DEICING/ANTI-ICING - SERVICING

1. General

A. This servicing section is to supply maintenance personnel with information necessary to remove the snow, ice or frost from the airplane when conditions exist (or are possible). deicing and anti-icing procedures are to be completed in conjunction with the flight crew. The pilot-in-command makes the final decision if an airplane's components are free of frozen contaminants.

B. The effectiveness of any Freezing Point Depressant (FPD) deicing or anti-icing treatment can only be estimated because of the many variables that influence holdover time. Those variables are:

(1) Ambient temperature
(2) Airplane surface temperature
(3) Freezing Point Depressant fluid application procedure
(4) Freezing Point Depressant solution strength
(5) Freezing Point Depressant film thickness
(6) Freezing Point Depressant fluid temperature
(7) Freezing Point Depressant fluid type
(8) Operation in close proximity to other airplanes, equipment and structures
(9) Operation on snow, slush, wet ramps, taxiways and runways
(10) Precipitation type and rate
(11) Residual moisture on airplane surface
(12) Relative humidity
(13) Solar radiation
(14) Wind speed and direction

2. Approved Products

A. For a list of Type I deicing fluids, refer to Deicing - Description and Operation.

3. Deicing/Anti-Icing Precautions

A. Before Type I deicing procedures begin, maintenance personnel must familiarize themselves with areas to be sprayed and areas to avoid a direct spray of fluid. Refer to Figure 301 for areas to be sprayed. Refer to Figure 302 for areas to apply anti-ice fluid. Refer to Figure 303 for critical areas to avoid spraying directly. Refer to Figure 304 for application sequence.

B. Type I deicing fluids must never be used at full strength (undiluted). Undiluted glycol fluid is quite viscous below 14&#65533;F (-10&#65533;C) and can actually produce lift restrictions of about 20 percent. Undiluted glycol has a higher freezing point than glycol/water mixture.

C. Deicing procedures must be completed with the engine off.

D. Before Type II, Type III or Type IV anti- ice procedures begin, maintenance personnel must familiarize themselves with the areas to be sprayed and areas not to be sprayed. Anti-icing is applied primarily to protect the wings, control surfaces and fuselage. Refer to Figure 302 for areas that receive the anti-ice application, Figure 303 for areas that do not receive the anti-ice aplication, and Figure 304 for the sequence of the application.

CAUTION: Although irritation from freezing point depressant fumes is classified as negligible, maintenance personnel must wear protective clothing during deicing/anti-icing procedures. Pure glycol, if swallowed in amounts of three ounces or more, can be fatal. Maintenance personnel must familiarize themselves with the Safety Data Sheet (SDS) before deicing/anti-icing procedures begin.

4. Type I Deicing Preparations

A. Before the deicing procedures begin, maintenance personnel must know the lowest possible outside air temperature (OAT). Based on this information, the glycol/water mixture must then be adjusted to lower the freezing point of the Type I solution to at least 18&#65533;F (10&#65533;C) below this OAT. The difference between the possible OAT and the freezing point of the solution is known as the &#65533;buffer.&#65533;

(1) Each manufacturer has specific instructions for mixing glycol/water and the freezing point that any given mixture will provide. Refer to these instructions when preparing Type I solutions.

(2) Most manufacturers provide a refractive index of their products. This index is required to ascertain the freezing point of any given solution. Refer to Unscheduled Servicing - Description and Operation for a list of manufacturers offering refractive index testing kits.

WARNING: It is the responsibility of the pilot and deicing personnel to know the freezing point of any solution they apply. A refractive index coupled with specific manufacturers data is the only positive method for identifying the freezing point of a previously mixed Type I solution whose glycol/water ratio is unknown.

CAUTION: Type I deicing fluid must not be intermixed between brands. Manufacturers add specific dyes to their product for visual evidence of contamination. A fluid that does not meet the color criteria made by the manufacturer must be considered to be contaminated and must not be used.

B. Make sure that Type I deicing fluid is between 160°F and 180°F (71°C and 82°C) before application begins.

5. Type II, Type III and Type IV Anti-Ice Preparations

A. Type II, Type III and Type IV anti-icing fluids undiluted and at ambient temperature unless otherwise specified by the manufacturer.

(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.

