



## AIRCRAFT MAINTENANCE MANUAL

### COLD WEATHER MAINTENANCE - MAINTENANCE PRACTICES

EFFECTIVITY: ALL

#### 1. General

- A. These procedures give the methods for the deicing and anti-icing of the aircraft on the ground for a safe takeoff.
- B. The procedures in this section are given in the sequence below. The tasks identified with (♦) are part of the Scheduled Maintenance Requirements Document (SMRD).

TASK NUMBER	DESCRIPTION	EFFECTIVITY
12-30-01-860-801-A	DEICING/ANTI-ICING FLUID APPLICATION	ALL



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TASK 12-30-01-860-801-A

EFFECTIVITY: ALL

2. DEICING/ANTI-ICING FLUID APPLICATION

A. General

- (1) These procedures give the methods for the deicing and anti-icing of the aircraft on the ground for a safe takeoff and flight.
- (2) When the aircraft surfaces contain frozen moisture, they must be deiced before the aircraft is dispatched. When there is freezing precipitation and the precipitation adheres to the surfaces at the time of dispatch, the aircraft must be deiced/anti-iced.
- (3) Deicing/anti-icing will prevent a large quantity of snow or ice accretion on the aircraft and surfaces. Ice accretion on the wing and flight control surfaces affects airflow over the affected surface, and can create lift or flight control problems for aircraft and affect flight safety. Ice accretion on the leading edge of engine inlets causes flow problems and can lead to ice ingestion.
- (4) If deicing and anti-icing are necessary, the procedure can be done in one or two steps. For the selection of the more correct method, you must know see the conditions that you have: weather conditions, available equipment, available fluids, and the holdover time.
- (5) Deicing is a procedure by which frost, ice, slush, or snow is removed from the aircraft to clean the surfaces.
- (6) Anti-icing is a procedure which prevents the formation of frost or ice and accumulation of snow or slush on the surfaces of the aircraft for a limited period of time (holdover time).

NOTE: Holdover time is the estimated time during which the anti-icing fluid will prevent the formation of frozen contamination on the protected surfaces of an aircraft.

- (7) These methods below are available:

(a) Deicing/anti-icing fluid application. It can be done in one or two steps.

- 1 One-step deicing/anti-icing may be done with an anti-icing fluid. The fluid used to deice the aircraft stays on the aircraft surfaces to give a limited anti-icing capability.

NOTE: The procedure is usually done when the precipitation is not continuous and the anti-icing protection is only necessary for a short time.

- 2 Two-step deicing/anti-icing includes deicing followed by anti-icing, as a separate fluid application. Anti-icing fluid is applied to protect the surfaces. It gives the maximum possible anti-icing capability.

NOTE: Do this procedure when the precipitation condition is continuous and the anti-icing protection is necessary for a longer time.

Do the two-step procedure as follows:

- a Use a heated mixture of deicing/anti-icing fluid and water or heated water to eliminate ice, snow, slush or frost from the aircraft surfaces.

- b Apply an overspray of a deicing/anti-icing fluid or a mixture of them with heated water. Do this task typically within 3 min, area by area, to prevent liquid from freezing again over the aircraft surface.

- 3 Use the method given in Table 201 to remove ice, snow, slush, or frost.

**NOTE:** There are many conditions for a decision on the method for removal of ice, snow, slush, or frost. Thus, the best method must agree with the operator's experience and the local conditions.

Table 201 - METHODS FOR REMOVAL AND PROTECTION AGAINST ICE, SNOW, SLUSH, OR FROST

<b>Methods</b>	<b>GUIDELINES</b>		
	<b>At 1°C (34°F) or more Temperature Stable or on the increase</b>	<b>At - 3°C (27°F) to 1°C (34°F) Temperature Stable or on the increase</b>	<b>At less than - 3°C (27°F)</b>
Unheated Water	Permitted method to remove snow from surfaces in hangar or in open area. Application of anti-icing fluid is optional	Not permitted	Not permitted
Hot Water Deicing 82°-93°C (180°-200°F) followed by anti-icing application <sup>[1]</sup>	Permitted method for removal of ice, slush, snow, or frost in hangar or in open area. Application of anti-icing fluid is optional	Recommended method for ice, slush, snow, or frost removal in hangar or in open area	Not permitted
Deicing Fluid <sup>[1][2]</sup>	Not necessary (optional use)	Permitted method for ice, slush, snow, or frost removal in an open area	Recommended method for ice, snow slush or frost removal in an open area
Anti-icing Fluid <sup>[1]</sup>	Not necessary (optional use)	Apply if hot water method is used. Apply as protection to keep the ice, snow, or frost quantity to a minimum. Apply again as necessary	Apply as protection if ice, snow, slush or frost condition is thought to come. Apply again as necessary

[1] Comply with the fluid manufacturer's recommendations.

[2] Fluid temperatures must not be of more than 93°C (200°F).

(b) Removal of snow and ice by manual methods.

- NOTE:
- The deicing/anti-icing procedure must always be done by trained and qualified persons.
  - Heavy quantity of snow will be difficult to remove from the aircraft surfaces and large quantities of fluid will be constantly consumed in the use. Under these conditions, take into consideration that you can remove the volume of the snow mechanically before you try to do a normal deicing procedure.

(c) Removal of snow (that does not adhere to the surface) with forced air.

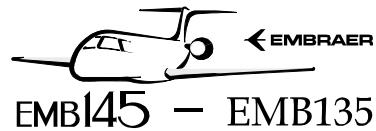
- 1 Forced air uses an air stream to remove accumulations of frozen contamination from the aircraft with or without fluid. Forced air could provide the option of injecting heated or unheated fluid into the air stream for removal of heavier frozen contamination.

- NOTE:
- Forced air only can not remove adhering contaminants and therefore will not eliminate the need for deicing processes
  - Forced air or forced air/fluid applications can not eliminate the need for deicing/anti-icing processes.
  - Forced air systems could also assist in the application of anti-icing fluids when approved by the fluid manufacturer.
  - Forced air can be heated or ambient temperature can be used.

(8) For these procedures, one of these fluids must be used:

- Unheated/heated water.
- Type I deicing fluid.
- Type II deicing/anti-icing fluid.
- Type III deicing/anti-icing fluid.
- Type IV deicing/anti-icing fluid.
- Tiolon A-20 - Anti-icing for door seals.

- NOTE:
- Use only type I fluid as given in the SAE AMS 1424 specification. The use of Alkali Organic Salt-based fluid is not recommended.
  - Use only type II, type III and type IV fluids as given in the SAE AMS 1428 specification.
  - Refer to the fluid manufacturer's specifications for fluid mixture, if applicable, and holdover times.
  - The performance characteristics of SAE Type II, Type III and IV deicing/anti-icing fluids may be degraded by excessive mechanical shearing or chemical contamination. Therefore, only compatible pumps, control valves, piping, and



application devices must be used. The design of fluid transfer systems must be as given in the fluid manufacturers' recommendations.

- SAE Type II, Type III and IV deicing/anti-icing fluids, if heated, must be heated in a manner to preclude fluid degradation in storage or application. The integrity of the fluid after heating must be checked periodically. Factors like heating rate and heating time cycles must be considered while you determine the frequency of fluid inspections. Refer to fluid manufacturer's recommendations.

- (9) The decision on the best method to do the tasks in this section must agree with each operator's experience, equipment and materials available, and local conditions.

**NOTE:** It is recommended the two-step procedure, whenever it is possible, to prevent type-II, III or IV fluid residue accumulation.

B. References

REFERENCE	DESIGNATION
AMM TASK 05-50-10-200-801-A/600	ICING OR SNOWING INSPECTION
AMM TASK 10-10-01-500-801-A/200	AIRCRAFT NORMAL PARKING
AMM TASK 12-30-01-200-801-A/600	DE-ICING/ANTI-ICING FLUID RESIDUES - GENERAL VISUAL INSPECTION
AMM TASK 49-16-01-000-801-A/400	APU AIR INTAKE DUCT - REMOVAL

C. Zones and Accesses

Not Applicable

D. Tools and Equipment

Not Applicable

E. Auxiliary Items

Not Applicable

F. Consumable Materials

SPECIFICATION (BRAND)	DESCRIPTION	QTY
Commercially available	Deicing and/or deicing/anti-icing fluid	AR

G. Expandable Parts

Not Applicable

H. Persons Recommended

QTY	FUNCTION	PLACE
1	Does the task	To drive the truck
1	Does the task	To apply the fluid on the aircraft

## I. Guidelines

- (1) You must regularly remove the snow from a parked aircraft. This will prevent a large quantity of snow and ice accretion on the aircraft. This practice also minimizes the possibility of ice accretion on the aircraft surfaces.
  - (a) To find the quantity of deicing/anti-icing fluid to use in the deicing mixture at a given temperature, refer to the airline procedure or the manufacturer's specifications for the fluid that you use.
  - (b) Use hot water or heated deicing fluid for best results in ice, frost, or snow removal. A fine-to-medium spray is recommended for best dispersion of the fluid across a large area of ice, frost, or snow for maximum melting.
  - (c) Refer to the manufacturer's specification for the deicing fluid dilution versus the temperature measured. The lower of the ambient temperature or aircraft surface temperature must be used as the reference temperature. If the melted ice or snow, mixed with deicing fluid, freezes again on the aircraft as it runs off, it shows that a larger concentration of deicing fluid is necessary.

**WARNING: DO NOT APPLY TYPE II, III OR IV FLUID MANY TIMES WITHOUT SUBSEQUENT APPLICATION OF SAE AMS 1424 TYPE I FLUID OR HOT WATER. IF YOU DO NOT OBEY THIS PRECAUTION, RESIDUES CAN COLLECT IN AERODYNAMICALLY QUIET AREAS, CAVITIES, AND GAPS. THE RESIDUES CAN BECOME A LIQUID AGAIN AND FREEZE UNDER CERTAIN TEMPERATURES AND HIGH HUMIDITY CONDITIONS. AS A RESULT, DAMAGE TO THE FLIGHT CONTROL SYSTEM CAN OCCUR.**

- (d) For long anti-icing protection a coat of undiluted anti-icing fluid type II, III or IV previously applied on dry and cleaned surfaces of a parked aircraft will give it some protection against ice, snow, or frost accretion. It may be necessary to apply anti-icing fluid several times to keep the aircraft protected. Local conditions and the duration of parking time will indicate the frequency of application.
- (e) The anti-icing fluid can also be applied on an aircraft which landed in precipitation conditions, where the air temperature is lightly above freezing. Because the aircraft external surfaces can be below the freezing point, ice can form and adhere to the surface.
- (f) Location for Deicing/Anti-Icing:

- 1 If the aircraft is moved from a warm hangar to an open location during freezing precipitation, do one of the steps that follow:
      - a Do the anti-icing procedure before the aircraft is moved out of the warm hangar.
      - b Let the aircraft temperature decrease below freezing, before it is moved out of the hangar.

