCTION WITH PRE-TAKEOFF CHECK PROCEDURES.

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Outside Air Temperature		Wing Surface	Approximate Holdover Times Under Various Weather Conditions (hours: minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow, Snow Grains or Snow Pellets			Freezing Drizzle*	Light Freezing Rain†	Rain on Cold Soaked Wing**	Other†‡
				Very Light	Light	Moderate				
-3 and above	27 and above	Aluminum	0:11 – 0:17	0:18 – 0:22	0:11 – 0:18	0:06 – 0:11	0:09 – 0:13	0:02 – 0:05	0:02 – 0:05	CAUTION: No holdover time guidelines exist
below -3 to -6	below 27 to 21	Aluminum	0:08 – 0:13	0:14 – 0:17	0:08 – 0:14	0:05 – 0:08	0:05 – 0:09	0:02 – 0:05		
below -6 to -10	below 21 to 14	Aluminum	0:06 – 0:10	0:11 – 0:13	0:06 – 0:11	0:04 – 0:06	0:04 – 0:07	0:02 – 0:05		
below -10	below 14	Aluminum	0:05 – 0:09	0:07 – 0:08	0:04 – 0:07	0:02 – 0:04				
SAE Type I fluid/water mixture is selected so that the freezing point of the mixture is at least 10 °C (18 °F) below OAT.										

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

FOOTNOTES :

- * Use light freezing rain holdover times if positive identification of freezing drizzle is not possible
- ** This column is for use at temperatures above 0 degrees Celsius (32 degrees Fahrenheit) only
- ‡ Heavy snow, ice pellets, moderate and heavy freezing rain, hail
- † Use light freezing rain holdover times in conditions of light snow mixed with light rain.

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 BE REDUCED WHEN AIRCRAFT SKIN TEMPERATURE IS LOWER THAN OAT.

Table 2 -- FAA guidelines for holdover times SAE TYPE I fluid mixtures on critical aircraft surfaces composed predominantly of aluminum as a function of weather conditions and outside air temperature

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CAUTION

THIS TABLE IS FOR DEPARTURE PLANNING ONLY AND SHOULD BE USED IN CONJUNCTION WITH PRE-TAKEOFF CHECK PROCEDURES.

Outside Air Temperature		Approximate Holdover Times Under Various Weather Conditions (hours: minutes)							Other [‡]
Degrees Celsius	Degrees Fahrenheit	Type III Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Freezing Fog	Snow, Snow Grains or Snow Pellets		Freezing Drizzle*	Light Freezing Rain [†]	Rain on Cold Soaked Wing**	
				Very Light	Light	Moderate			
-3 and above	27 and above	100/0	0:20-0:40	0:35-0:40	0:20-0:35	0:10-0:20	0:10-0:20	0:06-0:20	CAUTION: No holdover time guidelines exist
		75/25	0:15-0:30	0:25-0:35	0:15-0:25	0:08-0:15	0:08-0:15	0:02-0:10	
		50/50	0:10-0:20	0:15-0:20	0:08-0:15	0:04-0:08	0:05-0:09		
below -3 to -10	below 27 to 14	100/0	0:20-0:40	0:30-0:35	0:15-0:30	0:09-0:15	0:10-0:20	0:08-0:10	
		***75/25	0:15-0:30	0:25-0:30	0:10-0:25	0:07-0:10	0:09-0:12	0:06-0:09	
below -10	below 14	100/0	0:20-0:40	0:30-0:35	0:15-0:30	0:08-0:15			

SAE Type III fluid may be used below - 10°C (14°F), provided the freezing point of the fluid is at least 7°C (13°F) below OAT and aerodynamic acceptance criteria (LOUT) are met. For the currently available Type III product, the High Speed LOUT is - 29°C (- 20.2°F) and the Low Speed LOUT is - 16.5°C (2.3°F). Consider the use of SAE Type I when Type III fluid cannot be used.

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

FOOTNOTES :

- * Use light freezing rain holdover times if positive identification of freezing drizzle is not possible
- ** This column is for use at temperatures above 0 degrees Celsius (32 degrees Fahrenheit) only
- *** For aircraft with rotation speeds less than 100 knots, these holdover times only apply to outside air temperatures of -9°C (15.8°F) and above
- ‡ Heavy snow, ice pellets, moderate and heavy freezing rain, hail
- † Use light freezing rain holdover times in conditions of light snow mixed with light rain.

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 BE REDUCED WHEN AIRCRAFT SKIN TEMPERATURE IS LOWER THAN OAT.

Table 3 - FAA guidelines for holdover times SAE Type III fluid mixture as a function of weather conditions and outside air temperature

CAUTION

THIS TABLE IS FOR DEPARTURE PLANNING ONLY AND SHOULD BE USED IN CONJUNCTION WITH
PRE-TAKEOFF CHECK PROCEDURES.

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Outside Air Temperature		Wing Surface	Approximate Holdover Times Under Various Weather Conditions (hours: minutes)							Other†
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow, Snow Grains or Snow Pellets			Freezing Drizzle*	Light Freezing Rain†	Rain on Cold Soaked Wing**	
				Very Light	Light	Moderate				
-3 and above	27 and above	Composite	0:09—0:16	0:12—0:15	0:06—0:12	0:03—0:06	0:08—0:13	0:02—0:05	0:01—0:05	CAUTION: No holdover time guidelines exist
below -3 to -6	below 27 to 21	Composite	0:06—0:08	0:11—0:13	0:05—0:11	0:02—0:05	0:05—0:09	0:02—0:05		
below -6 to -10	below 21 to 14	Composite	0:04—0:08	0:09—0:12	0:05—0:09	0:02—0:05	0:04—0:07	0:02—0:05		
below -10	below 14	Composite	0:04—0:07	0:07—0:08	0:04—0:07	0:02—0:04				
SAE Type I fluid/water mixture is selected so that the freezing point of the mixture is at least 10 °C (18 °F) below OAT.										

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

FOOTNOTES :

- * Use light freezing rain holdover times if positive identification of freezing drizzle is not possible
- ** This column is for use at temperatures above 0 degrees Celsius (32 degrees Fahrenheit) only
- ‡ Heavy snow, ice pellets, moderate and heavy freezing rain, hail
- † Use light freezing rain holdover times in conditions of light snow mixed with light rain.

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 BE REDUCED
WHEN AIRCRAFT SKIN TEMPERATURE IS LOWER THAN OAT.

SAE TYPE I FLUID USED DURING GROUND DEICING/ANTI-ICING IS NOT INTENDED FOR AND DOES NOT
PROVIDE PROTECTION DURING FLIGHT

Table 4 – FAA guidelines for holdover times SAE Type I fluid mixture on aircraft critical surfaces composed predominantly of
composites as a function of weather conditions and outside air temperature

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