COLD WEATHER OPERATION

The Cold Weather Operation contains amplified procedures to operate in icing conditions and supplement those procedures published in the AFM. In case of disagreement, the AFM shall prevail.

EXTERNAL INSPECTION

Operating regulations clearly state that no takeoff is allowed when snow, ice or frost is adhering to the airplane.

Make sure nose wheel chocks are in place. If required, chock main wheels as well. Remove engine air inlet/outlet plugs and covers from pitot/static tubes, static ports and NACA air inlets. If required, leave engine plugs installed until engine start.

The pilot in command has the final responsibility for ensuring that the airplane is clear of ice, frost or snow. The primary method for the pilot to ensure a clean airplane is through close visual and physical inspection prior to takeoff. Visually check the wing, control surfaces, engines and fuselage prior to takeoff. In addition, as no frozen contamination is allowed on the wing upper surface, carry out a physical (hands-on) inspection to ensure that there is no ice accumulation. Do not touch the surfaces with bare hands, as the skin may stick to a freezing surface.

Even at intermediate stops, an external walk around is necessary due to the possibility of ice forming after landing from either cold soaking frost, conventional frost or precipitation freezing on the airplane.

During the pre-flight walk-around, ensure that the pitot tubes, pressurization static ports, all inlets, outlets and vents are clear of ice and unobstructed.

If the airplane has become cold soaked as a result of flight at very cold temperatures, fuel might be at a subfreezing temperature. This can cause ice accumulation if the airplane is subjected to high humidity, fog, drizzle or rain even when the outside air temperature is substantially above freezing.

At the completion of the walk-around, if ice, snow or frost is discovered, de-icing procedure will be required. Unheated/heated water or Type I, II, III or IV de-icing fluid can be used.

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The check for ice accumulation should be done in a well-lit area.

Fuselage, Wing, Tail and Control Surfaces ..... FREE OF FROST, ICE OR SNOW

Check that the fuselage, wing upper and lower surfaces, tail and control surfaces are free of frost, ice or snow. Inspect control surfaces, gaps and hinges for signs of residual fluid or gel.

No contamination is permitted on the lower or upper surface of the horizontal stabilizer or wing. Polished frost is not allowed.

A thin layer of hoarfrost where you can easily see below the airplane marking, letters, or paint lines on the fuselage top is permitted.

All snow and ice must also be cleared from nose radome and fuselage nose forward of windshield, as it is likely to blow back into windshields during taxi or takeoff.

Pitot Tubes/Static Ports ..... CLEAR OF ICE AND ANTI-ICING RESIDUE CONTAMINATION

Check if the pitot/static tubes and the static ports are free from residual de-icing fluid and that there are no hardened residues on any of those components. If any contamination is found on these components, call maintenance.

Engine/Pylon ..... CLEAR OF ICE OR SNOW

Check that the engine inlet is clear of ice or snow, and that the fan is free to rotate. Ensure that all ice deposits are removed prior to engine starting.

Landing Gear ..... CLEAR OF ICE, UNOBSTRUCTED

Check that doors, gear locks and mechanisms are unobstructed and clear of ice and snow and ensure no leaks exist.

Fuel Tank Air Inlets ..... CLEAR OF ICE OR SNOW

Check all inlets, outlets and vents are clear of ice and unobstructed.

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Batteries..... INSTALLED

For airplanes Pre-Mod. SB 505-24-0015: Ambient temperature of -10°C (14°F) or colder requires batteries removal to prevent cold soaking or the batteries should be preheated to temperatures warmer than -10°C (14°F). Verify that batteries have been re-installed or preheated.

For airplanes Post-Mod. SB 505-24-0015 or with an equivalent modification factory incorporated: Ambient temperature of -18°C (-0.4°F) or colder requires batteries removal to prevent cold soaking or the batteries should be preheated to temperatures warmer than -18°C (-0.4°F). Verify that batteries have been re-installed or preheated.

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DEICING/ANTI-ICING FLUID APPLICATION

Airplane surfaces contaminated by ice, frozen precipitation or frost must be deiced before departure. The airplane must be anti-iced when the risk of freezing precipitation exists at dispatch or freezing precipitation is actually taking place. While deicing removes ice, anti-icing protects against additional icing for a certain period of time, called holdover time. A combination of both deicing and anti-icing may be performed based on the judgment of the flight crew and procedures developed by the operator. The choice of the correct method and fluid to be applied must be done according to the weather condition, available equipment, available fluids and the holdover time.

Deicing and anti-icing fluids lower the freezing point of frozen precipitation thus delaying the accumulation of contamination on the airplane. When applied to a clean surface, the fluid forms a thin layer that has a lower freezing point than precipitation. The fluid is highly soluble in water, thus the precipitation or ice melts on contact with the fluid. These fluids also delay the onset of frost on airplane surfaces. As the ice melts, the fluid dilutes with the water, thereby causing the mixture to become less effective or to run off. Ice can begin to form again after enough dilution has occurred and the freezing point begins to rise.

Deicing/anti-icing fluids are not intended to provide icing protection during flight. The fluid must flow off the surface during takeoff. Embraer has performed flight tests to investigate the effects of approved fluids on performance and handling characteristics. The flight tests demonstrated these fluids did not have a measurable effect on takeoff and climb performance.

Anti-icing fluids include fluid types I, II, III or IV, in a mixture with water or undiluted. Type I fluid is not thickened and characteristically forms a thin wetting film which provides relatively limited holdover time. Type I fluid is usually used for deicing and provides protection against refreezing when no precipitation is present. Types II, III and IV fluids form a thicker film that provides a longer holdover time. The holdover time of the type IV fluid is greater than that of type II, which in its turn has a longer holdover time than type III fluid. Type IV is an enhanced-performance fluid, with anti-icing effectiveness superior to Type II and provides an increased holdover time. Type IV fluids offer significant operational advantages in terms of holdover times.

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However, all thickened fluids may dry out and residues may accumulate in aerodynamically quiet areas. The residues may rehydrate and refreeze during flight, which can potentially restrict the movement of flight controls. Operators are reminded to frequently inspect control surfaces, gaps and tab hinges for signs of fluid residues. A two-step deicing/anti-icing fluid application is recommended, so that residue accumulation in the critical areas is minimized.

A deicing fluid is composed of heated water, or a mixture of water and type I, II, III or IV fluids. Heating is applied to a minimum temperature of 60°C to ensure maximum deicing efficiency.

HOLDOVER TIMES

Holdover times for the fluids are shown in tables derived for each specific fluid brand, under various temperatures, fluid concentration and precipitation category.

- The lower limit of the published holdover time is used to indicate the estimated time of protection during moderate precipitation;
- The upper limit indicates the estimated time during light precipitation;
- Heavy conditions are not covered.

Therefore, crew experience and operational guidelines are required to clearly settle what is considered a heavy, moderate or light condition. The holdover time for the existing weather conditions has to be greater than the time from the start of fluid application to the start of takeoff roll.

Holdover times should be seen as rough approximations. They simply reflect the average estimated time that an anti-icing fluid should prevent the formation of frozen contaminants on the protected surfaces.

The following conditions can reduce actual holdover times:

- Windy conditions;
- Jet blast;
- Heavy precipitation or;
- High moisture content.

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In case of ice build-up after deicing/anti-icing fluid application, do not assume that ice will be blown off during takeoff roll. If the holdover time expires, return for another deicing/anti-icing fluid application.

