

ICAO Abbreviations and Terms Applicable to Aircraft De-icing & Anti-icing

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Abbreviations and Terms

Active frost: Condition when frost is forming. Active frost occurs when

- (1) the aircraft surface temperature is at or below the frost point, or
- (2) there is water in liquid form (e.g., dew) on the aircraft surface and the surface falls to/or below 0 °C (frozen dew).

Anti-icing: Procedure by which fluid is applied to provide protection against the formation of frost or ice or the accumulation of snow or slush on treated surfaces of an aircraft for a limited period of time.

Anti-icing fluid:

1. Mixture of water and Type I fluid.
2. Premix Type I fluid.
3. Type II, III, or IV fluids.
4. Mixture of water and Type II, III, or IV fluids.

Note: For deicing/anti-icing purposes in a one-step procedure, fluids in 1, 2, and 4 shall be heated to ensure a temperature of 60 °C (140 °F) minimum at the nozzle.

Anti-icing code: Report given to the flight crew that deicing/anti-icing has been carried out and the details of the anti-icing procedure that was applied. Also known as post-deicing/anti-icing report.

Cold-soak effect. The wings of aeroplanes are said to be “cold-soaked” when they contain very cold fuel as a result of having just landed after a flight at high altitude or from having been refueled with very cold fuel.

Cold-soaking: Ice can form on aircraft surfaces even when the outside air temperature (OAT) is well above 0 °C (32 °F). An aircraft equipped with wing fuel tanks may have fuel that is at a sufficiently low temperature such that it lowers the wing skin temperature to below the freezing point of water.

- The following factors contribute to cold soaking:
 - temperature and quantity of fuel in fuel cells,
 - type and location of fuel cells,
 - length of time at high altitude,
 - temperature of refueled fuel and
 - time since refueling.
- While on the ground, the cold-soaked aircraft will cause ice to form when water as rain or as vapor (humidity), comes in contact with cold-soaked surfaces.

Clear ice. Whenever precipitation falls on a cold-soaked aeroplane when on the ground, clear icing may occur.

- Even in ambient temperatures between -2°C and $+15^{\circ}\text{C}$, ice or frost can form in the presence of visible moisture or high humidity if the aeroplane structure remains at 0°C or below.

Note - Clear ice is very difficult to detect visually and may break loose during or after take-off.

Critical surfaces.

- Wings, control surfaces, propellers, horizontal stabilizers, vertical stabilizers, or any other stabilizing surface on an aircraft.
- These surfaces should be completely free of ice, snow, slush or frost before take-off.
 - The critical surfaces should be determined by the aircraft manufacture.

Certificate of analysis: A document, issued by a manufacturer, attesting that a lot or batch of a product fulfills the manufacturer's sales specification requirements, listing the tests, the test requirements, the test results on that lot or batch, the lot or batch number and a date.

Certificate of conformance: A document declaring that a product fulfills the requirements of a standard. Also known as certificate of conformity.

Check: Examination against a relevant standard by a trained and qualified person to ascertain satisfactory condition.

Chemical contamination (Contamination): Condition when substances (chemicals) are present where they should not be or are at concentrations higher than they should be.

Contamination check: A check of aircraft surfaces and components for contamination to establish the need for deicing.

De-icing. The process which removes ice, snow, slush or frost from aircraft surfaces.

De-icing/anti-icing. A procedure combining both the de-icing process and the anti-icing process and which can be performed in one or two steps:

- **One-step de-icing/anti-icing.** This procedure is carried out with heated anti-icing fluid. The fluid is used to de-ice the aircraft and remains on the surfaces to provide anti-icing capability.
- **Two-step de-icing/anti-icing.** This procedure contains two distinct steps. The first step, de-icing, is followed by the second step, anti-icing, as a separate fluid application. After de-icing, a separate overspray of anti-icing fluid is applied to protect the aircraft's critical surfaces, thus providing maximum anti-icing protection.

Drizzle. Fairly uniform precipitation composed exclusively of fine drops (diameter less than 0.5 mm (0.02 in)) very close together. Drizzle appears to float while following air currents although, unlike fog droplets, drizzle falls to the ground.

Deicing fluid:

1. Heated water.

- 2.Heated mixture of water and Type I fluid.
- 3.Heated premix Type I fluid.
- 4.Heated Type II, III, or IV fluids.
- 5.Heated mixture of water and Type II, III, or IV fluids.

