Guidelines and Useful Tips for Effective Deicing/Anti-Icing

1. Holdover time (HOT) has been exceeded when the fluid is no longer effective in its ability to absorb additional precipitation. This produces a visible build-up of surface contamination.

2. Fluid Color
   Colors are used as a visual aid in the application of fluids.
   SAE fluid specifications indicate the appropriate color for each of the types of fluids, as follows:
   - Type **I** fluids: Orange color.
   - Type **II** fluids: Colorless or a pale straw color.
   - Type **III** fluids: Bright yellow color.
   - Type **IV** fluids: Emerald green color.

   NOTE: If the color of the fluid being applied to the aircraft is NOT the color anticipated, the procedure should be stopped and the situation investigated.

3. For maximum deicing effect, heated water or heated SAE Type I fluids should be applied close to the surface of the aircraft skin to minimize heat loss. The heat combined with the high pressure and flow rates of the fluid will melt and subsequently flush off the frozen contaminants. SAE Type I fluids have limited holdover effectiveness when used for anti-icing purposes.

4. Establishing the appropriate HOT time range will require the following information:
   a. The precipitation type;

   b. The precipitation rate;

   c. The fluid in use, including:
      - Fluid type; and manufacturer
      - Fluid temperature
      - Fluid dilution

   d. Outside air temperature.

TYPE I DEICING FLUID APPLICATION GUIDELINES

Outside Air Temperature (OAT)	One-Step Procedure	Two-Step Procedure	
	Deicing/Anti-icing	First Step Deicing	Second Step Anti-icing [1]
-3°C (27°F) and above	Mix of fluid and water heated to 60°C (140°F) minimum at the nozzle with a freeze point of at least 10°C (18°F) below OAT.	Water or a mix of fluid and water, heated to 60°C (140°F) minimum at the nozzle.	Mix of fluid and water heated to 60°C (140°F) minimum at the nozzle with a freeze point of at least 10°C (18°F) below OAT.
Below -3°C (27°F)		Freeze point of heated fluid mixture not more than 3°C (5°F) above OAT.	

[1] To be applied before first step fluid freezes, typically within three (3) minutes.

*General Note for Heated Fluids: A fluid temperature of not less than 60°C (140°F) at the nozzle is desirable.

TYPE II-III-IV ANTI-ICING FLUID APPLICATION GUIDELINES (CONCENTRATIONS IN % BY VOLUME)

Outside Air Temperature (OAT)	One-Step Procedure	Two-Step Procedure	
	Deicing/Anti-icing	First Step Deicing	Second Step Anti-icing [1]
-3°C (27°F) and above	50/50 heated [2] Type II-III or IV	Heated water or a heated mix of Type I-II-III or IV with water.	50/50 Type II-III or IV
-14°C (7°F) and above	75/25 heated [2] Type II-III or IV	Heated suitable mix of Type I or II-III-IV and water with a freeze point of not more than 3°C (5°F) above OAT.	75/25 Type II-III or IV
-25°C (-13°F) and above	100/0 heated [2] Type II-III or IV		100/0 Type II-III or IV
Below -25°C (-13°F)	Type II-III or IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below OAT and the aerodynamic acceptance criteria, as defined by the fluid manufacturer's data sheets, are met. Consider use of Type I fluids when Type II-III or IV cannot be used.		

[1] To be applied before first step fluid freezes, typically within three (3) minutes.
[2] Clean aircraft may be anti-iced with unheated fluid.

*General Note for Heated Fluids: A fluid temperature of not less than 60°C (140°F) at the nozzle is desirable.

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Deicing/Anti-icing Fluid Application Information Guide

This guide is intended only to assist ground personnel. Always follow the applicable instructions in the Airplane Flight Manual (AFM), Aircraft Maintenance Manual (AMM) and Flight Crew Operating Manual (FCOM) and obey all safety precautions when performing deicing/ anti-icing procedures. In the event of a conflict between the instructions in this guide and the AFM or AMM or FCOM, the AFM, AMM and FCOM shall take precedence over this guide.

