DEICING/ANTI-ICING - DESCRIPTION AND OPERATION

1. General

A. FAA regulations require that all critical components (wings, control surfaces and engine inlets as an example) be free of snow, ice or frost before takeoff. The deicing process is intended to restore the airplane to a clean configuration so that neither aerodynamic characteristics nor mechanical interference from contaminants will occur.

B. Deicing and anti-icing fluids are aqueous solutions which work by lowering the freezing point of water in either the liquid or crystal phase which delays the onset of freezing. For this reason, they are referred to as a Freezing Point Depressant (FPD) fluids. Deicing fluid is classified as Type I. Anti-icing fluid is classified as Type II, Type III, or Type IV. The one-step method of airplane deicing utilizes only Type I fluid. The two-step approach to airplane deicing utilizes Type I fluid to deice the airplane, which is followed rapidly by application of Type II, Type III, or Type IV fluid to delay the onset of refreezing.

(1) Type I, Type II, Type III, and Type IV fluids have time limitations before refreezing begins. This time limitation is referred to as "holdover time," Type II, Type III, and Type IV anti-icing fluids have a much longer holdover time than Type I deicing fluids. Because holdover time is highly dependent on a number of factors, charts can provide only approximate estimates. Refer to specific manufacturers data sheets for holdover times. It remains the responsibility of the flight crew to determine the effectiveness of any deicing procedure.

CAUTION: You cannot mix Type I, Type II, Type III, and Type IV fluids because they are not compatible. Also, most manufacturer's prohibit mixing of brands within a type.

C. Deicing

(1) Deicing may be accomplished using the ambient temperature available from a heated hangar or by mechanical means using a glycol-based Freezing Point Depressant (FPD) Type I fluid.

(a) Care must be exercised, however, to ensure that all melted precipitation is removed from the airplane to prevent refreezing once the airplane is moved from the hangar to the flight line.

(b) Type I deicing fluids are applied in a temperature range from 160°F to 180°F (71°C to 82°C) using a moderate to high-pressure washer. Heated solutions of FPD are more effective than unheated solutions because thermal energy is used to melt the ice, snow or frost formations. Type I deicing fluids are used in the diluted state, with specific ratios of fluid-to-water dependent on ambient temperature. Type I deicing fluids have a very limited holdover time.

D. Anti-icing

(1) Anti-icing is accomplished by using Type II, Type III, or Type IV fluids, and their purpose is to delay the reforming of ice, snow or frost on the airplane. This is accomplished by using chemically thickened formulas with pseudo-plastic properties. This feature enables the fluid to form a protective film on treated surfaces of the airplane, and is designed to flow off airplane surfaces at high speeds.

CAUTION: Type II, Type III, and Type IV fluids are designed for use on airplanes with a VR speed of 85 knots or greater. Type II, Type III, and Type IV fluid is used undiluted and is typically applied to the airplane unheated. Holdover times for Type II, Type III, and Type IV fluid can vary widely based on atmospheric conditions. Consult specific manufacturers charts for holdover time.

E. Deicing fluids are not intended for use in removing snow deposits. Snow is best removed by mechanically sweeping or brushing it from the airplane structure.

F. Deicing procedures must be closely coordinated with the flight crew and carried out in a timely manner. Ultimate responsibility for safety of flight rests with the flight crew, and any decisions to deice an airplane must be accomplished under their direct supervision.

2. Deicing/Anti-Icing Fluids

NOTE: Equivalent substitutes may be used for the following tables:

A. Currently available Type I Deicing Fluids are listed in Table 1:

Table 1. SAE Type I and ISO Type I Deicing Fluids

NAME	MANUFACTURER	COLOR	CHEMICAL BASE

UCAR ADF Concentrate	Union Carbide 10235 West Little York Rd., Suite 300 Houston, TX 77040	Orange	Ethylene-glycol
UCAR ADF 50/50	Union Carbide	Orange	Ethylene-glycol
ARCOPLUS Dilute	ARCO Chemical Company 3801 West Chester Pike Newtown Square, PA 19073	Orange	Propylene-glycol
ARCOPLUS	ARCO Chemical Company	Orange	Propylene-glycol

B. Currently available Type II Anti-Icing Fluids are listed in Table 2:

Table 2. SAE Type II Anti-Icing Fluids

NAME	MANUFACTURER	COLOR	CHEMICAL BASE
KILFROST ABC-3	ARCO Chemical Company 3801 West Chester Pike Newtown Square, PA 19073	Pale Amber	Propylene-glycol
UCAR UC5-1	Union Carbide 10235 West Little York Rd., Suite 300 Houston, TX 77040	Pale Yellow	Ethylene-glycol
UCAR AAF ULTRA	Union Carbide	Emerald Green	Ethylene-glycol

C. Currently available Type III Anti-Icing Fluids are listed in Table 3:

Table 3. Qualified Type III Deicing/Anti-Icing Fluids

NAME	MANUFACTURER	COLOR	CHEMICAL BASE
Safewing MP III 2031 ECO	Clariant Corporation 60050 McHenry, IL	Bright yellow	50% Propylene Glycol

D. Currently available Type IV Anti-Icing Fluids are listed in Table 4:

Table 4. SAE Type IV Deicing/Anti-Icing Fluids

NAME	MANUFACTURER	COLOR	CHEMICAL BASE
UCAR ADF/AAF ULTRA+	Union Carbide 10235 West Little York Rd., Suite 300 Houston, TX 77040	Emerald Green	Ethylene-glycol

E. Currently available TKS Anti-Icing Fluids are listed in Table 5. Additional TKS Anti-Icing Fluid data is found in Replenishing - Description and Operation.

Table 5. TKS Anti-Icing Fluids

NAME	MANUFACTURER	SPECIFICATION	CHEMICAL BASE
AVL-TKS	Aviation Laboratories 5401 Mitchelldale #B6 Houston, TX 77092	DTD406B	Monoethylene glycol/isopropyl alcohol/deionized
TKS-Fluid	DW Davies 3200 PHILLIPS AVENUE RACINE, WI 53403	DTD406B	Monoethylene glycol/isopropyl alcohol/deionized

AeroShell Compound 07	AeroShell Shell Oil Company One Shell Plaza Houston, TX 77001	DTD406B	Monoethylene glycol/isopropyl alcohol/deionized