Aircraft Deicing Glossary

Issue 3 – April 2025

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The *Aircraft Deicing Glossary*:

- is a descriptive document
- is not a normative document
- does not replace documents from regulators
- does not replace SAE Standards
- does not replace aircraft manufacturer documentation
- does not replace engine manufacturer documentation
- does not replace fluid manufacturer documentation
- always rely on the original documentation.

Other documents by Jacques Leroux
Guide to Aircraft Ground Deicing
Compendium of Aircraft Deicing Research

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Abstract

This *Glossary* is a descriptive document providing contextual definitions of terms used in the domains of aircraft ground deicing, aircraft engine icing, rotorcraft deicing, and runway deicing.[1]

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Preface

Work on this *Glossary* began during a discussion of one simple observation: the meaning of a word is determined by its context. This observation then led to a question: could ambiguity in the deicing vocabulary be diminished? The task was to examine the contextual variance in deicing terminology, produce succinct definitions for each term, and juxtapose them with the corresponding definitions from SAE standards.

This *Glossary* attempts to bring clarity to the deicing terms acknowledging that the same words can have different meanings, can adapt, and change over time. It captures the contemporary definitions of words used in aircraft deicing, rotorcraft deicing, engine icing, and runway deicing. The *Glossary* further aims at functioning as a pedagogical and relational tool, connecting concepts whose relationship may not always be obvious. For example, the entry for freezing point depression is linked to colligative properties.

The *Glossary* assembles information in one document that can be used by members of the deicing community, whether experienced or new to the field. The *Glossary* aspires to be a tool that can be used by any person, at any time, in any part of the world, to access agreed upon meanings and, hopefully, be more trustworthy than casual internet searches.

[1] Get updates of this *Glossary* by emailing a request to jleroux8@outlook.com.

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Explanatory Notes

Italic: examples and titles are set in italic.

Reference numbers: the reference numbers at the end of each definition are clickable.

Small cap: words or expressions in small caps are defined in this *Glossary*. Underlined small caps indicate clickable links (press Ctrl + click to follow link) bringing you to that definition within the *Glossary*. Example: FROST.

Spelling: the words are spelled in United States English, but references are quoted in their original spellings. See the *Harmonization and Quality Criteria of SAE G-12 Standards* document for more information.[157]

Square brackets: the fields, comments, and reference short forms are given in square brackets.

Smaller font: quotes from other documents are in smaller font and marked with an asterisk:

> ***active frost**, condition when frost is forming. Active frost occurs when a) the aircraft surface temperature is at or below the frost point, or b) there is water in liquid form (e.g., dew) on the aircraft surface and the surface falls to/or below 0 °C (frozen dew). [SAE AS6285]

Sometimes the same reality is given two words, depending on the regulatory authority. For example, this is the case with *check* and *inspection*. The FAA and other regulators use the expression *pretakeoff contamination check*, whereas Transport Canada uses *pretakeoff contamination inspection*. Entries are made for both.

Abbreviations and Acronyms

Acronyms: a more complete list of abbreviations and acronyms is available in the *Guide to Aircraft Ground Deicing*.[102]

$[H^+]$	hydrogen ion concentration in mole per liter
AAF	aircraft anti-icing fluid
ABL	atmospheric boundary layer
ACARS	Aircraft Communications Addressing and Reporting System
ADF	aircraft deicing fluid
AIR	Aerospace Information Report (SAE)
AMS	Aerospace Material Specification (SAE)
AOA	angle of attack
AOC	air operator certificate (Transport Canada)
ARP	Aerospace Recommended Practice (SAE)
AS	Aerospace Standard (SAE)
BLDT	boundary layer displacement thickness
BOD	biochemical oxygen demand
bp	boiling point
CAP	corrective action plan
CDF	central deicing facility
CMO	Certificate Management Office (FAA)
COD	chemical oxygen demand
CSFF	cold-soaked fuel frost
d	dextrorotatory enantiomer
DDF	designated deicing facility
dl	racemic mixture of enantiomers
EC_{50}	effective concentration 50%
EFB	electronic flight bag
fp	freezing point

GIDS	ground ice detection system
GRF	global reporting format
GRV	glycol recovery vehicle
HHET	high humidity endurance test, high humidity endurance time
HOT	holdover time
HOTDR	holdover time determination report
HOTDS	holdover time determination system
HOUC	highest operational use concentration
HOUR	highest operational use refraction
HOWV	highest on-wing viscosity
HSR	high speed ramp
HUPR	highest usable precipitation rate
HUPR	highest usable precipitation rate
IQ	initial qualification
KPI	key performance indicator
l	levorotatory enantiomer
LAAT	lowest aerodynamic acceptance temperature
LC_{50}	lethal concentration 50%
LOUT	lowest operational use temperature
LOWV	lowest on-wing viscosity
LSR	low speed ramp
LUPR	lowest usable precipitation rate
LVO	low visibility operations
LWES	liquid water equivalent system
mol wt	molecular weight
mp	melting point
MSDS	material safety data sheet
MSR	middle speed ramp
OAT	outside air temperature
OpSpec	operations specification
p	page (plural pp)
PIC	pilot-in-command
PR	periodic requalification
RIPS	rotor ice protection system
ROGIDS	remote on-ground ice detection system
s	section (plural ss)
SDS	safety data sheet
SMS	safety management system
SQ	site qualification
sub verbo	under the word (plural *sub verbis*)
TAT	total air temperature
ThOD	theoretical oxygen demand
TOD	total oxygen demand
UQ	unit qualification
WSET	water spray endurance test, water spray endurance time

Recently Added Terms

Issue 3 of the *Aircraft Deicing Glossary* includes a total of 965 defined terms, with 168 new additions.

1,3-propanediol
abstract
accelerated aging
advanced air mobility aircraft
aerodynamic degradation
aerodynamic failure
aft-mounted engine
air parcel
air taxi
annual recurrent training
anoxic
aquatic toxicity
asphalt concrete degradation resistance
asymmetrical deicing
barrel icing
basket
biodegradability
bucket
Buehler test
chloride content
cold corner
color
corrosion of AMS5886 nickel alloy
corrosion of low-embrittling plate
crazing
deicing season
deliquescence
determine and report test
dilute
diluted
dimpled snow
distributor
domain
drag
dry-out exposure to cold dry air
effect on aircraft materials
effect on carbon brake systems
effect on painted surfaces
effect on transparent plastics
effect on unpainted surfaces
effective concentration 50%
emissivity
endothermic
enclosed cab
enclosed cabin
enclosed operator's cabin
exothermic
exposure to dry air
field
flowoff failure
fluid compatibility
foam stability
folding wing
follow-me vehicle
form
frac tank
freezing point curve
fuel temperature
function test
functionality check
guard leg
glycol mitigation plan
glycol recovery vehicle
ground icing
gyroplane
hard water stability
helicopter
helo
hindsight bias
hydrogen embrittlement
ice melting capacity
ice melting test
ice penetration test
ice undercutting test
independent laboratory
independent test facility
initial qualification training
intermediate bulk container
ISO container
ISO tank container
ISOtainer
laboratory batch

lethal concentration 50%
lift
list of fluids tested for anti-icing performance and aerodynamic acceptance
list of validated fluids
lot acceptance tests
lot number
low shear rate viscosity
mandatory documentation
mandatory information
materials compatibility
newton
Newton
offseason
open basket deicing unit
open bucket
operational check
oxidation
pass-fail test
pH litmus paper
pH paper strip
phase
phase transition
powered-lift
production batch
production lot
propeller icing
proportional mixing
purchaser
rationale
rear-mounted engine
regulator
rejection
relative wind
requalification
rheology
rheological profile
rheometer
rinsibility
rotational rate
rotational speed
rotational viscometer
rotor icing
rotorcraft
rotary-wing aircraft
runway concrete surface scaling resistance
sandwich corrosion
separation
significant figures
small sample adapter
solute
solvent
specific gravity
spindle
stress-corrosion resistance
storage stability
substantiation
successive dry-out and rehydration
surrogate
suspended matter
symmetrical deicing
tank truck
thermal degradation
thermal stability
thermal stability-accelerated aging test
thrust
top offloading
total immersion corrosion
total water content
tote
trace contaminants
transient aerodynamic effects of fluids
turbidity
tusk out
Type I concentrate
Type I diluted
Type I ready-to-use
Type II/III/IV undiluted
unfailed fluid
validated fluid
vendor
viscometer
weight
winglet
wingtip
wingtip device

Glossary

1,3-propanediol, **1.** [chemistry] Chemical Abstract registry number 503-30-0, alternate names: trimethylene glycol, 1,3-dihydroxypropane, 1,3-propylene glycol; molecular formula $C_3H_8O_2$; mol wt 76.10, bp 210-212 °C. **2.** [aircraft deicing] a FREEZING POINT DEPRESSANT rarely used in the formulation of aircraft deicing/anti-icing fluids. – Compare ETHYLENE GLYCOL, PROPYLENE GLYCOL.[105] [Merck Index]

abstract, [documentation] a concise summary of a research paper, article, report or book. It provides an overview of the key objectives, methods, results, and conclusions of the work, thereby offering readers a clear understanding of its content. Abstracts aim to capture and distill essential content for a quick read, yielding a grasp of purpose and significance that would otherwise take much time to acquire.

accelerated aging, **1.** [material science] the process of testing materials by exposing them to controlled environments that simulate the effects of time in a shorter period. This involves subjecting materials to conditions such as heat, moisture, chemicals, radiation, or electricity to observe changes in their properties like tensile strength, durability, or resistance to corrosion or degradation. The goal is to predict how materials will perform over time under normal conditions by observing their behavior under these intensified conditions. This method is particularly useful for assessing the longevity and reliability of materials used in various applications. **2.** aircraft deicing fluids are subjected to a number of accelerated aging protocols such as the THERMAL STABILITY–ACCELERATED AGING test or to measure their effects on aircraft materials.[39,130,131] [Britannica, SAE AMS1424, SAE AMS1428].

acceptable fluid, **1.** [fluid failure] anti-icing fluid that may be sporadically covered with frozen precipitation but can absorb more contamination because its overall surface has not met failure conditions. **2.** [aircraft deicing] aircraft deicing/anti-icing fluid that fulfills specification, fluid manufacturer, aircraft manufacturer and regulatory requirements.[108] [Myers]

accountable executive, **1.** chief executive officer (CEO). **2.** a position defined under regulations as responsible and accountable for operations of an airline. **–** Synonym: PROGRAM MANAGER.[46,179] [CARs 106.02, WESTJET]

accountable person, see PROGRAM MANAGER. – Synonyms: WINTER PROGRAM MANAGER, RESPONSIBLE PERSON, ACCOUNTABLE EXECUTIVE.

accretion, **1.** [cloud physics] the growth of frozen precipitation particle through the collision of an ice crystal or snowflake with supercooled water droplets, which freeze instantly on contact. **2.** the agglomeration of liquid or frozen particles; *ice can accrete (known as ACCRETION ICE) in flight on the leading edge of aircraft*.[62] [Dunlop]

accretion ice, [aircraft deicing] name given to ice accreted mostly on the leading edge of aircraft in flight. – Synonym: IMPACT ICE. See ACCRETION.

accuracy, [chemistry, engineering, metrology] the closeness of agreement between a measured quantity value and a true quantity value, in other words, the measure of how close the result of a

given analysis (or set of results) is to the correct or true value. The concept accuracy is not a quantity and is not given a numerical quantity value. A measurement is said to be more accurate when it offers a smaller measurement error. – Synonyms: MEASUREMENT ACCURACY, ACCURACY OF MEASUREMENT [French: exactitude, exactitude de mesure]. Compare PRECISION.[24,29,94] [Atkins, Bell, JCGM].

accuracy of measurement, see ACCURACY.

acoustic liner, [aircraft engine] an acoustic absorbent material used in the intake duct of jet engines to reduce noise. – See ENGINE BARREL ICING.[85] [Greaves]

active frost, **1.** [aircraft deicing] an atmospheric condition conducive to frost formation and continued frost growth. **2.** [aircraft deicing] a holdover time precipitation condition that can occur when a) the aircraft surface temperature is at or below the FROST POINT, or b) there is water in liquid form (e.g., dew) on the aircraft surface and the surface temperature falls to or is below 0 °C (frozen dew). **3.** [aircraft deicing] frost formation can also occur after an anti-icing fluid holdover time has expired. **4**. [aircraft deicing] a holdover precipitation condition whose rate is low but not quantified. **5.** [meteorology] active frost does not have a METAR code. – See ADVECTION, DEW, FROST, FROZEN DEW, RADIATIONAL COOLING.[74,88,93,150,151,162,174] [FAA General Info, Horrigan 2011, ICAO 9640, SAE AS6285, SAE AS6286, SIAGDP, TC TP 14052]