If the holdover time expires or contamination is found over the airplane before take off, the complete deicing/anti-icing procedure must be performed. Residues from previous treatment must be flushed off first. Under no circumstances should an airplane that has been previously anti-iced receive a further spray of anti-icing fluid directly on top of the anti-icing contaminated film.

The pre-takeoff contamination check is normally accomplished either from inside or outside the airplane within 5 minutes prior to beginning takeoff.

When inspecting the wing, during the pre-takeoff contamination check, look at the entire upper surface and not only at the leading edge or wing tip. Although the wing tips can be seen from the cockpit, almost the entire wing is visible from a cabin window. Therefore, it is strongly advised that the visual inspection be done by a crew member from the cabin. Additionally, the crew should ask for the assistance of trained and qualified personnel outside the airplane to assist in the pre-takeoff and check to make sure that the tail and fuselage, which are not visible from the cockpit or cabin, are free of any ice contamination.

It is the pilot's responsibility to decide whether or not to accept the airplane for flight. If contamination is suspected, the airplane should return for additional deicing or anti-icing. Takeoff in conditions of moderate and heavy freezing rain is not approved.

NOTE: Check if all air inlets and pylon are free of snow to avoid ingestion at the moment of turning the fan on or during the fluid application.

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GROUND DEICING/ANTI-ICING STRATEGY

To prevent frozen contamination on airplane surfaces deice and anti-icing operation requires that fluids be distributed uniformly over surfaces. In order to control uniformity, all horizontal surfaces must be visually checked during fluid application. The correct amount is indicated by fluid just beginning to drip off the leading edge. Do not use tools to scrape or scratch compacted snow from the airframe surfaces or from the gaps between fixed or movable surfaces. Once the airplane has been fully deiced, it is time to consider the prevention of any further ice contamination prior to takeoff by application of an anti-icing treatment.

The following surfaces must be protected:

- fuselage;

- wing upper surface and leading edge;

- horizontal stabilizer upper surface and leading edge;

- elevator upper surface;

- vertical stabilizer and rudder.

Soft Snow can be mechanically removed by blowing cold air across the airplane surface, with brooms, soft hand scrappers or rubber scrappers.

Engine deposits of snow should be mechanically removed from engine intakes with brooms, soft hand scrapers or rubber scrappers. Frozen deposits adhering to the lower surface of the intake or to the fan blades should be removed by applying hot air. To ensure the safety of ground personnel and passengers, this should be carefully coordinated with the flight crew.

Fuselage – Remove all accumulated snow on the nose to avoid snow blowing back during takeoff and restricting pilot visibility. Do not apply deicing or anti-icing fluid directly to the windshield and to the cockpit windows.

Fluid should be sprayed along the top centerline of the fuselage and then outboard, letting the fluid cascade down and across the windows. Fluid must not be sprayed directly onto windows and window seals, doors and door seals, scoops or NACA air inlets. Be careful not to cause damage to the antennas installed along the fuselage.

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Landing gear and wheel bays – application of fluid in this area must be kept to a minimum. Do not allow water or fluid mixture spray into wheels and brakes to avoid damage to carbon brakes. In these areas of the airplane, it is preferable to clear snow or slush using a brush.

Pitot/Static tubes and static ports. The fluids should be sprayed along the top of the sensors, allowing the fluid to cascade down across the sensor and deice it. Do not spray deicing fluid directly on the probes and static ports.

Vertical surfaces: Start at the top and then work down. The rudder should be in the neutral position.

Wings and Stabilizer: Spray from the tip inboard to the root, sweeping from the leading edge in the aft direction. It is important that the fluid be applied symmetrically to both wings so as to ensure that the aerodynamic effect of the fluid remaining is the same on both sides of the airplane.

A post-deicing/anti-icing check should be performed during or immediately following the ground deicing and anti-icing process. A check must be performed on all areas where fluid has been applied and to other areas that may be conducive to precipitation accumulation.

CAUTION: DO NOT APPLY FLUID DIRECTLY TO VENTS, DRAINS, OUTLETS OR INLETS, ICE DETECTOR, IASP, PITOT/STATIC TUBES AND STATIC PORTS.

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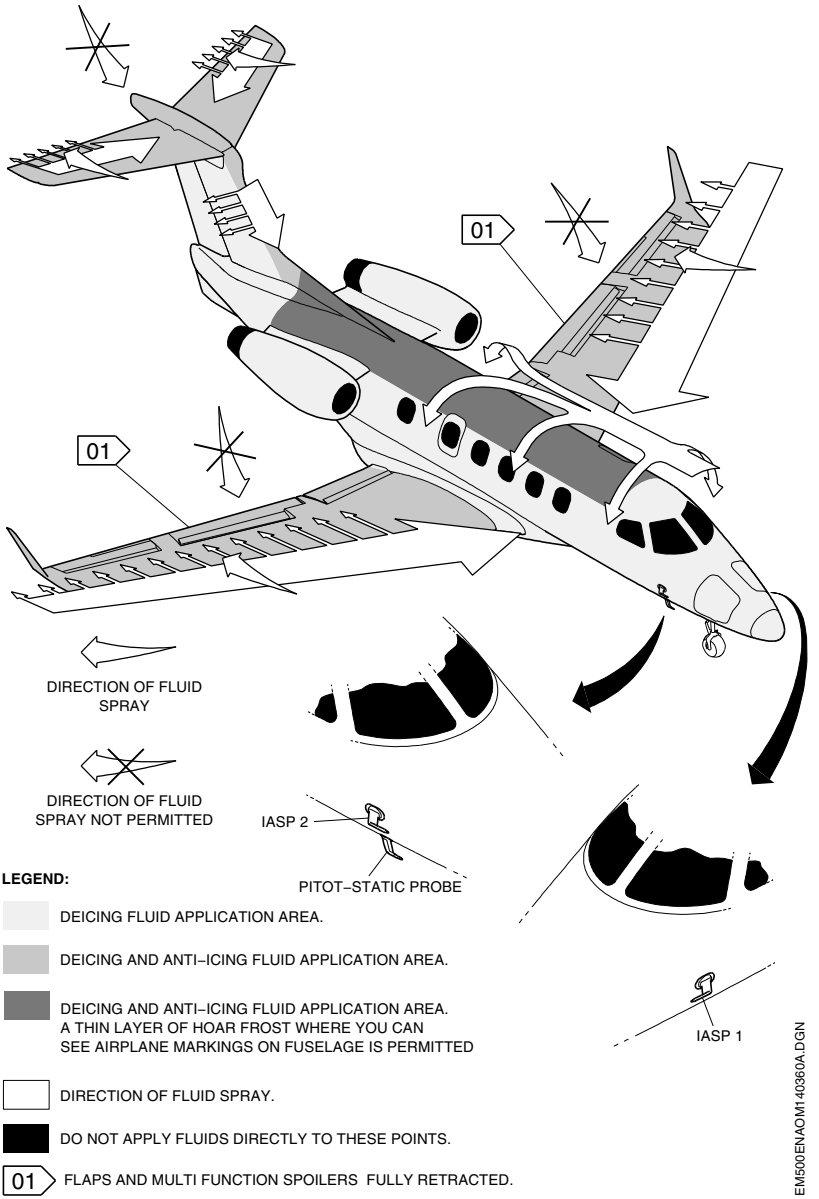

FLUID APPLICATION STRATEGY

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The approved fluids are:

- Type I, that agrees with SAE AMS 1424 specification (the use of Alkali Organic Salt-based fluid is not recommended);
- Type II, III and IV, that agree with SAE AMS 1428 specification.