NOTE: Type II, Type III, and Type IV anti-ice fluid has thickening agents, which are designed to remain on the wings of an airplane during ground operations or short term storage to provide some anti-ice protection. This fluid is also made to flow off readily during takeoff at speeds of approximately 85 knots. Type II, Type III, and Type IV anti-ice procedures supply longer holdover times than Type I deicing procedures.

CAUTION: You must apply Type II, Type III, and Type IV anti-ice fluid, must never be mixed with Type I deicing fluid. Anti-ice fluids, require dedicated equipment and must not be dispersed with equipment used for Type I deicing fluid. Type II, Type III and Type IV anti-ice fluids must not be mixed between brands.

WARNING: Refer to the manufacturers instructions for low temperature limits. If a Type II, Type III, or Type IV anti-ice fluid is applied at temperatures lower than those approved by the manufacturer, the fluid may remain on the airplane and severely inhibit lift characteristics.

B. Make sure to set the dedicated Type II, Type III, or Type IV equipment to apply low-to-moderate pressure fluid. Because you apply Type II, Type III, or Type IV anti-ice fluids immediately after the Type I deicing procedure, you must fully service the Type II, Type III, or Type IV equipment before Type I deicing begins.

6. Deicing Procedures

A. Remove heavy quantities of snow with brooms or other equivalent methods. Carefully brush around antennas, windows, flight controls, TKS anti-ice panels, probes, vanes and other airframe equipment.

B. Refer to Figure 301 for areas to spray. Refer to Figure 303 for areas to avoid spraying directly. Refer to Figure 304 for instructions of application.

C. If the deicing is to be followed by anti-ice, the anti-ice must begin immediately after completion of the deicing procedure.

NOTE: It is the heat of the deicing fluid that melts ice and snow. The only function of glycol in the deicing solution is to lower the freezing point of the fluid which remains on the airplane.

D. Spraying Hints For Type I Fluid

(1) The fluid must be sprayed on the airplane in a manner that decreases heat loss of fluid to the air. The fluid must be sprayed in a solid cone pattern of large coarse droplets.

(2) The fluid must be sprayed as close as possible to the airplane surfaces, but not closer than approximately 10 feet if a high pressure nozzle is used.

(3) If a thick layer of frozen snow or ice is on the airplane surface, it is better to concentrate a directed spray of heated fluid on one area until that section of the airplane is cleaned. The hot fluid will heat the airplane surface, and the heated surface will help loosen the frozen bond of ice and snow around the cleaned area.

(4) When spraying the wing and tail areas, spray from the tip inboard and from the leading to the trailing edge. This

procedure takes advantage of dihedral to aid in fluid dispersion.

(5) Make sure the upper fuselage is clear.

(6) Windshields and windows must not be sprayed directly.

(7) Pitot tubes and static ports must not be sprayed directly.

E. Deicing the airplane Refer to Figure 304 for application sequence.

NOTE: Record the time the deicing procedures begin. The length of time that deicing fluids remain effective is known as holdover time and is highly dependent on a number of variables. Refer to Pilot's Operating Handbook and FAA approved Airplane Flight Manual for Type I deicing fluid approximate holdover times.

(1) Deicing pilot side fuselage from spinner to wing strut area.

(2) Deicing upper fuselage above cockpit area (pilot side).

(3) Deicing left wing.

(4) Deicing left fuselage from wing strut area to tail.

(5) Deicing tail section - left side.

(6) Deicing tail section - right side.

(7) Deicing right fuselage from tail to wing strut area.

(8) Deicing right wing.

(9) Deicing upper fuselage above cockpit area (copilot side).

(10) Deicing copilot side fuselage from wing strut area to spinner.

(11) Complete post-deicing checks. Refer to Post- Application Checks.

(12) Convey deicing information to flight crew with the following statement: This airplane has been deiced using Type I deicing fluid with a freezing point of _____F. Holdover time began at _____.

7. Do an Anti-Ice Procedure on the Airplane

A. Anti-Ice the airplane.

WARNING: You must never apply Type II, Type III, or Type IV anti-ice fluids to pitot heads, control surface cavities, cockpit windows, the windshield, the fuselage nose, static ports, air inlets, or engine.

NOTE: Record the time that the anti-ice procedures begin. The length of time an anti-ice fluid remains effective is known as holdover time and is dependent on a number of variables. Refer to the appropriate manufacturer's information or the latest FAA "flight Standard Information Bulletin for Air Transportation (FAST)" for the approximate holdover time of anti-icing fluid, in undiluted form.