***active frost**, condition when frost is forming. Active frost occurs when a) the aircraft surface temperature is at or below the frost point, or b) there is water in liquid form (e.g., dew) on the aircraft surface and the surface falls to/or below 0 °C (frozen dew). [SAE AS6285, SAE AS6286]

adaptations, [safety science] decisions to deviate from formalized rules or procedures that are intentionally performed with the individual being aware that their actions are contrary to the rules. – See EXCEPTIONAL ADAPTATIONS, OPTIMIZING ADAPTATIONS, ROUTINE ADAPTATIONS, SITUATIONAL ADAPTATIONS.[177] [TSB]

additive package, [aircraft deicing fluids] a mixture of products added in relatively small but precise quantity to glycol and water to make new or recycled Type I; typically, the ingredients of an additive package include glycol, water, surfactant, pH control products, corrosion inhibitors, and dye. Glycol and water in the additive package act as SOLVENT for the other components in the formulation. – Colloquial short form synonym: ADPACK.

adherence failure, see ADHESION FAILURE.

adhesion failure, [fluid failure] a form of fluid failure that occurs when a layer of ice crystals builds up, the crystals come in contact with the surface below and are bonded to it. – Synonym: ADHERENCE FAILURE. See FLUID FAILURE.[108] [Myers]

adiabatic, **1.** [aerodynamics, chemistry, meteorology, thermodynamics] related to an ideal process in which heat, mass, or momentum does not leave or enter a system—that does not mean temperature does not change. In an adiabatic process, generally the temperature will change; *if a gas expands under adiabatic conditions, the temperature falls; if a gas compresses under adiabatic conditions, the temperature rises*. **2.** [aerodynamics] said of a process where no heat is added or taken away. **3.** [meteorology] said of a process in which there is no exchange of heat or mass of an

AIR PARCEL with the surrounding environment. See ADIABATIC COOLING, ADIABATIC WARMING, RAM RISE.[8,62,119,122,158] [AMS Glossary, Dunlop, Rennie, Rock, Shevell]

adiabatic cooling, [meteorology] the cooling that occurs to a parcel of air that moves upwards and is subject to expansion. – See ADIABATIC.[8,62] [AMS Glossary, Dunlop]

adiabatic warming, [meteorology] the warming that occurs to a parcel of air that moves downwards and is subject to compression. – See ADIABATIC. [8,62] [AMS Glossary, Dunlop]

adjusted allowance time, **1.** a reduced ALLOWANCE TIME required by the occurrence of accelerated fluid drainage from wings when FLAPS and SLATS are extended (deployed) during taxi, reducing the allowance time of Type III/IV fluids (there are no allowance times for Type I/II fluids). **2.** adjusted allowance times are published in the FAA and Transport Canada *Holdover Time Guidelines*. – Compare STANDARD ALLOWANCE TIME.[75,102,170] [FAA HOT, Guide, TC HOT]

adjusted holdover time, **1.** a reduced HOLDOVER TIME required by the occurrence of accelerated fluid drainage from wings when FLAPS and SLATS are extended (deployed) during taxi, reducing the holdover time of Type I/II/III/IV fluids. **2.** adjusted holdover times are published in the annual FAA and Transport Canada *Holdover Time Guidelines*. – Compare STANDARD HOLDOVER TIME.[75,102,170] [FAA HOT, Guide, TC HOT]

adpack, colloquial short form for ADDITIVE PACKAGE.

advanced air mobility aircraft, an umbrella term for aircraft that are typically highly automated, electrically powered, and have vertical takeoff and landing capability. Many of these aircraft fall into the POWERED-LIFT category are often referred to as AIR TAXI.[66] [FAA AAM]

advancing contact angle, **1.** [surface chemistry] a measurement of wetting behavior. A large advancing contact angle suggests poor wetting whereas a small advancing CONTACT ANGLE indicates better wetting. **2.** the angle formed by a liquid as it spreads out (advances) onto a surface. **3.** advancing contact angle is influenced by factors such as surface chemistry (hydrophilicity, hydrophobicity), surface contamination, SURFACE TENSION, and roughness. – See CONTACT LINE, RECEDING CONTACT ANGLE, HYDROPHILIC, HYDROPHOBIC, WETTING.[129] [SAE AIR6232]

***advancing contact angle**, the largest possible contact angle attained by the drop during volume addition before the motion of the contact line. Similarly, it is the maximum angle attained by the advancing front on an inclined surface before the motion of the contact line. [SAE AIR6232]

advection, [meteorology] generally, horizontal mass transport motion. **2.** [aircraft deicing] advection can result in changes to aircraft surface conditions; *wind can replenish wing surface heat that has been lost to RADIATIONAL COOLING, thus preventing frost formation; at dawn, solar heating can result in a rapid rise in humidity as dew is evaporated. Aircraft on the sunny side of the terminal may not be affected as they absorb the solar energy, but advection of the moist cold air over surfaces in the shade may result in frost formation and the wings may go from fully dry to fully frosted within a few minutes*. – See ADVECTION FOG, FROST.[5,8,62,88] [Ahrens, AMS Glossary, Dunlop, Horrigan 2011]

advection fog, **1.** [meteorology] fog that forms through the horizontal motion of stable air carried over a cold surface causing it to cool below its DEWPOINT, e.g., moist air over a cold body of water;

sea fog. **2.** [meteorology] pre-existing fog carried over to a neighboring area; *the sea fog invaded the land*.[8,62] [AMS Glossary, Dunlop]

aerodynamic acceptance, see AERODYNAMIC ACCEPTANCE TEST.

aerodynamic acceptance test, **1.** a wind tunnel test performed at different air temperatures to determine whether deicing/anti-icing fluids (Type I, II, III, or IV fluids) meet FLOWOFF requirements during TAKEOFF GROUND ROLL acceleration and INITIAL CLIMB. **2**. a wind tunnel test which may be performed under three different acceleration profiles known as the HIGH SPEED RAMP, MIDDLE SPEED RAMP, or LOW SPEED RAMP. **3.** a test whose outputs are the LOWEST AERODYNAMIC ACCEPTANCE TEMPERATURE and FLUID ELIMINATION based on the average final thickness of the remaining fluid on the wind tunnel test section. There are two different outputs for each ramp tested for a given fluid; *for example, a given dilution of a Type I concentrate may have a high speed ramp lowest aerodynamic acceptance temperature of -45° C with a fluid elimination final thickness of 350* μm *and a low speed ramp aerodynamic acceptance temperature of -38 °C with a fluid elimination final thickness of 440 μm.* **4.** a test defined in AS5900. **5.** a DETERMINE AND REPORT TEST for Type I, II, III, and IV fluids. **5.** the lowest aerodynamic acceptance temperatures resulting from the aerodynamic acceptance tests are used in the determination of the LOWEST OPERATIONAL USE TEMPERATUREs.[129,138,140,145,174] [SAE AIR6232, SAE ARP5718, SAE ARP6207, SAE AS5900, TC TP 14052]

aerodynamic degradation, [icing aerodynamics] condition when FROZEN CONTAMINATION, roughness, FAILED FLUID, or UNFAILED FLUID causes degradation of the aerodynamic performance or control of the aircraft. – See AERODYNAMIC ROUGHNESS, FLUID FAILURE CRITERIA.[141] [SAE ARP6852]

aerodynamic failure, [icing aerodynamics, aircraft deicing] an unquantified condition when frozen contamination, roughness, FAILED FLUID, or UNFAILED FLUID causes unacceptable degradation of the aerodynamic performance or control of the aircraft; *for example, an unfailed fluid below its LOWEST AERODYNAMIC ACCEPTANCE USE TEMPERATURE may cause unacceptable lift loss*. – See AERODYNAMIC DEGRADATION [141] [SAE ARP6852]

aerodynamic roughness, any irregularities to an otherwise smooth surface over which a fluid (liquid or gas) flows. Examples of surface irregularities include contamination due to snow, ice, frost, bugs, dirt, chipped or cracked paint, dents, scratches and the like. These surface irregularities perturb the fluid flow resulting in boundary layer TRANSITION and SEPARATION. – See BOUNDARY LAYER.

aerodynamically quiet areas, aircraft areas consisting of aerodynamically quiet cavities and aerodynamic surfaces with separated airflow. – See SEPARATION [aerodynamics].[108] [Myers]

***aerodynamically quiet areas**, there are two classes of aerodynamically quiet areas: aircraft cavities and aerodynamic surfaces with separated airflow. [Myers]

aerodynamically quiet cavity, aircraft cavity insufficiently scoured by airflow into which viscous fluids may seep but where drainage is inadequate for such to seep out.[108] [Myers]

***aerodynamically quiet cavities**, all aircraft have cavities into which fluids may seep under gravity, but where drainage may be inadequate for a viscous fluid to seep out. If the cavity is not sufficiently scoured by the airflow during takeoff to effectively remove a fluid more viscous than water, it is called an aerodynamically quiet cavity. [Myers]

aerodynamically quiet surface, **1.** an aircraft surface zone of low-velocity airflow where RESIDUAL FLUID will move very slowly or not at all. **2.** at takeoff, a zone of low-velocity airflow exists at the surface where trailing and possibly leading-edge devices are deployed to approximate the profile of a highly cambered AIRFOIL (thereby substantially increasing the lifting capability of the wing at low speeds), the airflow may separate from the aerodynamic surface, forming a separation bubble (typically breakaway of laminar airflow followed by a turbulent airflow reattachment). As a result, in the zone of very low-velocity airflow any residual fluid will move very slowly or not at all. – See LAMINAR FLOW, TURBULENT FLOW.[108] [Myers]

***aerodynamically quiet surfaces**, at takeoff, where trailing and possibly leading-edge devices are deployed to approximate the profile of a highly cambered airfoil (thereby substantially increasing the lifting capability of the wing at low speeds), the airflow may separate from the aerodynamic surface, forming a separation bubble (typically breakaway of laminar airflow followed by a turbulent airflow reattachment). As a result, a zone of very low-velocity airflow will exist at the surface; where any residual fluid will move very slowly or not at all. [Myers]

aft-mounted engine, [aircraft structure] an engine mounted at the rear of the fuselage; *for example, the MD-11 has one aft mounted engine (and two wing mounted engines); the Bombardier (now Mitsubishi) CRJ and Embraer ERJ aircraft have two aft-mounted engines*. – Synonym REAR-MOUNTED ENGINE.

ailerons, [aircraft components] control surfaces, generally on the outer part of the wing (near the tip) and mounted on the rear of the wing, which operate differentially to raise lift on one side of the wing and lower it on the other, causing the aircraft to roll about its LONGITUDINAL AXIS. The result of ROLL produces a turn of the aircraft.[71,158] [FAA H-8083-3C, Shevell]

air carrier, [FAA] a person who undertakes directly by lease, or other arrangement, to engage in air transportation.[1] [14 CFR § 1.1]

air operator, [Transport Canada] the holder of an air operator certificate.[174] [TC TP 14052]

air operator certificate (AOC), [Transport Canada] a certificate issued under the Canadian Air Regulations that authorizes the holder of the certificate to operate a commercial air service (the short form is OPERATOR CERTIFICATE).[174] [TC TP 14052]

air parcel, an imaginary volume of air to which may be assigned any or all the basic dynamic and thermodynamic properties of atmospheric air and retains its shape and characteristics as it moves in the atmosphere. An air parcel is large enough to contain a very great number of molecules, but small enough so that the properties assigned to it are approximately uniform within it.[8] [AMS Glossary]

air taxi, an advanced air mobility POWERED-LIFT aircraft typically highly automated, electrically powered, with vertical takeoff and landing capability.[66] [FAA AMM]

aircraft anti-icing fluid (AAF), see ANTI-ICING FLUID.

Aircraft Communications Addressing and Reporting System (ACARS), **1.** digital data link system using radio or satellite allowing for transmission of short messages between the aircraft and ground stations. **2.** [aircraft deicing] new communication platforms utilize electronic tablets as an electronic flight bag (EFB) (e.g., iPads) on flightdecks and in deicing vehicles. Deicing coordinators can interact with the flightcrew and deicing crew using web-based dispatching. For pad operations, including movement configuration and guidance, electronic message boards are now commonly used at deicing facilities.[137] [SAE ARP5660].