NOTE: - The fluid application must be accomplished by trained and qualified personnel. For further information refer to AMM TASK 12-31-00-660-801-A.

- Specifications for fluid mixture, if applicable, and holdover times are provided by FAA (Federal Aviation Administration), AEA (Association of European Airlines) and TCCA (Transport Canada Civil Aviation).

Airplane configuration for fluid application:

Thrust Levers ..... IDLE
Set the engines to idle speed if engines are operating.

BLEED 1 & 2 Switches ..... OFF
Set the bleed switches to the OFF position to close the PRSOV and keep the fumes out of the passenger cabin and cockpit.

AIR CONDITIONING MODE Switch ..... OFF
Set the air conditioning mode switch to the OFF position to turn off the VCS.

ECS Knob ..... OFF VENT
Set the ECS knob to the OFF VENT position to turn off all ACS lines and opens the RAV to emergency ventilation.

Control Yoke/Pitch Trim ..... FULL NOSE UP
To minimize fluid accumulation on the elevator, pull control yoke and set pitch trim to full nose up during fluid application over the horizontal stabilizer. After fluid application, set pitch trim to takeoff position.

Control Pedals..... NEUTRAL POSITION
Set the rudder to the neutral position during the fluid application. After application, apply full right pedal to help flow off of the excessive fluid.

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Ailerons ..... NEUTRAL POSITION

Set the ailerons to the neutral position during the fluid application.

Flaps and Spoilers ..... RETRACTED

Retract the flaps and spoilers to minimize the accumulation of fluid on the gaps and hinges.

Wait at least 1 minute after fluid application.

BLEED 1 & 2 Switches ..... AUTO

Wait at least 3 minutes after fluid application.

ECS Knob ..... BOTH

AIR CONDITIONING MODE Switch..... AS REQUIRED

NOTE: To avoid the gelling of the residual fluid, the inspection and the cleaning of the gaps under the spoilers' panels, on the hinges of the rudder, on the ailerons and on the flaps surfaces and air exhaust of horizontal stabilizer are required. Refer to AMM TASK 12-31-00/600 for further information.

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ENGINE STARTING

Do not start the engine until it has been verified that all ice deposits have been removed from the air inlet.

Perform normal engine starting. If the engine does not start, maintenance procedures may be required or ground heating may be necessary to warm the engines.

Battery assisted engine startings during cold weather operation may result in high ITTs.

In the event of oil temperature below -40°C (-40°F) for starting, ground heating is necessary to warm the engines.

NOTE: - For airplanes Pre-Mod. SB 505-24-0015: If the battery has been cold soaked for 2 hours or longer at an ambient temperature of -10°C (14°F) or lower, it is recommended using a GPU (if applicable) or pre-heating the battery to above -10°C (14°F) prior to engine start.

- For airplanes Post-Mod. SB 505-24-0015 or with an equivalent modification factory incorporated: If the battery has been cold soaked for 2 hours or longer at ambient temperature of -18°C (-0.4°F) or lower, it is recommended using a GPU (if applicable) or pre-heating the battery to above -18°C (-0.4°F) prior to engine start.

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AFTER STARTING

Engine Instruments..... MONITOR

Monitor engine instruments, mainly oil pressure and temperature. Apply associated abnormal procedure if any failure arises.

HEATING/ICE PROTECTION Panel..... AS REQUIRED

Flight Controls..... CHECK

Check control wheel, control column and rudder pedals for freedom of movement and full travel. Control forces can be increased at low temperatures.

Operate all trim systems, including backup pitch trim system, checking for freedom of movement and full travel. If any flight control is suspected of restricted movement or jamming, report to the maintenance personnel.

Flaps ..... CHECK

Extend and retract the flaps. Make sure the flaps are free from snow or ice before moving them. Leave flaps UP if application of anti-icing/deicing fluids is expected.

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TAXI

Use minimum thrust for breakaway and taxiing, to avoid blowing snow or slush on personnel or airplanes nearby.

Maintain ground speed below 10 kt when taxiing in snow covered or icy runways. Lower speeds will also avoid throwing slush on the mating wheel and brake assembly.

Use firm brake pressure on taxi stops whenever pavement conditions permit in order to warm up the brakes and dry moisture buildup within the disk stack. Anti-skid protection is not provided below this speed, so apply brakes accordingly.

During taxi, "cold set" (the condition where the tire retains the flat shape it had while parked) may induce vibration in the airplane. Vibration should disappear as the tires recover their elasticity during taxi. Do not initiate your takeoff run before the "cold set" disappears.

Turns should be performed at the largest turning radius, preferably at a speed which does not require braking during the turn.

Maintain a greater than normal distance from other airplanes while taxiing in snow or slush-covered runways, to avoid contamination by snow blown by jet blasts.

Flaps .....AS REQUIRED

When taxiing through slush or standing water, flaps should be retracted to avoid snow and slush contamination from the main gear wheels.

WARNING: IF FLAPS WERE LEFT UP DURING TAXI, COMPLETE AFTER START CHECKLIST BEFORE TAKING OFF.

CAUTION: TAXI AT REDUCED SPEED ON ICE-COVERED RUNWAYS TO AVOID SKIDDING. REDUCE SPEED FOR ALL TURNS AND USE CAUTION WHEN TAXIING WITH HIGH CROSSWINDS.

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BEFORE TAKEOFF

Flight Controls..... CHECK

Check freedom of movement and full travel of all flight controls (including trims).

Flaps ..... SET

Set flaps to takeoff setting (if flaps were left up after starting the engines).

Takeoff Configuration ..... CHECK

Ice Accumulation ..... CHECK

A pre-takeoff contamination check should be performed prior to takeoff and within the holdover time.

Aerodynamic surfaces must be confirmed free of all forms of frost, ice, snow and slush prior to entering the takeoff runway or initiating takeoff. This check is particularly important when the published holdover times are about to run out. When contamination is in evidence, the de-icing/anti-icing operation must be repeated.

Visually inspect wing surfaces/leading edge and engine by looking through an appropriate window. The pilot-in-command must ask for the assistance of trained and qualified ground personnel to assist in the pre-takeoff check, so that tail surfaces and fuselage are also inspected.

Ice Protection Systems..... CHECK

Shortly before takeoff, accomplish operation in icing conditions procedures contained in the approved AFM.

Ice Protection Systems..... AS REQUIRED

Set the ice protection systems according to the operation in icing conditions procedures contained in the approved AFM.

WARNING: TAKEOFF MUST NOT BE PERFORMED WITH CAS MESSAGE A-I WINGSTB INHB PRESENTED. REFER TO THE ASSOCIATED PROCEDURE.

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TAKEOFF

Do not apply static takeoff technique on an icy or slippery runway, as the airplane may begin to slide when thrust lever is advanced with brakes applied. In this case, release brakes and advance thrust levers simultaneously.

However, takeoff distance for slippery runways is calculated in the AFM using the static takeoff technique only. For rolling takeoffs, performance data is valid from the point where takeoff thrust is achieved.

Apply light forward pressure on control column to increase nose wheel steering effectiveness.

CLIMB/CRUISE

Operation in moderate to severe icing conditions may induce ice build up on the fan spinner and/or blades. If ice accumulates, its asymmetrical shedding may result in high fan vibration.

NOTE: Engine vibration indication may peek to the maximum value prior to ice shedding; however, this will not affect the engine.

When flying in icing conditions or after flying in icing conditions, ice accretion on unprotected areas may cause vibration at high speeds. If vibration and/or buffeting occur, a change in the current airspeed will eliminate these effects. At high speeds, reduce the airspeed as required.