**NOTE:** Anti-icing application will decrease the possibility that the ice or snow melts when it touches the warm aircraft and then freezes again.

- 2 If you use unheated water to remove the ice and frost, do the steps that follow:

- a Do the procedure in warm hangar.
- b If anti-icing fluid is not applied, then keep the aircraft in the warm hanger until it is dry.

**NOTE:** It will be necessary to examine those areas where water can collect and freeze. Application of anti-icing fluid will keep the drying requirements to a minimum.

- (g) When there is slush on runways, examine the aircraft for collected slush and damage to the structure:
- 1 Examine leading edges, air intakes, engine air inlets, flaps, ailerons, rudder, elevators, water drains, and skin panels for collected ice. Remove the ice if it is necessary:
  - 2 Examine the landing gear wheelwell areas for ice and snow collection and packing. Remove the ice if it is necessary.

(2) Necessary Precautions:

- (a) Do not dispatch the aircraft for take-off when the wings or tail surfaces have an adhering layer of ice, snow, slush, or frost.

**NOTE:** • Be specially careful with the wing and horizontal-stabilizer leading edges.  
• Frost on the bottom of the wings under the fuel tanks can occur when the fuel temperature is low, the outside air temperature is above freezing, and humidity is high. Takeoff with frost on the fuel tank under wing surfaces is permitted, if frost is not more than 3 mm (1/8 in).

- (b) The aircraft must be treated symmetrically, that is, left hand and right-hand sides must get the same and complete treatment.

**NOTE:** Symmetrical treatment prevents aerodynamic problems.

(c) Engines and APU precautions:

**CAUTION:** • EMBRAER AND SUNDSTRAND DO NOT RECOMMEND APU OPERATION DURING THE AIRCRAFT DEICING/ANTI-ICING PROCEDURE. IF THE APU IS KEPT IN OPERATION DURING THE DEICING/ANTI-ICING PROCEDURE, DAMAGE CAN OCCUR TO IT. IF APU OPERATION IS ABSOLUTELY NECESSARY, MAKE SURE THAT THE APU BLEED AIR VALVE IS CLOSED, PACKS ARE SET AT OFF, AND THE DEICING/ ANTI-ICING FLUID WILL NOT BE APPLIED DIRECTLY TO OR NEAR THE APU AIR INLET. IF YOU DO NOT OBEY THESE INSTRUCTIONS. THE FLUID CAN GO INTO THE INLETS. THIS CAN CAUSE APU OVERSPEED AND/OR WHEEL BURST. AS A RESULT, DAMAGE TO EQUIPMENT CAN OCCUR.  
• DO NOT APPLY FLUID DIRECTLY INTO THE ENGINE AND/OR APU AIR INLETS. MAKE SURE THAT THE ENGINE AND/OR APU BLEED VALVES ARE CLOSED.

- 1 The engines are usually shut down, but can stay in operation at idle. The bleed valves must be closed during the deicing/anti-icing operations.
- 2 If the engines or APU are in operation, the ground crew must monitor and keep away from the areas shown in [Figure 202](#):
  - (d) Do not use hard or sharp tools to remove the ice from the airplane surface.
  - (e) Do not apply hot fluid or hot water directly on cold windshields and windows, or crazing can occur.

**CAUTION: REMOVE ALL DEICING AND ANTI-ICING FLUIDS FROM THE WINDSHIELDS BEFORE THE AIRCRAFT TAKES OFF. THE FLUIDS CAN CAUSE BLURRED VISION OF THE CREW MEMBERS AND DAMAGE TO THE WINDSHIELDS AND WIPERS.**

- (f) Do not apply fluid directly to the cockpit windshields.
- (g) Do not apply fluid directly to or into these sensors and probes, to prevent damage to them:
  - 1 • Pitot Sensors/Pitot/Static Sensor;
  - Anemometric and Pressurization Static Ports;
  - TAT Probes;
  - Ice Detectors;
  - Angle-of-Attack (AOA) Sensors.
- (h) Do not apply fluid into the fuselage openings:
  - air scoops;
  - vents;
  - NACA air inlets, etc.

**CAUTION: THE REPEATED APPLICATION OF TYPE II, III OR IV FLUIDS, WITHOUT SUBSEQUENT APPLICATION OF TYPE I FLUID OR HOT WATER, CAN CAUSE RESIDUES TO COLLECT IN AERODYNAMICALLY QUIET AREAS, CAVITIES, AND GAPS. THE RESIDUES CAN REHYDRATE AND FREEZE UNDER CERTAIN TEMPERATURES AND HIGH HUMIDITY CONDITIONS. CONTROL SURFACES MUST BE INSPECTED AND FROM FLUID RESIDUES CLEARED OFF IN TEMPORARY INSPECTIONS AS A FUNCTION OF THE AIRCRAFT OPERATION.**

- (i) The application of hot water or heated Type-I fluid in the first step of the deicing/anti-icing process can keep the formation of residues to a minimum in the aerodynamically quiet areas, cavities, gaps, and flight control systems.
- (j) Do a periodic inspection of the control surfaces to remove all residual deicing/anti-icing fluid ([AMM TASK 12-30-01-200-801-A/600](#)). Operators must define this interval period as a function of their particular operation and experience.

- (k) Do a periodic inspection in the APU compartment to remove all residual deicing/ anti-icing fluid from the compartment. Operators must define this interval period as a function of their particular operation and experience.

**NOTE:** You can remove the deicing/Anti-icing fluid with an approved cleaner and soft cloth.

- (l) Forced air method, necessary precautions:

- 1 Forced air can not remove adhering contaminants and therefore will not eliminate the need for deicing processes.
- 2 Forced air can not be directed into engines, auxiliary intakes/exhausts or the Pitot/Static/AOA sensor, Static Port and TAT.
- 3 Forced air must not be used in areas that are made of rubber, plastic or other soft material, because damage may result.
- 4 Forced air must not be used near windscreen wipers, because damage may result.
- 5 When you remove ice, snow or slush from the landing gear and wheel bays areas, take care as debris can cause damage to the components.
- 6 When you remove ice, snow or slush from the aircraft surfaces, take care to prevent it from entering and accumulating in aerodynamically quiet areas such as control surface hinge areas or from entering engine inlets as special inspections may then be required.
- 7 Take care to prevent loose debris from impacting personnel or other aircraft surfaces.
- 8 Forced air applications can not eliminate the need for deicing/anti-icing processes.
- 9 A subsequent inspection of the critical surfaces will be required after the use of forced air.

**J. Preparation**

**SUBTASK 841-002-A**

- (1) Before the application of a deicing/anti-icing method, do the steps that follows:
- (a) Make sure that the aircraft is correctly parked [AMM TASK 10-10-01-500-801-A/200](#) and/or with the parking brake on.
  - (b) Set the flaps to the 0-degree position.
  - (c) Set the aileron and rudder surfaces to the neutral position.
  - (d) Set the gust lock lever to the locked position.
  - (e) Set Pitch Trim to a position between 0° and FULL NOSE DOWN. Thus, the horizontal-stabilizer leading edge will be fully UP.
  - (f) Make sure that all doors and cockpit direct-vision windows are closed.



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- (g) Make sure that the engines and APU bleed shut-off valves are closed.
- (h) Make sure that the air conditioning packs are in the off position to prevent cabin contamination with the fumes generated from ingestion of deicing/anti-icing fluids in the engine/APU.
- (2) If there is snow or ice accumulation on the airplane surface, do the procedure that follows for the mechanical removal:

**CAUTION:** • DO NOT USE SHARP TOOLS TO REMOVE ICE FROM THE AIRCRAFT.

- DO NOT USE TOOLS TO SCRAPE OR SCRATCH COMPACTED SNOW FROM THE AIRFRAME SURFACES OR FROM THE GAPS BETWEEN FIXED OR MOVABLE SURFACES.

- (a) You can mechanically remove soft snow if you blow cold air across the airplane surface, or use brooms, ropes, soft hand or rubber scrapers, or a squeegee as follows:
  - 1 With a maintenance lift truck or deicer equipment to get access, pull the snow off the surfaces. Do not try to walk or stand on the aircraft.
  - 2 Control the vehicle along the leading and trailing edges and remove as much snow as possible.
  - 3 A squeegee with a 0.609-meter (24 inch) non-marking hard rubber edge works best. But stiff-bristle brooms can be used. Metal surfaces on the broom or squeegee (attaching hardware included) must be correctly padded to prevent damage to the aircraft surfaces.
  - 4 A 1/2-inch rope with knots approximately 1.524 meters (5 feet) apart can be used to remove snow from the fuselage. Put the rope on the fuselage and, with a person on each side, move the rope rearward and forward in a "sawing" movement while you slowly move along the length of the aircraft.
  - 5 Remove the snow/ice accumulation from the engine intakes. Frozen deposits that adhere to the lower surface of the intake or to the fan blades must be removed with application of hot air.

K. Deicing/Anti-icing Fluid Application Procedures

SUBTASK 861-002-A

**WARNING: IF THE ENGINES OR APU ARE IN OPERATION, THE GROUND CREW MUST MONITOR AND KEEP AWAY FROM THE AREAS SHOWN IN FIGURE 202.**

**WARNING: MAKE SURE THAT THE TECHNICIAN IS TRAINED AND IS PREPARED TO DO THESE PROCEDURES.**

- (1) Deicing/anti-icing fluid application. It can be done in one or two steps.
  - (a) One-step deicing/anti-icing:

- 1 You will do it with an anti-icing fluid. The satisfactory fluid concentration is related to the necessary holdover time (related to the OAT) and to the weather conditions.

NOTE: • Refer to the fluid manufacturer's specifications for fluid mixture, if applicable, and holdover times.  
• The wing skin temperature can be different from the OAT. If it is lower than the OAT, you can use a stronger mixture.

(b) Two-step deicing/anti-icing:

- 1 You will do the first step with heated deicing fluid. The correct deicing fluid mixture is related to the OAT.
  - a Apply hot water or a hot mixture of deicing fluid and water to remove the ice, snow, slush or frost from the aircraft surfaces.
- 2 You will do the second step with anti-icing fluid. This fluid and its concentration are related to the necessary holdover time (related to the OAT) and to the weather conditions.
  - a Apply an overspray of anti-icing fluid or a mixture of them with heated water. You must do this step 3 minutes after the first step, area by area and not letting that the liquid freezes again on the aircraft surface.

NOTE: Refer to the fluid manufacturer's specifications for fluid mixture, if applicable, and holdover times.