NOTE: Unheated fluids are ineffective to de-ice.

Deicing service provider: The company responsible for the aircraft deicing/anti-icing operations on an airfield.

Deicing personnel: Groundcrew personnel with roles and responsibilities associated with aircraft ground icing operations.

Dewpoint: temperature at which unsaturated air must be cooled to cause saturation with respect to liquid water.

- The moisture condenses to liquid water either on surfaces as dew or as tiny liquid droplets suspended in air.

Fog and ground fog. A visible aggregate of minute water particles (droplets) in the air reducing the horizontal visibility at the Earth's surface to less than 1 kilometer.

Freezing fog. A fog formed of supercooled water droplets which freeze upon contact with exposed objects and form a coating of rime/clear ice.

- Generally, reduces the horizontal visibility at the earth's surface to less than 1 km (5/8 mile).

Freezing drizzle. drizzle in the form of supercooled water drops which freeze upon impact with any surface. Fairly uniform precipitation composed exclusively of fine drops [diameter less than 0.5 mm (0.02 inch)] very close together, which freeze upon impact with the ground or other exposed objects.

Frost. A deposit of small, white ice crystals formed on the ground or other surfaces. Frost is formed by sublimation, i.e. when water vapour is deposited upon a surface whose temperature is at or below freezing.

Freezing point: Temperature at which a liquid starts to become a solid.

Freezing point buffer: The difference between the outside air temperature (OAT) and the freezing point of the fluid used.

Freezing point buffer, negative: Condition when the freezing point of a deicing/anti-icing fluid is above the OAT.

Freezing rain

- **Light:** Precipitation of liquid water particles which freezes upon impact with the ground or other exposed objects, either in the form of drops of more than 0.5 mm (0.02 inch) or smaller drops which, in contrast to drizzle, are widely separated.

- Measured intensity of liquid water particles is up to 2.5 mm/h (0.10 in/h) or 25 g/dm²/h with a maximum of 0.25 mm (0.01 inch) in 6 minutes.
- **Moderate:** Precipitation of liquid water particles which freezes upon impact with the ground or other exposed objects.
 - Moderate freezing rain may appear in the form of large drops or can appear to fall in sheets where individual drops are not identifiable. Moderate freezing rain has a measured intensity of between 0.10 to 0.30 in/h.
- **Heavy:** Precipitation of liquid water particles which freezes upon impact with the ground or other exposed objects.
 - Heavy freezing rain can seem to fall in sheets and individual drops may not be identifiable. Heavy freezing rain has a measured intensity of more than 0.30 in/h.

Frost/hoarfrost: Tiny ice crystal formed on a surface at or below the frost point. Frost generally occurs with clear skies at temperatures below freezing point. Frost can also occur from the freezing of dew.

- **Frost, local:** The limited formation of frost in localized wing areas cooled by cold fuel or large masses of cold metal in the wing structure; this type of frost does not cover the entire wing.
- **Frost point:** temperature, at or below 0 °C, at which air undersaturated with moisture must be cooled (at constant pressure) to cause saturation with respect to ice.
 - The moisture directly deposits, without going through the liquid phase, as frost on exposed surfaces providing nucleation sites.
 - The frost point is higher (warmer) than the dewpoint by about 10% at a given humidity level in air. Air temperature readings given by a thermometer are applicable to the height above ground of the thermometer itself.
 - Because cool air sinks and the ground often cools very quickly, especially on clear nights, the ground temperature on clear, still nights is invariably lower than the temperature only a few feet higher.
 - Thus, frost can form even when a thermometer gives a reading above freezing. The same happens with aircraft—frost can form on aircraft when the thermometer air temperature reading is above 0 °C.

Fuel frost: Frost, normally in the area of the wing fuel tanks, caused by the cold-soaking. Also known as non-environmental frost or cold-soaked fuel frost.

Groundcrew: Personnel with responsibilities for the handling, maintenance and servicing of an aircraft while on the ground, as well as the coordination of these activities.

High humidity. An atmospheric condition where the relative humidity is close to saturation.

Hoar frost. A greyish-white crystalline deposit of frozen water vapour formed on surfaces in clear, still weather.