***aircraft communication and reporting system** (ACARS), digital data link system transmitted via VHF radio that allows airline flight operations departments to communicate with aircraft.[137] New communication platforms utilize electronic tablets as an electronic flight bag (EFB) (e.g., iPads) on flight decks and in deicing vehicles. Deicing coordinators can interact with the flightcrew and deicers using web-based dispatching. For pad operations, including movement configuration and guidance, electronic message boards are now commonly used at DDFs. [SAE ARP5660]

aircraft deicing facility, see DEICING FACILITY.

aircraft deicing fluid (ADF), see DEICING FLUID.

aircraft deicing pad, see DEICING PAD.

aircraft hydraulic fluid, **1.** oils used in struts and hydraulic systems. **2.** [aircraft brakes] potential contaminants for carbon brakes.[126] [SAE AIR5490]

***airplane hydraulic fluid**, oils used in struts and hydraulic systems. [SAE AIR5490]

aircraft icing conditions, atmospheric conditions that result in the buildup of ice on an aircraft's leading-edge surfaces in flight caused by the impingement and freezing of liquid (usually supercooled) hydrometeors, and on the whole aircraft when it is on the ground. – See GROUND ICING CONDITIONS, IN-FLIGHT ICING, IN-FLIGHT ICING CONDITIONS, HYDROMETEORS.[177] [TSB]

aircraft lubricants, **1.** greases and oils for aircraft. **2.** [aircraft brakes] aircraft lubricants can be potential contaminants for carbon brakes, particularly when applied to landing gear component.[127] [SAE AIR5490]

***airplane lubricants**, greases and oils, particularly that are applied to landing gear components. [SAE AIR5490]

aircraft surface coating, **1.** a coating applied to an aircraft surface; *a drag-reducing aircraft surface coating; a dirt repelling aircraft surface coating; an aircraft surface coating to improve shine.* **2.** [aircraft deicing] a coating applied with properties that may be ICEPHOBIC, HYDROPHOBIC, SUPERHYDROPHOBIC, or HYDROPHILIC that may affect the WETTING of aircraft deicing fluids, excluding surface finishes applied by the original equipment manufacturer. – Synonyms: SURFACE COATING, SURFACE FINISH.[129] [SAE AIR6232]

***aircraft surface coating**, coating applied to an aircraft surface with properties that may be icephobic, hydrophobic, super-hydrophobic, or hydrophilic. This term as used in the document is not intended to refer to surface finishes that have been qualified by the original equipment manufacturer. [SAE AIR6232]

aircraft wash fluids, **1.** cleaning solutions applied to an aircraft and/or its components. **2.** [aircraft brakes] potential contaminants for carbon brakes.[127] [SAE AIR5490]

***airplane wash fluids**, cleaning solutions applied to the airplane and/or its components. [SAE AIR5490]

airfoil, [aerodynamics] a structure which provides an aerodynamic force when it interacts with a moving stream of air; *wing, propeller, rudder, trim tab are examples of airfoils*. 2. a structure, the shape of which gives rise to lower pressures on one surface (suction surface) compared with the other (pressure surface) when moving through a fluid (e.g., air).[24,71,158] [Atkins, FAA H-8083-3C, Shevell]

airframe, [aircraft components] the structural components of an airplane, including the framework and skin of such parts as the fuselage, empennage, wings, landing gear (minus tires), and engine mounts.

allowance time, **1.** estimated amount of time in which aircraft protection is expected to hold against contamination from ice pellets or small hail or other forms of precipitation mixed with these. **2.** Type III and Type IV fluids provide allowance times whereas there are no allowance times with Type I and Type II fluids. **3.** allowance times are derived from aerodynamic fluid flowoff performance data and visual inspection of fluids exposed to these precipitation types. **4.** allowance time tables and a LIST OF VALIDATED FLUIDS are published in the FAA and Transport Canada *Holdover Time Guidelines*. **5.** PRETAKEOFF CONTAMINATION CHECK (or the Transport Canada equivalent PRETAKEOFF CONTAMINATION INSPECTION) are never used to extend the time of allowance times as fluid failures with ice pellets or small hail cannot be determined by the process of pretakeoff contamination check or pretakeoff contamination inspection. See STANDARD ALLOWANCE TIME, ADJUSTED ALLOWANCE TIME,.[75,138,140,170] [FAA HOT, SAE ARP5718, SAE ARP6207, TC HOT]

***allowance time**, time, from the initial application of fluid, that a fluid is expected to provide protection of an aircraft against contamination from conditions of or mixed with ice pellets or small hail. Allowance times are derived from aerodynamic fluid flow off performance data and visual inspection of fluids exposed to these precipitation types. [SAE ARP5718, SAE ARP6207]

angle of attack (AOA), [aerodynamics] the acute angle between the CHORD LINE of the AIRFOIL and the direction of the RELATIVE WIND.[71] [FAA H-8083-3C]

annual recurrent training, [aircraft deicing] mandatory training, to be repeated every year, program that ensures personnel involved in deicing operations, including flightcrews, are brought up-to-date with the latest procedures, safety protocols, and best practices, as in the INITIAL QUALIFICATION TRAINING.[74,151,172] [FAA General Info, SAE AS6286, TC 622.11]

anoxic, describing a process or system in which oxygen is deficient or absent; *anoxic water has no or very little oxygen*.[7,119] [Allaby, Rennie]

anti-icing, a precautionary procedure to protect aircraft surfaces from the formation or accumulation of freezing or frozen contamination, such as ice, snow, frost, or slush, for a limited period. – Compare DEICING.[63,68,93,108,143,144,150,172,174] [EASA EU Reg, FAA AC 120-60B, ICAO 9640, Myers, SAE AS5635, SAE AS5681, SAE AS6285, TC 622.11, TC TP 14052,]

***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. [SAE AS6285]

***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 (holdover time). [SAE AS5635]

***anti-icing**, a precautionary procedure that provides protection of an aircraft against the formation of frost or ice and accumulation of snow or slush on treated surfaces of the aircraft for a limited period of time. [SAE AS5681]

anti-icing code, report given to the flightcrew, stating that deicing/anti-icing has been carried out and the details of the anti-icing procedure that was applied.[63,150] [EASA EU Reg, SAE AS6285]

***anti-icing code**, report given to the flightcrew that deicing/anti-icing has been carried out and the details of the anti-icing procedure that was applied. [SAE AS6285]

anti-icing fluid, **1.** a fluid applied to an aircraft as a precautionary procedure to provide protection from the formation or accumulation of freezing or frozen contamination, including ice, snow, frost, or slush, on treated surfaces for a limited period. **2.** a fluid consisting of a) heated mixture of water and TYPE I CONCENTRATE, b) heated TYPE I READY-TO-USE, c) heated or unheated TYPE II/III/IV UNDILUTED, or d) heated or unheated mixture of water and Type II//III/IV. – Compare DEICING FLUID.[63,64,67,68,174] [EASA EU Reg, EASA SIB 2008-29, FAA 120-112, FAA 120-60B, TC TP 14052]

***anti-icing fluid**: a) Mixture of water and Type I fluid; b) Premix Type I fluid; c) Type II, III, or IV fluids; d). Mixture of water and Type II, III, or IV fluids. [AS6285]

anti-icing performance, test consisting of the WATER SPRAY ENDURANCE TEST and the HIGH HUMIDITY ENDURANCE TEST. – Compare ENDURANCE TIME, HOLDOVER TIME.[75,130,131170] [FAA HOT, SAE AMS1424, SAE AMS1428, TC HOT]

antioxidant treatment, [aircraft brakes] treatment applied to carbon brakes to reduce OXIDATION.[127] [SAE AIR5490]

***antioxidant (AO) treatments**, treatment applied to carbon brakes to reduce oxidation. [SAE AIR5490]

appearance, **1.** [chemistry] the visual characteristic of a substance. **2.** [aircraft deicing fluids, runway deicing products] appearance an OPERATIONAL PROPERTY part of the qualification and sales specifications of aircraft deicing fluids and of runway deicing products; *the appearance of this Type I is clear orange color liquid, substantially free of suspended matter*; *the appearance of this Type IV is green liquid with slight haze, substantially free from suspended matter; the appearance of this runway deicing product is blue liquid, free from skins and lumps*; *the appearance of this runway deicing product is white free flowing solid, free from foreign material*. **3.** the characteristics considered when performing the appearance test can be COLOR, color uniformity, TURBIDITY, homogeneity and SUSPENDED MATTER. **3.** a PASS-FAIL TEST for aircraft deicing fluids and runway deicing products. [130,131,132,133] [SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

apron, part of an airport, other than the maneuvering area, intended to accommodate the loading and unloading of passengers and cargo, the refueling, servicing, maintenance and parking of aircraft, and any movement of aircraft, vehicles and pedestrians necessary for such purposes.[174] [TC TP 14052]

aquatic toxicity, **1**. the harmful effects of chemicals and pollutants on aquatic organisms and ecosystems. **2.** [aircraft deicing and runway deicing products] evaluation of the effect of fully formulated deicing/anti-icing fluid (not just the glycols) and runway deicing products, on fish (e.g., fathead minnows, rainbow trout) and aquatic invertebrates (e.g., *daphnia magna)*. **3.** aquatic

toxicity is a DETERMINE AND REPORT TEST whose results are classified under ENVIRONMENTAL PROPERTY of aircraft deicing fluids and runway deicing products. **4.** aquatic toxicity is generally reported as the lethal concentration 50% (LC_{50}), the concentration that causes death in 50% of the test population (e.g., for fathead minnows or rainbow trout), or effective concentration 50% (EC_{50}), the concentration that causes a specific effect such as immobilization in the test population (e.g., for *daphnia magna*). With metrics like LC_{50} and EC_{50}, a higher number indicates less toxicity because these values represent the concentration of a substance required to affect a given percentage of the test population (i.e., 50% for LC_{50} or EC_{50}); *for example, a product with a LC_{50} of 27,000 mg/L is less toxic than one with a LC_{50} of 1000 mg/L*. – See ENVIRONMENTAL PROPERTIES, FLUID PROPERTIES.[39,130,131,132,133] [Britannica, SAE AMS1424, SAE AMS1428, SAE AMS1435]

aqueous solution, a SOLUTION in which the SOLVENT is water.[102] [Guide]

ash [runway contaminant], a grayish white to black soft solid residue of combustion normally originating from pulverized particulate matter ejected by volcanic eruption.[69] [FAA AC 150/5200-28G]

asphalt concrete degradation resistance, [runway deicing products] a pass-fail test for runway deicing products used in Europe where the reduction in adhesion value of the runway asphalt concrete surface must not be more than 50% when tested according to the method, known as LFV Method 2-98 (EN 12697-41), as described in AMS1431 and AMS1435.[132,133] [SAE AMS1431, SAE AMS1435]

asymmetrical deicing, the removal of contamination with deicing/anti-icing fluids or the prevention against contamination with anti-icing fluids in a manner that differs quantitatively or qualitatively between the two sides of the aircraft, including the wing, horizontal stabilizer and vertical stabilizer. Asymmetrical deicing is a safety concern due to the potential imbalance of aerodynamic forces that may affect the performance and control of the aircraft. *Examples of asymmetrical deicing: the use of Type I on the left wing and Type IV on the right wing; spot deicing on the right wing and no deicing on the left wing.* – Compare SYMMETRICAL DEICING.[93,115,150,151,174] [ICAO 9640, Oda, SAE AS6285, SAE AS6286, TC TP 14052

atmospheric boundary layer (ABL), see PLANETARY BOUNDARY LAYER.

atmospheric icing conditions, see AIRCRAFT ICING CONDITIONS.[177] [TSB]

attitude, [aerodynamics] the position of an aircraft as determined by the relationship to its axes and a reference, usually the Earth's horizon.[71] [FAA H-8083-3C]

audit evidence, records, statements of fact or other information, which are relevant to audit criteria and verifiable.[152] [SAE AS6332]

***audit evidence**, records, statements of fact or other information, which are relevant to the audit criteria and verifiable. [SAE AS6332]