**WARNING: ANTI-ICING/DEICING FLUID IS TOXIC. DO NOT BREATHE ITS MISTS OR SPRAY DURING APPLICATION. DO NOT LET THE MATERIAL TO GET INTO YOUR EYES. DO NOT LET IT TO STAY ON YOUR SKIN FOR A LONG TIME. WEAR THE CORRECT PROTECTIVE CLOTHING.**

(2) Deicing Fluid Application:

- (a) Use the minimum fluid mixture possible for the temperature you have. Refer to the fluid manufacturer's specification for the recommended concentrations.

(b) For maximum effectiveness and minimum consumption:

- 1 The solution must be heated and applied near the aircraft surfaces:

NOTE: • The fluid temperatures must not be higher than 93°C (200°F)  
• The correct temperature is 60°C (140°F) minimum at the nozzle.

- 2 Adjust the fluid stream to a pressure that will not be higher than 10 psi in an area of 25 in<sup>2</sup>(161.3 cm<sup>2</sup>) on the aircraft surface. Larger fluid stream pressures can cause damage to the aircraft surfaces.

**WARNING: DO NOT APPLY FLUIDS DIRECTLY TO THE POINTS SHOWN IN FIGURE 201.**

- (c) The deicing fluid must be applied, as necessary, to the areas shown in the Application Diagram of [Figure 203](#) only.

**CAUTION:** DO NOT POINT SOLID FLUID STREAM DIRECTLY TO THE SURFACE. APPLY AT A LOW ANGLE TO PREVENT DAMAGE TO THE AIRCRAFT SURFACES. DO NOT USE HIGH-PRESSURE SPRAY TO REMOVE ICE AND SNOW OFF THE AIRCRAFT SURFACES. LARGER FLUID STREAM PRESSURES CAN CAUSE DAMAGE TO THE AIRCRAFT SURFACES.

- (d) Apply only the necessary quantity of fluid to remove the ice or snow and let a light coating of fluid stay on the aircraft. Stop until the heated fluid works and dissipates the ice or snow. Do not soak or flush the aircraft.

- (e) Set the spray nozzle to keep the fluid consumption to a minimum. Obey the instructions that follow:

1 Frost, fog, or light mist setting:

- If there is no wind, use the smallest solid stream setting (30 GPM, approximately).

2 Light-to-moderate snow:

- Use the smallest solid stream setting (30 GPM, approximately). In windy conditions, it can be necessary to use the second solid-stream setting (60 GPM, approximately).

3 Ice:

- Try to remove loose ice from the aircraft skin. Use small solid-stream setting (30 GPM).

- (f) Always apply fluid to the aircraft high points with wide sweeping movements. Make sweeping movements, as necessary, and let the fluid run on the surface. Do not hold the spray nozzle in one location until the snow dissipates.

- (g) In strong winds, do the steps that follow:

**NOTE:** Wind conditions will decrease the temperature on the aircraft skin and put the stream of fluid out of shape.

1 Put the aircraft upwind.

2 Point the spray fluid downwind and let the wind help carry the fluid to the aircraft surface.

3 Apply the spray as near to the surface as possible.

(3) Hot-Water Deicing Application:

- (a) Water heated to 82°-93°C (180°-200°F) can be used satisfactorily to remove ice or snow from the aircraft surfaces when the ambient temperature is - 3°C (27°F), stable or on the increase.

- (b) To not let that water freezes again, anti-icing fluid must be applied to the surface immediately after you remove ice with hot water.

- (c) Optionally add 10% glycol to the hot water tank. This will keep to a minimum the freezing of the remaining water in the equipment that you used to remove the ice.

(4) Anti-Icing Fluid Application:

- (a) Remove the snow from the aircraft surfaces before the anti-icing fluid is applied.

- (b) The decision as to anti-ice is related to some of these conditions:

- 1 The ambient air temperature.
- 2 The anticipated ambient air temperature changes.
- 3 The moisture content of the air (humidity).
- 4 The amount and type of precipitation which occurs.
- 5 The length of time that the aircraft will stay on the ground or the holdover time.

- (c) Regular Use:

**CAUTION: DO NOT APPLY FLUIDS DIRECTLY TO THE POINTS SHOWN IN FIGURE 201.**

- 1 Anti-icing fluid must be applied, as necessary, to the aircraft surfaces when freezing precipitation can adhere to the aircraft (at the time of dispatch), in the areas shown in the Application Diagram of [Figure 204](#).

- (d) Optional Use:

- 1 When you get a frost, snow, freezing rain, or freezing fog warning from the local meteorological service, apply anti-icing fluid to clean the aircraft surfaces before the start of the freezing precipitation. This will keep to a minimum the possibility that the snow and ice bond or decrease the accumulation of frozen precipitation on the aircraft surfaces. It makes the subsequent deicing easier.

- (e) The anti-icing fluid can also be applied on an aircraft which landed in precipitation conditions, where the air temperature is lightly above freezing. Because the aircraft external surfaces can be below the freezing point, ice can form and adhere to the surface.

- (f) General:

- 1 For a satisfactory anti-icing, a film of fluid is necessary on the aircraft surfaces which are clean or which were deiced. For longer anti-icing protection, undiluted, unheated Type II or IV fluid must be used. The high fluid pressures and flow rates usually related to deicing are not necessary for this operation and, where possible, pump speeds must be decreased as necessary. The nozzle of the spray gun must be adjusted to give a medium spray.

**NOTE:** • Undiluted fluid is usually applied cold to the surfaces of the aircraft.

- Type-I fluids are not satisfactory when used for anti-icing and gives a minimum holdover time.

(g) Anti-Icing Fluid Strategy:

**CAUTION:** IT IS POSSIBLE THAT THE ANTI-ICING FLUIDS DO NOT FLOW UNIFORMLY ON THE WING LEADING EDGES AND ON THE HORIZONTAL AND VERTICAL STABILIZERS. THESE SURFACES MUST BE MONITORED TO MAKE SURE THAT THEY ARE CORRECTLY COATED WITH FLUID.

- 1 Do the anti-icing procedure as near the departure time as possible to better use the available holdover time. Distribute the anti-icing fluid uniformly. To control the uniformity, do a visual check on all horizontal aircraft surfaces during application of the fluid. The necessary amount will be visually shown by the fluid that starts to drip off the leading edge and trailing edge.

(h) Fluid-Related Limits:

**CAUTION:** AN AIRCRAFT THAT WAS ANTI-ICED MUST NOT GET OTHER COATING OF ANTI-ICING FLUID DIRECTLY ON TOP OF THE CONTAMINATED FILM. IF A NEW PROTECTION BEFORE THE NEXT FLIGHT IS NECESSARY, FIRST DEICE THE EXTERNAL SURFACES (AND REMOVE ALL RESIDUES) WITH A HOT DEICING FLUID MIXTURE AND THEN APPLY NEW ANTI-ICING FLUID.

- 1 For the application of the deicing/anti-icing fluids, refer to the fluid manufacturer's specifications

(5) Forced Air method application:

- (a) You can remove the snow (that does not adhere to the surface) with forced air. Use the pressure supply unit and apply the forced air to the surfaces:
  - From a distance of 1,5 to 6 m (5 to 20 ft).
  - With a maximum pressure of 34,5 kPa (5 psi).
  - At the minimum angle to the surface.

(6) For effective removal of snow and ice, use the procedures that follow:

**NOTE:** Always apply fluid in the aft direction. This is to prevent fluid accumulation in aerodynamically quiet areas.

(a) Wing deicing procedure:

**CAUTION:** BE CAREFUL WHEN YOU REMOVE ICE AND SNOW FROM WING SURFACE WHERE VORTEX GENERATORS ARE INSTALLED NOT TO CAUSE DAMAGE TO THEM.

- 1 Spray the fluid from the wing tip inboard to the root and sweep from the leading edge to the trailing edge.

- NOTE: • No frozen contamination is permitted on the wing upper surface.
- Frost on the bottom of the wings under the fuel tanks can occur when the fuel temperature is low, the outside air temperature is above freezing, and humidity is high. Takeoff with frost on the fuel tank under wing surfaces is permitted, if it is not more than 3 mm (1/8 in).

2 Tactile Inspection:

1. Inspection by touch is necessary if with a visual inspection it is not possible to be sure that all forms of snow and ice were removed.
- 3 You can remove the snow (that adheres to the surface), frost, slush and the ice with hot air.

NOTE: The hot air temperature must not be greater than 80°C (176°F) on this area.

(b) Elevator and Tail deicing procedure:

CAUTION: • BE CAREFUL WHEN YOU REMOVE ICE AND SNOW FROM WING AND TAIL SURFACES WHERE VORTEX GENERATORS ARE INSTALLED NOT TO CAUSE DAMAGE TO THEM.

- MAKE SURE THAT YOU DEICE/ANTI-ICE THE ENTIRE TAIL SURFACE (TOP, BOTTOM AND LEADING EDGE) TO MAKE SURE OF COMPLETE REMOVAL OF ALL TRACES OF SNOW, SLUSH, ICE, AND/OR FROST ACCUMULATION.
- THE PITCH TRIM MUST BE POSITIONED BETWEEN ZERO AND FULL NOSE-DOWN POSITION.

- 1 Spray fluid from the surface tip inboard to the root and sweep from the leading edge to the trailing edge, obey the procedures that follow:
- 2 Horizontal-Stabilizer Fluid Spraying - Recommended Procedures ([Figure 208](#)):
  - a Up to 45-degree Angle Fluid Application (from leading edge to trailing edge), refer to DET. 1.
  - b Cross-Spraying Fluid Application (truck on the left side of the aircraft, with the spray pointed at the right elevator/stabilizer), refer to DET. 2.
  - c Straight Fluid Application (from leading edge to trailing edge), refer to DET. 3.
- 3 Horizontal-Stabilizer Fluid Spraying - Not Recommended Procedures ([Figure 208](#)):
  - a Back Spraying Fluid Application (from trailing edge to leading edge), refer to DET. 4.

- b Side Spraying Fluid Application, refer to DET. 5.
- 4 You can remove the snow (that adheres to the surface), frost, slush and the ice with hot air.

NOTE: The hot air temperature must not be greater than 80°C (176°F) on this area.

- (c) Vertical Surfaces/ Winglets deicing procedure ([Figure 208](#)):

CAUTION: IF APPLICATION TO THE RUDDER SURFACE IS DONE, BE CAREFUL NOT TO LET FLUIDS TO FLOW OFF INTO THE APU.

- 1 Vertical Surface/ Winglet Fluid Spraying - Permitted Procedure:

- a Start at the top and then work down.
  - b Apply the fluid at an angle of less than 45 degrees in relation to the aircraft centerline to prevent fluid spills into the APU during the vertical stabilizer fluid spraying.
  - c You can remove the snow (that adheres to the surface), frost, slush and the ice with hot air.