NOTE: Type II, Type III, or Type IV anti-ice fluid must be applied in three minutes after deicing is complete due to the limited holdover time of Type I deicing fluid. If Type II, Type III, or Type IV anti-ice fluid has been applied and the airplane has not been dispatched before new ice has formed, the airplane must be completely deiced again and a second anti-ice treatment applied immediately.

NOTE: Anti-ice fluid is applied to the airplane at low pressure to form a thin film on its surfaces. Type II, Type III or Type IV anti-ice fluids must cover the airplane surfaces without runoff. Type II, Type III, or Type IV anti-ice fluids are applied only from the wing section aft.

(1) Refer to Figure 302 for the areas where you must to apply anti-ice fluid. Refer to Figure 303 for the specific areas where you must not apply anti-ice fluid. Refer to Figure 304 for the application sequence.

(2) Apply anti-ice fluid to the left wing.

(3) Apply anti-ice fluid to the left tail section and empennage.

(4) Apply anti-ice fluid to the right tail section and empennage.

(5) Apply anti-ice fluid to the right wing.

(6) Complete a post-application check. Refer to Post-Application Checks.

(7) Convey anti-ice information to the flight crew with the following statement: This airplane has been anti-iced using Type II, Type III, or Type IV anti-ice fluid. Holdover time began at _____.

8. Post-Application Checks

A. After the airplane has been deiced, maintenance personnel must perform a post - application check to make sure that all the critical areas are free of ice, snow or slush. These critical areas are as follows:

(1) Wing leading edges, upper surfaces and lower surfaces.

(2) Horizontal and vertical stabilizers.

(3) All control surfaces and control surface gaps.

(4) Spoilers.

(5) Windshields for clear visibility.

(6) Engine inlets.

(7) Antennas.

(8) All pitot and static probes/ports.

(9) Fuel tank and fuel cap vents.

(10) Air inlet scoops.

(11) Landing gear.

9. Post-Flight Clean Up

A. It is highly recommended that airplanes which have undergone deicing or anti-icing procedures be thoroughly cleaned after flight operations are completed. Refer to External - Cleaning procedures.

10. Wheel Brake Deicing Procedure

A. Wheel Brake Deicing

(1) If the brakes freeze from ice forming after the airplane has been parked on the ramp, and full deicing procedures are not required, the following must be completed to remove the ice from the brake area.

CAUTION: Exercise care when you use a ground heater to deice the brakes if the airplane is setting on ice or is in close proximity to other parked airplanes.

(a) Use a ground heater if available.

(b) Spray or pour isopropyl alcohol on the brakes.

(c) Cycle the brakes asymmetrically while you apply engine power.

(d) In slush conditions, spraying alcohol on the brakes before taxi and takeoff will help prevent the brakes from freezing in flight.

11. Deicing Boot Cleaning

A. Clean the Deicing Boots.

NOTE: Boots on the wings, struts, stabilizers, propeller and cargo pod (if installed) must be washed and serviced routinely.

CAUTION: Do not clean with petroleum based liquids such as methyl-n-propl ketone, unleaded gasoline, etc. You must be careful with the deicing boots to prevent damage. The deicing boots have an electrical coating to bleed off the static charges and could make holes in the tail deicing boots.

CAUTION: The temperature of the water must not be more than 140 f (60 C).

(1) Clean the deicing boots with mild soap and water, then rinse thoroughly with clean water.

NOTE: Isopropyl alcohol can be used to remove grime which cannot be removed using soap. If isopropyl alcohol is used for cleaning, wash area with mild soap and water, then rinse thoroughly with clean water.

(2) Keep boots clean and free from oil, grease and other solvents which will cause the rubber to swell and deteriorate.

12. Deicing Boot Preservation

A. You can get a longer service life out of the deicing boots and reduce the adhesion of ice to them if you apply AGE MASTER No. 1 and ICEX II or SHINEMASTER PREP, SHINEMASTER, and ICEX II to the them.