WARNING: ICE SPEED MUST NOT BE RESET UNTIL CREW IS CERTAIN ALL ICE HAS BEEN REMOVED.

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HOLDING

LDG GEAR Lever ..... UP

Flaps ..... UP

Recommended Airspeed:

Above 30000 ft ..... 165 KIAS MINIMUM

Below 30000 ft ..... 150 KIAS MINIMUM

CAUTION: EVEN SMALL ACCUMULATIONS OF ICE ON THE WING LEADING EDGE MAY CHANGE THE STALL CHARACTERISTICS OR THE STALL PROTECTION SYSTEM WARNING MARGIN.

DESCENT

Observe normal (including operation in icing conditions) procedures contained in the approved AFM.

When using the autopilot, monitor pitch attitude and speed continuously.

CAUTION: EVEN SMALL ACCUMULATIONS OF ICE ON THE WING LEADING EDGE MAY CHANGE THE STALL CHARACTERISTICS OR THE STALL PROTECTION SYSTEM WARNING MARGIN.

APPROACH AND LANDING

Observe normal (including operation in icing conditions) procedures contained in the approved AFM.

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LANDING ON WET OR SLIPPERY RUNWAYS

Conduct a positive landing to ensure initial wheel spin-up and initiate firm ground contact upon touchdown, achieving wheel load as quickly as possible. Such technique avoids hydroplaning on wet runways and reduces the strength of any ice bond that might have been eventually formed on brake and wheel assemblies during flight.

The factors that influence the occurrence of hydroplaning are high speed, standing water and poor runway macrotexture. When hydroplaning occurs, it causes a substantial loss of tire friction and wheel spin-up may not occur.

Icy runways can be very slippery at all speeds depending on temperature.

Stopping the airplane with the least landing run must be emphasized when landing on wet or slippery runways.

- Anticipate the approach procedures and speeds: a well-planned and executed approach, flare and touchdown minimize the landing distance.
- Lower nose wheel immediately to the runway. It will decrease lift and will increase main gear loading.
- Apply brakes with moderate-to-firm pressure, smoothly and symmetrically, and let the anti-skid do its job.
- If no braking action is felt, hydroplaning is probably occurring. Do not apply Emergency/Parking Brake, as it will remove anti-skid protection. Maintain runway centerline and keep braking until airplane is decelerated.

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TAXIING AND PARKING

Ice Protection Systems ..... AS REQUIRED

After landing, set the Ice Protection systems according to weather conditions.

Flaps ..... AS REQUIRED

NOTE: - Make sure the flaps are free from snow, ice or slush before retracting them.

- If any difference is felt while taxiing, verify if tires present any flat spot which may indicate that the brake was blocked at touchdown.

CAUTION: TAXI AT REDUCED SPEED IN ICE-COVERED RUNWAYS TO AVOID SKIDDING THE AIRPLANE AND THROWING SLUSH ON WHEEL AND BRAKE ASSEMBLIES.

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LEAVING THE AIRPLANE – SECURING FOR COLD SOAK OR AN EXTENDED PERIOD

Anti-icing fluid can be applied to the airplane surfaces at the time of arrival, on short turnarounds during freezing precipitation, and on overnight stops. This will minimize ice accumulation before departure and usually makes subsequent deicing easier.

The procedures below should be performed in the event of extended airplane exposure to low temperatures. At non-maintenance stations, the crew should ensure that the following actions have been accomplished.

Flaps ..... UP

Wheel Chocks ..... IN PLACE

Emergency/Parking Brakes ..... AS REQUIRED

For an icy ramp, leave Emergency/Parking Brakes applied. Otherwise, Emergency/Parking Brakes must not be applied to avoid brakes freezing.

Protective Covers ..... INSTALL

Install the available protective covers.

Batteries ..... REMOVE

For airplanes Pre-Mod. SB 505-24-0015: Remove the batteries if ambient surface temperature of -10°C (14°F) or lower is forecasted. For airplanes Post-Mod. SB 505-24-0015 or with an equivalent modification factory incorporated: Remove the batteries if ambient surface temperature of -18°C (-0.4°F) or lower is forecasted.

Doors ..... CLOSE

All doors must be closed to prevent snow and humidity from entering into the airplane.

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GENERAL REMARKS WHEN FLYING IN ICING CONDITIONS

Continuously monitor engine parameters, airplane pitch, attitude and airspeed.

Closely monitor the SAT indication and presence of moisture. If environmental ice condition exists, even intermittent, check the windshield and wing surface for ice accumulation. To visualize ice formation, if necessary, use a flash light on the windshield and the wing inspection light on the wing. If any ice formation is detected or suspected turn on the ice protection system. When flying in detected or suspected ice condition, use ice speeds as reference.

Be careful with any mistrimed condition that may be masked by the autopilot - keep the airplane trimmed at all the times. Consider turning autopilot off if any ice is visible on the airplane or if you suspect you are flying in severe icing conditions. The autopilot use is prohibited in the following conditions:

- Severe icing;
- Unusual control force or control deflection, or unusually large control forces to move flight controls when the autopilot is disconnected periodically for checking purposes; or
- Indications of frequent autopilot re-trimming during straight and level flight.

Monitor anti-ice systems for proper operation. Apply the associated AFM abnormal procedure in case of system failure. If the failure persists, exit and avoid icing conditions. Make the air traffic controller know you are requesting a change due to icing conditions and keep him informed about it.

Strictly follow AFM Limitation and Operation In Icing Conditions normal procedures, according to Wing and Stabilizer Anti-Ice System Operational Envelope.

Avoid landing at an airport where icing conditions exist or are anticipated if anti-ice system, brakes or flight controls have failed.

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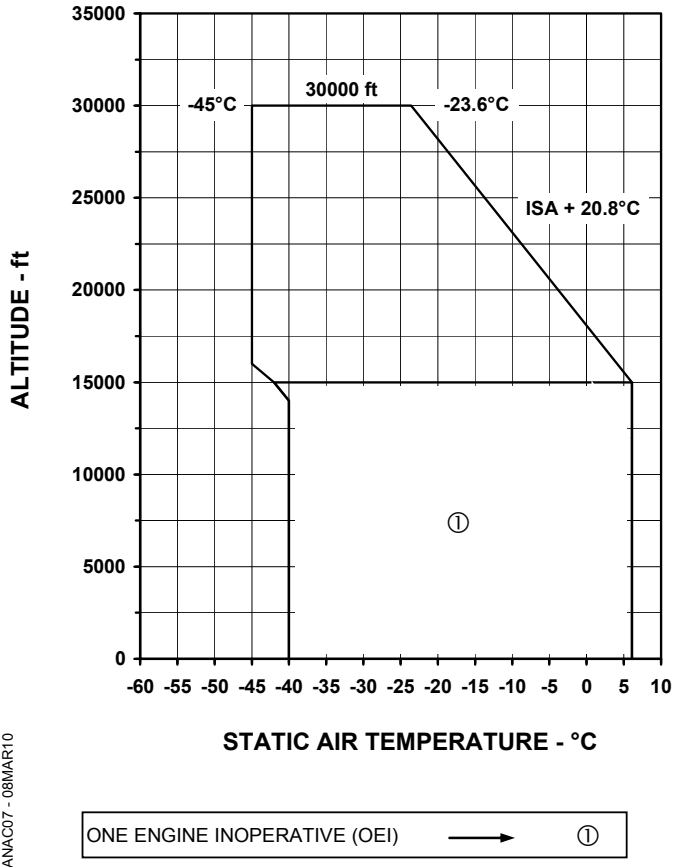
Do not hesitate to leave icing conditions when icing cannot be handled, even with anti-ice system operating properly.

