ENGINEERING AUTHORIZATION APPROVAL FORM

EA no.	B737NG-EA-12-937R1
Subject	PROCEDURES FOR DEICING/ANTI-ICING OF AIRCRAFT ON THE GROUND IN WINTER CONDITION
Type	NON AD
Method of Compliance	INSPECTION, CLEANING, LUBRICATION
Applicability	LION AIR'S B737-800/900ER FLEETS *(if operate in winter condition)*
Material Needed	NO
Priority	RUSH
Estimate MH	TBD
Special Tools	NO
Affected Document	NO
Required Inspection Item Task	NO

Approved By: **Date:** **February 10, 2016**

xxxxx

FORM NO: xxxxx

ENGINEERING AUTHORIZATION

SUBJECT : **PROCEDURES FOR DEICING/ANTI-ICING OF AIRCRAFT ON THE GROUND IN WINTER CONDITION**		NO	: B737NG-EA-12-937R1
		DATE	: February 10, 2016
		REFERENCE	: *SEE REFERENCES*
CATEGORY	: RECOMMENDED	A/C TYPE	: B737-800/900ER
SECTION	: LINE MAINTENANCE	EFFECTIVITY	: *SEE EFFECTIVITY*
TYPE	: INSPECTION, CLEANING, LUBRICATION		
DUE DATE	: *SEE COMPLIANCE*	WT/ARM CHANGE	: NONE
PRIORITY	: RUSH		
ATTENTION	: LM, PPC, QA, OPERATION SAFETY, STORE	EST. MAN HOURS	: *SEE EST. MAN-HOURS*

REASON OF REVISION

This Engineering Authorization has been revised the RII category.

REASON

This Engineering Authorization establishes the minimum requirements and procedures for ground-based B737-800/900ER aircraft deicing/anti-icing methods with fluids and procedures to facilitate the safe operation of transport aircraft during icing conditions. Frost, ice or snow deposits, which can seriously affect the aerodynamic performance and/or controllability of an aircraft, are effectively removed by the application of the procedures specified in this Engineering Authorization. All procedures was developed to promote and develop safe practices, effective procedures related to aircraft ground operations in winter conditions to ensure the highest possible levels of safety for passengers, flight crew and ground personnel. Inspection and examination of an item against a relevant standard should be performed by **trained and qualified personnel**.

DESCRIPTION

This Engineering Authorization specifies the recommended methods for de-icing and anti-icing of aircraft on the ground to provide an aerodynamically clean aircraft. When aircraft surfaces are contaminated, they shall be de-iced prior to dispatch. When there is a risk of contamination of the aircraft surfaces at the time of dispatch, these surfaces shall be anti-iced. If both de-icing and anti-icing are required, the procedure may be performed in one or two steps.

The selection of a ONE- or TWO- step process *(where holdover time is critical, a two-step procedure using undiluted type II, III, or IV fluid for the second step should always be considered)* depends upon weather conditions, available equipment, available fluids and the holdover time to be achieved.

PREPARED BY

Renni Ekaputri

DISTRIBUTION	LM	PPC	QA	OPERATION	SAFETY	STORE
xxxxxxxx						

EFFECTIVITY

Lion Air's B737-800/900ER fleets in which those aircrafts will be operated in winter condition.

COMPLIANCE

This Engineering Authorization recommends that during the winter season, each aircraft should be inspected and cleaned carefully **before DEPARTURE.**

EST.MAN-HOURS

TBD

WEIGHT AND BALANCE

None

REFERENCES

This Engineering Authorization should be performed using **the latest revision** in accordance of the references:

1. AMS 1424, Deicing/Anti-Icing Fluid, Aircraft, SAE Type I.
2. AMS 1428, Fluid, Aircraft Deicing/Anti-Icing, Non Newtonian, Pseudoplastic, SAE Types II, III, IV.
3. ARP 4737, Aircraft Deicing/Anti-Icing Methods.
4. Boeing AMM 12-33-01, Revision 58, October 15, 2015.
5. Boeing Multi-Model Service Letter 737-SL-12-014, January 11th, 2000.
6. Boeing Multi-Model Service Letter 737-SL-12-019-A, August 28th, 2007.
7. Boeing Multi-Model Service Letter 737-SL-12-3-A, December 2nd, 1982.
8. Boeing Multi-Model Service Letter 737-SL-12-7-A, August 5th, 1991.
9. Boeing Multi-Model Service Letter 737-SL-12-9, November 18th, 1992.
10. Boeing Multi-Model Service Letter 737-SL-12-12, October 19th, 1993.

PUBLICATION AFFECTED

None

MATERIAL REQUIREMENTS

Reference	Description	Specification
G02301	Fluid - Aircraft Deicing/Anti-Icing (SAE Type I)	SAE AMS 1424
G02460	Fluid - Aircraft Deicing/Anti-Icing, Non-Newtonian (SAE Type II, III, IV)	SAE AMS 1428

SPECIAL TOOL AND EQUIPMENT

None

ACCOMPLISHMENT INSTRUCTION

CAUTION: KEEP THE WORK AREA, WIRES AND ELECTRICAL BUNDLES CLEAN OF METAL PARTICLES OR CONTAMINATION WHEN YOU USE TOOLS. UNWANTED MATERIAL, METAL PARTICLES OR CONTAMINATION CAUGHT IN WIRE BUNDLES CAN CAUSE DAMAGE TO THE BUNDLES. DAMAGED WIRE BUNDLES CAN CAUSE SPARKS OR OTHER ELECTRICAL DAMAGE.

GENERAL:

1) Aircraft operation in cold weather conditions can cause special problems. These problems occur because of the effects of the ice, snow, slush, frost, and low temperatures. This procedure gives data for removal of ice, snow, slush and frost from the aircraft. This procedure also gives data for the prevention of subsequent accumulation of ice, snow, slush and frost. It also includes other related data for the operation of the aircraft in cold weather. The operator must find and use the correct procedures for the weather conditions that occur.

2) You must make sure the maintenance procedures for operation during ice, snow and/or frost conditions are satisfactory for the conditions. Use the data that follow to make sure the procedures are satisfactory:
   (a) Previous weather conditions.
   (b) The equipment or materials that are available.
   (c) The weather conditions at the airport where you will operate.

3) Low temperatures (below freezing) can affect grease viscosity. Lubricate landing gear and flight control components in warm weather prior to cold weather ground operations or in a heated hangar.
   (a) If lubrication must be accomplished in cold weather, warm air or electric heat blankets can be used to heat the components and the grease gun.
   (b) For the landing gear, an enclosure can be fabricated around the strut to make the heating more efficient.
   (c) Do not apply heat directly to tires.

4) If the temperature of the fuel is below 32°F (0°C), do not drain the fuel tank sumps.

5) Definitions:
   (a) Ice that has accumulated on the fan blades while the aircraft has been on the ground for a prolonged stop, such as a plane that has been parked overnight, is considered Ground-Accumulated Ice.
      1. Ground-Accumulated Ice must be removed before engine start.

(b) Ice that has accumulated on the fan blades while the engine is running at idle is considered Operational Ice.

1. Operational Ice is allowed before departure because it can be removed by engine run-ups during taxi-out.

(c) Deicing is a procedure to remove the frost, ice or snow from the aircraft. Hot water or a hot mixture of water and deicing/anti-icing fluid is applied.

1. Alternate methods of deicing are forced air and infrared deicing. Refer to FAA Notice 8000.XXX for the current winter season, which includes industry information on these alternate methods.

(d) Anti-icing is a procedure to make sure that ice, snow and/or frost does not collect and become attached to the aircraft surfaces. Anti-icing fluid or a mixture of anti-icing fluid and water is applied to the aircraft.

(e) **One step** ice removal/anti-icing applies a hot deicing/anti-icing fluid or mixture of fluid and water. Use the conditions that follow to make a decision on how hot to make the fluid or the fluid and water mixture:

1. The ambient temperature
2. The weather conditions.

(f) **Two step** ice removal/anti-icing has the steps that follow:

1. Apply hot water or a hot mixture of deicing/anti-icing fluid and water to remove the ice.
2. Immediately follow with a spray of a deicing/anti-icing fluid or a mixture of deicing/anti-icing fluid and water for anti-icing. This step must be done less than 3 minutes after you started the first step. If it is necessary, do the procedure area by area.