NOTE: The hot air temperature must not be greater than 80°C (176°F) on this area.

**WARNING: THE REPEATED APPLICATION OF TYPE II, III OR IV FLUIDS, WITHOUT SUBSEQUENT APPLICATION OF TYPE I FLUID OR HOT WATER, CAN CAUSE RESIDUES TO COLLECT IN AERODYNAMICALLY QUIET AREAS, CAVITIES, AND GAPS. THE RESIDUES CAN REHYDRATE AND FREEZE UNDER CERTAIN TEMPERATURES AND HIGH HUMIDITY CONDITIONS. CONTROL SURFACES MUST BE INSPECTED AND FROM FLUID RESIDUES CLEARED OFF IN TEMPORARY INSPECTIONS AS A FUNCTION OF THE AIRCRAFT OPERATION.**

- (d) Do a periodic inspection of the control surfaces to remove all residual deicing/ anti-icing fluid ([AMM TASK 12-30-01-200-801-A/600](#)). Operators must define this interval period as a function of their particular operation and experience.
- (e) Fuselage deicing procedure:

**CAUTION:** • DO NOT APPLY FLUID INTO THE FUSELAGE OPENINGS, SUCH AS AIR SCOOPS, VENTS, NACA AIR INLETS, ETC. IF THIS FLUID COLLECTS, SUBSEQUENT SYSTEM MALFUNCTIONS AND COMPONENT DAMAGE WILL OCCUR.

- ICE ON THE FUSELAGE MUST BE REMOVED. IF NOT, IT CAN GO INTO THE ENGINES IN OPERATION. A THIN LAYER OF HOAR FROST WHERE YOU CAN SEE THE AIRCRAFT MARKINGS ON THE FUSELAGE IS PERMITTED.
- BE CAREFUL WHEN YOU REMOVE ICE AND SNOW FROM THE FUSELAGE WHERE LIGHTS, TUBES, SENSORS, PROBES, AND ANTENNAS ARE INSTALLED NOT TO DAMAGE TO THE EQUIPMENT.

1 Spray along fuselage top centerline and then outboard. Let the fluid cascade down and across the windows.

**NOTE:** Do not let the direct spray hit windows and window seals, doors, and door seals.

2 You can remove the snow (that adheres to the surface), frost, slush and the ice with hot air.

**NOTE:** The hot air temperature must not be greater than 80°C (176°F) on this area.

(f) Nose radome, Windows and Windshields deicing procedure:

1 Nose radome and adjacent areas must be clear from ice and snow to prevent the ice and snow from blowing back to the windshield, thus degrading the pilots' vision during taxiing and takeoff.

**CAUTION:** • DO NOT APPLY HOT FLUID OR HOT WATER DIRECTLY ON COLD WINDSHIELDS AND WINDOWS, OR CRAZING CAN OCCUR.

- DO NOT APPLY FLUID DIRECTLY TO THE COCKPIT WINDSHIELDS. THE FLUID ON THE WINDSHIELDS MUST BE FULLY REMOVED BEFORE THE AIRCRAFT TAKES OFF. DEICING/ANTI-ICING FLUIDS WILL CAUSE BLURRED VISION OF THE CREW MEMBERS.

2 Remove all collected ice from the windshield wiper blades.

3 Remove all deicing/anti-icing fluid from the cockpit windows before the departure. Carefully examine the windows with the wipers installed. Make sure that fluid is removed from all the forward areas where it can flow back on the windshields during the taxi and takeoff. These areas must be clean before the departure.

**NOTE:** • You can remove the deicing/anti-icing fluid with an approved cleaner and a soft cloth.

- Before you clean the windshield, make sure that the windshield heating system is switched off.

- 4 You can remove the snow (that adheres to the surface), frost, slush and the ice from the nose radome with hot air.

NOTE: The hot air temperature must not be greater than 80°C (176°F) on these areas.

- (g) Sensors deicing procedure:

CAUTION: DO NOT APPLY FLUID DIRECTLY TO OR INTO THE PITOT SENSORS/PITOT/STATIC SENSOR/ANEMOMETRIC AND PRESSURIZATION STATIC PORTS/TAT PROBES/ICE DETECTORS/ANGLE-OF-ATTACK (AOA) SENSORS. APPLY THE FLUIDS ABOVE THE PROBES AND THEN LET THEM RUN DOWN.

- 1 Examine and remove all ice attached to the surface which is in a radius of two feet from:

- Pitot sensors;
- Pitot/static sensors;
- Anemometric and pressurization static ports;
- Total Air Temperature (TAT) probes;
- Angle-of-attack (AOA) sensors;
- Ice detectors.

- 2 If ice cause blockage of the static port holes or Pitot/Static/AOA sensors, carefully apply hot air until the ice melts.

NOTE: The hot air temperature must no be greater than 80°C (176°F) on these areas.

- (h) Deicing procedures of Engine and APU:

NOTE: The engines are usually shut down but may stay in operation at idle during deicing/anti-icing operations.

**WARNING: IF THE ENGINES OR APU ARE IN OPERATION, THE GROUND CREW MUST MONITOR AND KEEP AWAY FROM THE AREAS SHOWN IN FIGURE 202.**

**CAUTION:** • DO NOT APPLY FLUID DIRECTLY INTO THE ENGINE AND/OR APU AIR INLETS. MAKE SURE THAT THE ENGINE AND/OR APU BLEED VALVES ARE CLOSED.

- EMBRAER AND SUNDSTRAND DO NOT RECOMMEND APU OPERATION DURING THE AIRCRAFT DEICING/ANTI-ICING PROCEDURE. IF THE APU IS KEPT IN OPERATION DURING THE DEICING/ANTI-ICING PROCEDURE, DAMAGE CAN OCCUR TO IT. IF APU OPERATION IS ABSOLUTELY NECESSARY, MAKE SURE THAT THE APU BLEED AIR VALVE IS CLOSED, PACKS ARE SET AT OFF, AND THE DEICING/ANTI-ICING FLUID WILL NOT BE APPLIED DIRECTLY TO OR NEAR THE APU AIR INLET. IF YOU DO NOT OBEY THESE INSTRUCTIONS, THE FLUID CAN GO INTO THE INLETS. THIS CAN CAUSE APU OVERSPEED AND/OR WHEEL BURST. AS A RESULT, DAMAGE TO EQUIPMENT CAN OCCUR.
- MAKE SURE THAT ALL BLEED AIR SOURCES (ENGINE AND APU) ARE CLOSED WHEN YOU DO THE PROCEDURE WITH THE ENGINES OR APU IN OPERATION. ENGINE AND APU BLEED AIR VALVES MUST BE CLOSED, AND PACKS MUST BE SET TO OFF.
- MAKE SURE THE APU INLET AREA IS CLEAR BEFORE YOU START THE APU. THE ICE OR SNOW THAT COLLECTED IN THE INLET AREA, CAN CAUSE DAMAGE TO THE APU.
- AFTER DEICING/ANTI-ICING PROCEDURE IS COMPLETE, WAIT A MINIMUM OF ONE MINUTE TO USE THE ENGINE AND/OR APU BLEED AND THREE MINUTES TO USE THE PACKS. THE GASES FROM THE DEICING/ANTI-ICING FLUID CAN GO INTO THE AIR CONDITIONING SYSTEM WHEN THE APU IS IN OPERATION.

- 1 Do not point the spray of deicing/anti-icing fluid directly into the engine or APU inlets, exhausts, engine thrust reversers, scoops, vents, drains, etc.
- 2 If there is accumulation of snow or ice accumulation in the engine or APU air inlet and/or surrounding area, remove it mechanically (with hands, spatula, hot air or other applicable tool).

**NOTE:** • Hot air can be used to remove ice, snow or slush from the engine or APU air inlets. The hot air temperature must be no greater than 93°C (200°F).

- If necessary, remove the APU intake. Refer to [AMM TASK 49-16-01-000-801-A/400](#).
- Forced air shall not be directed into engines and/or auxiliary intakes/exhausts.

- 3 Conduct a periodic inspection in the APU compartment to remove all residual deicing/ anti-icing fluid from the compartment. Operators should

define this interval period according to their particular operation and experience.

NOTE: Do not use forced air into the APU inlet/outlet

- (i) Landing Gear deicing procedure:

**WARNING: THE BRAKES MUST BE COOL (YOUR HAND CAN BE HELD ON THE BRAKE HOUSING) BEFORE YOU APPLY ANTI-ICING/DEICING FLUID TO THE WHEEL AREA.**

**CAUTION:** • DO NOT APPLY DEICING FLUID TO THE WHEELS AND BRAKES NOT TO CAUSE THEIR INCORRECT OPERATION. IF IT OCCURS, THE WHEELS AND BRAKES MUST BE REPLACED.  
• DO NOT TRY TO MOVE THE AIRCRAFT IF THE TIRES ARE FROZEN TO THE GROUND. MAKE SURE THAT THE WHEELS TURN WHEN THE AIRCRAFT IS MOVED.

- 1 You can remove accumulations such as blown snow with other means than fluid (mechanically, forced air and hot air) from the wheels, wheel bays, brakes, or tires.
- 2 Warming and drying the brakes will help you prevent a frozen brake condition on pushback and/or taxi operation. If the wheel brakes are frozen, you can use hot air sources, focused directly towards the carbon disk heat stack. The hot air source must produce a high volume of air, in order to thaw and dry out the heat stack.

NOTE: • The hot air temperature must not be greater than 85°C (194°F) on these areas.  
• The GSE nozzle must be right angled to the LDG (parallel to ground).  
• The maximum air speed must not be greater than 400 km/h (250 mph).  
• Be careful not to cause damage to the equipment.

- 3 You can use a hot air source to remove the ice and to release the tires from the ground.
- 4 Make sure that there is not a layer of ice and/or snow on the movable parts and the position indication switches of the landing gear.
- 5 Keep the application of deicing fluid on the landing gear and wheel bays areas to a minimum.

NOTE: Do not spray deicing fluid directly on wheels and brakes.

- (j) Main-Door, Service-Door, and Baggage-Door Seals deicing procedure ([Figure 205](#), [Figure 206](#), and [Figure 207](#)):

To prevent from ice build up on door seals, do as follows:

- 1 Open the main-door, the service-door and the baggage-door.
- 2 Clean the door seals and the frame seals with a cloth dampened with Triton X-100 or equivalent detergent.
- 3 To prevent from ice build up on the door seals, do as follows:
- 4 Finish cleaning of the door seals and frame seals with a cloth moist with isopropyl alcohol (FED SPEC TT-I-735).
- 5 Apply Tiolon A-20 to the main-door, service-door, and baggage-door seals, and to the main-door and service-door frame seals.