NOTE: Even if the ice detector is installed, the flight crew still has the primary responsibility to monitor for ice condition and to determine when to activate the ice protection system.

WING AND STABILIZER ANTI-ICE SYSTEM OPERATIONAL ENVELOPE



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COLD WEATHER OPERATION

The Cold Weather Operation contains amplified procedures to operate in icing conditions and supplement those procedures published in the AFM. In case of disagreement, the AFM shall prevail.

EXTERNAL INSPECTION

Operating regulations clearly state that no takeoff is allowed when snow, ice or frost is adhering to the airplane.

Make sure nose wheel chocks are in place. If required, chock main wheels as well. Remove engine air inlet/outlet plugs and covers from pitot/static tubes, static ports and NACA air inlets. If required, leave engine plugs installed until engine start.

The pilot in command has the final responsibility for ensuring that the airplane is clear of ice, frost or snow. The primary method for the pilot to ensure a clean airplane is through close visual and physical inspection prior to takeoff. Visually check the wing, control surfaces, engines and fuselage prior to takeoff. In addition, as no frozen contamination is allowed on the wing upper surface, carry out a physical (hands-on) inspection to ensure that there is no ice accumulation. Do not touch the surfaces with bare hands, as the skin may stick to a freezing surface.

Even at intermediate stops, an external walk around is necessary due to the possibility of ice forming after landing from either cold soaking frost, conventional frost or precipitation freezing on the airplane.

During the pre-flight walk-around, ensure that the pitot tubes, pressurization static ports, all inlets, outlets and vents are clear of ice and unobstructed.

If the airplane has become cold soaked as a result of flight at very cold temperatures, fuel might be at a subfreezing temperature. This can cause ice accumulation if the airplane is subjected to high humidity, fog, drizzle or rain even when the outside air temperature is substantially above freezing.

At the completion of the walk-around, if ice, snow or frost is discovered, de-icing procedure will be required. Unheated/heated water or Type I, II, III or IV de-icing fluid can be used.

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The check for ice accumulation should be done in a well-lit area.

Fuselage, Wing, Tail and Control Surfaces ..... FREE OF FROST, ICE OR SNOW

Check that the fuselage, wing upper and lower surfaces, tail and control surfaces are free of frost, ice or snow. Inspect control surfaces, gaps and hinges for signs of residual fluid or gel.

No contamination is permitted on the lower or upper surface of the horizontal stabilizer or wing. Polished frost is not allowed.

A thin layer of hoarfrost where you can easily see below the airplane marking, letters, or paint lines on the fuselage top is permitted.

All snow and ice must also be cleared from nose radome and fuselage nose forward of windshield, as it is likely to blow back into windshields during taxi or takeoff.

Pitot Tubes/Static Ports ..... CLEAR OF ICE AND ANTI-ICING RESIDUE CONTAMINATION

Check if the pitot/static tubes and the static ports are free from residual de-icing fluid and that there are no hardened residues on any of those components. If any contamination is found on these components, call maintenance.

Engine/Pylon ..... CLEAR OF ICE OR SNOW

Check that the engine inlet is clear of ice or snow, and that the fan is free to rotate. Ensure that all ice deposits are removed prior to engine starting.

Landing Gear ..... CLEAR OF ICE, UNOBSTRUCTED

Check that doors, gear locks and mechanisms are unobstructed and clear of ice and snow and ensure no leaks exist.

Fuel Tank Air Inlets ..... CLEAR OF ICE OR SNOW

Check all inlets, outlets and vents are clear of ice and unobstructed.

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Batteries..... INSTALLED

Ambient temperature of -18°C (-0.4°F) or colder requires batteries removal to prevent cold soaking or the batteries should be preheated to temperatures warmer than -18°C (-0.4°F). Verify that batteries have been re-installed or preheated.

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DEICING/ANTI-ICING FLUID APPLICATION

Airplane surfaces contaminated by ice, frozen precipitation or frost must be deiced before departure. The airplane must be anti-iced when the risk of freezing precipitation exists at dispatch or freezing precipitation is actually taking place. While deicing removes ice, anti-icing protects against additional icing for a certain period of time, called holdover time. A combination of both deicing and anti-icing may be performed based on the judgment of the flight crew and procedures developed by the operator. The choice of the correct method and fluid to be applied must be done according to the weather condition, available equipment, available fluids and the holdover time.

Deicing and anti-icing fluids lower the freezing point of frozen precipitation thus delaying the accumulation of contamination on the airplane. When applied to a clean surface, the fluid forms a thin layer that has a lower freezing point than precipitation. The fluid is highly soluble in water, thus the precipitation or ice melts on contact with the fluid. These fluids also delay the onset of frost on airplane surfaces. As the ice melts, the fluid dilutes with the water, thereby causing the mixture to become less effective or to run off. Ice can begin to form again after enough dilution has occurred and the freezing point begins to rise.

Deicing/anti-icing fluids are not intended to provide icing protection during flight. The fluid must flow off the surface during takeoff. Embraer has performed flight tests to investigate the effects of approved fluids on performance and handling characteristics. The flight tests demonstrated these fluids did not have a measurable effect on takeoff and climb performance.

Anti-icing fluids include fluid types I, II, III or IV, in a mixture with water or undiluted. Type I fluid is not thickened and characteristically forms a thin wetting film which provides relatively limited holdover time. Type I fluid is usually used for deicing and provides protection against refreezing when no precipitation is present. Types II, III and IV fluids form a thicker film that provides a longer holdover time. The holdover time of the type IV fluid is greater than that of type II, which in its turn has a longer holdover time than type III fluid. Type IV is an enhanced-performance fluid, with anti-icing effectiveness superior to Type II and provides an increased holdover time. Type IV fluids offer significant operational advantages in terms of holdover times.

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However, all thickened fluids may dry out and residues may accumulate in aerodynamically quiet areas. The residues may rehydrate and refreeze during flight, which can potentially restrict the movement of flight controls. Operators are reminded to frequently inspect control surfaces, gaps and tab hinges for signs of fluid residues. A two-step deicing/anti-icing fluid application is recommended, so that residue accumulation in the critical areas is minimized.

A deicing fluid is composed of heated water, or a mixture of water and type I, II, III or IV fluids. Heating is applied to a minimum temperature of 60°C (140°F) to ensure maximum deicing efficiency.

HOLDOVER TIMES

Holdover times for the fluids are shown in tables derived for each specific fluid brand, under various temperatures, fluid concentration and precipitation category.

- The lower limit of the published holdover time is used to indicate the estimated time of protection during moderate precipitation;
- The upper limit indicates the estimated time during light precipitation;
- Heavy conditions are not covered.

Therefore, crew experience and operational guidelines are required to clearly settle what is considered a heavy, moderate or light condition. The holdover time for the existing weather conditions has to be greater than the time from the start of fluid application to the start of takeoff roll.

Holdover times should be seen as rough approximations. They simply reflect the average estimated time that an anti-icing fluid should prevent the formation of frozen contaminants on the protected surfaces.

The following conditions can reduce actual holdover times:

- Windy conditions;
- Jet blast;
- Heavy precipitation or;
- High moisture content.

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In case of ice build-up after deicing/anti-icing fluid application, do not assume that ice will be blown off during takeoff roll. If the holdover time expires, return for another deicing/anti-icing fluid application.