(g) **Holdover time** is the approximate time anti-icing fluid will keep the frost, ice, or snow off the aircraft surfaces that have protection.

Note: You cannot find the level of protection or the holdover time with precision. The weather conditions and the fluid/fluid mixture will have an effect on the holdover time. Refer to FAA Notice 8000.XXX for the current winter season. This document includes tables for holdover times for all commercially available deicing fluids that have been certified for the current winter season.

WARNING: USE THE CORRECT EQUIPMENT FOR EACH TYPE OF FLUID. THE INCORRECT EQUIPMENT WILL DECREASE THE TIME THAT THE FLUID WILL PREVENT ICE. ICE CAN PREVENT THE FREE MOVEMENT OF FLIGHT CONTROL SURFACES. THIS CAUSES A DANGEROUS CONDITION DURING FLIGHT.

(h) **Type I (not thickened) deicing/anti-icing fluids** usually have a minimum of 80 percent Glycol. The temperature makes the viscosity change, but the shear stress does not change. These fluids give anti-icing protection for only a short time.

(i) **Type II, Type III and Type IV (thickened) deicing/anti-icing fluids** usually have a minimum of 50 percent Glycol. There is also 45 to 50 percent water plus thickeners and inhibitors. The temperature and the shear stress that is applied can make the viscosity of these fluids change. They are usually very viscous at low levels of shear stress. When the shear stress changes, their viscosity decreases very quickly. Type II, Type III and Type IV fluids give longer holdover times than Type I deicing/anti-icing fluids.

WARNING: KEEP WATER OUT OF THE STATIC PORTS. WATER CAN FREEZE AND CAUSE A BLOCKAGE OF THE PORTS. ICE IN THE STATIC PORTS IS DANGEROUS DURING FLIGHT.

(j) An aircraft that is parked, for this cold weather procedure, is an aircraft in the loading area for a short time to be prepared for the departure. If the aircraft stays in the loading area through the night in cold weather conditions, refer to the guidelines for Parked Aircrafts in this procedure.

1. Cold weather operation does not include an aircraft that is parked for a long time. If the aircraft has been parked for a long time, do this task: Put the Aircraft Back to A Serviceable Condition after the Storage, TASK 10-12-02-550-801.

(k) Slush is ice and/or snow that is not fully melted. Thus, the ice removal/anti-icing procedures for ice and snow removal apply to slush. A special procedure for slush is not necessary.

6) The application of Type II, III, and IV fluid, especially when used in a one-step process or in the first step of a two-step process, may cause residues to collect in aerodynamically quiet areas, cavities and gaps. The application of hot water or heated Type I fluid in the first step of a two-step process will minimize the formation of residues. Residues may rehydrate and freeze under certain temperature, high humidity and/or rain conditions and may block or impede critical flight control systems. If a Type II, III, or IV fluid is used in a one-step process or in the first step of a two-step process, then an appropriate inspection and cleaning program should be established. Whenever suitable, deice and anti-ice with only Type I.

7) Deicing fluid residues can slowly migrate out of crevice areas after being removed from open areas by cleaning. Repeated cleaning of the aircraft may be necessary.

The deicing fluid residue inspection and cleaning steps in this procedure should be used to remove these residues.

8) Start electronic equipment in the cold weather conditions the same as in the usual conditions. A special procedure is not necessary.

9) To start the engines in cold weather, do this task: Procedure to Prepare the Engine for Operation, TASK 71-00-00-700-818-F00.

10) The start the APU in cold weather, do this task: APU Starting and Operation - Activation, TASK 49-11-00-860-801.

11) It is acceptable to install the spare dynamic seal in place of the active dynamic seal (cap seal assembly) to reduce leakage past the shock strut dynamic seal in cold weather. Re-install the cap seal assembly as the active dynamic seal when warm weather returns. See NOSE LANDING GEAR SHOCK STRUT SEALS - REPAIRS, PAGEBLOCK 32-21-11/801 for details.

NO	DESCRIPTION	PERFORMED BY	DATE
Read all step of this EA making sure that you have understood of the work to be performed. If you have any discrepancy or if any step is not clear consult to engineer that originated this EA.			
I.	**GUIDELINES** **NOTE: The selection of a ONE- or TWO- step process *(where holdover time is critical, a two-step procedure using undiluted type II, III, or IV fluid for the second step should always be considered)* depends upon weather conditions, available equipment, available fluids and the holdover time to be achieved.**		
A.	Many conditions can have an effect on which procedure you use to remove ice, snow, or frost or to make sure it does not collect and become attached to the aircraft surfaces. Each operator must look at the local weather conditions. If it is possible, use the procedures that were used before with the same conditions. In general, Type II, Type III and Type IV fluids give a longer holdover time than Type I fluids. Use Type II, Type III and Type IV fluids to decrease the risk that ice, snow, or frost will collect on the aircraft during a long taxi. The figure that follows gives general guidelines to help you find the correct ice, snow, or frost removal procedure. This gives you the same procedure you will find when you use the full guidelines in this procedure. **(Table 1, Table 2)**		

	NOTE: The applicable fluids which meet the Boeing document D6-17487, "Certification Test of Aircraft Material" and conform to any of the following specifications, are acceptable fluids.		
B.	The following is a list of Type I (newtonian) fluids: 1) Fluid, G02301, latest revision, Type I		
C.	The following is a list of Type II, Type III and Type IV (non-newtonian) fluids: 1) Fluid, G02460		
D.	Use a hot mixture of water and Type I, Type II, Type III, or Type IV deicing/anti-icing fluids when you do the one-step ice removal/anti-icing procedure. The quantity of water mixed with the fluid, and the temperature you use, are affected by the following: 1) The weather conditions 2) The holdover protection that is necessary 3) The condition of the aircraft		
E.	It is necessary to have sufficient fluid temperature and flow rate to flush the ice and snow from the aircraft surfaces when it collects there. More ice, snow or frost will not collect on the aircraft surfaces where there is remaining fluid. The mixture and type of fluid used will have an effect on the holdover time. The weather conditions can make it necessary to apply the fluid/water mixture again. This will be necessary to remove the frozen fluid that collected since the fluid/water mixture was last applied. This is also done to increase the protection time.		
F.	**CAUTION:** DO NOT POINT A SOLID FLOW OF FLUID DIRECTLY AT THE SURFACE. APPLY THE FLUID AT LOW ANGLE TO PREVENT DAMAGE TO THE AIRCRAFT SURFACES. DO NOT USE A HIGH PRESSURE SPRAY TO BLOW THE ICE AND SNOW OFF THE AIRCRAFT SURFACES. For the best ice or snow removal, the temperature of the deicing fluid and hot water should be 140–180°F (60–82°C), at the nozzle. A fine to medium spray is recommended to apply the fluid across a large area of ice or snow. This will cause the ice or snow to melt the fastest. A solid flow of fluid is recommended to flush		

	the ice or snow from the aircraft surfaces.		
G.	A layer of anti-icing fluid will give protection from ice, snow, and frost if you apply the fluid to a dry wing on a cold soaked aircraft. A mixture of anti-icing fluid and water (the ambient temperature will have an effect on when to use a mixture with water) will also give protection if you apply it to a dry wing.		
H.	Since the temperature of the external surfaces of the aircraft can be below freezing, ice can attach to the surface. There can be clear ice below the layer of snow or slush, which is not easy to find. Make sure that all the ice is removed after you do the ice removal or ice removal/anti-icing procedure. It may be necessary to feel the surface to do the inspection.		
I.	When the precipitation is continuous, the two-step ice removal/anti-icing procedure is usually recommended. The quantity of fluid used in the mixture is affected by the following: 1) The airline experience 2) The instructions of the fluid manufacturer 3) The air temperature.		
J.	Make sure there is no ice, snow, or frost on the wing for the takeoff. To do this, you must carefully examine the aircraft before the departure.		
K.	You must remove snow from a parked aircraft regularly. This will make sure that a large quantity of snow will not collect and possibly freeze on the aircraft surface.		
L.	**CAUTION:** CAREFULLY MOVE ROPES OR FABRIC HOSES ON THE WING OR FUSELAGE. EQUIPMENT THAT IS INSTALLED ON THE SURFACE OF THE WING OR FUSELAGE CAN BE DAMAGED BY THE MOVEMENT OF THE ROPES OR FABRIC. Use brooms with long handles to remove the snow from the wings and horizontal stabilizers. You can use ropes or a fabric hose to remove the snow from the fuselage. Move the rope or hose back and forth on the top of the fuselage as you move it aft.		