(Note — this differs from the World Meteorological Organization (WMO) definition of hoar frost for the purposes of this document.)

Holdover time. Holdover time (HOT) is the estimated time the anti-icing fluid will prevent the formation of ice and frost and the accumulation of snow on the protected (treated) surfaces of an aeroplane.

Hail: Precipitation of small balls or pieces of ice with a diameter ranging from 5 to 50 mm (0.2 to >2.0 inches) falling either separately or agglomerated.

Highest on-wing viscosity (HOWV): Highest viscosity of a thickened deicing/anti-icing fluid which is still aerodynamically acceptable.

Hoarfrost: A synonym for frost. See frost/hoarfrost.

Holdover time: Estimated time for which an anti-icing fluid will prevent the formation of frost or ice and the accumulation of snow on the treated surfaces of an aircraft.

Ice pellets: Precipitation of transparent (grains of ice) or translucent (small hail) pellets of ice, which are spherical or irregular, and have a diameter of 5 mm (0.2 inch) or less. Ice pellets usually bounce when hitting hard ground.

Lowest on-wing viscosity (LOWV): Lowest viscosity of a thickened deicing/anti-icing fluid for which the applicable holdover timetable can still be used.

Lowest operational use temperature (LOUT): The LOUT is the higher (warmer) of:

- The lowest temperature at which the fluid meets the aerodynamic acceptance test (according to AS5900) for a given type (high speed or low speed) of aircraft, or
- The freezing point of the fluid plus the buffer of 10 °C (18 °F) for Type I fluid and 7 °C (13 °F) for Type II, III, or IV fluids.

Post-deicing check: A check by qualified ground personnel to ensure that all critical surfaces are free of adhering contamination after the deicing procedure has been completed.

Post-deicing/anti-icing check: A check by qualified ground personnel to ensure that all critical surfaces are free of adhering contamination after the deicing/anti-icing procedure has been completed.

Post-deicing/anti-icing report: Report given to the flightcrew confirming that deicing/anti-icing has been carried out and the details of the deicing/anti-icing procedure that was applied.

Pre-deicing process: A process to remove large quantities of frozen contamination prior to the regular deicing/anti-icing process with the objective of reducing the quantity of deicing fluid to be used.

Pre-flight contamination check: A check performed by the flightcrew or groundcrew prior to departure to verify the presence of adhering contamination to establish the need for deicing/anti-icing. It may be part of the flightcrew walk-around before the flight.

Pre-takeoff check: A check by the flightcrew prior to takeoff and within holdover time. This check is normally conducted from inside the flightdeck. It is normally accomplished by a continuous assessment

of the conditions that affect holdover time and includes an assessment and adjustment of holdover time.

Pre-takeoff contamination check: A check of the critical surfaces for adhering contamination. This check is accomplished after the holdover time has been exceeded and must be completed within 5 minutes prior to the beginning of takeoff.

Proximity sensor: A proximity sensor is a safety feature on some models of deicing equipment that, upon activation, disengages relevant systems, preventing equipment movement and damage from occurring due to physical contact between equipment components (e.g., spray nozzle, forced air nozzle, operator basket, etc.) and aircraft surfaces.

- As a safety mechanism, the proximity sensor is designed to prevent damage from occurring to aircraft surfaces, normally while the equipment chassis is in a stationary position (not maneuvering).
- Where equipped, the type of sensor used may vary by design, and may activate either by physical contact (e.g., a proximity switch with contact mechanism), or by non-physical activation (e.g., infrared, radar, etc.).

Precipitation intensity. Intensity of precipitation is an indication of the amount of precipitation collected per unit time interval.

- It is expressed as light, moderate or heavy. Intensity is defined with respect to the type of precipitation occurring, based either on rate of fall for rain and ice pellets or visibility for snow and drizzle.
- The rate of fall criterion is based on time and does not accurately describe the intensity at a particular time of observation.

Qualified staff: Trained staff who have passed theoretical and practical training tests and have been qualified to perform this type of job; refer to AS6286.

Quality assurance: Is process-oriented, and it focuses on preventing quality issues. It is a proactive approach. An audit is done to validate QA processes, the quality procedures to be followed (e.g., “documented”)

Quality control: Is product-oriented and focused on identifying quality issues in manufactured products and performance of service. It is a reactive approach. Inspections/checks/tests are done as part of the QC procedure, to verify the quality of the available procedures and operations. (e.g., “implemented”).