**CAUTION:** DO NOT POINT THE SPRAY OF DEICING/ANTI-ICING FLUID DIRECTLY INTO THE DRAIN AREAS.

- (k) Waste water and condensation drains deicing procedure:

- 1 Make sure that all waste water and condensation drains on the aircraft have no ice or blockage.

**NOTE:** It is not necessary to seal the drains during deicing or anti-icing operation.

L. Follow-on

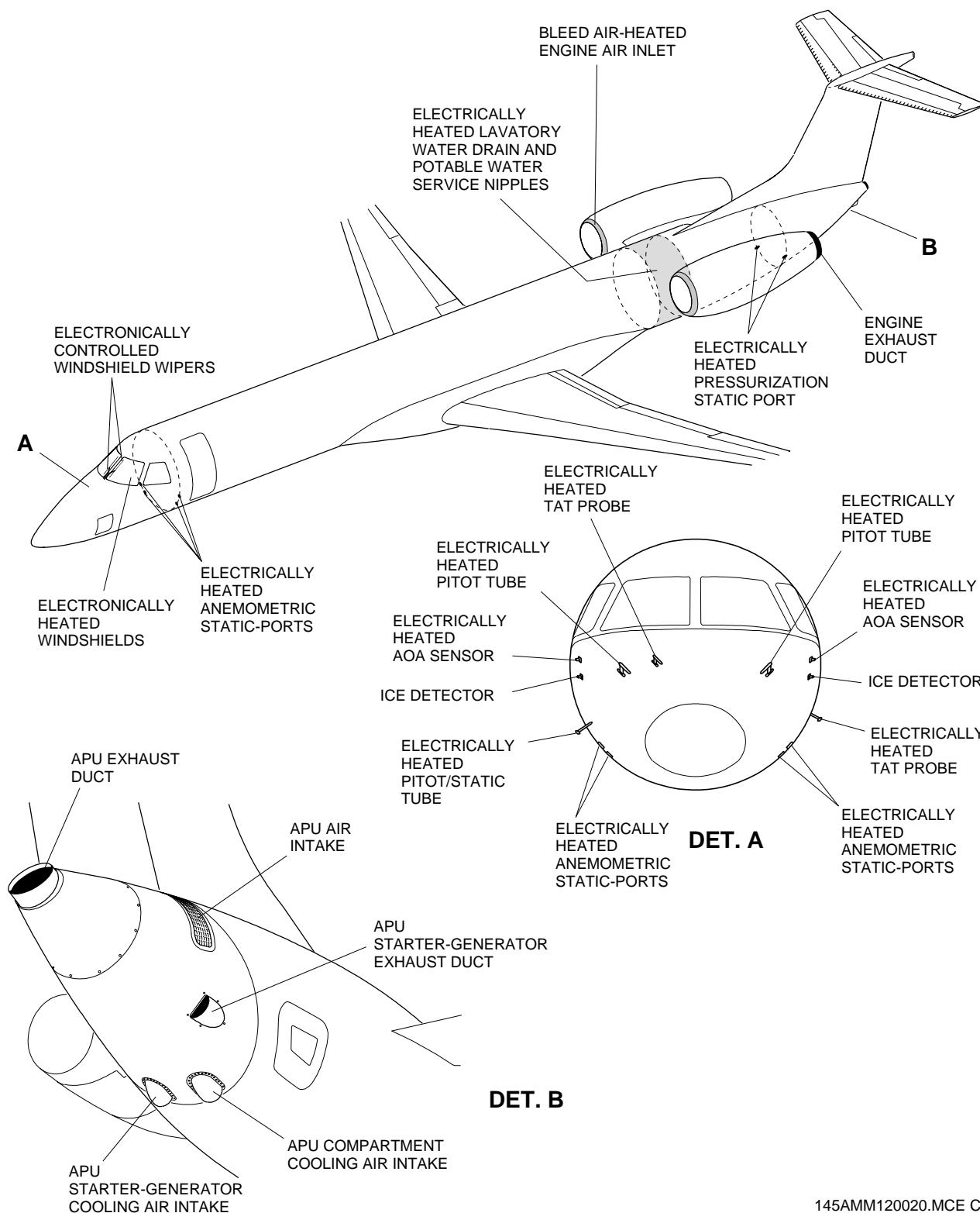
**SUBTASK 842-002-A**

- (1) Remove all tools, equipment, and unwanted materials from the work area.
- (2) Do the inspection/check procedure for ice or snow accumulation. Refer to **AMM TASK 05-50-10-200-801-A/600**.

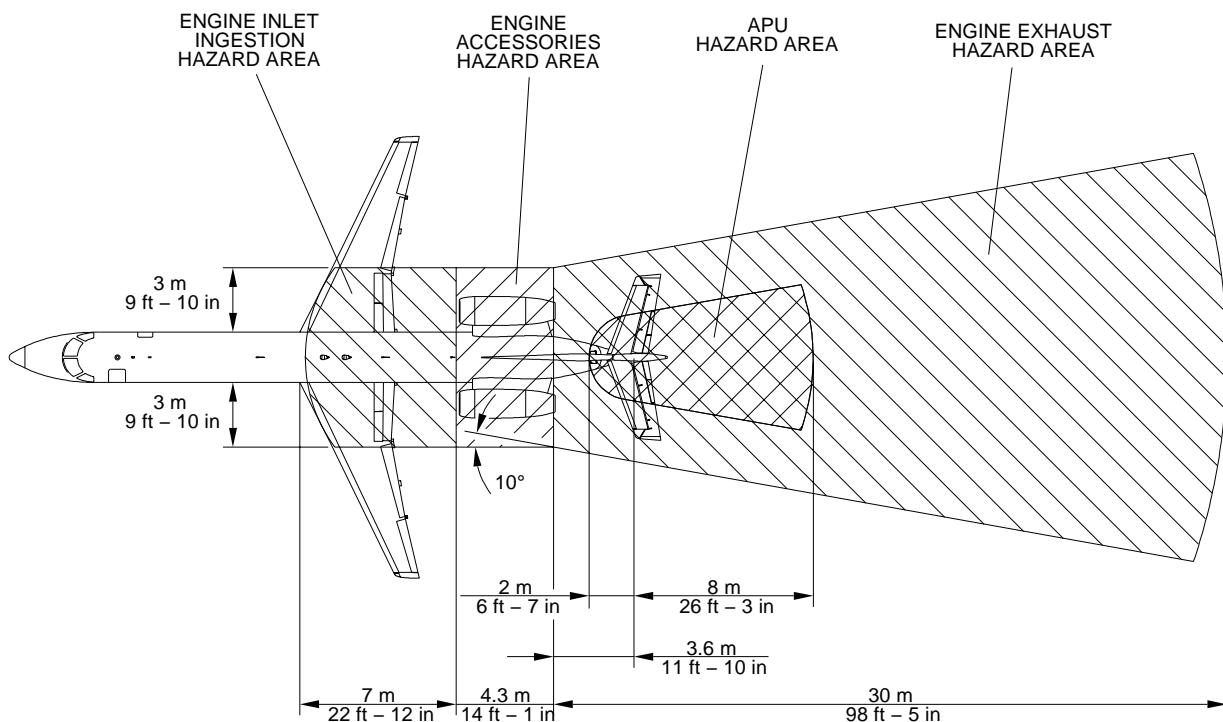
**EFFECTIVITY:: ALL**

Do Not Apply Fluids Directly to these Points

Figure 201



145AMM120020.MCE C

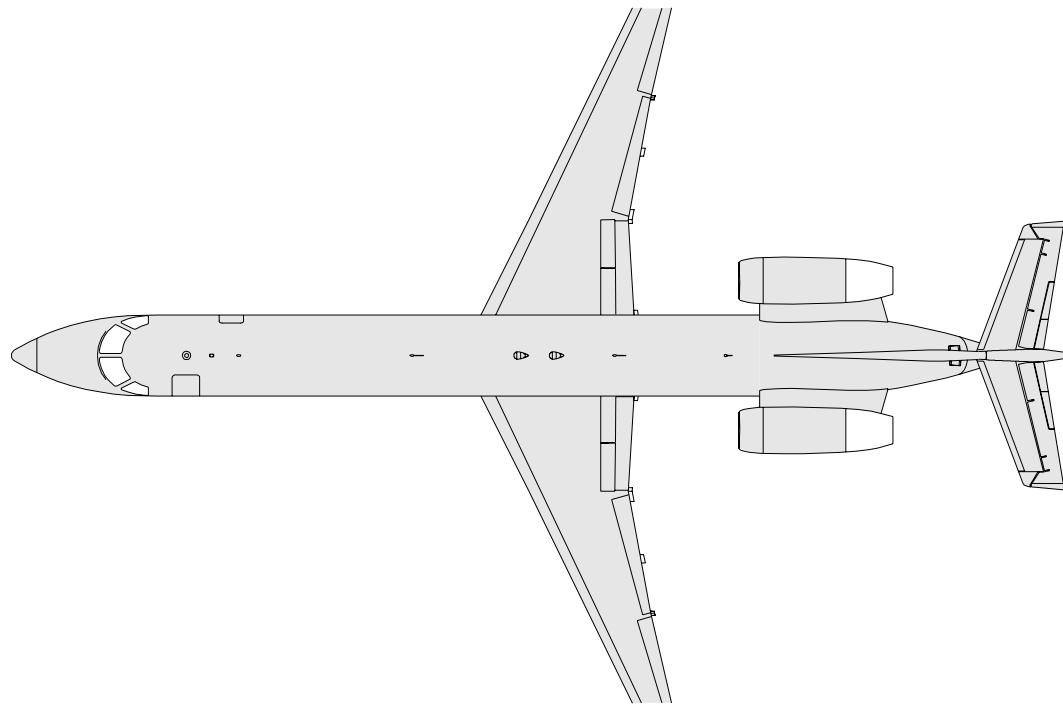
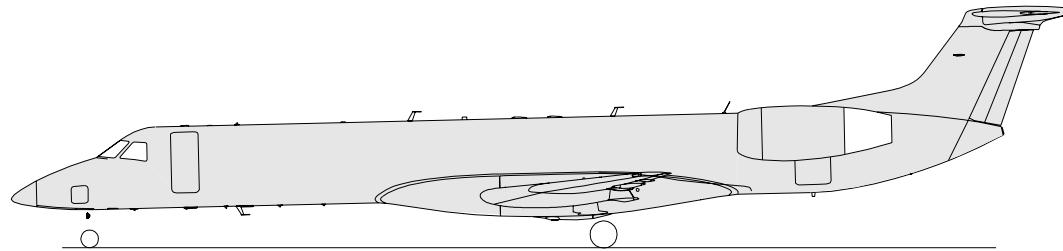
**EFFECTIVITY:: ALL**
**Hazard Areas**
**Figure 202**


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*EFFECTIVITY:: ALL*

Fluid Application Diagram for Deicing

Figure 203



DEICING FLUID APPLICATION AREAS.