Avogadro's number, **1.** a numerical value of $6.02214976 \times 10^{23}$. **2.** number of atoms, molecules, ions, electrons or a specified group of particles in a mole. **3.** Avogadro's number is dimensionless; it expresses the number of constituent particles in a mole. – See MOLE.[44] [Bureau]

axes of an aircraft, three imaginary lines that pass through an aircraft's center of gravity. The axes can be considered as imaginary axes around which the aircraft turns. The three axes pass through the center of gravity at 90° angles to each other. The axis from nose to tail is the LONGITUDINAL AXIS, the axis that passes from wingtip to wingtip is the LATERAL AXIS, and the axis that passes vertically through the center of gravity is the VERTICAL AXIS.[71] [FAA H-8083-3C]

barrel icing, see ENGINE BARREL ICING.

basket, [aircraft deicing unit] partially enclosed work platform mounted on a boom and used by deicing personnel to perform deicing/anti-icing, various checks of the aircraft and its component, such as the PREFLIGHT CONTAMINATION CHECK, TACTILE CHECK or POSTDEICING/ANTI-ICING CHECK. – Synonym, OPEN BASKET. Colloquial synonyms: BUCKET, OPEN BUCKET. See OPEN BASKET DEICING UNIT. Compare ENCLOSED CABIN.[119,179] [Polar, Vestergaard]

batch, a quantity of something produced in one operation under uniform conditions. – Compare LOT.[102] [Guide, Hibbert]

bench instrument, [chemistry] a measuring instrument designed to be used on a laboratory bench. Synonym: BENCHTOP INSTRUMENT. – See LABORATORY INSTRUMENT. Compare FIELD INSTRUMENT.

benchtop instrument, a measuring instrument designed to be used on a laboratory bench; *benchtop pH meter*, *benchtop balance*. – Synonym: BENCH INSTRUMENT. See LABORATORY INSTRUMENT. Compare FIELD INSTRUMENT.

bimetallic temperature gauge, uses two metallic strips bonded together. As temperature increases, one metal expands more than the other, causing the strip to curl. This mechanical motion is read on an analog temperature numbered scale or digital readout. – See TEMPERATURE GAUGE, THERMOMETER.

biochemical oxygen demand (BOD), **1.** [environmental science] the amount of oxygen taken up by microorganisms that decompose organic products in water. BOD is measured by keeping a sample of water containing a known amount of oxygen and of product for a number of days (e.g., 5, 15, 20, 28) (incubation period) at a given temperature (e.g., 5 °C, 20 °C). The remaining amount of oxygen is measured at the end of the test. The result is reported in kg O_2/kg of product. **2.** [aircraft deicing fluids and runway deicing products] a DETERMINE AND REPORT TEST whose result is classified under ENVIRONMENTAL PROPERTY and required in the QUALIFICATION of Type I/II/III/IV fluids and runway deicing products. – See CHEMICAL OXYGEN DEMAND, THEORETICAL OXYGEN DEMAND, TOTAL OXYGEN DEMAND, BIODEGRADABILITY.[119,130,131,132,133,156] [Rennie, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435, Schaschke]

biodegradability, **1.** [science] the ability of a material to be broken down by microorganisms and be reabsorbed by the natural environment. **2.** [aircraft deicing fluids, runway deicing products] a DETERMINE AND REPORT TEST whose results are classified under ENVIRONMENTAL PROPERTY of aircraft deicing fluids and runway deicing products estimated by taking the ratio of the BIOCHEMICAL OXYGEN DEMAND (BOD) to the CHEMICAL OXYGEN DEMAND (COD).[39,130,131,132,133] [Britannica, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435.]

black ice, a colloquial name for clear ice coating roadway or other paved surfaces. In the DOMAIN of aircraft deicing the preferred term is not black ice but CLEAR ICE and refers to ice buildup specifically on the aircraft.[62] [Dunlop]

bleed air ducts, [aircraft engine] passages that divert compressed air from the engine compressor section for various purposes, such as powering aircraft systems or heating the cabin. They are typically located within the engine NACELLE and can connect to different parts of the aircraft.[71] [FAA H-8083-3C]

blowing snow, **1.** [meteorology] snow lifted from the surface of the earth by the wind to a height of 6 feet (2 meters) or more above the ground and blown about in such quantities that the reported horizontal visibility is reduced to less than 7 miles (11 km). Blowing snow can be falling snow or snow that has already accumulated but is picked up and blown about by strong winds. **2.** a condition with METAR code BLSN. **3.** [aircraft deicing] a condition to be used with the snowfall intensity as a function of prevailing visibility table. – See SNOWFALL VISIBILITY TABLE.[62,75,113,170] [Dunlop, FAA HOT, NOAA FMH-1, TC HOT]

bleed-through, insufficient color intensity of a Type II/III/IV to prevent visual interference from a layer of orange Type I underneath the Type II/III/IV. – See COLOR. [138] [SAE ARP5718]

*insufficient color intensity to prevent interference from a layer of Type I fluid underneath (this phenomenon is known as **bleed-through**). [SAE ARP5718]

bottom loading, loading a tank, rail car or TANK TRUCK from the bottom outlet. Bottom loading is usually frowned upon for fear of spill unless there is a DRY DISCONNECT COUPLING. – Compare SPLASH LOADING.

boundary layer, **1.** [mechanical engineering, aerodynamics, aircraft fluid testing] the region within a fluid (gas or liquid) flowing over a surface which is affected primarily by the viscosity of the fluid. The fluid velocity changes from zero at the surface to its free-stream value at the edge of the boundary layer. **2.** [meteorology] the thin layer of fluid where adhesion causes different forms of flow than its freely moving fluid; in meteorology a distinction is made between PLANETARY BOUNDARY LAYER and SURFACE BOUNDARY LAYER. – See BOUNDARY LAYER DISPLACEMENT THICKNESS.[24,62,158] [Atkins, Dunlop, Shevell]

boundary layer displacement thickness (BLDT), **1.** [aerodynamics] the measured displacement of airflow over a surface. **2.** [aircraft deicing fluid testing] the increase in boundary layer displacement over the flat plate surface caused by fluid flowoff during the AERODYNAMIC ACCEPTANCE TEST and correlated to transient loss of lift during takeoff with fluids. – See FLOWOFF, TRANSIENT AERODYNAMIC EFFECTS OF FLUIDS.[129] [SAE AIR6232]

***boundary layer displacement thickness** (BLDT), the measured displacement of the air flow over a surface. The increase in BLDT over the flat plate surface caused by the fluid flow-off during the AS5900 aerodynamic acceptance is directly related to loss of lift during takeoff. [SAE AIR 6332]

brine, water with a high concentration of salt.[102] [Guide]

brining, the dissolution of a salt at high concentration in water.[102] [Guide]

Brix (°Brix), **1.** [chemistry] a scale of refraction, expressed in degrees from 0.00 to 100.00, that represents the concentration of a solution of sucrose in water. **2.** a scale of refraction, expressed in degrees, usable for any substance using a calibration curve for that substance. **3.** [aircraft deicing] a scale of refraction calibrated to the glycol concentration or freezing point of a deicing fluid. **4.** a scale of refraction named after Adolf F. W. Brix (1798-1870). – See CALIBRATION CURVE, REFRACTION.[150,156,174] [SAE AS6285, Schaschke, TC TP 14052]

***Brix (degrees Brix or °Brix)**, unit of measurement of refraction. See also refraction and refractometer. [SAE AS6285]

bucket, [aircraft deicing unit] colloquial synonym for BASKET.

Buehler test, see SUCCESSIVE DRY-OUT AND REHYDRATION.

buffer, **1.** [chemistry] a solution that resists changes in pH when acid or alkali is added to it. **2.** [aircraft deicing] short for FREEZING POINT BUFFER.[119] [Rennie]

bulb thermometer, see definition 2 under THERMOMETER.

cabin crew, personnel, other than flightcrew members, assigned to passenger cabin safety duties for the flight; *federal inspectors and air security officers that also work aboard the aircraft are not flightcrew, but are not cabin crew per se as they do not always take direction from the airline crew members. Deadheading pilots and flight attendants are also considered to be working but not considered active cabin crew unless activated to relieve an ill or injured operating crew member*.[91,92] [Horrigan 2024, IATA]

calibration, the process of using known reliable standards, under set conditions, to relate to an experimentally observed value; *calibration of a pH meter, refractometer, viscometer, balance*.[29,102] [Bell, Guide]

calibration certificate, a document stating that an instrument has been calibrated and by whom, usually issued by the instrument manufacturer or a calibration laboratory.

calibration curve, **1.** a plot, graph, or equation of an instrument output (or reading or response) to samples of know concentration or known physical property. **2.** [aircraft deicing] a plot or equation of refraction (in °BRIX, °C or °F) vs known glycol content. **3.** [aircraft deicing] a plot or equation of refraction (in °Brix, °C or °F) vs know freezing point. – See PHYSICAL PROPERTIES.[24,102] [Atkins, Guide]

camber line, [aerodynamics] an imaginary curve constructed midway between the upper and lower surfaces of an AIRFOIL. – Synonym: MEAN CAMBER LINE.[24,158] [Atkins, Shevell]

cancelation date, see SAE STANDARD.

carbon brake, a brake that uses friction material composed of a carbon-carbon composite; this is usually in the form of a carbon fiber preform densified with additional carbon as matrix.[127] [SAE AIR5490]

***carbon brake**, a brake that uses friction material composed of a carbon-carbon composite. This is usually in the form of a carbon fiber preform densified with additional carbon as matrix. [SAE AIR5490]

carbon brake antioxidant treatment, see ANTIOXIDANT TREATMENT.

carbon brake friction and wear modifiers, see FRICTION AND WEAR MODIFIERS.

Cassie state, [surface chemistry] a WETTING condition in which a liquid droplet rests on a textured or rough surface, with air trapped beneath the droplet. In this state, the liquid does not come into direct contact with the solid surface but rather sits atop air pockets created by the surface roughness resulting in a hydrophobic or water repellency condition; *water beading on a lotus leaf is an example of a Cassie state*. – Compare WENZEL STATE.[129] [SAE AIR6232]

***Cassie state**, when the liquid of a drop does not fill the voids in the solid on which it sits and the voids remain filled with air, resulting in a hydrophobic condition; the opposite of Wenzel state. [SAE AIR6232]

catalysis, **1.** the process of changing the rate of a chemical reaction with a catalyst. **2.** the effect of a substance (the catalyst) that, without itself undergoing change, aids a chemical change in other substances. – See CATALYST, CATALYTIC OXIDATION.[156,119] [Schaschke, Rennie]

catalyst, [chemistry] a substance that increases the rate of a chemical reaction without itself undergoing any permanent chemical change. – See CATALYTIC OXIDATION.[119] [Rennie]

catalytic oxidation, [aircraft brakes] oxidation of carbon brakes accelerated by a CATALYST. – See EFFECT ON CARBON BRAKE SYSTEMS.[127,128] [SAE AIR5490, SAE AIR5567]

***catalytic oxidation**, oxidation that is accelerated by a catalyst. [SAE AIR5490]

category specification, **1.** a specification that defines which FREEZING POINT DEPRESSANTs are used in Type I or Type II/III/IV fluids and together with the foundation specification fully define Type I or Type II/III/IV fluids. **2.** AMS1424/1, AMS1424/2, AMS1428/1, and AMS1428/2 are the only category specifications. **3.** AMS1424 and AMS1428 are not category specifications. – Compare FOUNDATION SPECIFICATION.[130,131] [SAE AMS1424, SAE AMS1428]

causal chain, [root cause analysis] ordered sequence of actions and conditions that led an outcome or event of interest.[168] [TC AC SUR-002]

central deicing facility (CDF), an area at an airport designated to manage deicing and anti-icing activities in a central location while fulfilling operational, safety, and environmental requirements.[70,137,174] [FAA AC 150/5300-14D, SAE ARP5660, TC TP 14052]

centralized deicing facility, see CENTRAL DEICING FACILITY.

Certificate Management Office (CMO), [FAA] an office of the FAA that specializes in the certification, surveillance, and inspection of major air carriers and Flight Safety International's part 142 Training Centers.[73] [FAA CMO]

certificate of analysis, a document, usually 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 of manufacture. Laboratories other than the fluid manufacturer may also issue certificates of analysis.