M. Before you move an aircraft out of a warm hangar during icing conditions, do the anti-icing procedure on the aircraft. This will make it less likely that ice or snow will melt when it touches the warm aircraft and freeze again.

N. If you remove ice with water that is not hot you must do it in a warm hangar. Keep the aircraft in the hangar until the surfaces are dry. It will be necessary to do a check of those areas where the water can collect and freeze. If anti-icing fluid is applied, it is not as necessary for the aircraft to dry.

O. General Precautions

WARNING: DEICING/ANTI-ICING FLUID IS DANGEROUS. DO NOT LET IT TOUCH THE SKIN OR EYES, AND USE CLOTHING THAT GIVES SUFFICIENT PROTECTION.

WARNING: DO NOT DIRECTLY SPRAY DEICING FLUIDS INTO APU OR ENGINE INLETS, EXHAUSTS, DUCTS AND PITOT-STATIC PROBES. THESE FLUIDS CAN CAUSE DAMAGE TO THE EQUIPMENT AND CAN CAUSE BAD AIR FLIGHT DATA.

CAUTION: DO NOT POINT THE FLUID STREAM DIRECTLY ON THE SURFACE OF THE AIRCRAFT (NORMAL, OR PERPENDICULAR TO THE SURFACE). APPLY THE FLUID AT A LOW ANGLE TO PREVENT DAMAGE TO AIRCRAFT SURFACES. HIGH-PRESSURE FLUID CAN CAUSE DAMAGE TO AIRCRAFT SURFACES.

1) Do not point a spray of deicing/anti-icing fluid directly at or into the pitot inlets, TAT probes or static ports shown in **(Figure 1).**
2) Do not point a spray of hot deicing fluid or hot water directly at cold windows.
3) Make sure the AC packs are shut off prior to deicing.
4) Do not point a spray of deicing/anti-icing fluid directly into the engine, APU, scoops, vents, drains,

Cabin Air Compressor (CAC) and Ram Air inlets, etc.

5) Do not exceed an impingement of 50 psi (345 kPa) at the surface.
6) Do not point a solid flow of fluid directly at the aircraft surfaces.
7) Make sure that ice and/or snow is not pushed into the areas around the flight controls during ice and snow removal.
8) Remove all of the ice or snow from the door and girt bar areas before you close a door.
9) Do not open the cargo doors if it is not necessary. Remove the ice and snow from the cargo containers before you put them on the aircraft. Before the doors are closed for flight put anti-icing fluid on these areas:
   a) The pressure relief doors
   b) The lower door sills
   c) The bottom edge of the door
10) Do not use hard or sharp tools to remove the ice from the aircraft surface.
11) The right and left sides of the wing and horizontal stabilizer must get the same ice removal/anti-icing procedure.
   a) If contamination exists only in a limited area (such as a spoiler panel) and there is no active precipitation, it is permitted to deice only that area, but the same area should also be treated on the other wing.
12) If SAE Type II, III, or IV fluids are used, then remove all of the deicing/anti-icing fluid from the cockpit windows before the departure. Make sure you 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: Deicing/anti-icing fluid can be removed by rinsing with approved cleaner and a soft cloth or flushing with type I fluid.

13) After ice removal/anti-icing procedure has been done many times, you must examine the following areas for deicing/anti-icing fluid residues, remove the residues, and re-lubricate affected components as follows:

a) If the ambient temperature is at or below freezing, move the aircraft to a heated hangar.

b) Gain access to the following areas where flight controls and other system components are located:

<1> Wing rear spar areas, including the actuating components for the spoilers, ailerons, flaps, and the control surface hinges and balance bays.

<2> Wing leading edge devices, including the actuating components.

<3> Horizontal stabilizer rear spar, including the actuating components for the elevators, elevator tabs (if applicable) and the control surface hinges and balance bays.

<4> Vertical stabilizer, including actuating components for the rudder, and the control surface hinges.

<5> APU bay and bilge area of the tailcone.

c) Visually inspect for dry or rehydrated residues in the areas mentioned above.

NOTE: Dry residue will normally be a thin film that may be partially covered with dirt or grease. Rehydrated residue will often be a thicker, gel-like substance.

NOTE: It may be necessary to use a borescope to inspect inside the elevator panels where the tab control rods go through. Residues can get into this area and cause an unbalance condition in the elevator.

WARNING: DO NOT APPLY WATER TO THE CONTROL CABLES WHEN THE TEMPERATURE IS AT OR BELOW 32°F (0°C). ICE CAN FORM ON THE CABLES AND PREVENT THE OPERATION OF IMPORTANT FLIGHT CONTROL SYSTEMS DURING FLIGHT.

		d) Spray the area with a fine mist of warm water to rehydrate any residue and wait at least 15 minutes to allow the rehydration to occur. e) Remove the residues by hand with rags or soft brushes using warm water or a mixture of warm water and Type I fluid. <1> You can also use a low pressure stream of water or compressed air to rinse away the residues. <a> When rinsing the residues away, make sure the residues do not flow into crevice areas that are not accessible. f) Check all drain holes in the areas where residues were removed to make sure that they are clear and not blocked by the residues. g) Re-lubricate bearings, fittings, and control cables in areas that were cleaned as required. h) Re-apply corrosion inhibiting compound to all surfaces and components in areas that were cleaned as required.		
	P.	When there is slush on the runways, examine the aircraft when it gets to the ramp. Look for slush that collected on the aircraft or damage to the aircraft surfaces. 1) Examine the areas that follow for ice that collected and damage to the skin panels (remove the ice if it is necessary): a) The leading edges b) The flaps c) The flap wells d) The vertical stabilizer e) The rudder f) The bottom and the top surface of the horizontal stabilizers and elevators. 2) Examine the wheel well areas for ice, slush and snow that collected. Remove the ice if it is necessary. 3) Examine the skin panels behind the wheel wells for damaged edges.		
	Q.	Use the applicable Structural Repair Manual (SRM) procedure to repair any damaged skin panels.		
	R.	Make sure the concentration of the deicing/anti-icing fluid is correct before you apply it to the aircraft.		

S.	**WARNING:** DO NOT WALK ON THE WINGS OR THE HORIZONTAL STABILIZER. ICE OR SNOW ON THESE SURFACES IS NOT SAFE. MAINTENANCE PERSONS CAN FALL WHICH MAY CAUSE PERSONAL INJURY OR AIRCRAFT DAMAGE. Use a boomtruck, a cherry-picker or deicing/anti-icing truck to do deicing/anti-icing.	X	
II.	**SPECIFIC REQUIREMENTS**		
A.	**Probes and Sensors** 1) All of the probes and sensors must have no ice, snow, or frost on them. After you remove the ice, make sure there is no moisture collected on them. This moisture could subsequently freeze. Apply deicing/anti-icing fluid for protection. 2) Pitot Probe, Static Ports, and Total Air Temperature (TAT) Probes **(Figure 1)**: a) Look for ice that is attached to the surface 4 feet or less from the pitot inlets, static ports, and TAT probe inlets. Remove all the ice in these areas. b) Do not point a spray of deicing/anti-icing fluid directly at or into the pitot inlets, static ports, or the TAT probes. c) If ice causes a blockage of the static openings, carefully apply warm air until the ice melts. d) If you applied too much fluid to the fuselage near the static ports, examine the nearest in-line drain. 3) Angle-of-Attack Sensor **(Figure 1)** a) Make sure that no ice and/or snow is on the sensors. Make sure the sensors are free to move. Apply deicing fluid if it is necessary.		
B.	**Control Surfaces** 1) Retract the wing flaps, slats, and spoilers during icing conditions or when snow falls. If it is necessary to operate these controls, make sure they are not blocked by ice or snow before you retract them. **NOTE:** If an aircraft comes to the gate with the flaps not fully retracted during icing conditions or when snow falls, examine those flaps that are not fully retracted. Look for ice or snow that has collected		