If the holdover time expires or contamination is found over the airplane before take off, the complete deicing/anti-icing procedure must be performed. Residues from previous treatment must be flushed off first. Under no circumstances should an airplane that has been previously anti-iced receive a further spray of anti-icing fluid directly on top of the anti-icing contaminated film.

The pre-takeoff contamination check is normally accomplished either from inside or outside the airplane within 5 minutes prior to beginning takeoff.

When inspecting the wing, during the pre-takeoff contamination check, look at the entire upper surface and not only at the leading edge or wing tip. Although the wing tips can be seen from the cockpit, almost the entire wing is visible from a cabin window. Therefore, it is strongly advised that the visual inspection be done by a crew member from the cabin. Additionally, the crew should ask for the assistance of trained and qualified personnel outside the airplane to assist in the pre-takeoff and check to make sure that the tail and fuselage, which are not visible from the cockpit or cabin, are free of any ice contamination.

It is the pilot's responsibility to decide whether or not to accept the airplane for flight. If contamination is suspected, the airplane should return for additional deicing or anti-icing. Takeoff in conditions of moderate and heavy freezing rain is not approved.

NOTE: Check if all air inlets and pylon are free of snow to avoid ingestion at the moment of turning the fan on or during the fluid application.

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GROUND DEICING/ANTI-ICING STRATEGY

To prevent frozen contamination on airplane surfaces deice and anti-icing operation requires that fluids be distributed uniformly over surfaces. In order to control uniformity, all horizontal surfaces must be visually checked during fluid application. The correct amount is indicated by fluid just beginning to drip off the leading edge. Do not use tools to scrape or scratch compacted snow from the airframe surfaces or from the gaps between fixed or movable surfaces. Once the airplane has been fully deiced, it is time to consider the prevention of any further ice contamination prior to takeoff by application of an anti-icing treatment.

The following surfaces must be protected:

- fuselage;

- wing upper surface and leading edge;

- horizontal stabilizer upper surface and leading edge;

- elevator upper surface;

- vertical stabilizer and rudder.

Soft Snow can be mechanically removed by blowing cold air across the airplane surface, with brooms, soft hand scrappers or rubber scrappers.

Engine deposits of snow should be mechanically removed from engine intakes with brooms, soft hand scrapers or rubber scrappers. Frozen deposits adhering to the lower surface of the intake or to the fan blades should be removed by applying hot air. To ensure the safety of ground personnel and passengers, this should be carefully coordinated with the flight crew.

Fuselage – Remove all accumulated snow on the nose to avoid snow blowing back during takeoff and restricting pilot visibility. Do not apply deicing or anti-icing fluid directly to the windshield and to the cockpit windows.

Fluid should be sprayed along the top centerline of the fuselage and then outboard, letting the fluid cascade down and across the windows. Fluid must not be sprayed directly onto windows and window seals, doors and door seals, scoops or NACA air inlets. Be careful not to cause damage to the antennas installed along the fuselage.

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Landing gear and wheel bays – application of fluid in this area must be kept to a minimum. Do not allow water or fluid mixture spray into wheels and brakes to avoid damage to carbon brakes. In these areas of the airplane, it is preferable to clear snow or slush using a brush.

Pitot/Static tubes and static ports. The fluids should be sprayed along the top of the sensors, allowing the fluid to cascade down across the sensor and deice it. Do not spray deicing fluid directly on the probes and static ports.

Vertical surfaces: Start at the top and then work down. The rudder should be in the neutral position.

Wings and Stabilizer: Spray from the tip inboard to the root, sweeping from the leading edge in the aft direction. It is important that the fluid be applied symmetrically to both wings so as to ensure that the aerodynamic effect of the fluid remaining is the same on both sides of the airplane.

A post-deicing/anti-icing check should be performed during or immediately following the ground deicing and anti-icing process. A check must be performed on all areas where fluid has been applied and to other areas that may be conducive to precipitation accumulation.

CAUTION: DO NOT APPLY FLUID DIRECTLY TO VENTS, DRAINS, OUTLETS OR INLETS, ICE DETECTOR, IASP, PITOT/STATIC TUBES AND STATIC PORTS.

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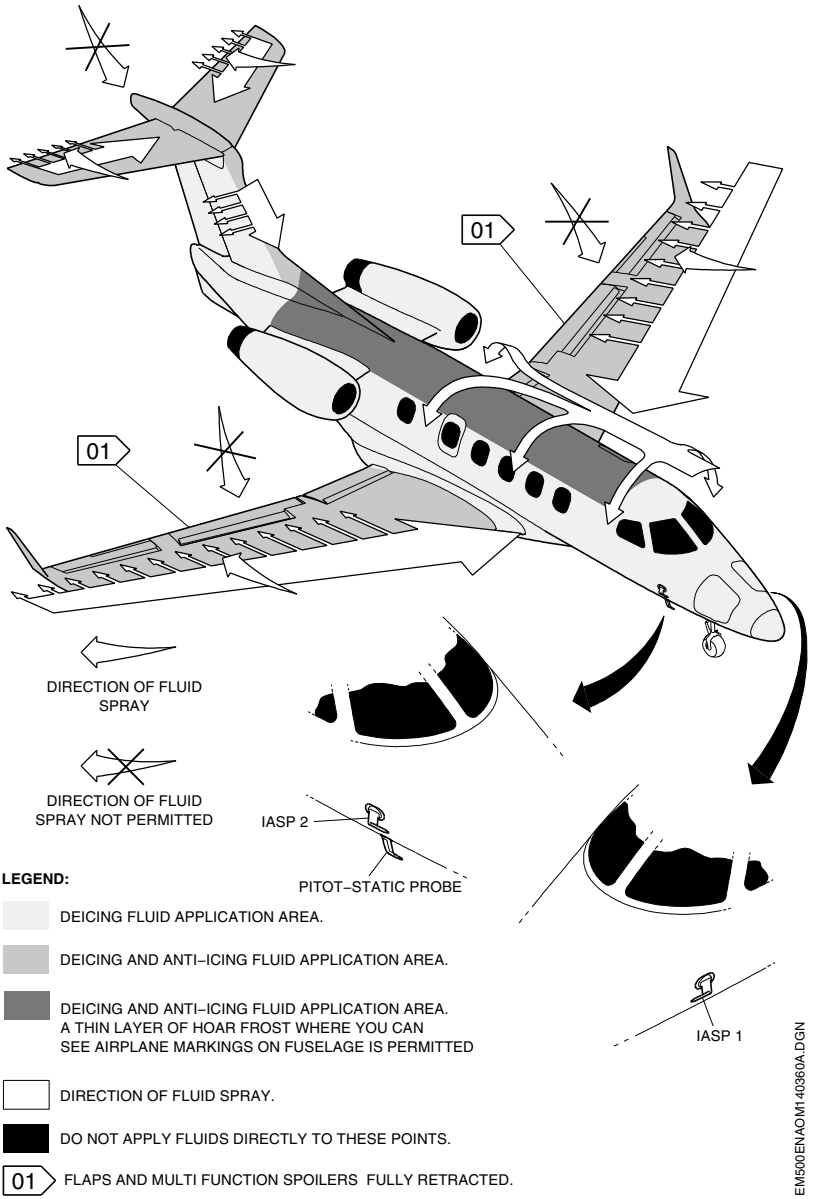

FLUID APPLICATION STRATEGY

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The approved fluids are:

- Type I, that agrees with SAE AMS 1424 specification (the use of Alkali Organic Salt-based fluid is not recommended);
- Type II, III and IV, that agree with SAE AMS 1428 specification.