Plural is certificates of analysis. – Compare CERTIFICATE OF CONFORMANCE.[102,150] [Guide, SAE AS6285]

***certificate of analysis**, 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. [SAE AS6285]

certificate of conformance, document declaring that a product fulfills the requirements of a standard. – Synonym: CERTIFICATE OF CONFORMITY. Compare CERTIFICATE OF ANALYSIS.[102,150] [Guide, SAE AS6285]

***certificate of conformance**, a document declaring that a product fulfills the requirements of a standard. Also known as certificate of conformity. [SAE AS6285].

certificate of conformity, see CERTIFICATE OF CONFORMANCE (the usual term is certificate of conformance).[102,150] [Guide, SAE AS6285]

certificates of analysis, plural of certificate of analysis.[48] [Cambridge]

certification, **1.** [general] a formal recognition granted by an authoritative body that a product, system, or process has met predefined standards; *aircraft deicing fluids and runway deicing products fulfilling the requirements of SAE AMS1424, AMS1428, AMS1431 and AMS1435 are not certified as there is no provision for an authoritative body to certify them.* **2.** [quality assurance] the process by which recognition is obtained from an appropriate party that a material, product, process, service or environment meets certain specified requirements. **3.** [human resources] formal approval by the appropriate certifying agency to function at a certain level of practice; *the certification of this teacher was revoked*; *this jurist cannot practice law before she is certified by the Law Society*. – See CERTIFIED. Compare QUALIFICATION.[10,45,130,131,132,133] [ASTM E699, Butterfield, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

certified, a material, product, system, service, process or environment that has obtained certification. – See CERTIFICATION. Compare QUALIFIED.

check, **1.** to look at something to obtain information. **2.** examining work to ensure that it has been done correctly. **3.** [aircraft deicing] examination against a relevant standard by a trained and qualified person to ascertain satisfactory condition. – See PREFLIGHT CONTAMINATION CHECK, TACTILE CHECK, POSTDEICING/ANTI-ICING CHECK, PRETAKEOFF CHECK, PRETAKEOFF CONTAMINATION CHECK.[82,106,150] [Gorse, MW, SAE AS6285]

***check**, examination against a relevant standard by a trained and qualified person to ascertain satisfactory condition. [SAE AS6285]

checktime, [holdover time nowcasting system] the output of an automated nowcasting system to support real time holdover time determination. Checktime is a time in the past that indicates whether an aircraft anti-icing fluid is still within holdover time in the given conditions. Incorporating real-time snowfall rates, ambient air temperature, and fluid type, the algorithm begins with the current time and integrates the fluid's loss in protection capacity rate backwards in time, minute by minute, until it determines sufficient precipitation has fallen for the fluid protection capability to be exhausted. The time at which this occurs is displayed to the user as the checktime and is updated every minute. The checktime is compared to the time when the aircraft

was anti-iced. If the time the aircraft was anti-iced remains more recent than the checktime, the fluid is still within holdover time.[67,142] [FAA AC120-112, SAE AS5537]

chemical contamination, presence of substances (chemicals) where they should not be or are at concentrations higher than they should be. – See CONTAMINATION. Compare FROZEN CONTAMINATION.[150] [SAE AS6285]

***chemical contamination**, condition when substances (chemicals) are present where they should not be or are at concentrations higher than they should be. [SAE AS6285]

chemical oxygen demand (COD), **1.** [environmental science] the amount of oxygen required to chemically oxidize organic and inorganic compounds in water. The test procedure is based on the chemical oxidation of the organic and inorganic contaminants dissolved or suspended in water. The quantity of oxidant (potassium dichromate) consumed is expressed in mg/L. **2.** a DETERMINE AND REPORT TEST whose results are classified under ENVIRONMENTAL PROPERTY for Type I/II/II/IV fluids and runway deicing products. – Compare BIOCHEMICAL OXYGEN DEMAND, TOTAL OXYGEN DEMAND, THEORETICAL OXYGEN DEMAND, BIODEGRADABILITY.[7,156] [Allaby, Schaschke]

chloride content, [solid runway deicing products] a PASS-FAIL TEST for solid runway deicing products where the level of soluble chloride on a dry basis must not exceed 250 ppm as determined by the APHA method 4500-Cl or equivalent.[163,132] [APHA 4500-Cl, SAE AMS1431]

chord, [aerodynamics] the length of the CHORD LINE.[24,71,158] [Atkins, FAA H-8083-3C, Shevell]

chord line, [aerodynamics] an imaginary straight line drawn between the LEADING EDGE and TRAILING EDGE of an AIRFOIL[24,71,158] [Atkins, FAA H-8083-3C, Shevell]

clean aircraft, **1.** an aircraft without any contamination or any fluid**. 2.** an aircraft with a fluid that has not failed. **3.** an aircraft without adhering contamination. **4.** an aircraft meeting the regulation and regulatory guidance requirements for takeoff with respect to frozen contamination taking into consideration specific allowable contamination, as defined under regulation and regulatory guidance, such as unfailed fluid, COLD SOAKED FUEL FROST within certain areas, THIN HOARFROST on the fuselage, or non-adhering FROZEN CONTAMINATION. – See FAILED FLUID, FLUID FAILURE, GUIDANCE, UNFAILED FLUID.

clean aircraft concept, regulatory compliance guidance consisting in an array of operational practices (called defenses in safety science) to ensure that crews and other operational persons understand the need to ensure that, before any takeoff is attempted, the aircraft is clean, meaning free from critical surface contamination as defined by regulations and regulatory GUIDANCE.[58,60,61,152,174,177] [Dekker 2011, Dekker 2014, Dekker 2019, SAE AS6332, TC TP 14052, TSB]

***clean aircraft concept**, during conditions conducive to airplane icing during ground operations, take-off shall not be attempted when ice, snow, slush, or frost is adhering to the wings, propellers, control surfaces, engine inlets, or other critical surfaces. This is known as the "clean aircraft concept." [AS6332]

c**lean stormwater**, **1.** normal runoff without noteworthy contamination. **2.** [aircraft deicing] stormwater with permissible/allowable glycol concentration. – See CONTAMINATED STORMWATER, STORMWATER.[135] [SAE ARP4902]

*c**lean stormwater**, normal runoff without chemicals. [SAE ARP4902]

cleaning certificate, see WASH CERTIFICATE.

cleaning solvents, **1.** degreasers and paint stripping solvents that may become contaminants for aircraft brakes. **2.** [aircraft brakes] potential contaminants for carbon brakes.[127] [SAE AIR5490]

***cleaning solvents**, chemical degreasers and paint stripping agents. [SAE AIR5490]

clear ice, **1.** [meteorology] glossy, clear, or translucent ice formed by large liquid water drops, rapid accretion of liquid water, slight supercooling and slow dissipation of the latent heat of fusion. In meteorology, also known as glaze or glaze ice. **2.** [aircraft deicing] a smooth and transparent coating of ice difficult to detect visually on aircraft critical surfaces. **3.** [aircraft deicing] a coating of ice which may make the aircraft critical surfaces appear to be wet. **4.** [aircraft deicing] a form of ice that may occur in flight or on the ground. **5.** [aircraft deicing] a form of ice attributable to cold soaking or incomplete deicing. **6.** [aircraft deicing] a form of ice that may form from freezing or non-freezing precipitation on cold-soaked aircraft surfaces at outside air temperatures as high as 15 °C. **7.** [aircraft deicing] transparent layer of ice that forms when high humidity, cloud drops, fog, drizzle, or rain encounter objects below 0 °C. **8.** [aircraft deicing] a form of ice particularly difficult to detect at night or on a wet aircraft. **9.** [aircraft deicing] a form of ice whose detection may require a TACTILE CHECK or a GROUND ICE DETECTION SYSTEM. **10.** [aircraft deicing] a firmly adhering form of ice that is difficult to remove. **11.** [aircraft deicing] a form of ice that may break loose after takeoff, causing flameout or damage to aft-mounted engines or impact damage to aft critical surfaces, such as the horizontal stabilizer. – The meteorological synonyms are: GLAZE, GLAZE ICE (when on the aircraft the HARMONIZED TERM is clear ice). See COLD SOAKING, ACCRETION, SUPERCOOLING, LATENT HEAT OF FUSION. Compare RIME.[8,63,64,93,144,151,162,174] [AMS Glossary, EASA EU Reg, EASA SIB 2008-29, ICAO 9640, SAE AS5681, SAE AS6286, SIAGDP, TC TP 14052]

***clear ice**, clear ice forms at temperatures at or below 0 °C, often associated with a high concentration of large supercooled water droplets. It can also be a residual product of an incomplete deicing process. Clear ice is hard and appears as a smooth and glassy coating that can be very difficult to detect without a tactile inspection. Clear ice might not be seen during a walk around, particularly if the wing is wet or during night-time operations. Clear ice can occur in flight or on the ground. Clear ice adheres firmly to surfaces, is difficult to remove, and requires special care during deicing/anti-icing. [SAE AS5681]

climb, [aerodynamics] gaining altitude. The climb phase normally follows takeoff and precedes cruise.[71] [FAA H-8083-3C]

cloud condensation nuclei, **1.** [meteorology] an aerosol particle forming a center for condensation under extremely high supersaturation. **2.** active nuclei at high supersaturation may coagulate to form larger particles that become condensation nuclei. **3.** process can be important for fog and freezing fog formation. – See SUPERSATURATION. Compare CONDENSATION NUCLEUS.[8] [AMS Glossary]

cockpit, **1.** [aircraft components] front part of an aircraft, particularly smaller aircraft, from which the pilot controls the aircraft. **2.** the cockpit in larger aircraft is usually called the flightdeck—although in civil aviation both cockpit and flightdeck are sometimes used interchangeably. – (FLIGHTDECK is a HARMONIZED TERM; cockpit is not).[157] [Harmonization]

cold corner, a term for the upper surface of a wing prone to ice or CLEAR ICE formation due to COLD SOAKING, typically in the fuel tank area. The cold corner area is well defined for some aircraft, such as the MD80s and MD90s.[174] [TP 14052]

cold front, [meteorology] any non-occluded front, which moves in such a way that colder air replaces warmer air at the surface. Boundary between two airmasses where the colder airmass is replacing the warmer airmass.[62,162] [Dunlop, SIAGDP]

cold-soak effect, see COLD SOAKING.

cold-soaked fuel frost (CSFF), frost developed on cold-soaked aircraft surfaces by DEPOSITION (sometimes called DESUBLIMATION) of air humidity on the external surfaces of fuel tanks. – Synonym: NONENVIRONMENTAL FROST. See COLD-SOAKED SURFACE FROST.[150] [SAE AS6285]

***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. [SAE AS6285]

cold-soaked surface frost (CSSF), frost developed on cold-soaked aircraft surfaces by deposition (sometimes called DESUBLIMATION) of air humidity. – Synonym: NONENVIRONMENTAL FROST. – SEE COLD-SOAKED FUEL FROST.[63,150] [EASA EU Reg, SAE AS6285]

cold soaking, **1.** a condition in which aircraft surfaces are cooled below ambient outside air temperature, which is caused by the aircraft flying at high altitude and descending into warmer air or having been refueled with very cold fuel or having been stationed for several hours in extreme cold followed by a warming of the ambient outside air temperature; *for example, in Calgary and Edmonton, aircraft on station overnight in extreme cold can experience a rapid rise in outside air temperature due to a warm humid wind (Chinook) resulting in non-flight related frost.* **2.** a condition conducive to the formation of ice, particularly frost (known as COLD-SOAKED SURFACE FROST or COLD-SOAKED FUEL FROST) or CLEAR ICE, on cold-soaked aircraft surfaces at OUTSIDE AIR TEMPERATURE well above (warmer than) 0 °C. **3.** a condition requiring the creation of holdover times for outside air temperature above 0 °C. **4.** cold soaking can result in aircraft surface temperature below the LOWEST OPERATIONAL USE TEMPERATURE of thickened and unthickened fluids.[93,108,150,162,174] [ICAO 9640, Myers, SAE AS6285, SIAGDP, TC TP 14052]

***cold soaking**, Ice can form 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. If an aircraft has been at a high altitude, where cold temperature prevails, for a period of time, the aircrafts' major structural components such as the wing, tail and fuselage will assume the lower temperature, which will often be below the freezing point. This phenomenon is known as cold soaking. While on the ground, the cold soaked aircraft will cause ice to form when liquid water, either as condensation from the atmosphere or as rain, comes in contact with cold soaked surfaces. [SAE AS6285]

colligative property, [chemistry] said of properties of solutions that vary depending on the number of (collection of, concentration of) particles (molecules or ions) present in the SOLVENT rather than the kinds of particles. Freezing point depression, lowering of vapor pressure, osmotic pressure, and elevation of boiling point are examples of colligative properties. – See FREEZING POINT DEPRESSION.[102,119] [Guide, Rennie]

color, **1.** [science] the sensation produced when light of different wavelengths falls on the human eye. **2.** [aircraft deicing fluids] an OPERATIONAL PROPERTY of Type I (orange), Type II (yellow),