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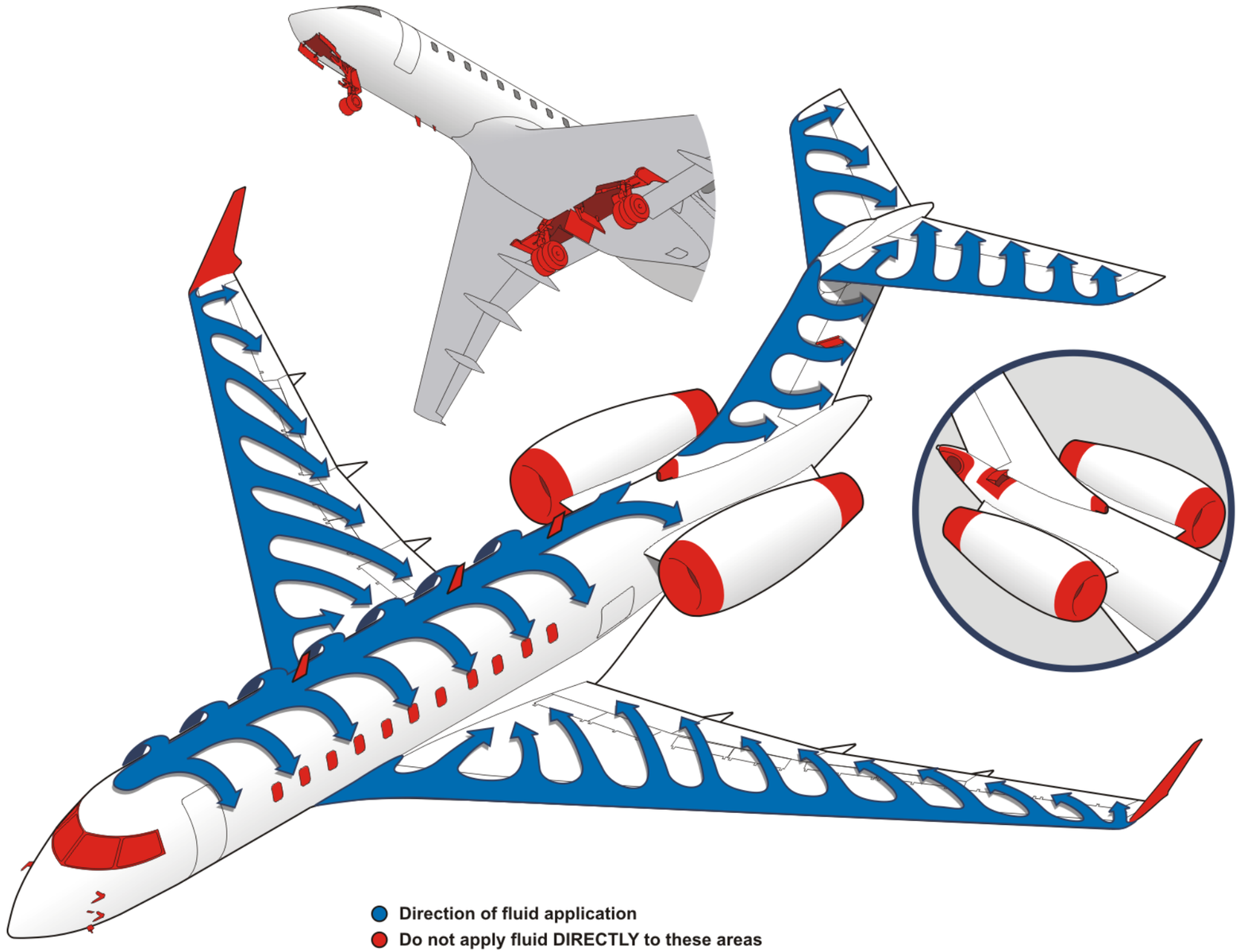
General Precautions:

1. The APU should be off during the application of deicing/anti-icing fluids.
2. Deicing/ anti-icing with the engines running is permitted, but when possible should be avoided.
3. Wing and engine anti-ice systems must be off during the application of deicing/ anti-icing fluids.
4. Deicing/ anti-icing may be performed with passengers on board. All doors should be closed.
5. Do not spray fluid into the APU or engine inlet and exhaust, scoops, vents and drains, or directly against cockpit or cabin windows, AOA vanes, antennas and probes.
6. Do not direct a solid stream of fluid perpendicular to aircraft surfaces.
7. Do not apply fluid to the landing gear assemblies, gear bays, brakes, tires or wheels. Snow and ice in these areas should be cleaned prior to deicing/ anti-icing.
8. Under no circumstances can an airplane that has been anti-iced, receive another coat of type **II** or **IV** fluid on top of the existing film. If the holdover time is exceeded, surfaces must first be deiced with a mixture of hot water and deicing fluid, prior to another application of anti-ice fluid.

Fluid Application:

1. Remove any heavy accumulation of snow or ice with a soft broom prior to deicing.
2. It is recommended that flaps be set to 30 degrees, and stabilizer trim be set to 14° (nose up) for deicing/ anti-icing.
3. Deicing/ anti-icing may be accomplished using either a one step or two step application process. A one step application will provide limited protection and holdover time. Two-step application is required whenever there is continuous precipitation.
4. A spray trajectory of at least 3 meters (10ft) is recommended to help avoid damage to aircraft surfaces from direct spray. The maximum force of the continuous flow of fluid should not be more than 10psi on an area of 25sq. in.
5. Apply deicing/ anti-icing fluid to the aircraft as required in the following sequence:
   a. Horizontal Stabilizer - Apply fluid from the leading edge to the trailing edge. Start at the outboard edge and move inboard.
   b. Vertical Stabilizer - For vertical surfaces start at the top and work down.
   c. Fuselage - Apply fluid from nose to tail. Spray from the top outboard allowing the fluid to cascade down the sides.
   d. Wings - Apply fluid from the leading edge to the trailing edge. Start at the outboard edge and move inboard.
6. The left and right wings and horizontal stabilizers must receive equal (symmetrical) treatment.



Direction of fluid application

Do not apply fluid DIRECTLY to these areas

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