NOTE: - The fluid application must be accomplished by trained and qualified personnel. For further information refer to AMM TASK 12-31-00-660-801-A.

- Specifications for fluid mixture, if applicable, and holdover times are provided by FAA (Federal Aviation Administration), AEA (Association of European Airlines) and TCCA (Transport Canada Civil Aviation).

Airplane configuration for fluid application:

Thrust Levers ..... IDLE
Set the engines to idle speed if engines are operating.

BLEED 1 & 2 Switches ..... OFF
Set the bleed switches to the OFF position to close the PRSOV and keep the fumes out of the passenger cabin and cockpit.

AIR CONDITIONING MODE Switch ..... OFF
Set the air conditioning mode switch to the OFF position to turn off the VCS.

ECS Knob ..... OFF VENT
Set the ECS knob to the OFF VENT position to turn off all ACS lines and opens the RAV to emergency ventilation.

Control Yoke/Pitch Trim ..... FULL NOSE UP
To minimize fluid accumulation on the elevator, pull control yoke and set pitch trim to full nose up during fluid application over the horizontal stabilizer. After fluid application, set pitch trim to takeoff position.

Control Pedals..... NEUTRAL POSITION
Set the rudder to the neutral position during the fluid application. After application, apply full right pedal to help flow off of the excessive fluid.

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Ailerons ..... NEUTRAL POSITION

Set the ailerons to the neutral position during the fluid application.

Flaps and Spoilers ..... RETRACTED

Retract the flaps and spoilers to minimize the accumulation of fluid on the gaps and hinges.

Wait at least 1 minute after fluid application.

BLEED 1 & 2 Switches ..... AUTO

Wait at least 3 minutes after fluid application.

ECS Knob ..... BOTH

AIR CONDITIONING MODE Switch..... AS REQUIRED

NOTE: To avoid the gelling of the residual fluid, the inspection and the cleaning of the gaps under the spoilers' panels, on the hinges of the rudder, on the ailerons and on the flaps surfaces and air exhaust of horizontal stabilizer are required. Refer to AMM TASK 12-31-00/600 for further information.

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ENGINE STARTING

Do not start the engine until it has been verified that all ice deposits have been removed from the air inlet.

Perform normal engine starting. If the engine does not start, maintenance procedures may be required or ground heating may be necessary to warm the engines.

Battery assisted engine startings during cold weather operation may result in high ITTs.

In the event of oil temperature below -40°C (-40°F) for starting, ground heating is necessary to warm the engines.

NOTE: If the battery has been cold soaked for 2 hours or longer at ambient temperature of -18°C (-0.4°F) or lower, it is recommended using a GPU (if applicable) or pre-heating the battery to above -18°C (-0.4°F) prior to engine start.

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AFTER STARTING

Engine Instruments..... MONITOR

Monitor engine instruments, mainly oil pressure and temperature. Apply associated abnormal procedure if any failure arises.

HEATING/ICE PROTECTION Panel..... AS REQUIRED

Flight Controls..... CHECK

Check control wheel, control column and rudder pedals for freedom of movement and full travel. Control forces can be increased at low temperatures.

Operate all trim systems, including backup pitch trim system, checking for freedom of movement and full travel. If any flight control is suspected of restricted movement or jamming, report to the maintenance personnel.

Flaps ..... CHECK

Extend and retract the flaps. Make sure the flaps are free from snow or ice before moving them. Leave flaps UP if application of anti-icing/deicing fluids is expected.

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TAXI

Use minimum thrust for breakaway and taxiing, to avoid blowing snow or slush on personnel or airplanes nearby.

Maintain ground speed below 10 kt when taxiing in snow covered or icy runways. Lower speeds will also avoid throwing slush on the mating wheel and brake assembly.

Use firm brake pressure on taxi stops whenever pavement conditions permit in order to warm up the brakes and dry moisture buildup within the disk stack. Anti-skid protection is not provided below this speed, so apply brakes accordingly.

During taxi, "cold set" (the condition where the tire retains the flat shape it had while parked) may induce vibration in the airplane. Vibration should disappear as the tires recover their elasticity during taxi. Do not initiate your takeoff run before the "cold set" disappears.

Turns should be performed at the largest turning radius, preferably at a speed which does not require braking during the turn.

Maintain a greater than normal distance from other airplanes while taxiing in snow or slush-covered runways, to avoid contamination by snow blown by jet blasts.

Flaps .....AS REQUIRED

When taxiing through slush or standing water, flaps should be retracted to avoid snow and slush contamination from the main gear wheels.

WARNING: IF FLAPS WERE LEFT UP DURING TAXI, COMPLETE AFTER START CHECKLIST BEFORE TAKING OFF.

CAUTION: TAXI AT REDUCED SPEED ON ICE-COVERED RUNWAYS TO AVOID SKIDDING. REDUCE SPEED FOR ALL TURNS AND USE CAUTION WHEN TAXIING WITH HIGH CROSSWINDS.

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BEFORE TAKEOFF

Flight Controls..... CHECK

Check freedom of movement and full travel of all flight controls (including trims).

Flaps ..... SET

Set flaps to takeoff setting (if flaps were left up after starting the engines).

Takeoff Configuration ..... CHECK

Ice Accumulation ..... CHECK

A pre-takeoff contamination check should be performed prior to takeoff and within the holdover time.

Aerodynamic surfaces must be confirmed free of all forms of frost, ice, snow and slush prior to entering the takeoff runway or initiating takeoff. This check is particularly important when the published holdover times are about to run out. When contamination is in evidence, the de-icing/anti-icing operation must be repeated.

Visually inspect wing surfaces/leading edge and engine by looking through an appropriate window. The pilot-in-command must ask for the assistance of trained and qualified ground personnel to assist in the pre-takeoff check, so that tail surfaces and fuselage are also inspected.

Ice Protection Systems..... CHECK

Shortly before takeoff, accomplish operation in icing conditions procedures contained in the approved AFM.

Ice Protection Systems..... AS REQUIRED

Set the ice protection systems according to the operation in icing conditions procedures contained in the approved AFM.

WARNING: TAKEOFF MUST NOT BE PERFORMED WITH CAS MESSAGE A-I WINGSTB INHB PRESENTED. REFER TO THE ASSOCIATED PROCEDURE.

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TAKEOFF

Do not apply static takeoff technique on an icy or slippery runway, as the airplane may begin to slide when thrust lever is advanced with brakes applied. In this case, release brakes and advance thrust levers simultaneously.

However, takeoff distance for slippery runways is calculated in the AFM using the static takeoff technique only. For rolling takeoffs, performance data is valid from the point where takeoff thrust is achieved.

Apply light forward pressure on control column to increase nose wheel steering effectiveness.

CLIMB/CRUISE

Operation in moderate to severe icing conditions may induce ice build up on the fan spinner and/or blades. If ice accumulates, its asymmetrical shedding may result in high fan vibration.

NOTE: Engine vibration indication may peek to the maximum value prior to ice shedding; however, this will not affect the engine.

When flying in icing conditions or after flying in icing conditions, ice accretion on unprotected areas may cause vibration at high speeds. If vibration and/or buffeting occur, a change in the current airspeed will eliminate these effects. At high speeds, reduce the airspeed as required.

WARNING: ICE SPEED MUST NOT BE RESET UNTIL CREW IS CERTAIN ALL ICE HAS BEEN REMOVED.