DEICING FLUID NON-APPLICATION AREAS.

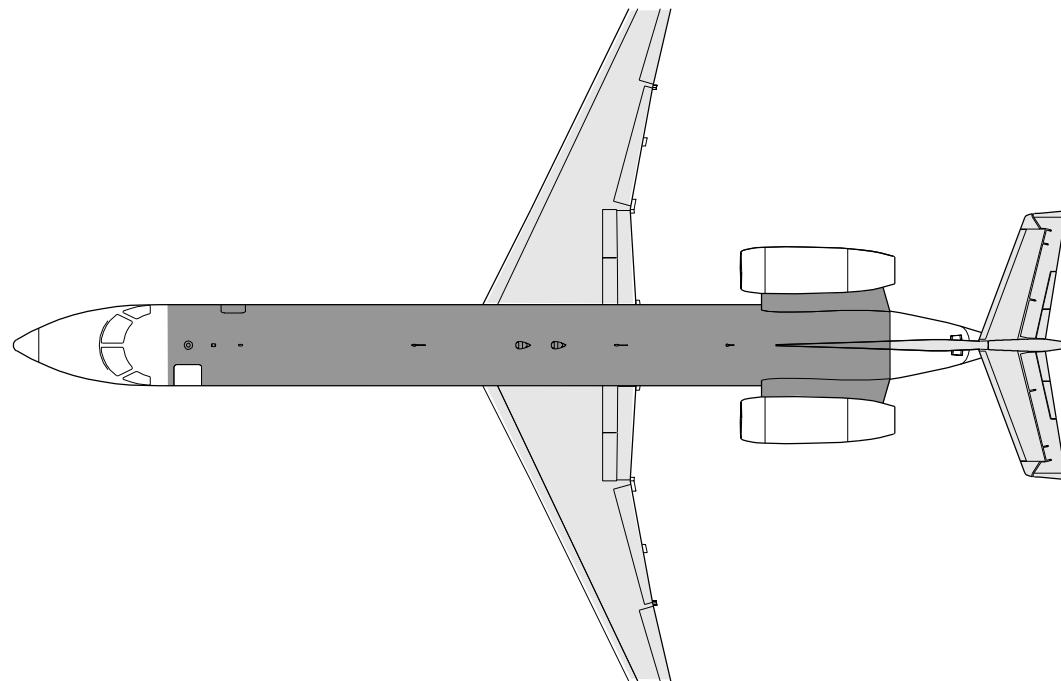
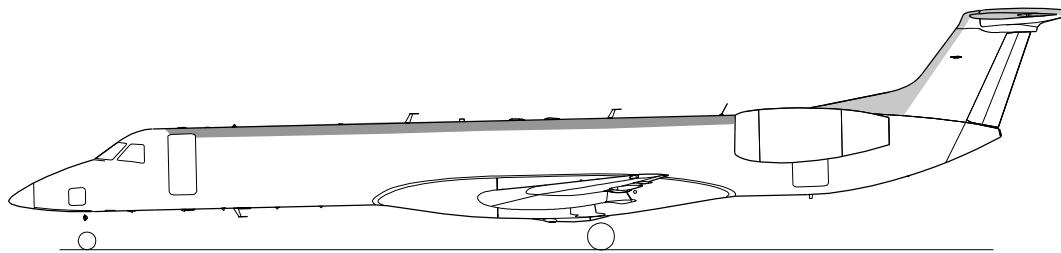
NOTE: DO NOT APPLY FLUIDS DIRECTLY TO THE POINTS SHOWN IN FIGURE 201.

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**EFFECTIVITY:: ALL**

Fluid Application Diagram for Anti-icing

Figure 204



- A THIN LAYER OF HOAR FROST WHERE YOU CAN SEE THE AIRCRAFT MARKINGS ON THE FUSELAGE IS PERMITTED.  
OTHERWISE, ANTI-ICING FLUID MUST BE APPLIED.
- ANTI-ICING FLUID APPLICATION AREAS.
- ANTI-ICING FLUID NON-APPLICATION AREAS.

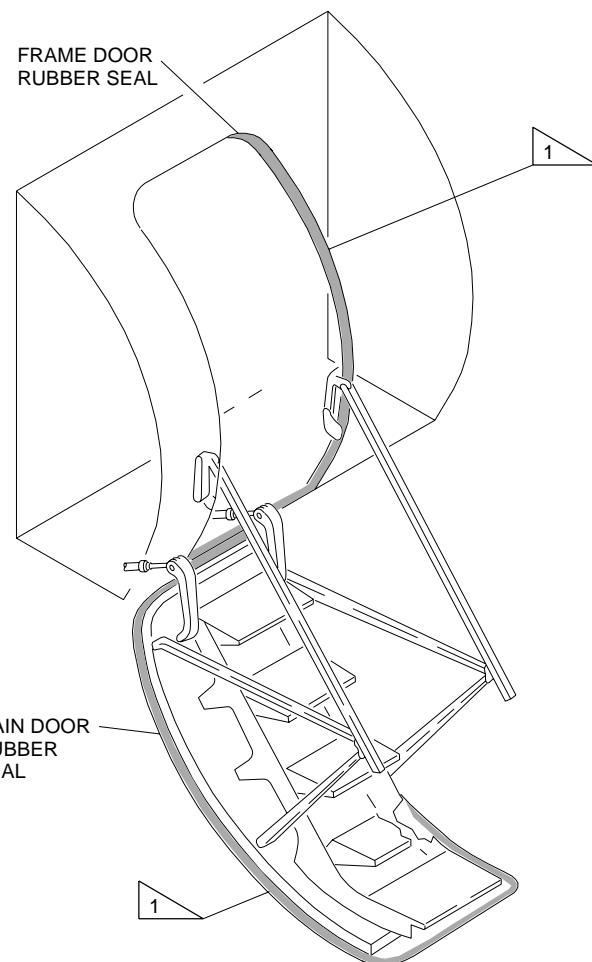
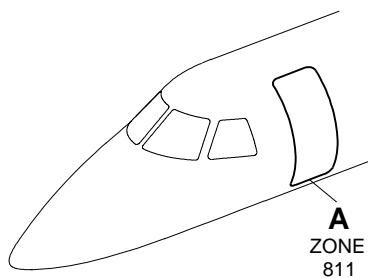
NOTE: DO NOT APPLY FLUIDS DIRECTLY TO THE POINTS SHOWN IN FIGURE 201.

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EFFECTIVITY:: AIRCRAFT WITH AIRSTAIRS MAIN DOOR

Anti-icing Application on Main Door Seals

Figure 205

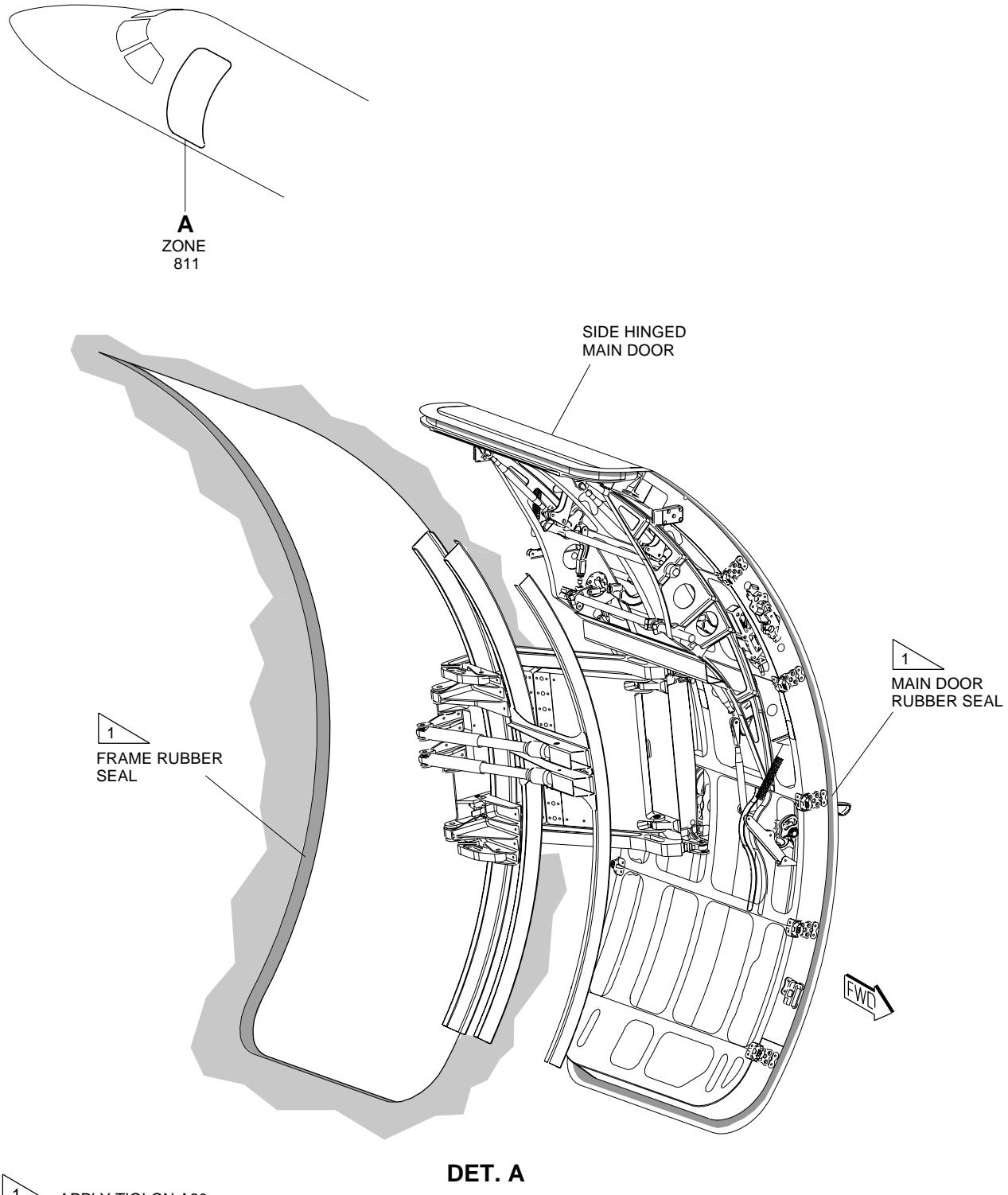


DET. A

 APPLY TIOLON A20.