	before they are retracted. 2) All of the control surfaces must have no ice, snow, or frost on them. After you remove the ice, make sure there is no moisture collected in the hinges, guide tracks and actuators for the flight controls. This moisture could subsequently freeze. Apply deicing/anti-icing fluid for protection. **WARNING:** TO AVOID PERSONAL INJURY, ENSURE THAT THE STABILIZER TRIM WHEEL HANDLE IS STOWED PRIOR TO USING ELECTRIC TRIM. 3) Stabilizer trim a) Set the stabilizer position to 5 units. b) Deicing operations should be conducted from the forward side of the stabilizer to minimize liquids that might enter the tailcone area. 4) Open the leading edge devices and look for ice or snow.		
C.	**Wing and Horizontal Tail Surfaces** **CAUTION:** BE CAREFUL WHEN YOU REMOVE THE ICE AND SNOW FROM THE WING AND TAIL SURFACES NEAR THE VORTEX GENERATORS. IF YOU ARE NOT CAREFUL YOU CAN CAUSE DAMAGE TO THE VORTEX GENERATORS. 1) The wing, including winglets (if installed) and horizontal tail surfaces must have no ice, snow, and frost on them. **NOTE:** A layer of frost 1/8-inch thick or less on the lower wing surfaces (in the spar area) is permitted if it is caused by very cold fuel. But, all of these areas must have no ice, snow, or frost on them: • Leading edge devices • Control surfaces, including both sides of horizontal and vertical stabilizers • Tab surfaces • The top wing surface 2) The leading edge surfaces must have no ice, snow or frost on them. Examine the areas between the surfaces that move and the surfaces that do not move to make sure there is no ice. 3) The right and left sides of the horizontal stabilizer must get the same ice removal/anti-icing procedure. a) If contamination exists only in a limited area		

	(such as a spoiler panel) and there is no active precipitation, it is permitted to deice only that area, but the same area should also be treated on the other wing.		
D.	**Fuselage and Vertical Tail Surfaces** **CAUTION:** BE CAREFUL WHEN YOU REMOVE THE ICE AND SNOW FROM THE FUSELAGE AREA WHERE THERE ARE LIGHTS AND ANTENNA. IF YOU ARE NOT CAREFUL, YOU CAN CAUSE DAMAGE TO THE EQUIPMENT. 1) The fuselage and the vertical tail surfaces must have no ice or snow on them. Ice and snow increase the aerodynamic drag and the weight of the aircraft. **NOTE:** Thin hoar frost is permitted on the top surface of the fuselage if all the vents and ports are clear. Thin hoar frost is a white layer of constant thickness with a sharp crystalline texture. It usually occurs on surfaces that are out on a cold night with no clouds. Hoar frost is thin. You can see items on the surface below the layer of frost, such as paint lines, marks or letters. 2) Do not apply hot deicing fluid or hot water directly on the pilots' windshield or the passenger windows. You can let the fluid flow on the windows after you apply it to the top of the cabin. This is permitted since the fluid will be cool when it gets to the window. 3) Do not spray any fluid into the elevator feel system pitot probes that are located on each side of the vertical stabilizer. 4) Do not point a spray of deicing/anti-icing fluid directly into the inlet duct or exhaust for the APU. 5) If SAE Type II, III or IV fluids are used, then all of the deicing/anti-icing fluid on the cockpit windows must be removed before the departure. Carefully examine the windows with the wipers installed. Also, examine the forward areas where the fluid can flow aft on the windshields during the taxi and takeoff. These areas must be clear before the departure. **NOTE:** Deicing/anti-icing fluid can be removed by rinsing with approved cleaner and a soft cloth or flushing with type I fluid.		

E. **Engines and APU**

WARNING: PERSONS MUST STAY CLEAR OF THE DANGEROUS AREAS IN FRONT OF OR IN BACK OF AN ENGINE AND IN THE APU EXHAUST WHEN THEY OPERATE. INJURY OR DEATH OF PERSONS CAN OCCUR IN THESE AREAS. (ENGINE GROUND SAFETY PRECAUTIONS, TASK 71-00-00-800-805-F00)

1) For the safety of persons, do not operate the engines or the APU during the ice removal/anti-icing operations. But, if it is necessary to do the ice removal/anti-icing procedure during engine and/or APU operation, do the steps that follow:
   a) Make sure the engine and/or the APU is at idle speed.
   b) Do not point the spray of deicing/anti-icing fluids directly into the engine and/or APU inlet.

CAUTION: DO NOT START THE ENGINES IN AREAS WHERE THERE ARE PUDDLES OF DEICING OR ANTI-ICING FLUID. MOVE THE AIRCRAFT TO A DIFFERENT LOCATION. THE FLUID CAN GO INTO THE ENGINE COMPRESSOR. THESE FLUIDS CAN CAUSE COMPRESSOR STALL, AND ENGINE SURGE.

CAUTION: MAKE SURE THE APU INLET AREA IS CLEAR BEFORE YOU START THE APU. THE APU CAN BE DAMAGED BY THE ICE OR SNOW THAT COLLECTED IN THE INLET AREA.

2) If the engines/APU are on, do the steps that follow to keep the fumes out of the cabin when you apply deicing/anti-icing fluid in the area of the engines/APU inlets.
   a) Close the valves for the air conditioning pack to the cabin.
   b) Close the shutoff valves for the APU air supply.

WARNING: DO NOT DIRECTLY SPRAY DEICING FLUIDS INTO APU OR ENGINE INLETS, EXHAUSTS, DUCTS AND PITOT-STATIC PROBES. THESE FLUIDS CAN CAUSE DAMAGE TO THE EQUIPMENT AND CAN

	CAUSE BAD AIR FLIGHT DATA. 3) Do not point a spray of deicing/anti-icing fluid directly into the areas below: a) The inlet ducts for the engine or APU b) Exhausts c) Engine thrust reversers d) Engine inlet e) Probes attached to the strut f) Engine bleed air ducts 4) Remove the ice from the Vortex generator on the APU inlet door when the APU is not in operation. 5) Remove Ground-Accumulated Ice from fan blades prior to take-off.		
F.	**Brakes** 1) When deicing or anti-icing the aircraft, protect the wheels and brakes from fluid contamination with the methods below: a) Do not direct a spray of deicing or anti-icing fluids at the wheels or brakes. b) Use suitable covers on the wheels and brakes when operationally feasible. c) Apply the parking brake to reduce incidental contamination of brake friction surfaces when operationally feasible. **NOTE:** The brakes do not need to be re-applied if the wheels have not rotated since the last brake application. d) Manually remove snow or ice accumulation from the wheels, brakes, or tires. A hot air blower may be used for this purpose.		
G.	**Landing Gear and Doors** 1) Make sure there is not a layer of ice or snow on the movable parts and the position indication switches for the landing gear. a) This could prevent the correct operation of the landing gear. b) Make sure that you do not remove lubricants, or make the lubricants thinner when you apply deicing, or anti-icing fluids. c) Parts that are not lubricated can seize, or they will not operate correctly. 2) Remove the ice and snow from these areas: **NOTE:** It is the airline's decision to apply or not apply anti-icing fluid as protection after the ice is removed.		

	a) The landing gear doors b) The door latches c) The uplock mechanism d) The uplock hook e) The downlock mechanism f) The bungee springs g) The lock actuators h) The position indication switches 3) Make sure that ice did not collect on the steering cables for the nose wheel. a) If there is ice, remove it from the cables. 4) Examine the alternate extend system for ice in these areas because they are open, and do not have heat: a) Examine control cables for landing gear extension b) The external mechanism for the landing gear **CAUTION:** DO NOT MOVE THE AIRCRAFT IF THE TIRES FREEZE TO THE GROUND. MAKE SURE THE WHEELS TURN WHEN YOU MOVE THE AIRCRAFT. 5) Remove the ice and snow from the ground areas around the landing gear. This will make it less possible that the tires will freeze to the ground. This will also prevent unwanted aircraft movement because of the wind or engine operation. a) Use warm air or deicing fluid to release the tires from the ground or to remove frozen material. b) Do not use salt because it can collect on the metal parts, and it causes corrosion.		
H.	**Wing Fuel Tanks** 1) Frost can occur on the wings in the fuel tank areas in ambient air temperatures that are more than 32°F (0°C). 2) The condensation of moisture in the air causes frost when it touches cold surfaces that are less than 32°F (0°C). 3) The frost will usually melt when you add fuel. a) If the frost stays on the bottom surfaces, and it is more than ⅛ in. (3 mm) thick, remove it before flight. 4) Clear ice can occur on the top of the wing when		