NAME	MANUFACTURER	USE

ICEX II	Aviall Distribution Dallas, TX Phone: 800-284-2551 Email: www.aviall.com API Memphis, TN Phone: 800-450-6777 Email: www.apiparts.com AAR Wood Dale, IL Phone: 877-227-6900 Email: www.aarcorp.com	To increase ice shedding from deicing boots.
AGE MASTER No. 1	Any of the manufactures listed above	To protect the deicing boots against deterioration
RESURFACING KIT 74-451-L.	Any of the manufactures listed above	To resurface the deicing boots with a tough layer of estane
SHINEMASTER PREP	Any of the manufactures listed above	To clean the deicing boots before you apply SHINEMASTER
SHINEMASTER	Any of the manufactures listed above	To improve the cosmetic high gloss look of the deicing boots

(1) Apply AGE MASTER No. 1 and ICEX II to the deicing boots if you have not resurfaced them with Goodrich Resurfacing Kit 74-451-L.

(2) Apply SHINEMASTER and ICEX II to the deicing boots if you have resurfaced them with Goodrich Resurfacing Kit 74-451-L. This kit applies a tough film of estane to the deicing boots.

NOTE: AGE MASTER No. 1 is used to protect the rubber of the deicing boots against deterioration from ozone, sunlight, weathering, oxidation, and pollution.

NOTE: ICEX II is used to help retard ice adhesion and to extend the appearance of new deicing boots.

NOTE: Goodrich Resurfacing Kit 74-451-L is used to put a new surface made of a tough layer of estane on the deicing boots.

NOTE: SHINEMASTER PREP and SHINEMASTER restore a cosmetic, high-gloss look to the deicing boots and adds a layer of estane to the deicing boot surface.

B. You must do the application of both AGE MASTER No. 1 and ICEX II in accordance with the instructions that follow:

CAUTION: Protect adjacent areas and clothing, and use plastic or rubber gloves during applications. AGE MASTER No. 1 stains and ICEX II contains silicone which makes paint touch-up almost impossible.

CAUTION: Make sure that you follow the manufacturers warnings and cautions when you apply AGE MASTER No. 1 and ICEX II.

(1) AGE MASTER No. 1 Application Instructions:

NOTE: Apply AGE MASTER No. 1 every 6 months or 150 flight hours, whichever comes first.

CAUTION: You must not use AGE MASTER No. 1 on deicing boots if they have been treated with Goodrich Resurfacing Kit 74-451-L. The resurfacing kit applies a layer of estane to the deicing boots, which is not compatible with AGE MASTER No. 1 treatments. You must use SHINEMASTER in place of AGE MASTER No 1 on deicing boots that were treated with a layer of estane.

CAUTION: Protect adjacent areas and clothing, and use plastic or rubber gloves during applications. AGE MASTER No. 1 stains and ICEX II contains silicone which makes paint touch-up almost impossible.

(a) Clean all oil, grease, and wax from the deicing boot surfaces before you apply AGE MASTER No. 1. Put masking tape on the adjacent areas to protect the painted surfaces.

(b) For best results and appearance, apply AGE MASTER No. 1 in a single, ful,l and even continuous motion

(spanwise) with a soft clean cloth. Let AGE MASTER No. 1 penetrate into the rubber.

CAUTION: You must not apply AGE MASTER No. 1 as a spray. It can cause damage to related components, and it is a fire hazard.

1 You must apply three layers of AGE MASTER No. 1 for a complete treatment.

NOTE: Additional applications of AGE MASTER No. 1 can be necessary for older deicing boots.

NOTE: The total amount of AGE MASTER No. 1 applied in all (three coats) must not exceed 0.3 to 0.4 ounces per square foot. One quart of AGE MASTER No. 1 will treat 80 to 106 square feet in a three application process.

2 Allow 5 to 10 minutes for AGE MASTER No.1 to dry before you apply another layer. The time it takes to dry can vary with weather conditions and/or temperature.

(c) Use waterless hand cleaner to clean your hands and equipment and to remove stains from your clothing after you finish your work with AGE MASTER No.1.

(2) ICEX II Application Instructions:

NOTE: ICEX II must be applied every 50 flight hours to airframe deicing boots and every 15 flight hours to propeller deicing boots.

(a) Clean the deicing boot surface with a mild soap and water solution before you apply ICEX II.

(b) After you clean the deicing boots, rinse them fully with clean water and let them dry fully.

(c) Use isopropyl alcohol to remove substances that you cannot remove with soap and water. After you clean the deicing boots with isopropyl alcohol, clean the surface again with mild soap and water, rinse fully with clean water, and let them dry fully.

NOTE: Do not apply ICEX II on surfaces that are treated with AGE MASTER No. 1 until they have dried a minimum of 25 hours.