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**EFFECTIVITY:: AIRCRAFT WITH SIDE-HINGED MAIN DOOR**  
 Anti-icing Application on Main Door Seals  
 Figure 206



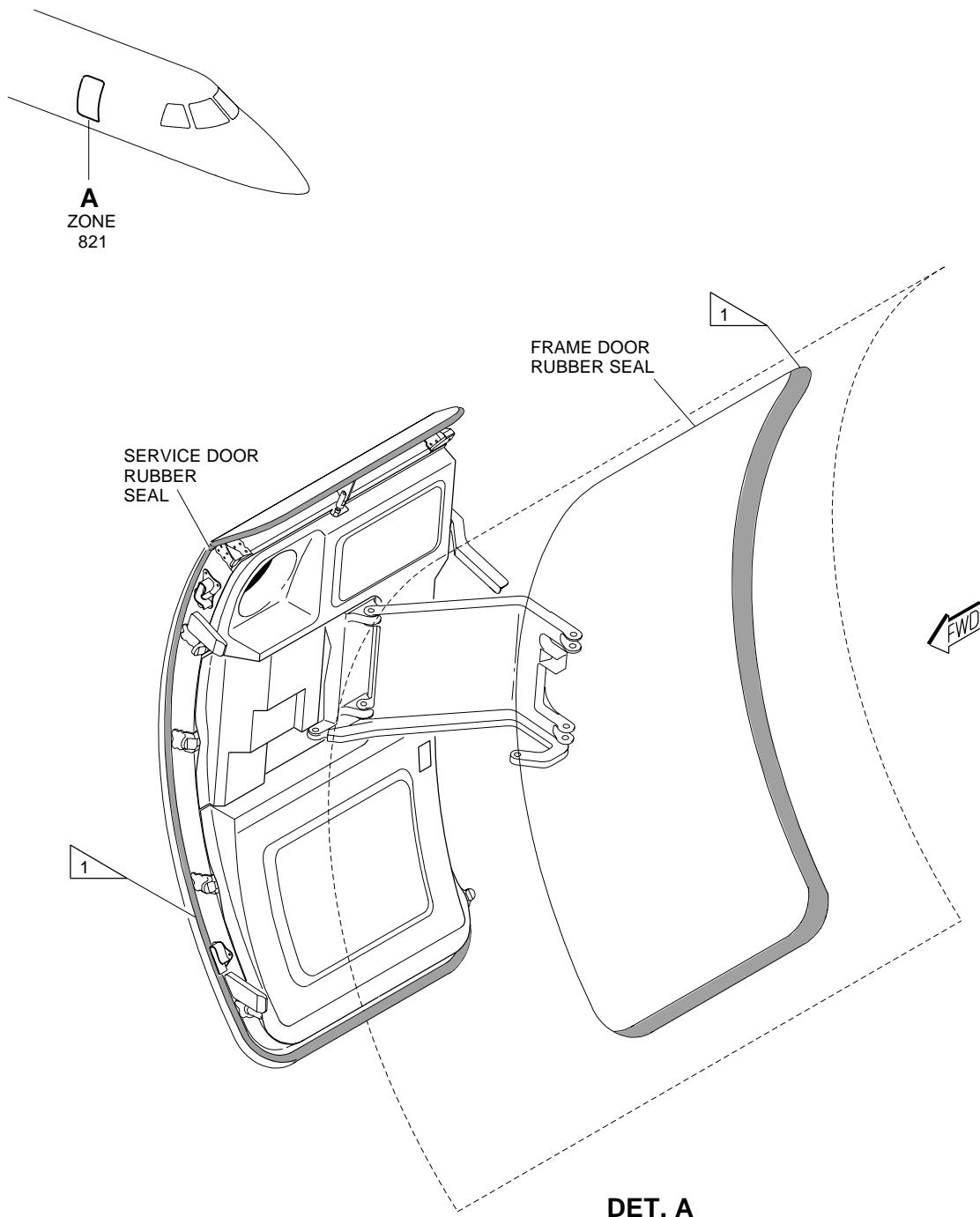
**DET. A**

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**EFFECTIVITY:: ALL**

Anti-icing Application on Door Seals

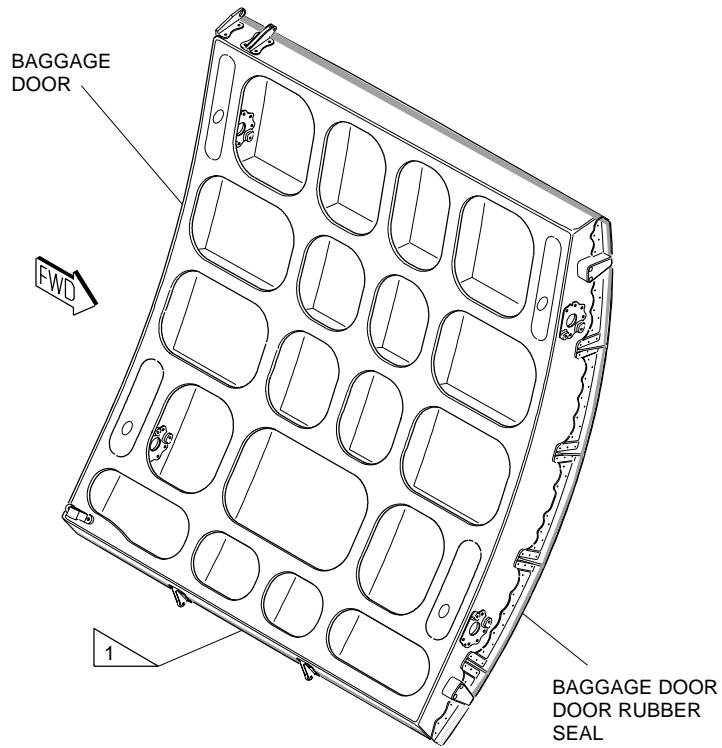
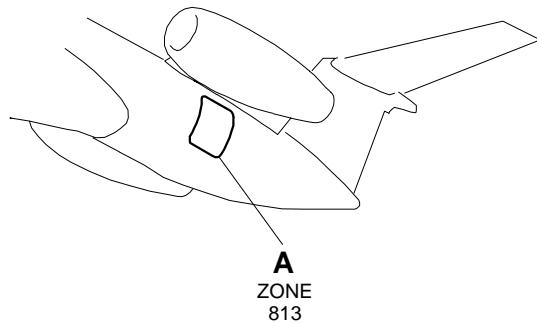
Figure 207 - Sheet 1



 **1** APPLY TIOLON A20.

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EFFECTIVITY:: ALL  
Anti-icing Application on Door Seals  
Figure 207 - Sheet 2



DET. A

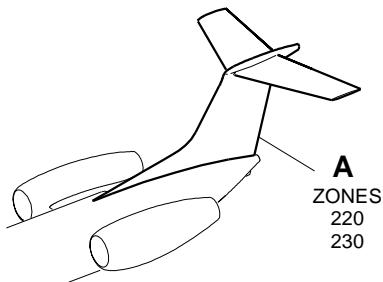
 1 APPLY TIOLON A20.

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**EFFECTIVITY:: ALL**

Fluid Spraying - Recommendations

Figure 208

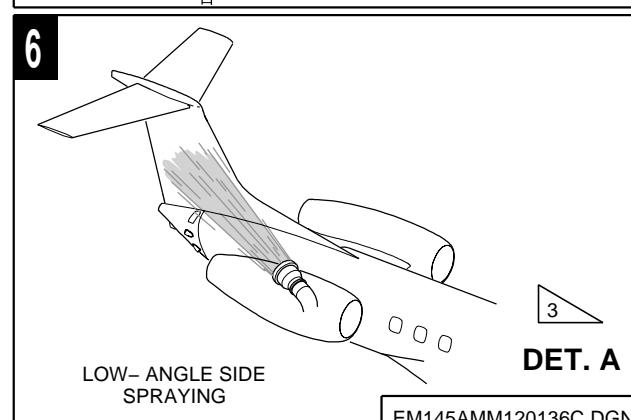
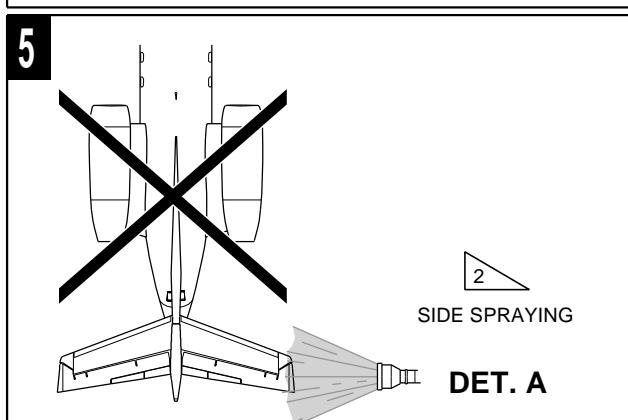
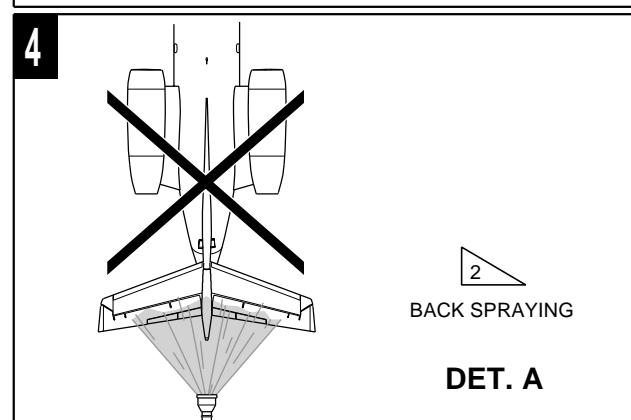
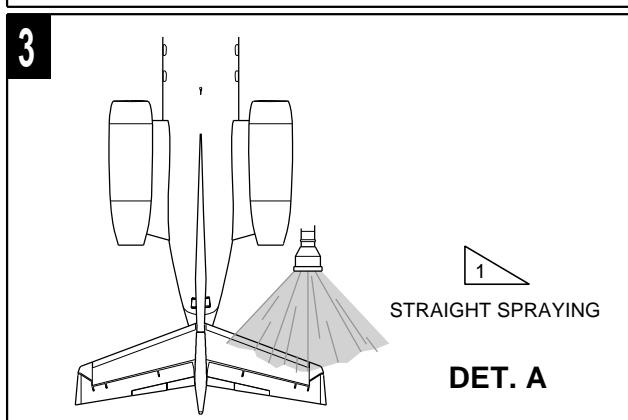
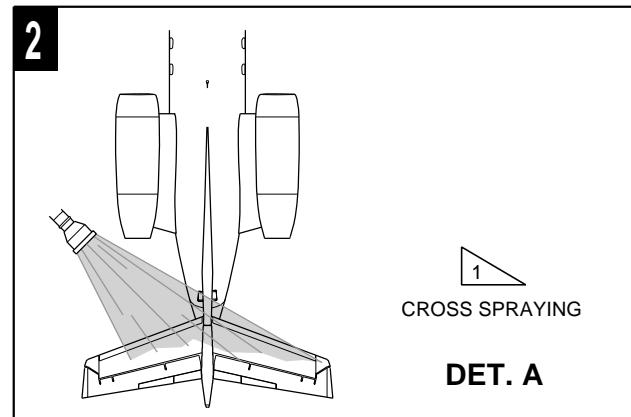
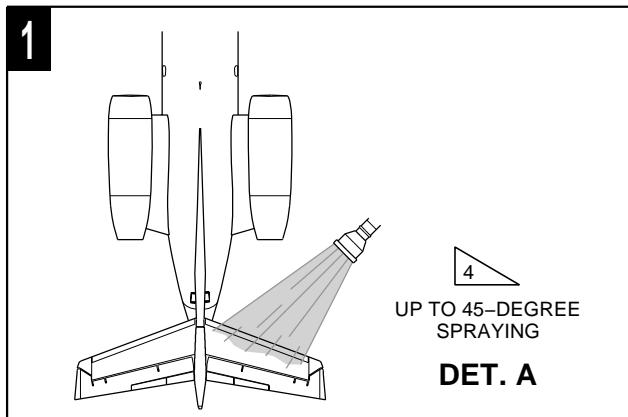