Type III (bright yellow), and Type IV (green). **3.** color is imparted to aircraft deicing fluids to instantly identify the fluid Type and to facilitate application. **4.** [thickened fluids] insufficient color intensity of Type II/III/IV can lead to an undesirable condition called BLEED-THROUGH. **5.** aircraft deicing fluids are generally formulated on-purpose with dyes that fade in sunlight. **6**. [runway deicing products] a PHYSICAL PROPERTY of liquid runway deicing product (uncolored or optional blue) and solid runway deicing product (uncolored or optional blue). **7.** the color and its uniformity is verified when checking for APPEARANCE for deicing fluids and runway deicing products.[100,130,131,132,133] [Law, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

commingling, the mixing or combination of two different fluids.[102] [Guide]

commuter turboprop aircraft, see LOW SPEED AIRCRAFT.

compacted snow, [runway contaminant] snow compressed and consolidated into a solid FORM that resists further compression such that an aircraft will remain on its surface without displacing any of it.[69] [FAA 150/5200-30D]

complete plate failure, a fluid testing scenario in which 100 percent of the standard plate has reached a VISUAL FAILURE condition. – Synonyms: ENTIRE PLATE FAILURE, FULL PLATE FAILURE, TOTAL PLATE FAILURE.[108] [Myers]

compliant spent deicing fluid, fluid with glycol concentrations less than environmental guidelines or regulations that can be sent to a STORMWATER system (compliance depends on environmental regulations which are jurisdiction dependent). – See SPENT DEICING FLUID.[135] [SAE ARP4902]

***compliant deicing fluids**, fluids with glycol concentrations less than published guidelines can be gravity fed or pumped to the stormwater system. [SAE ARP4902]

concentrate, **1.** something concentrated. **2.** [aircraft deicing] a form of Type I fluid usually containing 80, 88 or 92 percent glycol by weight and that must be DILUTED before use; *TYPE I CONCENTRATE*. **3.** [aircraft deicing] the word concentrate is not used to describe Type II/III/IV. – Compare TYPE I READY-TO-USE, NEAT, UNDILUTED.

condensation, the phase change from vapor or gas to liquid accompanied with the release of LATENT HEAT. The opposite of EVAPORATION.[119,156,162] [Rennie, Schaschke, SIAGDP]

condensation nucleus [meteorology], any particle, solid or liquid, facilitating condensation of water vapor to water droplets. – Compare FREEZING NUCLEUS. See NUCLEATION, NUCLEUS, CLOUD CONDENSATION NUCLEI.[39,62] [Britannica, Dunlop,]

conditions conducive to aircraft icing on the ground, any conditions which may result in freezing or frozen contamination on aircraft.[63,64] [EASA EU Reg, EASA SIB 2008-29]

confirmation bias, [safety science] tendency to seek (pay attention to) information that confirms what one already believes to be true (based on memory), while, at the same time, ignoring (paying less attention to) or discounting information that is inconsistent with beliefs (perceiving it as less significant). – See PLAN CONTINUATION BIAS, HINDSIGHT BIAS.[177] [TSB]

conformity, the fulfillment of a requirement or standard.[152] [SAE AS6332]

*conformity, the fulfillment of a requirement. [SAE AS6332]

contact angle, **1.** [surface chemistry] a measurement of WETTING. **2.** at a gas-liquid-solid interface, the angle that the tangent to the liquid surface makes with the solid surface at the point of contact. **3.** at angles of 90˚ or more the liquid is said to wet the surface. – Synonym: WETTING ANGLE. See ADVANCING CONTACT ANGLE, RECEDING CONTACT ANGLE.[24,96,129,156] [Atkins, Krüss, SAE AIR6232, Schaschke]

***contact angle**, angle, conventionally measured relative to the liquid-air and liquid-solid interfaces, quantifying the wettability of a solid surface by a liquid. [SAE AIR6232]

contact angle hysteresis, [surface chemistry] the difference between the advancing and receding contact angles.[129] [SAE AIR6232]

***contact angle hysteresis**, the difference between the advancing and receding contact angles. [SAE AIR6232]

contact line, **1.** [surface chemistry] the gas (air) liquid (e.g., deicing fluid) solid (e.g., aircraft surface) interface as a drop of liquid spreads on a surface. **2.** a contact line may advance, recede or be stationary.

contaminant, [runway contaminant] a deposit, such as frost, any snow, slush, ice, or water, on an airport pavement where the effects could be detrimental to the friction characteristics of the pavement surface. – Compare CONTAMINATION.[69] [FAA AC 150/5300-30D]

contaminated runway, [runway contaminant] for purposes of condition reporting and airplane performance, a runway is considered contaminated when more than 25 percent of the runway surface area (within the reported length and width being used) is covered by frost, ice, and any depth of snow, slush, or water. – See CONTAMINANT. [69] [FAA AC 150/5300-30D]

contaminated stormwater, [aircraft deicing] stormwater containing deicing products above allowable/permissible levels.[135] [SAE ARP4902]

***contaminated stormwater**, stormwater that contains deicing chemicals. [SAE ARP4902]

contamination, **1.** [aircraft deicing] any forms of frozen or semi-frozen deposits on an aircraft, such as frost, snow, slush, ice, ice pellets or hail within a fluid, frozen fluid or semi-frozen fluids (collectively referred to as FROZEN CONTAMINATION or simply contamination). **2.** [chemistry] substances (chemicals) present where they should not be or are at concentrations higher than they should be (referred to as CHEMICAL CONTAMINATION or simply contamination).[68,144,150,152,174] [FAA AC 120-60B, SAE AS6332, SAE AS6285, SAE AS6681, TC TP 14052]

***contamination**, all forms of frozen or semi-frozen deposits on an aircraft, such as frost, snow, slush, or ice (also known as frozen contamination). [SAE AS6285]

contamination check, see PREFLIGHT CONTAMINATION CHECK (the HARMONIZED TERM is preflight contamination check).

continuation bias, see PLAN CONTINUATION BIAS.

control point, where transfer of control of an aircraft occurs between controlling agencies.[137] [SAE ARP5660]

***control point**, where transfer of control of an aircraft occurs between controlling agencies. [SAE ARP5660]

convective cloud, [meteorology] a could that owes its vertical development to convection, that is the vertical transport of heat and other properties through vertical mass motion.[8,62] [AMS Glossary, Dunlop]

conventional glycol, SEE GLYCOL (CONVENTIONAL).

corrective action, **1.** activities to address non-compliance and eliminate the causes of non-compliance to prevent recurrence. **2.** a reactive process to address concerns or issues after they have occurred.[152,168] [SAE AS6332, TC AC SUR-002]

***corrective action**, is a reactive process to address concerns or issues after they have occurred. It assumes that a non-conformance or problem has been identified and has been reported by employees of the organization or by customers or other interested parties/stakeholders. [SAE AS6332]

corrective action plan (CAP), a plan submitted in response to findings outlining how it proposes to address findings and ensure on-going compliance.[168] [TC AC SUR-002]

corrosion of AMS5886 nickel alloy, [aircraft deicing fluids] a high temperature (1040 °C) corrosion PASS-FAIL TEST for NON-GLYCOL based Type I/II/III/IV fluids to indicate if such fluids could cause corrosion in jet engines.[130,131,134] [SAE AMS1424, SAE AMS1428, SAE AMS5886]

corrosion of low-embrittling plate, 1. [aircraft materials] a method used in aviation to evaluate the corrosive effects of aircraft maintenance chemicals on cadmium plating applied to high-strength steel components. This test is significant because cadmium plating is used to protect steel parts from corrosion while minimizing the risk of HYDROGEN EMBRITTLEMENT, which can weaken the material. The test involves immersing cadmium-plated specimens in the maintenance chemicals under controlled conditions. The effects are assessed by measuring weight changes in the specimens and conducting visual inspections for signs of corrosion or damage. **2.** [aircraft deicing fluids and runway deicing products] a PASS-FAIL TEST classified under MATERIALS COMPATIBILITY and performed according to ASTM F1111.[23,130,131,132,133] [ASTM F1111, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

crazing, a characteristic of some polymers, whereby fine crack-like defects that produce bright reflections appear on loading. They are not true cracks, rather regions of highly plastically deformed material interspersed with voids. Crazing is an underlying mode of polymer fracture.[24,86] [Atkins, Greenhalgh]

critical angle of attack, [aerodynamics] the angle of attack at which a wing stalls regardless of airspeed, flight attitude or weight. – See ANGLE OF ATTACK.[71] [FAA H-8083-3C]

critical component, a component which could adversely affect the mechanical or aerodynamic function of an aircraft. – See CRITICAL SURFACE.[150,151,152] [SAE AS6285, SAE AS6286, SAE AS6332]

critical ice contamination, ice contamination which leaves little or no aerodynamic lift or control margin and results in an aircraft accident. The amount, type (e.g., frost, clear ice) and spatial distribution of the contamination that is classified as critical is dependent on several variables including aircraft type and aircraft conditions at takeoff.[144] [SAE AS5681]

***critical ice contamination** is defined as ice contamination which leaves little or no aerodynamic lift or control margin and results in an aircraft accident. The amount, type (e.g., frost, clear ice) and spatial distribution of the contamination that is classified as critical is dependent on several variables including aircraft type and aircraft conditions at takeoff. [SAE AS5681]

critical surface, **1.** the wings, control surfaces, rotors, propellers, HORIZONTAL STABILIZER, VERTICAL STABILIZER or any other stabilizing surface of an aircraft, or any other critical surface identified in the aircraft flight manual. **2.** any surface which could adversely affect the mechanical or aerodynamic function of an aircraft. **3.** there can be divergences in critical surface lists across different regulators. – See CRITICAL COMPONENT.[93,150,151,172,174] [ICAO 9640, SAE AS6285, SAE AS6286, TC 622.11, TC TP 14052]

***critical surface**, a surface which could adversely affect the mechanical or aerodynamic function of an aircraft. [SAE AS6285]

crosshair, [fluid testing] a marking on a STANDARD TEST PLATE. – See FOURTH CROSSHAIR FAILURE, FIFTH CROSSHAIR FAILURE.

decision making, [safety science] a cognitive process that involves identifying and choosing a course of action from several alternatives. Decision making for pilots occurs in a dynamic environment and includes four steps: gathering information, processing information, making a decision, and acting on that decision.[10,177] [APA, TSB]

defrosting, the removal of frost, from an aircraft CRITICAL SURFACES, and their subsequent protection (the usual terms are DEICING or DEICING/ANTI-ICING).[174] [TC TP1402]

degree-specific holdover time, the holdover time calculated at degree decrements beginning at 3 °C down to the aircraft deicing/anti-icing fluid LOWEST OPERATIONAL USE TEMPERATURE.[167] [TC AC 700-061]

degree-specific holdover time data presentation, the method or means by which the data from the degree-specific holdover time database is presented in its final and verified form to the end user of the data, such as a modified paper holdover time table, an electronic presentation of a holdover time table, or an electronic application in an electronic flight bag.[167] [TC AC 700-061]

deicing, **1.** process to remove frozen contamination, excluding anti-icing; *first-step deicing* **2.** process to remove ice, snow, slush or frost from an aircraft's critical surfaces, by mechanical means, by the use of heat, or by the use of a heated fluid or a combination thereof. **3.** process to remove or prevent frozen contamination; *deicing unit, deicing vehicle.* **4.** the processes related to deicing an aircraft, including PREFLIGHT CONTAMINATION CHECK, deicing, anti-icing, POST DEICING/ANTI-ICING CHECK, communications with flightcrew, and dispatch; *ground deicing.*[63,68,108,143,144,172,174] [EASA EU Reg, FAA AC 120-60B, Myers, SAE AS5635, SAE AS5681, TC TP 14052]

***deicing**, procedure by which frost, snow, slush, or ice is removed from an aircraft in order to provide clean surfaces and components. [SAE AS6285]

***deicing**, procedure by which frost, snow, slush, or ice are removed from an aircraft in order to provide clean surfaces and components. [SAE AS5635]