(d) Apply ICEX II with a soft clean cloth in a single continuous motion (spanwise) without further cleaning. Make sure you fully cover the deicing boot with ICEX II.

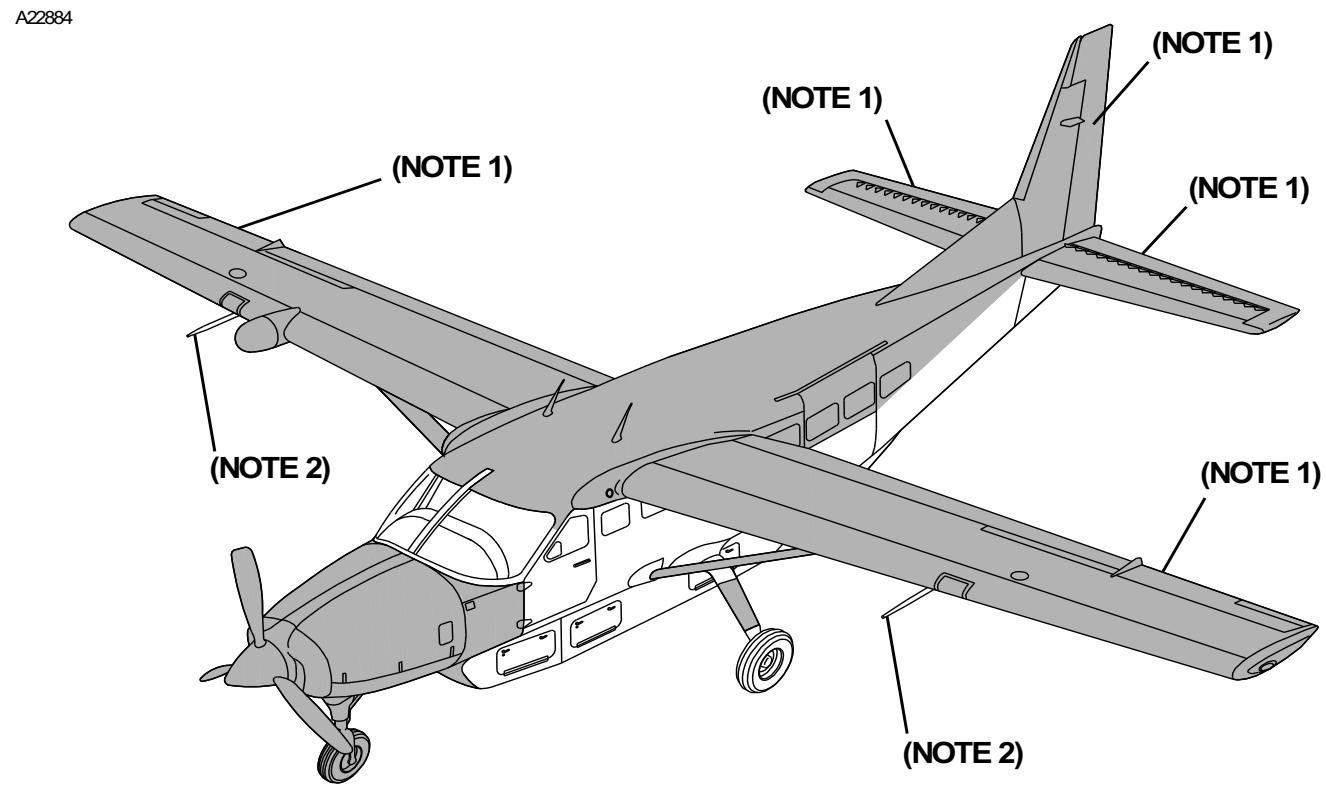
CAUTION: You must not apply ICEX II as a spray. It can cause damage to related components, and it is a fire hazard.

NOTE: If you use too much ICEX II in an application, the result will be a sticky surface that will collect dust and dirt. This will reduce the efficiency of the ICEX II. One quart of ICEX II covers approximately 500 square feet.

(3) SHINEMASTER Application Instructions.

(a) Refer to the specific manufacturer's instructions on how to apply SHINEMASTER on estane coated boots.

Figure 301 : Sheet 1 : Essential Areas to be Deiced



NOTE 1: PAY SPECIAL ATTENTION TO THE GAPS BETWEEN THE FLIGHT CONTROLS. ALL SNOW, ICE AND SLUSH MUST BE REMOVED FROM THESE GAPS.