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HOLDING

LDG GEAR Lever ..... UP

Flaps ..... UP

Recommended Airspeed:

Above 30000 ft ..... 170 KIAS MINIMUM

Below 30000 ft ..... 155 KIAS MINIMUM

CAUTION: EVEN SMALL ACCUMULATIONS OF ICE ON THE WING LEADING EDGE MAY CHANGE THE STALL CHARACTERISTICS OR THE STALL PROTECTION SYSTEM WARNING MARGIN.

DESCENT

Observe normal (including operation in icing conditions) procedures contained in the approved AFM.

When using the autopilot, monitor pitch attitude and speed continuously.

CAUTION: EVEN SMALL ACCUMULATIONS OF ICE ON THE WING LEADING EDGE MAY CHANGE THE STALL CHARACTERISTICS OR THE STALL PROTECTION SYSTEM WARNING MARGIN.

APPROACH AND LANDING

Observe normal (including operation in icing conditions) procedures contained in the approved AFM.

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LANDING ON WET OR SLIPPERY RUNWAYS

Conduct a positive landing to ensure initial wheel spin-up and initiate firm ground contact upon touchdown, achieving wheel load as quickly as possible. Such technique avoids hydroplaning on wet runways and reduces the strength of any ice bond that might have been eventually formed on brake and wheel assemblies during flight.

The factors that influence the occurrence of hydroplaning are high speed, standing water and poor runway macrotexture. When hydroplaning occurs, it causes a substantial loss of tire friction and wheel spin-up may not occur.

Icy runways can be very slippery at all speeds depending on temperature.

Stopping the airplane with the least landing run must be emphasized when landing on wet or slippery runways.

- Anticipate the approach procedures and speeds: a well-planned and executed approach, flare and touchdown minimize the landing distance.
- Lower nose wheel immediately to the runway. It will decrease lift and will increase main gear loading.
- Apply brakes with moderate-to-firm pressure, smoothly and symmetrically, and let the anti-skid do its job.
- If no braking action is felt, hydroplaning is probably occurring. Do not apply Emergency/Parking Brake, as it will remove anti-skid protection. Maintain runway centerline and keep braking until airplane is decelerated.

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TAXIING AND PARKING

Ice Protection Systems ..... AS REQUIRED
After landing, set the Ice Protection systems according to weather conditions.

Flaps ..... AS REQUIRED

NOTE: - Make sure the flaps are free from snow, ice or slush before retracting them.

- If any difference is felt while taxiing, verify if tires present any flat spot which may indicate that the brake was blocked at touchdown.

CAUTION: TAXI AT REDUCED SPEED IN ICE-COVERED RUNWAYS TO AVOID SKIDDING THE AIRPLANE AND THROWING SLUSH ON WHEEL AND BRAKE ASSEMBLIES.

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LEAVING THE AIRPLANE – SECURING FOR COLD SOAK OR AN EXTENDED PERIOD

Anti-icing fluid can be applied to the airplane surfaces at the time of arrival, on short turnarounds during freezing precipitation, and on overnight stops. This will minimize ice accumulation before departure and usually makes subsequent deicing easier.

The procedures below should be performed in the event of extended airplane exposure to low temperatures. At non-maintenance stations, the crew should ensure that the following actions have been accomplished.

Flaps ..... UP

Wheel Chocks ..... IN PLACE

Emergency/Parking Brakes ..... AS REQUIRED

For an icy ramp, leave Emergency/Parking Brakes applied. Otherwise, Emergency/Parking Brakes must not be applied to avoid brakes freezing.

Protective Covers ..... INSTALL

Install the available protective covers.

Batteries ..... REMOVE

Remove the batteries if ambient surface temperature of -18°C (-0.4°F) or lower is forecasted.

Doors ..... CLOSE

All doors must be closed to prevent snow and humidity from entering into the airplane.

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GENERAL REMARKS WHEN FLYING IN ICING CONDITIONS

Continuously monitor engine parameters, airplane pitch, attitude and airspeed.

Closely monitor the SAT indication and presence of moisture. If environmental ice condition exists, even intermittent, check the windshield and wing surface for ice accumulation. To visualize ice formation, if necessary, use a flash light on the windshield and the wing inspection light on the wing. If any ice formation is detected or suspected turn on the ice protection system. When flying in detected or suspected ice condition, use ice speeds as reference.

Be careful with any mistrimed condition that may be masked by the autopilot - keep the airplane trimmed at all the times. Consider turning autopilot off if any ice is visible on the airplane or if you suspect you are flying in severe icing conditions. The autopilot use is prohibited in the following conditions:

- Severe icing;
- Unusual control force or control deflection, or unusually large control forces to move flight controls when the autopilot is disconnected periodically for checking purposes; or
- Indications of frequent autopilot re-trimming during straight and level flight.

Monitor anti-ice systems for proper operation. Apply the associated AFM abnormal procedure in case of system failure. If the failure persists, exit and avoid icing conditions. Make the air traffic controller know you are requesting a change due to icing conditions and keep him informed about it.

Strictly follow AFM Limitation and Operation In Icing Conditions normal procedures, according to Wing and Stabilizer Anti-Ice System Operational Envelope.

Avoid landing at an airport where icing conditions exist or are anticipated if anti-ice system, brakes or flight controls have failed.

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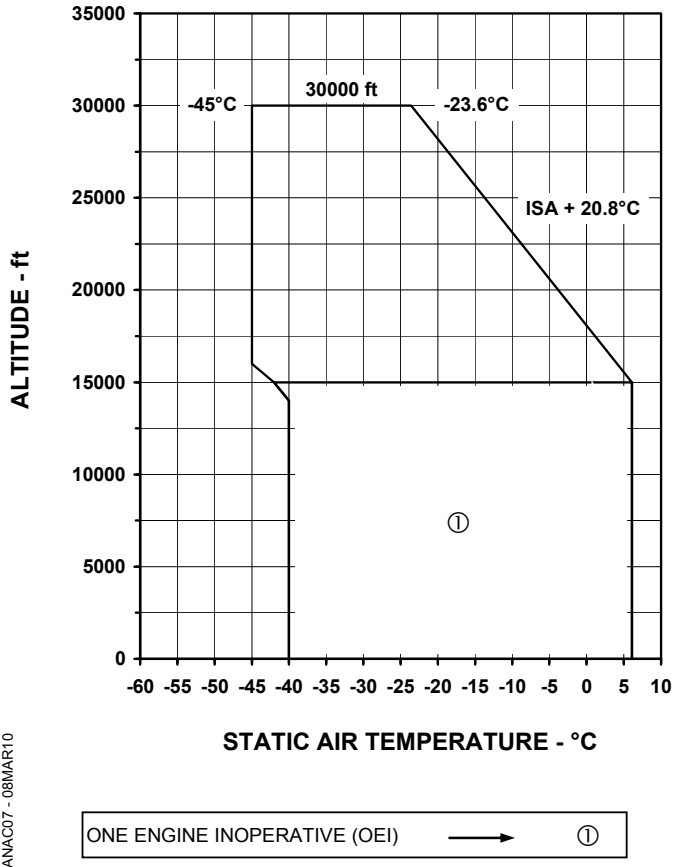
Do not hesitate to leave icing conditions when icing cannot be handled, even with anti-ice system operating properly.

NOTE: Even if the ice detector is installed, the flight crew still has the primary responsibility to monitor for ice condition and to determine when to activate the ice protection system.

WING AND STABILIZER ANTI-ICE SYSTEM OPERATIONAL ENVELOPE



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