1 HORIZONTAL STABILIZER FLUID SPRAYING – RECOMMENDED PROCEDURES.

2 HORIZONTAL STABILIZER FLUID SPRAYING – NOT RECOMMENDED PROCEDURES.

3 VERTICAL STABILIZER FLUID SPRAYING – RECOMMENDED PROCEDURE.

4 HORIZONTAL STABILIZER FLUID SPRAYING – PERMITTED PROCEDURE.



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**EFFECTIVITY:: ALL**

Deicing/Anti-icing Fluid Application Guide  
Figure 209

# Deicing/Anti-icing Fluid Application Guide

This guide is intended to assist deicing/anti-icing fluid application staff only and is not a substitute for Embraer and/or operator's manuals. Deicing/anti-icing fluid application shall be accomplished in full accordance with Embraer AMM TASK 12-30-01-860-801-A and AOM, and/or operator's manuals.

**Be aware of deicing/anti-icing fluid holdover time expiration. Refer to fluid manufacture's Specification.**

**EMBRAER recommends two-step procedure whenever possible to prevent fluid residue accumulation.**

## A. FUSELAGE

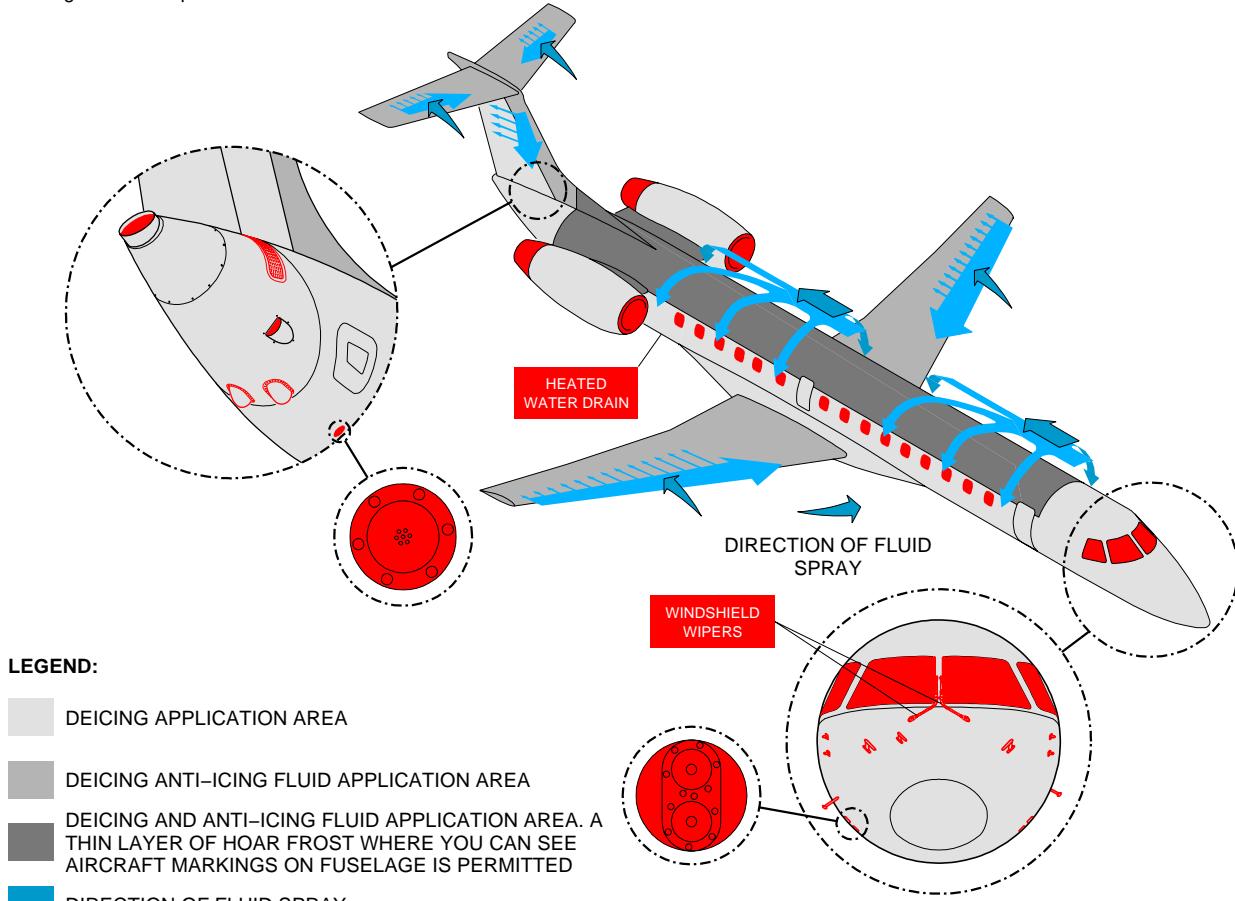
- Spray along fuselage top centerline and then outboard, letting the fluid cascade down and across the windows.

## B. WINGS

- Spray the fluid from the wing tip inboard to the root, sweeping from the leading edge to the trailing edge.

### Tactile Inspection

Inspection by touch is required if it is not possible to be certain that all forms of snow and ice have been removed by making a visual inspection.



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**EFFECTIVITY:: ALL**

Deicing/Anti-icing Fluid Application Guide

Figure 210

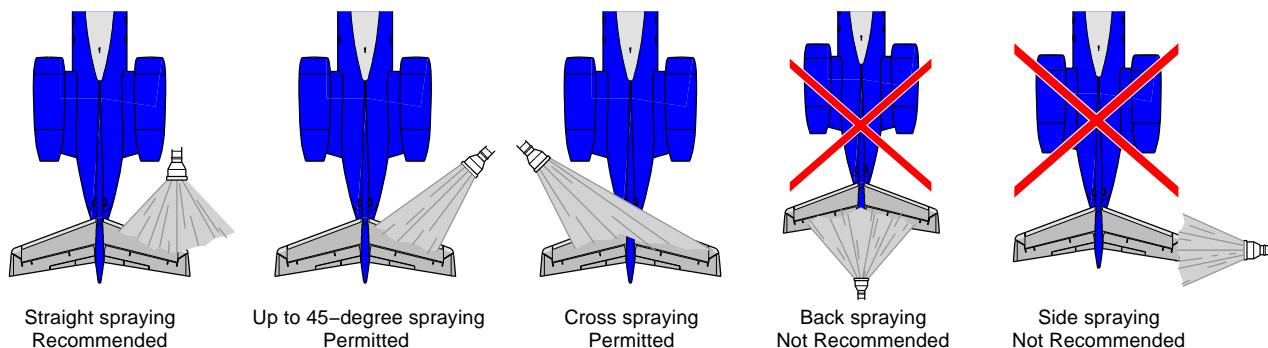
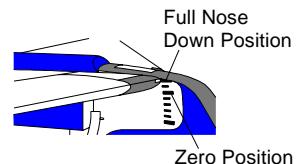
# Deicing/Anti-icing Fluid Application Guide

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## C. TAIL & ELEVATOR

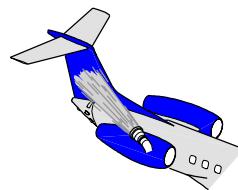
PITCH TRIM POSITION: BETWEEN ZERO AND FULL NOSE DOWN.

- Spray fluid from the surface tip inboard to the root, sweeping from the leading edge to the trailing edge. Refer to the figures below for proper spray direction to avoid APU fluid ingestion.



## D. VERTICAL SURFACES/WINGLETS

- Start at the top and then work down. Apply the fluid at an angle of less than 45 degrees (Reference: fuselage centerline).

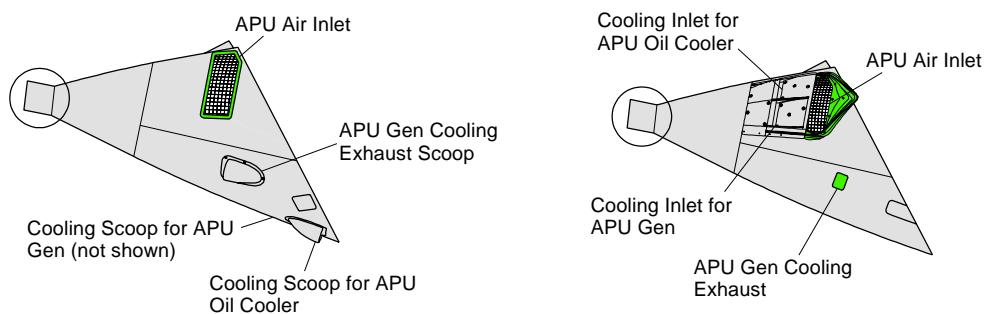


## E. ENGINE AND APU

- Do not point the spray of deicing/anti-icing fluid directly into the engine or APU inlets, exhaust, engine thrust reversers, scoops, vents, and drains.
- In case of either snow or ice accumulation in the APU air inlet and on surrounding area, refer to AMM TASK 12-30-01-860-801-A for instructions to remove it mechanically.

**CAUTION:**

- MAKE SURE THE APU INLET AREA IS CLEAR BEFORE YOU START THE APU.
- APU OPERATION IS NOT RECOMMENDED DURING THE AIRPLANE DEICING/ANTI-ICING PROCEDURE.



Depending on the design of the tailcone installed on the aircraft, the APU air inlet may differ.

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