NOTE 2: REMOVE SNOW, ICE AND SLUSH FROM PITOT TUBES BY HAND ONLY.

NOTE: SHADED AREAS INDICATE ESSENTIAL AREAS TO BE DEICED.

Figure 302 : Sheet 1 : Areas to Apply Anti-Ice Fluid

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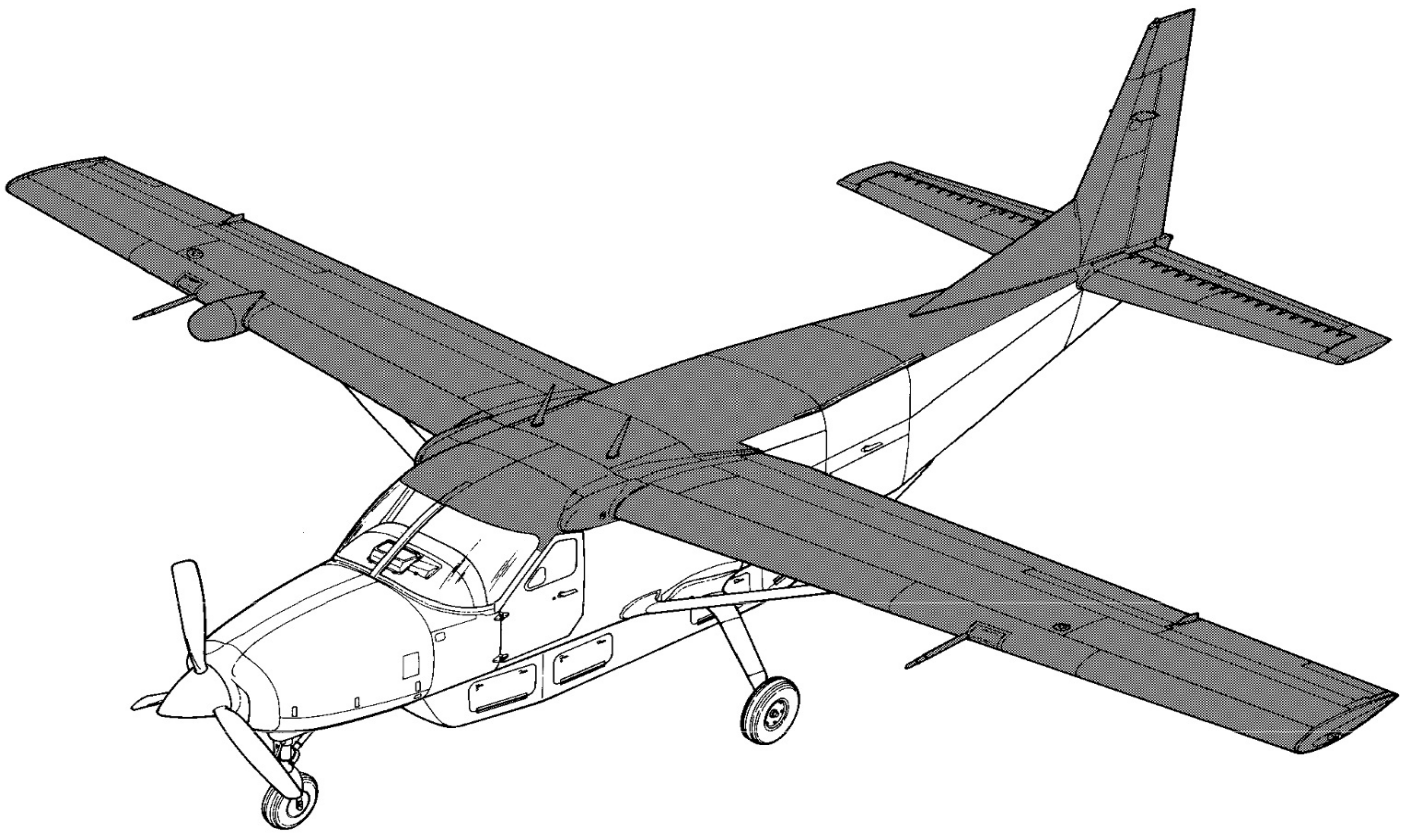

NOTE 1: ANTI-ICE FLUID SHOULD BE APPLIED AT LOW PRESSURE TO FORM A THIN FILM ON SURFACE. FLUID SHOULD JUST COVER AIRPLANES WITHOUT RUNOFF.