	these conditions occur: a) The temperature of the fuel in the tank is less than 32°F (0°C) b) The ambient temperature is more than 32°F (0°C) c) There is rain, drizzle, or fog.		
	5) Carefully examine the top of the wing to see if there is clear ice. Use the equipment that is necessary to get sufficient access to the top of the wing to do this check. It is possible that the clear ice can only be found by touch. You must remove clear ice and anti-ice the wing, if it is necessary, before the takeoff.		
I.	If the temperature of the fuel is below 32°F (0°C), do not drain the fuel tank sumps.		
J.	Miscellaneous 1) Drains a) Examine all of the waste water and condensate drains on the aircraft to make sure there are not blockages because of ice or other material. It is not necessary to put a plug on the drains during the ice removal or anti-icing procedure. But, do not point a fluid spray at these drain areas. 2) Windshield Wiper Blades a) Remove the ice that collected on the windshield wiper blades.		
III.	**HOT WATER ICE REMOVAL**		
A.	You can use hot water 140°F (60°C) to 180°F (82°C) maximum nozzle temperature to remove ice and snow from the aircraft surfaces when the ambient temperature is 27°F (-3°C), stable or on the increase.		
B.	To prevent the water from freezing again you must apply anti-icing fluid to the surface immediately after you remove the ice with hot water.		
IV.	**ONE-STEP ICE REMOVAL/ANTI-ICING**		
A.	The application of Type II, III, and IV fluid, especially when used in a one-step process or in the first step of a two-step process, may cause residues to collect in aerodynamically quiet areas, cavities and gaps. The application of hot water or heated Type I fluid in the		

	first step of a two-step process will minimize the formation of residues. Residues may rehydrate and freeze under certain temperature, high humidity and/or rain conditions and may block or impede critical flight control systems. If a Type II, III, or IV fluid is used in a one-step process or in the first step of a two-step process, then an appropriate inspection and cleaning program should be established. Whenever suitable, deice and anti-ice with only Type I.		
B.	You can do the one-step ice removal/anti-icing procedure, with the deicing/anti-icing fluid heated to 140°F (60°C) to 180°F (82°C) at the nozzle. Use this procedure to remove the ice and snow from the aircraft when the temperature is less than 28°F (-2°C). 1) After you use the mixture to make the aircraft surfaces are clean, the remaining fluid will give some anti-icing protection.		
C.	The fluid mixed with the water can be Type I deicing (ice removal)/anti-icing fluid or Type II, Type III or Type IV deicing/anti-icing fluid. The holdover time will be longer with the Type II, Type III or Type IV deicing/anti-icing fluid. With each fluid, quantity of fluid to use in the mixture is affected by the following: 1) The airline experience 2) The fluid specifications 3) The manufacturer's recommendations 4) The weather conditions.		
D.	If additional treatment is required before flight, the full deicing/anti-icing procedure must be performed. Ensure that any residues from previous treatments are flushed off.		
V.	**TWO-STEP ICE REMOVAL/ANTI-ICING**		
A.	The application of Type II, III, and IV fluid, especially when used in a one-step process or in the first step of a two-step process, may cause residues to collect in aerodynamically quiet areas, cavities and gaps. The application of hot water or heated Type I fluid in the first step of a two-step process will minimize the formation of residues. Residues may rehydrate and freeze under certain temperature, high humidity and/or rain conditions and may block or impede critical flight control systems. If a Type II, III, or IV fluid is		

	used in a one-step process or in the first step of a two-step process, then an appropriate inspection and cleaning program should be established. Whenever suitable, deice and anti-ice with only Type I.		
B.	The two-step ice removal/anti-icing procedure is usually the recommended procedure when the precipitation conditions are continuous. The second step must be done no more than 3 minutes after you begin the first step. Do the procedure area by area if it is necessary.		
C.	The items that follow will have an effect on the holdover time you get after you do the anti-icing procedure. 1) The fluid that was used 2) The weather conditions		
D.	Do not apply an additional coating of anti-icing fluid on top of contaminated fluid (fluid that has been absorbing precipitation). If additional treatment is required before flight, the full deicing/anti-icing procedure must be performed. Ensure that any residues from previous treatment are flushed off.		
VI.	**TO PARK THE AIRCRAFT** **WARNING:** IF HIGH WINDS ARE POSSIBLE, USE THE PROCEDURE IN (PARK THE AIRCRAFT, TASK 10-11-03-580-801) TO SET THE STABILIZER. HIGH WIND CONDITIONS CAN CAUSE DAMAGE TO THE AIRCRAFT AND INJURY TO PERSONNEL.		
A.	The area where you will park the aircraft must be clear of ice and snow. (Aircraft Parking, TASK 10-11-01-580-801 gives the full procedures to park the aircraft. **NOTE:** Use Prepare The Aircraft For Storage for More Than Seven Days, TASK 10-12-02-550-802 if more steps are necessary because of the weather conditions and length of time the aircraft will be parked.		
B.	When it is possible, point the aircraft in the direction the wind is usually from.		
C.	Set the aircraft control surfaces so that the aircraft is ready for deicing/anti-icing operations if necessary to remove accumulated snow and ice. 1) Put the wing flaps to the full up position.		

	2) Put the stabilizer position to 5 units of trim.		
D.	**CAUTION:** EXAMINE THE ENGINE INTAKE AREAS IMMEDIATELY AFTER SHUTDOWN FOR ICE THAT IS THERE. REMOVE THE ICE WHILE THE TEMPERATURE OF THE ENGINE DECREASES AND BEFORE YOU INSTALL THE ENGINE PROTECTIVE PLUGS AND COVERS. IF YOU INSTALL THE PLUGS BEFORE THE TEMPERATURE OF THE ENGINE DECREASES, THE REMAINING HEAT IN THE ENGINE WILL MELT THE ICE TO WATER. THIS WATER WILL FLOW TO THE BOTTOM OF THE FAN SECTION. IT WILL FREEZE AGAIN WHEN THE TEMPERATURE OF THE ENGINE IS BELOW FREEZING. THIS WILL LOCK THE TIPS OF THE FAN LOWER BLADES IN ICE. Install all the plugs and covers, where available, for the intake or exhaust ducts and the different probes such as the pitot tubes. Use a brush to apply a thin layer of anti-ice fluid to the aircraft surface before you install the cover. The covers will not freeze to the aircraft if you do this.		
VII.	**ENGINE OPERATION**		
A.	The full procedures to operate the engines in cold weather conditions do this task: Procedure to Prepare the Engine for Operation, TASK 71-00-00-700-818-F00.		
B.	**CAUTION:** REMOVE ICE AND SNOW FROM THE ENGINE. IF YOU DO NOT REMOVE THE ICE AND SNOW, DAMAGE TO THE ENGINE CAN OCCUR. Remove Ground-Accumulated Ice.		
C.	Large pieces of ice and/or snow that go into the engine inlet can cause damage to the internal engine parts. Remove all the ice or snow from the engine inlet ducts and fan blades before you start the engines.		
D.	Engine icing can occur when the conditions that follow occur:		

	NOTE: You must use the thermal anti-icing system for the engines/nacelles when these conditions occur. 1) There is moisture you can see such as clouds, fog, rain, snow, sleet or ice crystals. 2) You will do ground operations with the static air temperature is less than 50°F (10°C).		
E.	Before you start the engines, make sure there are no fluids around the exhaust areas that can start ignition.		
VIII.	**FUEL ICING**		
A.	The items that follow have the most effect on the quantity of water in aviation fuels: 1) Where the fuel is kept 2) How the fuel is moved.		
B.	Fuel that is open to moisture or the usual atmospheric conditions contains more water than that kept in tightly sealed containers. This water in the fuel, when there is high humidity and temperature conditions that change, can be more than 3 gallons in each thousand gallons of fuel. As the temperatures decrease, there is a separation of the water and the fuel. The water will collect at the lowest point in the tank and freeze if the temperature is sufficiently low. If the temperature of the fuel is below 32°F (0°C), do not drain the fuel tank sumps. To check for water at the fuel tank sump drain valves with fuel temperature below 32°F (0°C), do one of the following to raise the temperature of the fuel: 1) Fill the fuel tanks with warn fuel		
IX.	**TOILETS AND PORTABLE WATER**		
A.	The water will not freeze in an aircraft that operates because there is sufficient heat in the area. When the aircraft does not operate and is let stay in an area that is not heated, more servicing is necessary. Do the steps that follow if the cabin temperature will decrease below the freezing point. **1) Toilets** a) When the aircraft will be operated you can add antifreeze fluids to the solution used to precharge the waste tank to make sure it will not freeze. Be careful in the selection of the materials you use. The antifreeze and the flushing deodorizer detergent can make foam		

when mixed. Foam can also occur when antifoam agents break down when they mix with a deodorizing detergent. Look at the fluid manufacturers' instructions to see if they can be mixed.

b) When the aircraft will not be operated you must fully drain the toilet flushing system to make sure it will not freeze, do this task: Waste Tank Servicing, TASK 12-17-01-610-801.