***deicing**, a procedure by which frost, ice, snow, or slush is removed from the aircraft in order to provide aerodynamically clean surfaces. This is typically performed using heated (at least 60 °C) deicing fluid. [SAE AS5681]

deicing/anti-icing, the combination of deicing and anti-icing performed in either one or two steps. – See DEICING, ANTI-ICING.[63,108,150] [EASA EU Reg, Myers, SAE AS6285]

***deicing/anti-icing**, combination of or referring to both of the procedures for "deicing" and "anti-icing." It may be performed in one or two steps. [SAE AS6285]

deicing and anti-icing fluids, the fluids used to conduct deicing and anti-icing procedures.[138] [SAE AS5718]

deicing bay, specific area of a deicing facility where the deicing and/or anti-icing of aircraft is performed.[137] [SAE ARP5660]

***deicing bay**, specific area of a deicing facility where the deicing and/or anti-icing of aircraft is performed. [SAE ARP5660]

deicing boot, **1.** [aircraft component] a flexible membrane (e.g., rubber) installed on some propeller-driven aircraft wing leading edges that inflate and deflate, shedding ice accreted in flight. **2.** deicing boots are regularly treated with specially designed products that, if they spread to the wing surface, can interfere with the WETTING properties of deicing/anti-icing fluids. – See ACCRETION, ACCRETION ICE.[71,87] [FAA H-8083-3C, Hansard]

deicing coordinator, the person who controls movement of aircraft and coordinates the deicing/anti-icing activities of deicing vehicles on a deicing pad or, if appropriate, procedures and/or technology for safe separation of deicing/anti-icing operation and communication on multiple deicing bays.[137,151] [SAE ARP5660, SAE AS6286]

***deicing coordinator** qualification (DI-L50) entitles the person to coordinate and manage the deicing/anti-icing operation and/or work as a team leader. This qualification is intended for coordinating deicing/anti-icing operations mainly at remote and/or centralized deicing facility areas or for other similar/anti-icing coordination functions at an airport. The qualification includes the performance of deicing/anti-icing treatment (DI-L20), supervision of deicing/anti-icing (DI-L30) and driving the deicing vehicle (DI-L10). There shall be a note of restriction to this qualification if some of the duties are not performed as mentioned. The deicing coordinator shall receive training covering in detail all parts mentioned in the standard teaching plan. Local procedures shall be taken into account and emphasized more than others where relevant. [SAE AS6286]

***deicing coordinator** or **primary deicing vehicle operator**, [Located at any deicing location] person responsible for coordinating deicing/anti-icing operation of an aircraft and for communicating with the PIC at locations where deicing vehicles are used and a ground coordinator is not used for this purpose. Depending on the location's setup, this coordination may be accomplished by an individual (not assigned to a vehicle) or it may be a vehicle assigned to deice/anti-ice a specific portion of the aircraft. The external interphone system or VHF radio and/or and new communication platforms that utilize EFBs (e.g., electronic tablets/iPads) on flightdecks and in deicing vehicles. Deicing leads can interact with the coordinators, flightcrew and deicers using web-based dispatching. For pad operations, including movement configuration and guidance, electronic message boards are now commonly used at DDFs in order to communicate deicing/anti-icing and associated check (inspection) information to the PIC. [SAE ARP5660]

***deicing coordinator**, person who controls the movement of the aircraft and coordinates the deicing/anti-icing activities of the deicing vehicle(s) on a deicing pad or, if appropriate, procedures and/or technology for safe separation of deicing/anti-icing operation and communication is established, on multiple deicing bays. This person may communicate with the PIC through the interphone or via VHF radio and/or new communication platforms that utilize EFBs (e.g., electronic tablets/iPads) on flightdecks and in deicing vehicles. Deicing coordinators can interact with the pilots and deicers using web-based dispatching. For pad operations, including movement configuration and guidance, electronic message boards are now commonly used at DDFs for the

purpose of communicating associated check (inspection) information. A deicing coordinator may perform these duties at locations that do not utilize a ground coordinator. [SAE ARP5660]

deicing crew, **1.** personnel assigned to duty for an individual piece of deicing equipment. **2.** personnel assigned to duty for deicing an aircraft. – Compare FLIGHTCREW, CABIN CREW.[137] [SAE ARP5660]

deicing event, **1.** a series of actions required to deice and check after deicing an aircraft for contamination, culminating with the release of that aircraft compliant with the ground icing regulatory requirements; *the deicing event for flight 870 took eight minutes*. **2.** occurrence of deicing several aircraft over hours or days at a location; *this deicing event lasted two days*.[144] [SAE AS5681]

***deicing event**, a deicing event is the series of actions required to deice and inspect one aircraft, culminating with the release of that aircraft in what is considered to be a state compliant with the ground icing regulatory requirements. [SAE AS5681]

deicing facility, **1.** airport facility designed to conduct aircraft deicing/anti-icing operations while fulfilling operational, safety, and environmental requirements. **2**. generic term for any deicing facility including CENTRAL DEICING FACILITY, DESIGNATED DEICING FACILITY, REMOTE DEICING FACILITY, TERMINAL DEICING FACILITY, DEICING BAY.[70,135,137,174] [FAA AC 150/5300-14, SAE ARP4902, SAE ARP5660, TC TP 14052]

***aircraft deicing facility**, an aircraft deicing facility is a facility where: frost, ice, slush, or snow is removed (deicing) from the aircraft in order to provide clean surfaces, and/or clean surfaces of the aircraft receive protection (anti-icing) against the formation of frost or ice and accumulation of snow or slush for a limited period of time. [SAE ARP4902]

deicing fluid, **1.** a fluid applied to an aircraft to remove frozen contamination. **2.** a fluid consisting of a) heated water, b) a heated mixture of water and TYPE I CONCENTRATE, c) heated TYPE I READY-TO-USE, d) heated TYPE II/III/IV UNDILUTED, or e) heated mixture of water and Type II/III/IV. **3**. collective name for deicing and anti-icing fluids; *these are the deicing fluid storage tanks*.[63,64,67,150,174] [EASA EU Reg, FAA AC 120-112, SAE AS6285, TC TP 14052]

***deicing fluid**, a) heated water, b) heated mixture of water and Type I fluid c) Type I fluid, d) heated Type II, III, or IV fluids, e) heated mixture of water and Type II, III, or IV fluids. – NOTE: Unheated fluids are ineffective to deice. [SAE AS6285]

deicing fluid blender, **1.** [aircraft deicing] colloquial term to designate equipment to mix a fluid with water or mix the same fluid at different concentration to achieve a target concentration (or freezing point) dictated by several factors including the aircraft type (high speed, middle speed, low speed), OUTSIDE AIR TEMPERATURE, LOWEST OPERATIONAL USE TEMPERATURE, and HIGHEST OPERATIONAL USE CONCENTRATION. **2.** the blending system can be stand-alone or part of a DEICING VEHICLE in which case it is referred to as in-truck proportional mixing. – Compare IN-TRUCK PROPORTIONAL MIXING.[130,131] [SAE AMS1424, SAE AMS1428]

deicing instructor, person with demonstrated competence in the deicing/anti-icing subjects to be instructed and with the skills to deliver the training effectively.[151] [SAE AS6286]

***deicing instructor**, training shall be conducted by personnel who have demonstrated competence in the deicing/anti-icing subjects to be instructed and who have the skills to deliver the training effectively. The instructor shall have received the proper training for a DI-L20 qualification, including the performance of deicing/anti-icing treatment, supervision of deicing/anti-icing (DI-L30) and driving the deicing vehicle (DI-L10). The instructor shall have proper training in instructional methods and sufficient knowledge of the training subject (e.g., aircraft critical areas and systems, fluid types, deicing vehicles, etc.). It is also recommended that the instructor attends or performs practical training and deicing/anti-icing of an aircraft on an annual basis in order to maintain

necessary experience and knowledge. There shall be a note of restriction to this qualification if some of the duties are not performed as mentioned. The deicing instructor shall receive training covering all parts mentioned in the standard teaching plan. Local procedures shall be taken into account and emphasized more than others where relevant. There may be cases where specialists in a related field (e.g., a meteorologist, air traffic control staff, etc.) are used as instructors for a particular subject. These specialists do not need to be qualified in deicing/anti-icing. [SAE AS6286]

deicing operator, qualified person performing deicing/anti-icing operations and associated CHECKs.[137] [SAE AS5660]

***deicing operator**, qualified person, defined in AS6286, performing deicing/anti-icing operations on the ground and associated checks at a DDF. [SAE AS5660]

***deicing operator**, the deicing operator qualification (DI-L20) includes the Contamination Check (check for the need to deice the aircraft), performance of deicing/anti-icing treatment, and the post deicing/anti-icing check. This level of qualification includes driving the deicing vehicle (DI-L10) and the Pre/post deicing Inspector qualification level (DI-L30B). There shall be a note of restriction to this qualification if some of the duties are not performed as mentioned. The deicing operator shall receive training covering in detail all parts mentioned in the standard teaching plan (except coordination and instructional procedures). Where relevant, local procedures shall be taken into account and emphasized more than others (e.g., some airports perform only centralized deicing and some perform a mixed gate and centralized operation). [SAE AS6286]

deicing pad, **1.** operational area within a DEICING FACILITY, including taxiways, taxi lanes, STAGING BAYs, and DEICING BAYs, controlled by the ICEHOUSE. **2.** an area on a deicing facility where aircraft receive deicing and/or anti-icing treatment generally consisting of an inner area for positioning an aircraft to receive the deicing/anti-icing treatment and an outer area providing sufficient width for the safe maneuvering of deicing vehicles during deicing [definition 2 is synonymous with DEICING BAY].[70,135,137,174] [FAA AC 150-5300-14D, SAE ARP4902, SAE ARP5660, TC TP 14052]

***aircraft deicing pad**, an aircraft deicing pad consists of two areas: an inner area for the parking of aircraft to receive deicing/anti-icing treatment and an outer area for maneuvering two or more mobile deicing vehicles This outer area provides the "vehicle lane width" necessary for two or more mobile deicing vehicles to satisfactorily perform simultaneous and complete left and right side uniform fluid distribution techniques for removing deposits of frost, ice, slush, and snow from aircraft surfaces and for anti-icing operations. [SAE ARP4902]

***deicing pad**, operational area within a DDF, including taxiways, taxi lanes, staging bays, and deicing bays, controlled by the Icehouse. [SAE ARP5660]

deicing personnel, groundcrew personnel with roles and responsibilities associated with aircraft ground icing operations.[150] [SAE AS6285]

deicing season, 1. predetermined period at an airport when deicing/anti-icing services are readily available, as opposed to when advance notification is required to receive these services; *the deicing season at the Toronto Pearson International Airport is from October 1 to April 30.* **2.** period when there may be deicing at a given airport. – Compare OFFSEASON.[84] [GTAA]

deicing service provider, see SERVICE PROVIDER.

deicing supervisor, person supervising deicing operations.[151] [SAE AS6286]

***deicing supervisor,** DI-L30 this level of qualification includes the performance of the post deicing/anti-icing check, driving the deicing vehicle (DI-L10) and the deicing operator qualification (DI-L20). There shall be a note of restriction to this qualification if some of the duties are not performed as mentioned. The person supervising the deicing/anti-icing and performing the required checks shall receive training covering relevant parts mentioned in the standard teaching plan. Local procedures shall be taken into account and emphasized more than others where relevant. [SAE AS6286]

deicing unit, a term encompassing fixed, mobile (deicing vehicle) and towed equipment used in deicing operations. – See DEICING VEHICLE.[102] [Guide]

deicing vehicle, a mobile vehicle used in deicing operations to dispense deicing and anti-icing fluids and/or to perform check for the presence of frozen contamination. – See DEICING UNIT.

deicing truck, see DEICING VEHICLE.

deicing vehicle driver, person driving a DEICING VEHICLE and performing related communications.[151] [SAE AS6286]

***deicing vehicle driver**, **DI-L10**, **the** deicing vehicle driver qualification (DI-L10) qualifies the person to maneuver the vehicle and perform the communication procedures but it does not include any other deicing levels. There shall be a note of the restriction to this qualification if some of the duties are not performed as mentioned. The driver shall receive training covering relevant parts mentioned in the standard teaching plan. Also, where relevant, local procedures shall be taken into account and emphasized more than others. [SAE AS6286]

deicing/anti-icing, a combination of deicing and anti-icing performed in either one or two steps. – See DEICING, ANTI-ICING.[63,64,93,150] [EASA EU Reg, EASA SIB 2008-29, ICAO 9640, SAE AS6285]

deicing/anti-icing fluid, **1.** FREEZING POINT DEPRESSANT solution applied to the exterior of an aircraft for the purpose of removing and protecting against frozen contamination prior to takeoff. **2.** [aircraft brakes] potential source of contamination for carbon brakes.[127] [SAE AIR5490]