NOTE 2: SHADED AREAS INDICATE AREAS WHERE ANTI-ICE FLUID IS APPLIED.

NOTE 3: AVOID DIRECT SPRAY ON PITOT STATIC TUBES, WINDSHIELDS, CABIN WINDOWS, AND STALL WARNING VANE.

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Figure 303 : Sheet 1 : Deicing Fluid Minimum Direct Spray Areas

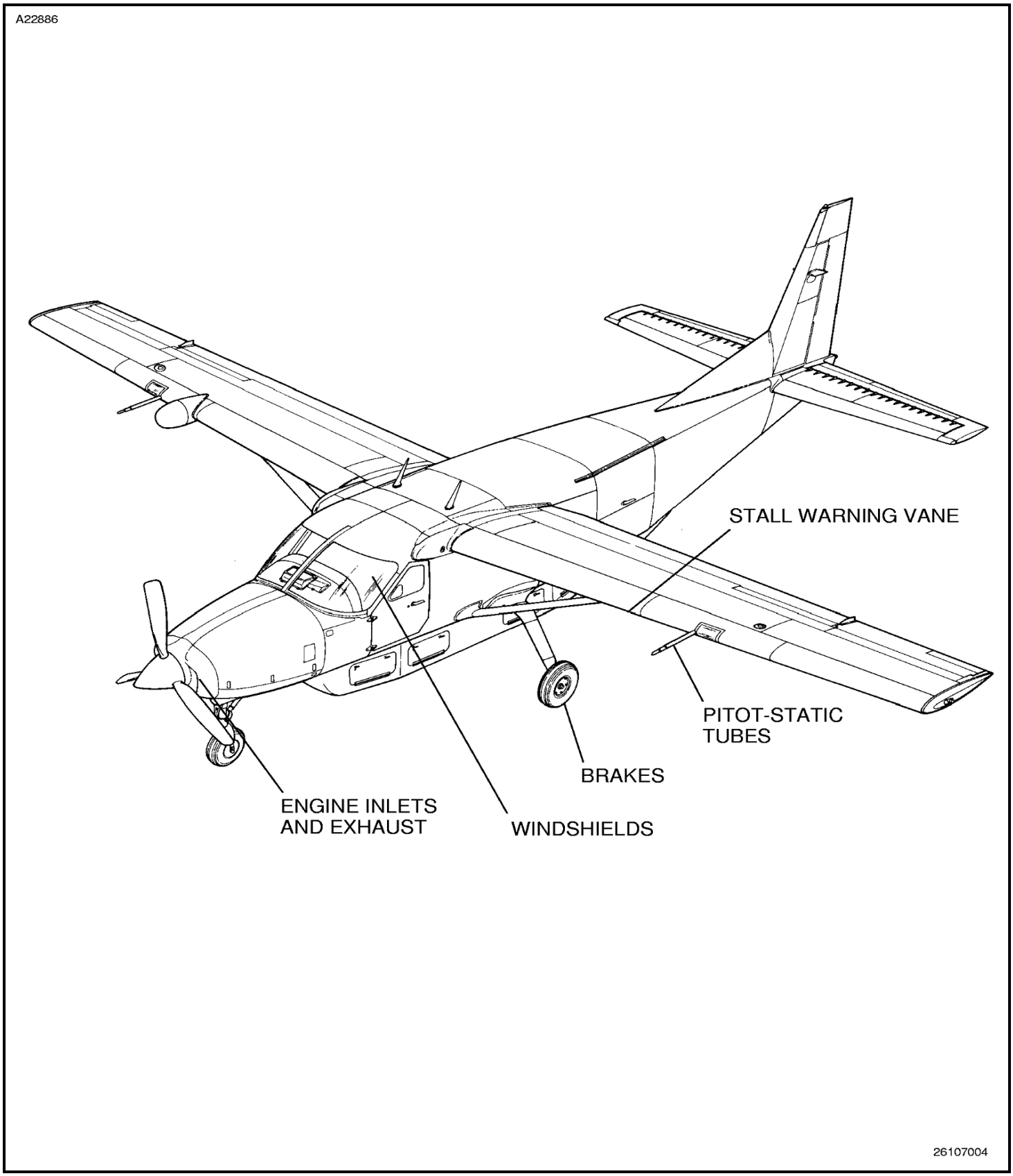

Figure 304 : Sheet 1 : Deicing Application