2) Portable Water

CAUTION: DRAIN THE WATER SYSTEM. IF THE WATERLINES HAVE WATER IN THEM, THEY CAN FREEZE IN COLD WEATHER. THIS CAN CAUSE DAMAGE TO THE WATERLINES.

a) You must drain all of the water from the potable water system, do this task:
Potable Water System - Drain, TASK 12-14-01-600-801.

All above steps have been done without any deviation.

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ANNEXURE A.
GUIDELINE FOR THE APPLICATION OF FLUID TYPE AND HOLDOVER TIMES

OUTSIDE AIR TEMPERATURE (OAT)	TWO-STEP PROCEDURE		ONE-STEP PROCEDURE DEICING/ANTI-ICING
	1ST STEP: DEICING	2ND STEP: ANTI-ICING	
27°F (-3°C) or more	Water, or a mixture of fluid and water at a minimum temperature of 140°F (60°C) at the nozzle	Mixture of fluid and water at a minimum temperature of 140°F (60°C), 180°F (82°C) maximum at the nozzle with freezing point of at least 18°F (10°C) below OAT	Mixture of fluid and water at a minimum temperature of 140°F (60°C), 180°F (82°C) maximum at the nozzle with a maximum freezing point of 18°F (10°C) less than the OAT (subtract 18°F from the OAT to get the maximum freezing point)
Less than 27°F (-3°C)	The freezing point of the heated fluid mixture must be a maximum of 5°F (3°C) more than OAT		
NOTE: Upper temperature limit can not be more than the fluid manufacturer's recommendation. **NOTE:** This table is applicable for the use of Type I Holdover Time Guidelines. If holdover times are not required, a temperature of 140°F (60°C), 180°F (82°C) maximum at the nozzle is desirable. **CAUTION:** WING SKIN TEMPERATURE MAY DIFFER AND, IN SOME CASES, BE LOWER THAN OAT. A STRONGER MIX (MORE GLYCOL) CAN BE USED UNDER THESE CONDITIONS.			
1) To be applied before first step fluid freezes, typically within 3 minutes.			

TABLE 1: GUIDELINE FOR THE APPLICATION OF TYPE I FLUID MIXTURE

OUTSIDE AIR TEMPERATURE (OAT)	ONE-STEP PROCEDURE DEICING/ANTI-ICING	TWO-STEP PROCEDURE	
		1ST STEP: DEICING	2ND STEP: ANTI-ICING
27℉ (-3℃) and above	50/50 Heated Type II / IV or 100/0 Heated Type III	Heated water or a heated mixture of Type I, Type II, Type III or Type IV and water	50/50 Type II / IV or 100/0 Type III
Below 27℉ (-3℃) to 7℉ (-14℃)	75/25 Heated Type II / IV or 100/0 Heated Type III	Heated mixture of Type I, Type II, Type III, or Type IV, and water with a maximum freezing point of 5℉ (3℃) more than OAT	75/25 Type II / IV or 100/0 Type III
Below 7℉ (-14℃) to -13℉ (-25℃)	100/0 Heated Type II / III or IV	Heated mixture of Type I, Type II, Type III, or Type IV, and water with a maximum freezing point of 5℉ (3℃) more than OAT	100/0 Type II / III or IV
Below -13°F (-25°C)	You can use Type II / IV fluid at temperatures that are less than 13°F (25°C) if the freezing point of the fluid is a maximum of 13 degrees F (7 degrees C) less than the OAT, and aerodynamic acceptance criteria are met. You can use Type III fluid when the temperature is less than 14°F (10°C) if the fluid freezing point is a maximum of 13 degrees F (7 degrees C) less than the OAT, and aerodynamic acceptance criteria are met. Consider the use of Type I when Type II, III, or IV fluid can not be used.		

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

NOTE: For heated fluids, a fluid temperature not less than 140°F (60°C) and not more than 180°F (82°C) at the nozzle is desirable. Upper temperature limit shall not exceed fluid manufacturer recommendations.

CAUTION:

- WING SKIN TEMPERATURE MAY DIFFER AND, IN SOME CASES, BE LOWER THAN OAT. A STRONGER MIX (MORE GLYCOL) CAN BE USED UNDER THESE CONDITION.
- AS FLUID FREEZING MAY OCCUR, 50/50 TYPE II OR IV FLUID SHALL NOT BE USED FOR THE ANTI-ICING STEP OF A COLD-SOAKED WING AS INDICATED BY FROST OR ICE ON THE LOWER SURFACE OF THE WING IN THE AREA OF THE FUEL TANK.
- AN INSUFFICIENT AMOUNT OF ANTI-ICING FLUID, ESPECIALLY IN THE SECOND STEP OF A TWO-STEP PROCEDURE, MAY CAUSE A SUBSTANTIAL LOSS OF HOLDOVER TIME, PARTICULARLY WHEN USING A TYPE I FLUID MIXTURE FOR THE FIRST STEP (DEICING).

TABLE 2: GUIDELINE FOR THE APPLICATION OF TYPE II, Type III and Type IV FLUID MIXTURE

OAT		Approximate Holdover Times Under Various Weather Conditions (hours : minutes)						
°C	°F	Active Frost	Freezing Fog	Snow/ Snow Grains (1)	Freezing Drizzle (2)	Light Freezing Rain	Rain on Cold Soaked Wing	Other (3)
-3 and above	27 and above	0:45	0:11 - 0:17	0:06 - 0:11	0:09 - 0:13	0:02 - 0:05	0:02 - 0:05 (4)	CAUTION: No Holdover time Guidelines exist
below -3 to -6	below 27 to 21	0:45	0:08 - 0:13	0:05 - 0:08	0:05 - 0:09	0:02 - 0:05		
below -6 to -10	below 21 to 14	0:45	0:06 - 0:10	0:04 - 0:06	0:04 - 0:07	0:02 - 0:05		
below -10	below 14	0:45	0:05 - 0:09	0:02 - 0:04				

(1) In light "Rain and Snow" conditions use "Light Freezing Rain" holdover times.
(2) If positive identification of "Freezing Drizzle" is not possible use "Light Freezing Rain" holdover times.
(3) Other conditions are: Heavy snow, snow pellets, ice pellets, hail, moderate freezing rain and heavy freezing rain.
(4) No holdover time guidelines exist for this condition for 0°C (32°F) and below

Type I Fluid / Water Mixture is selected so that the Freezing Point of the mixture is at least 10 °C (18 °F) below actual OAT

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 also be reduced when the aircraft skin temperature is lower than OAT. **Therefore, the indicated times should be used only in conjunction with a pre-takeoff check.**

De-icing/anti-icing fluids used during ground de-icing/anti-icing are not intended for - and do not provide - protection during flight.

TABLE 3: GUIDELINE FOR HOLDOVER TIMES ANTICIPATED FOR TYPE I FLUID MIXTURES AS A FUNCTION OF WEATHER CONDITIONS AND OAT

OAT		Type II Fluid Concentration Neat-Fluid/Water (Vol %/Vol %)	Approximate Holdover Times Under Various Weather Conditions (hours : minutes)						
°C	°F		Active Frost	Freezing Fog	Snow/ Snow Grains (1)	Freezing Drizzle (2)	Light Freezing Rain	Rain on Cold Soaked Wing	Other (3)
-3 and above	27 and above	100/0	8:00	0:35-1:30	0:20-0:45	0:30-0:55	0:15-0:30	0:05-0:40 (4)	CAUTION: No Holdover time Guidelines exist
		75/25	5:00	0:25-1:00	0:15-0:30	0:20-0:45	0:10-0:25	0:05-0:25 (4)	
		50/50	3:00(6)	0:15-0:30	0:05-0:15	0:05-0:15	0:05-0:10		
below -3 to -14	below 27 to 7	100/0	8:00(6)	0:20-1:05	0:15-0:30	0:15-0:45 (5)	0:10-0:20 (5)		
		75/25	5:00(6)	0:20-0:55	0:10-0:20	0:15-0:30 (5)	0:05 -0:15 (5)		
below -14 to -25	below 7 to -13	100/0	8:00(6)	0:15-0:20	0:15-0:30				
below -25	below -13	100/0	Type II fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the OAT and the aerodynamic acceptance criteria are met. Consider use of type I fluid when type II fluid cannot be used (see table 3).						