Rain. Precipitation of liquid water particles, either in the form of drops of more than 0.5 mm in diameter or smaller drops which, in contrast to drizzle, are widely separated.

Rime. A deposit of ice, produced by freezing supercooled fog or cloud droplets on objects at temperatures below or slightly above freezing. It is composed of grains separated by air, sometimes adorned with crystalline branches.

- **Rime ice:** Small, frozen, spherical water droplets, opaque/milky and granular in appearance, which look similar to frost in a freezer; typically, rime ice has low adhesion to the surface and its surrounding rime ice particles.

Refraction: The bending of light as it passes from one transparent substance into another. For solutions, the refraction will vary upon the concentration of the solute in the solvent.

- Using a calibration curve, it is possible to determine the concentration of the solute in the solvent.
 - For example, for aqueous glycol solutions, it is possible to determine the concentration of the glycol in water by measuring refraction with a refractometer and comparing the result to the calibration curve.
 - Refraction can be expressed as a dimensionless number (index of refraction) or as a scale of concentration, e.g., degrees Brix (°Brix), or freezing point (°C or °F). See also refractometer.
- **Refractive index:** Unit of measurement of refraction expressed in the form of a dimensionless number. See also refraction and refractometer.

Refractometer: An instrument to measure refraction. Result of measurement with a refractometer can be expressed as a dimensionless number (index of refraction) or as a scale of concentration, e.g., degrees Brix (°Brix), or freezing point (°C or °F).

Residue/gel: A buildup of dried out thickened fluids typically found in aerodynamically quiet areas of the aircraft.

Slush: Snow or ice that has been combined with water.

- Water-saturated snow which with a heel-and-toe slap-down motion against the ground will be displaced with a splatter.

Snow: Precipitation of ice crystals, most of which are branched, star-shaped, or mixed with unbranched crystals. At temperatures higher than -5 °C (23 °F), the crystals are generally agglomerated into snowflakes.

Snow grains: Precipitation of very small white and opaque particles of ice that are fairly flat or elongated with a diameter of less than 1 mm (0.04 inch); when snow grains hit hard ground, they do not bounce or shatter.

Snow pellets: Precipitation of white, opaque particles of ice. The particles are round or sometimes conical, their diameters range from approximately 2 to 5 mm (0.08 to 0.2 inch), they are brittle and easily crushed, and they do bounce and may break upon contact with hard ground.

Storage tank: A vessel for holding fluid that can be fixed, or mobile; includes rolling tanks (ISO tanks), totes, tank trucks, or drums.

Shear force. Shear force is a force applied laterally on an anti-icing fluid.

- When applied to a Type II, III or IV fluid, the shear force will reduce the viscosity of the fluid; when the shear force is no longer applied, the anti-icing fluid should recover its viscosity.
- For instance, shear forces are applied whenever the fluid is pumped, forced through an orifice or when subjected to airflow. If excessive shear force is applied, the thickener system could be

permanently degraded and the fluid viscosity may fall outside the range set by the manufacturer and tested for certification.

- Fluid degraded in this manner should not be used for operational purposes.

Snow. Precipitation of ice crystals, mostly branched in the form of six-pointed stars.

- The crystals are isolated or agglomerated to form snowflakes.
- Dry snow. Snow from which a snowball cannot readily be made and which has a temperature less than 0°C.

Tactile check: Process by which a person touches specific aircraft surfaces. Tactile checks, under certain circumstances, may be the only way of confirming the critical surfaces of an aircraft are not contaminated. For some aircraft, tactile checks are mandatory as part of the deicing/anti-icing check process to ensure the critical surfaces are free of frozen contaminants.

Thickened fluid. A fluid that contains polymeric thickeners. AMS1428 Type II, III, and IV fluids are thickened fluids; AMS1424 Type I fluids are not thickened.

Wet snow. Snow which contains a great deal of liquid water.

Visible moisture. Fog, rain, snow, sleet, high humidity (condensation on surfaces) and ice crystals can all produce visible moisture on aircraft, taxiways and runways exposed to and contaminated by these conditions.

Next Steps

For Training Related to Aircraft De – Icing & Anti-Icing please see www.sassofia.com, www.sofemaonline.com. For questions please email Team@sassofia.com