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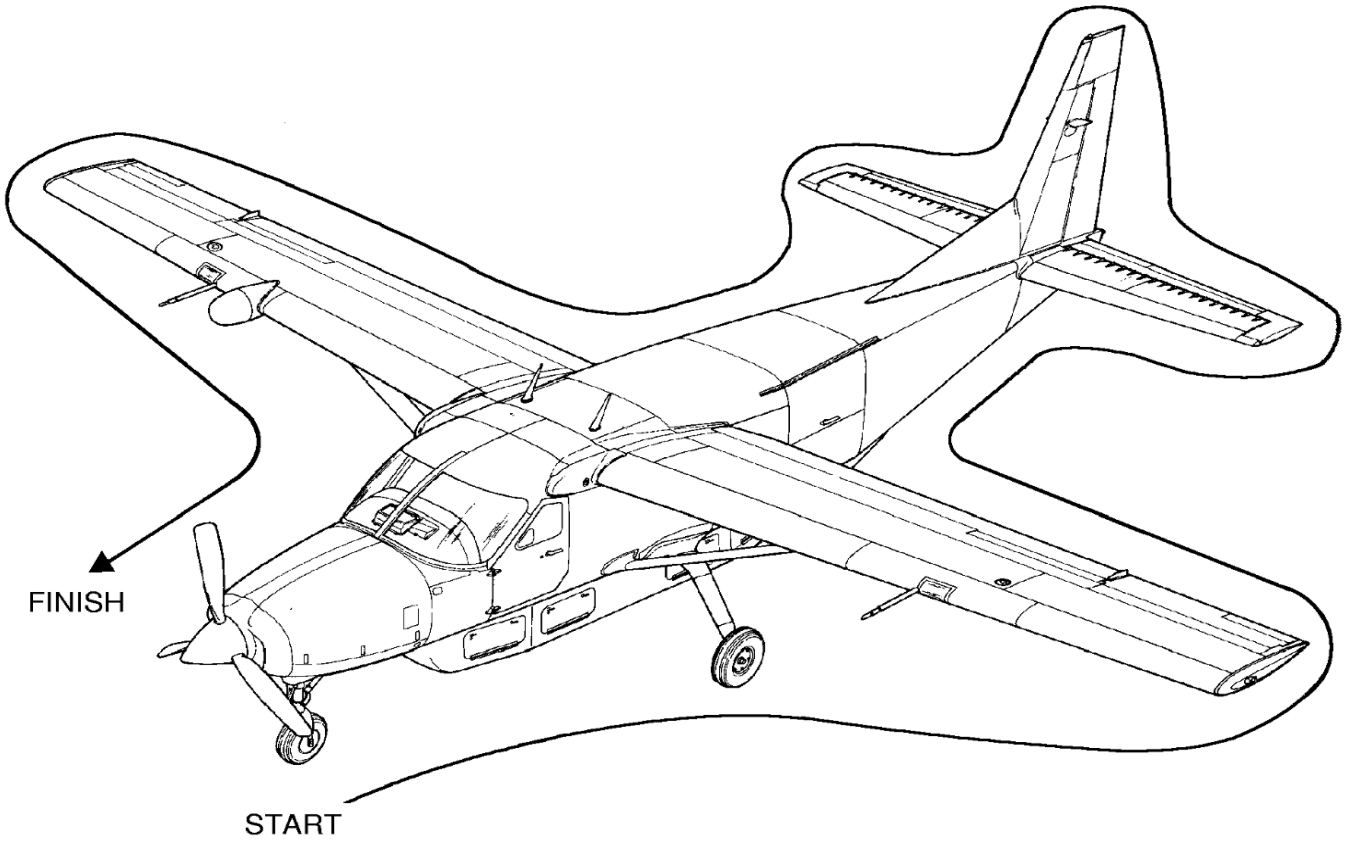
NOTE: BY STARTING DEICE APPLICATION AT LEFT NOSE, THE PILOT CAN GET A CONSERVATIVE ESTIMATE OF ICE REFORMATION FROM INSIDE THE COCKPIT. SINCE THIS WAS THE FIRST AREA DEICED, IT WILL BE THE FIRST AREA TO EXPERIENCE NEW ICE REFORMATION.



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