(1) In light "Rain and Snow" conditions use "Light Freezing Rain" holdover times
(2) If positive identification of "Freezing Drizzle" is not possible use "Light Freezing Rain" holdover times
(3) Other conditions are: Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, hail
(4) No holdover time guidelines exist for this condition for 0°C (32°F) and below
(5) No holdover time guidelines exist for this condition below -10°C (14°F)
(6) Radiation cooling during active frost conditions may reduce holdover times when operating close to the lower end of the OAT range

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 also be reduced when the aircraft skin temperature is lower than OAT. **Therefore, the indicated times should be used only in conjunction with a pre-takeoff check.**

De-icing/anti-icing fluids used during ground de-icing/anti-icing are not intended for - and do not provide - protection during flight.

TABLE 4: GUIDELINE FOR HOLDOVER TIMES ANTICIPATED FOR TYPE II FLUID MIXTURES AS A FUNCTION OF WEATHER CONDITIONS AND OAT

OAT		Type III Fluid Concentration Neat-Fluid/Water (Vol %/Vol %)	Approximate Holdover Times Under Various Weather Conditions (hours : minutes)						
°C	°F		Active Frost	Freezing Fog	Snow / Snow Grains (1)	Freezing Drizzle (2)	Light Freezing Rain	Rain on Cold Soaked Wing	Other (3)
-3 and above	27 and above	100/0	2:00	0:20-0:40	0:10-0:20	0:10-0:20	0:08-0:10	0:06-0:20 (4)	CAUTION: No Holdover time Guidelines exist
		75/25	1:00	0:15-0:30	0:08-0:15	0:08-0:15	0:06-0:10	0:02-0:10 (4)	
		50/50	0:30	0:10-0:20	0:04-0:08	0:05-0:09	0:04-0:06		
below -3 to -10	below 27 to 14	100/0	2:00	0:20-0:40	0:09-0:15	0:10-0:20	0:08-0:10		
		75/25	1:00	0:15-0:30	0:07-0:10	0:09-0:12	0:06-0:09		
below -10	below 14	100/0	2:00	0:20-0:40	0:08-0:15				

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 are met. Consider use of type I fluid when type III fluid cannot be used (see table 3).

(1) In light "Rain and Snow" conditions use "Light Freezing Rain" holdover times
(2) If positive identification of "Freezing Drizzle" is not possible use "Light Freezing Rain" holdover times
(3) Other conditions are: Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, hail
(4) No holdover time guidelines exist for this condition for 0°C (32°F) and below

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 also be reduced when the aircraft skin temperature is lower than OAT. **Therefore, the indicated times should be used only in conjunction with a pre-takeoff check.**

De-icing/anti-icing fluids used during ground de-icing/anti-icing are not intended for - and do not provide - protection during flight.

TABLE 5: GUIDELINE FOR HOLDOVER TIMES ANTICIPATED FOR TYPE III FLUID MIXTURES AS A FUNCTION OF WEATHER CONDITIONS AND OAT

OAT		Type IV Fluid Concentration Neat-Fluid/Water (Vol %/Vol %)	Approximate Holdover Times Under Various Weather Conditions (hours : minutes)						
°C	°F		Active Frost	Freezing Fog	Snow/ Snow Grains (1)	Freezing Drizzle (2)	Light Freezing Rain	Rain on Cold Soaked Wing	Other (3)
-3 and above	27 and above	100/0	12:00	1:15-2:30	0:35-1:15	0:40-1:10	0:25-0:40	0:10-1:05 (4)	CAUTION: No Holdover time Guidelines exist
		75/25	5:00	1:05-1:45	0:20-0:55	0:35-0:50	0:15-0:30	0:05-0:40 (4)	
		50/50	3:00(6)	0:15-0:35	0:05-0:15	0:10-0:20	0:05-0:10		
below -3 to -14	below 27 to 7	100/0	12:00(6)	0:20-1:20	0:20-0:40	0:20-0:45 (5)	0:10-0:25 (5)		
		75/25	5:00(6)	0:25-0:50	0:15-0:35	0:15-0:30 (5)	0:10-0:20 (5)		
below -14 to -25	below 7 to -13	100/0	12:00(6)	0:15-0:40	0:15-0:30				
below -25	below -13	100/0	Type 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 the OAT and the aerodynamic acceptance criteria are met. Consider use of type I fluid when type IV fluid cannot be used (see table 3).						

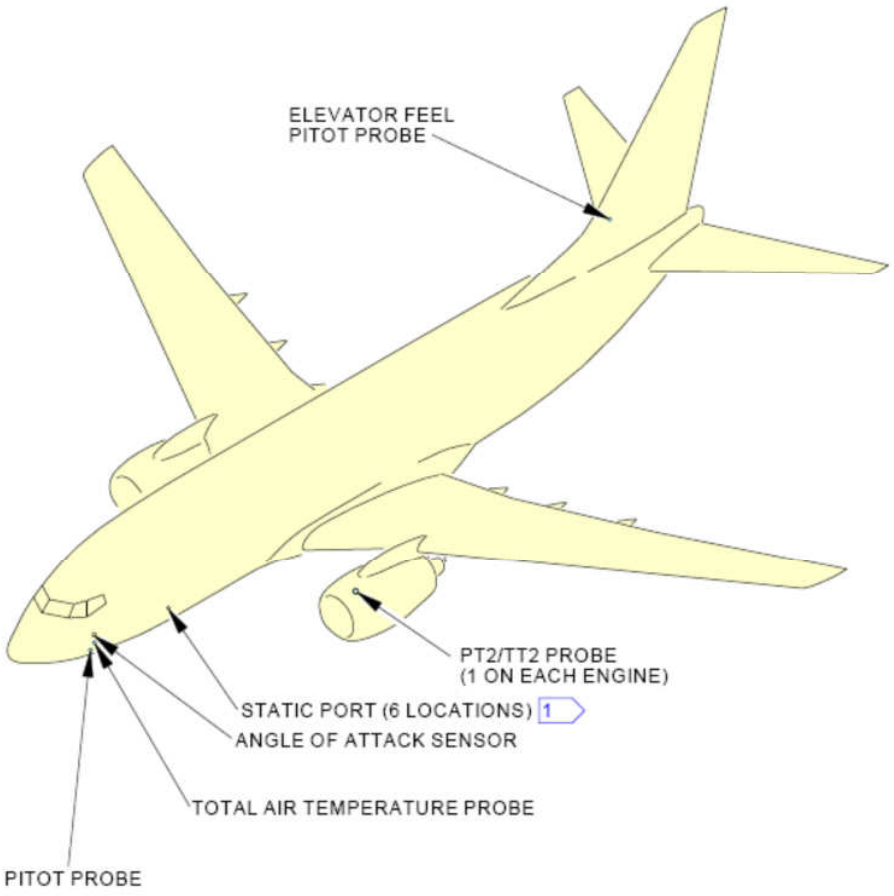
(1) In light "Rain and Snow" conditions use "Light Freezing Rain" holdover times
(2) If positive identification of "Freezing Drizzle" is not possible use "Light Freezing Rain" holdover times
(3) Other conditions are: Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, hail
(4) No holdover time guidelines exist for this condition for 0°C (32°F) and below
(5) No holdover time guidelines exist for this condition below -10°C (14°F)
(6) Radiation cooling during active frost conditions may reduce holdover times when operating close to the lower end of the OAT range

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 also be reduced when the aircraft skin temperature is lower than OAT. **Therefore, the indicated times should be used only in conjunction with a pre-takeoff check.**

De-icing/anti-icing fluids used during ground de-icing/anti-icing are not intended for - and do not provide - protection during flight.

TABLE 6: GUIDELINE FOR HOLDOVER TIMES ANTICIPATED FOR TYPE IV FLUID MIXTURES AS A FUNCTION OF WEATHER CONDITIONS AND OAT

ANNEXURE B.



(LEFT SIDE IS SHOWN, RIGHT SIDE IS OPPOSITE)

1 ONE ALTERNATE STATIC PORT NEAR THE BOTTOM OF THE FUSELAGE IS NOT SHOWN.

H04173 S0006661762_V4

FIGURE 1: PROBE LOCATIONS

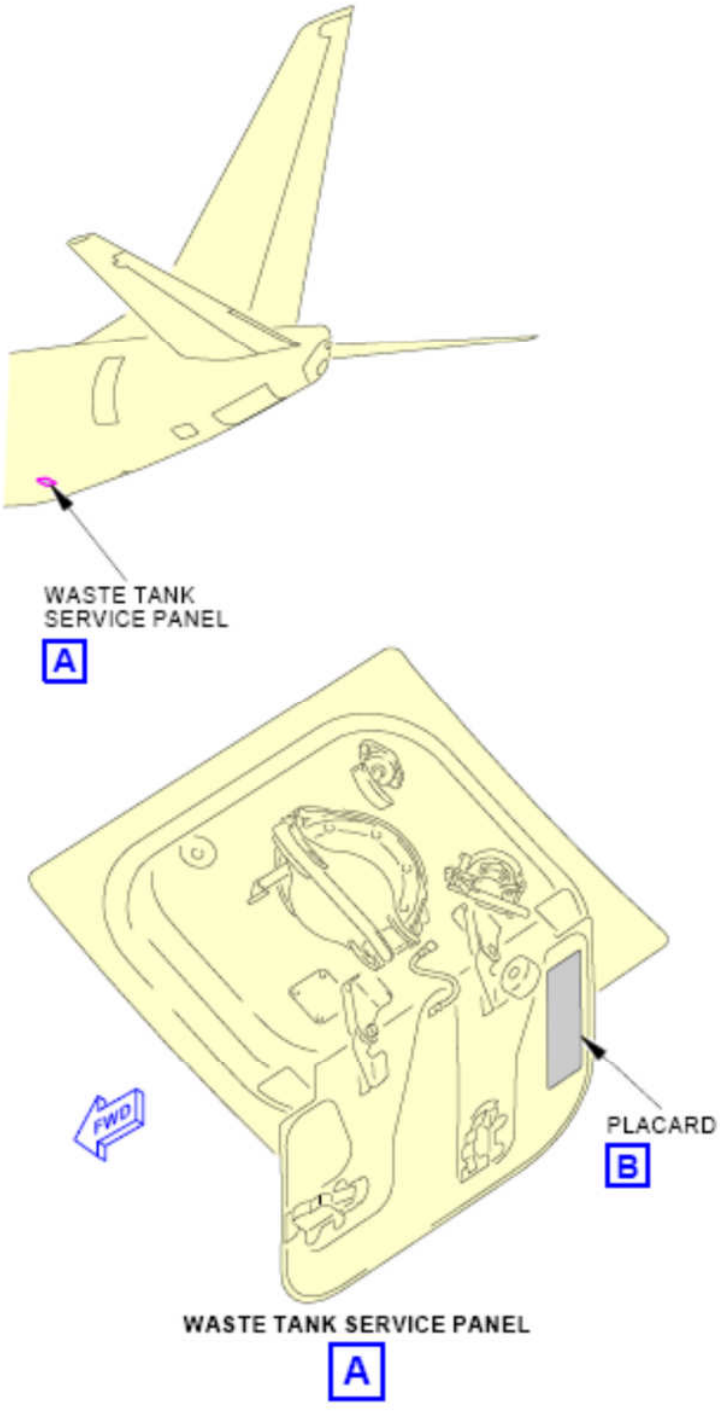


FIGURE 2: WASTE TANK

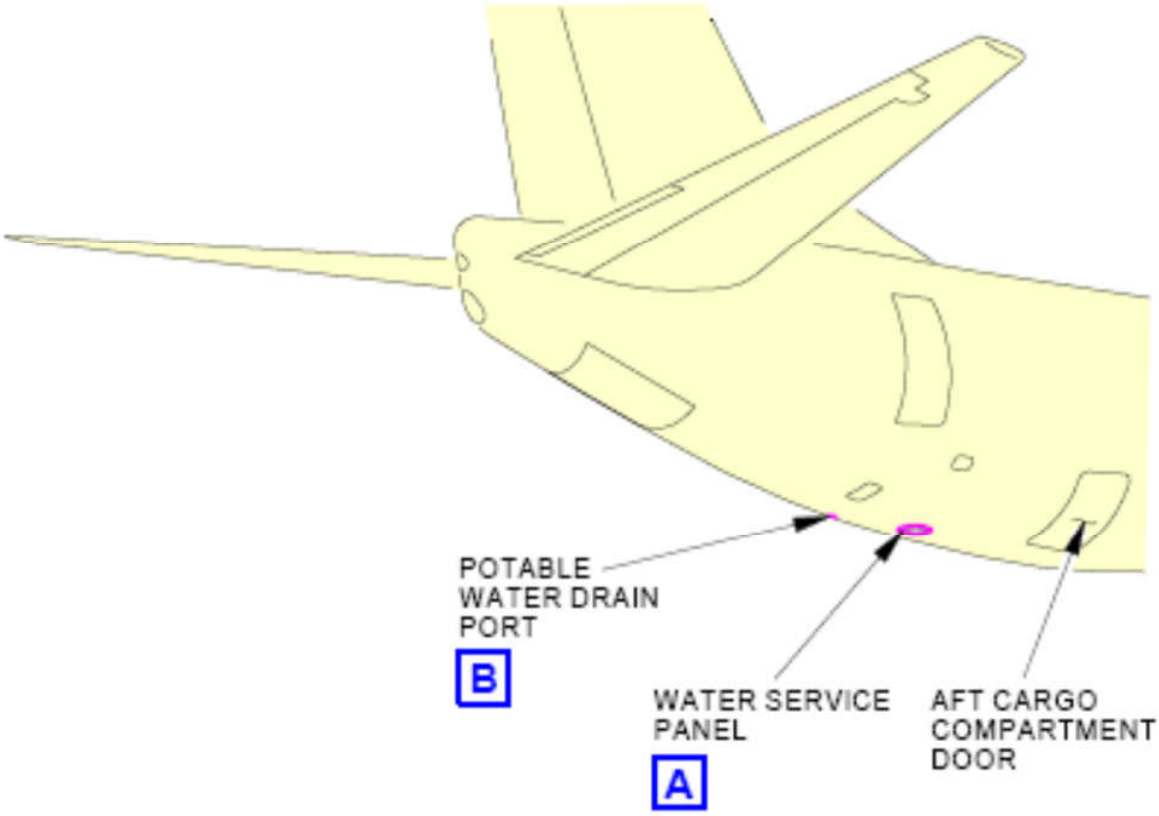


FIGURE 3: PORTABLE WATER

ANNEXURE C.
DEICING/ANTI-ICING CHECKLIST AND REPORT

AIRLINE NAME : ..... DATE : .....
STATION NAME : ..... A/C REG. : .....
INSPECTED BY : ..... A/C MSN : .....

Handling airline performing deicing/anti-icing : .....
Responsible Manager : .....
Address : .....
Phone : .....
E-mail : .....

Handling airline performing deicing/anti-icing : .....
(Fill in if not the same as above)
Responsible Manager : .....
Address : .....
Phone : .....
E-mail : .....

FLUIDS

		Specification Fluid Released To				
		ISO 11075	**ISO 11078**	**AMS 1424**	**AMS 1428**	**Others**
Fluid A:	Manufactures:					
	Brand Name/Type:					
Fluid B:	Manufactures:					
	Brand Name/Type:					
Fluid C:	Manufactures:					
	Brand Name/Type:					

Specify above all deicing/anti-icing fluids likely to be used on aircraft by the previously named Handling Airline. It is up to the individual Airline to approve the listed fluid(s).

Finding/Recommendations: .....
.....
.....
.....

Corrective measures required prior to deicing/anti-icing operation: (YES/NO) .....
.....
.....
.....

ENGINEERING AUTHORIZATION

NO. : B737NG-EA-12-937R1	DATE : February 10, 2016
Aircraft Reg:	

STATION:			STARTED TIME:		FINISHED TIME :
RII : YES ☐ NO ☑			ACTUAL MAN HOURS		
INSPECTED BY			RELEASED BY		
SIGN	STAMP	DATE	SIGN	AUTH. NO. STAMP	DATE