***airplane anti-icing/deicing fluid**, a chemical solution applied to the exterior of an aircraft for the purpose of preventing and removing frozen deposits of frost, ice, and snow prior to take-off. [SAE AIR5490]

deliquescence, **1.** [chemistry] the process by which a hygroscopic solid absorbs water from the atmosphere to such that it forms a concentrated solution of the solid, thereby becoming a liquid. **2.** one of the pass-fail criteria of solid runway deicing products in the storage stability test.[120,132] [Rennie, SAE AMS1431]

deposition, **1.** [meteorology] the process by which water vapor changes directly to a solid (ice) without going through a liquid phase. **2.** [chemistry] the process by which a vapor changes directly to a solid without going through a liquid phase. In chemistry deposition is sometimes called DESUBLIMATION. – Compare SUBLIMATION.[62] [Dunlop]

deposition nucleus, [meteorology] a solid particle suspended in air that nucleates an ice crystal directly from water vapor. – Synonym: ICE NUCLEUS. See ICE CRYSTALS.[8,62] [AMS Glossary, Dunlop].

descriptor, [meteorology] qualifiers that further describe current weather phenomena and are used with certain types of precipitation and obscurations in METAR codes. The descriptor qualifiers are shallow (MI), partial (PR), patches (BC), low drifting (DR), blowing (BL), shower(s) (SH), thunderstorm (TS), and freezing (FZ); *freezing rain (FZRA), blowing snow (BLSN), freezing drizzle (FZDZ)*. – Synonym: METAR DESCRIPTOR.[50,113] [MANOBS, NOAA FMH-1]

designated deicing facility (DDF), collectively one or multiple designated airport infrastructure facilities, such as a central deicing facility or remote deicing facilities, designed to conduct

deicing/anti-icing of aircraft while fulfilling operational, safety, and environmental requirements.[137] [SAE ARP5660]

***designated deicing facility** (DDF), accumulation of multiple designated airport infrastructure facilities designed to conduct deicing/anti-icing of aircraft (CDFs or remote deicing facilities, or a combination thereof) while fulfilling all operational, safety, and environmental requirements. [SAE ARP5660]

desublimation, see DEPOSITION.

determine and report test, [aircraft deicing fluids, runway deicing products] a type of test intended to make data available to the purchaser for evaluation and comparison against competitive products. The VENDOR and PURCHASER may agree on acceptance criteria for determine and report test results. *Examples of these tests are biochemical oxygen demand, chemical oxygen demand, biodegradability, aquatic toxicity, trace contaminants, ice melting test, ice undercutting test, ice penetration test, and effect on carbon brake systems*. – Compare PASS-FAIL TEST, MANDATORY INFORMATION. [130,131,132,133] [SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

dew, [meteorology] water droplets formed by CONDENSATION of water vapor from the air on objects near the ground whose temperature is below the DEWPOINT of the surface air due to RADIATIONAL COOLING at night, but remains above freezing temperature. – See FROST, FROST POINT, FROZEN DEW.[62] [Dunlop]

dewetting, **1.** [surface chemistry] the rupture of a liquid film on a solid surface. **2.** [aircraft deicing] the lack of uniform coverage of a deicing fluid generally due to hydrophobicity of the surface or chemical contamination of the deicing fluid. – Compare WETTING.[24] [Atkins]

dewpoint, [meteorology] the temperature at which unsaturated air must be cooled, at constant barometric pressure and constant water vapor content, to cause SATURATION to occur with respect to liquid water. – Compare FROST POINT.[74,150,162,174] [FAA General Information, SAE AS6285, SIAGDP, TC TP 14052]

***dewpoint**, the 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. [SAE AS6285]

diamond dust, see ICE CRYSTALS.

diethylene glycol, **1.** [chemistry] Chemical Abstract registry number 111-46-6, alternate names: 2,2'-oxybisethanol; 2,2'-oxydiethanol; DEG; molecular formula $C_4H_{10}O_3$; mol wt 106.12; bp 244-245 °C. **2.** [aircraft deicing] a FREEZING POINT DEPRESSANT rarely used in the formulation of aircraft deicing/anti-icing fluids. – Compare ETHYLENE GLYCOL, PROPYLENE GLYCOL.[105] [Merck Index]

dilute, synonym for DILUTED.

diluted, **1.** weakened or thinned by having been mixed with something else, such as water. **2.** [aircraft deicing fluids] said of TYPE I CONCENTRATE or TYPE II/III/IV UNDILUTED to which water has been added. – Synonym DILUTE. See TYPE I DILUTED, TYPE II/III/IV (75/25), TYPE II/III/IV (50/50).

dimensionless quantity, [metrology] quantities that do not have associated physical units or dimensions where all units cancel out such as mass fraction, REFRACTIVE INDEX, REYNOLDS NUMBER, and Mach number. [French: grandeur sans dimension].[94] [JCGM]

dimpled snow, surface of snow that has small indentations or dimples, often resembling the surface of a tufted mattress. This phenomenon occurs when the snow melts unevenly due to variations in factors like location, terrain, and air movement. The dimples are essentially areas where the underlying structure of the snow collapses.

disinfectants, **1.** products to destroy, inactivate or reduce the concentration of pathogens to limit the spread of diseases. **2.** [aircraft brakes] a potential contaminant for carbon brakes.[127] [SAE AIR5490]

***disinfectants**, chemicals applied to aircraft to kill biological organisms for limiting the spread of diseases. [SAE AIR5490]

dissolution, [chemistry] the process of dissolving a SOLUTE in a SOLVENT; *the dissolution of sodium acetate in water*. – Compare LIQUEFACTION.[102] [Guide]

distributor, **1.** [chemical industry] an entity that purchases products from manufacturers, stores them, repackages if needed, and sells to end-user customers. They are valuable in the supply chain as they extend the reach of manufacturers. **2.** distributorship is normally set up by a contract between the manufacturer and distributor stipulating the parties involved, term and termination, products and specifications, price, currency, payment terms, freight terms, territory, exclusivity/non-exclusivity, performance metrics, confidentiality, warranty and liability, use of trademarks and patents, force majeure clauses, safety and responsible care clauses, and governing law. – Compare VENDOR, PURCHASER, LICENSEE.[39] [Britannica]

domain, [psychology–system model of creativity] the cultural context or body of knowledge within which creativity occurs. It includes the rules, guidelines, expertise, conventions, and symbolic systems (like art, science, or music) that define a particular area of expertise or area of human activity. *The domain of music includes musical theory, notation, scales, modes, phrasing, time signatures, tempos, chord notation and progression, key signatures, styles, performances, etc.; the domain of chemistry includes all the knowledge, skills, and techniques related to creating and understanding chemical reactions and substances; the domain of aircraft ground deicing includes all knowledge, skills and techniques to perform aircraft deicing.* – Compare FIELD.[54] [Csikszentmihalyi]

drag, **1.** [aerodynamics] an aerodynamic force acting on the aircraft (or body) in a direction opposite its motion through the air. Drag depends on the density of the air, the square of the velocity, the air viscosity and compressibility, the size and shape of the body, and the body's inclination to the flow. **2.** one of the main four forces acting upon an aircraft, the others being LIFT, THRUST, and WEIGHT. [24,71,109,158] [Atkins, FAA H-8083-3C, NASA Drag, Shevell]

drizzle, [meteorology] uniform liquid precipitation composed of fine water droplets less than 0.5 mm but larger than 100 µm in diameter that appears to float while following air currents but eventually falls to the ground, unlike fog droplets that remain suspended in the air. Drizzle usually falls from low stratus clouds and is frequently accompanied by low visibility. Drizzle intensities are defined as light (-DZ) (the rate of fall from a trace to 0.3 mm (0.01 in.) h^{-1}), moderate (DZ)

(the rate of fall from 0.3–0.5 mm (0.01–0.02 in.) h^{-1}), and heavy (+DZ) (the rate of fall greater than 0.5 mm (0.02 in.) h^{-1}). See FREEZING DRIZZLE.[62,93,113,150] [Dunlop, ICAO 9640, NOAA FMH-1, SAE AS6285]

dry disconnect coupling, [chemical industry] a type of coupler designed for spill-free loading of liquids during connection or disconnection.

dry runway, [runway contaminant] a runway that is neither wet, nor contaminated.[69] [FAA AC150-52-30D]

dry snow, snow that has insufficient liquid water to cause it to stick together; this kind of snow occurs generally at temperatures below -5 °C (23 °F).[69,93] [FAA AC150/5200-30D, ICAO 9640]

***dry snow**, snow from which a snowball cannot readily be made and which has a temperature less than 0°C. [ICAO 9640]

dry-out exposure to cold dry air, **1.** [thickened fluids] a test to simulate the effect of cold dry air (1 °C, 40% relative humidity) on Type II/II/IV fluids for 24 hours and their propensity to form residues. **2.** a PASS-FAIL TEST in the INITIAL QUALIFICATION of Type II/II/IV fluids and classified as an OPERATIONAL PROPERTY. – See FLUID RESIDUE. Compare SUCCESSIVE DRY-OUT AND REHYDRATION.[131] [SAE AMS1428]

effect on aircraft materials, see MATERIALS COMPATIBILITY.

effect on carbon brake systems, [runway deicing products] a DETERMINE AND REPORT TEST in which the runway deicing product is tested to measure its effect on the catalytic oxidation of carbon brakes according to AIR5567.[128,132,133] [SAE AIR5567, SAE AMS1431, SAE AMS1435]

effect on painted surfaces, **1.** test method to determine of the effects of cleaning solutions and various chemical materials on painted aircraft surface **2.** [deicing fluids, runway deicing products] a PASS-FAIL TEST classified under MATERIALS COMPATIBILITY to evaluate the effect of aircraft deicing fluid or runway deicing products on painted aircraft surfaces according to ASTM F502.[20,130,131,132,133] [ASTM F502, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

effect on transparent plastics, **1.** [aviation materials] test method to determine the CRAZING effect that a liquid or semi liquids will have on transparent acrylic plastic material. **2.** [aircraft deicing fluids, runway deicing, products] a PASS-FAIL TEST classified under MATERIALS COMPATIBILITY to evaluate the stress crazing effect of heated (65 °C) aircraft deicing fluids and runway deicing products on transparent stretched acrylates and polycarbonates and performed according to ASTM F484.[19,130,131,132,133] [ASTM F484, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

effect on unpainted surfaces, **1.** test method to determine the effects of cleaning solutions and various chemical materials on unpainted aircraft surface **2.** [deicing fluids, runway deicing products] a PASS-FAIL TEST classified under MATERIALS COMPATIBILITY to evaluate the effect of aircraft deicing fluid or runway deicing products on unpainted aircraft surfaces according to ASTM F502.[20,130,131,132,133] [ASTM F502, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

effective concentration (EC_{50}), [ecotoxicity] the concentration that causes a specific effect such as immobilization in the test population (e.g., for *daphnia magna*). – Compare LETHAL CONCENTRATION 50%. See AQUATIC TOXICITY.

effective date, [SAE] see SAE STANDARD.

elevator, **1.** [aircraft component] a horizontal moveable control surface part of the HORIZONTAL TAIL, normally hinged to the rear of the HORIZONTAL STABILIZER. **2.** movement of the elevator rotates the aircraft about its LATERAL AXIS, controlling PITCH.[71,158] [FAA H-8083-3C, Shevell]

elimination, see FLUID ELIMINATION.

emissivity, a measure of a material's ability to emit infrared energy.

enclosed cab, short form for ENCLOSED CABIN**.**

enclosed cabin, [aircraft deicing unit] enclosed work platform mounted on a boom and used by deicing personnel to perform deicing/anti-icing or CHECKs on the aircraft or its components. Compare BASKET.[84] [GTAA]

enclosed cabin deicing unit, aircraft ground deicing equipment, self-propelled or towable, equipped with an ENCLOSED CABIN used to perform aircraft deicing/anti-icing and associated CHECKs.[84] [GTAA]

enclosed operator's cabin, see ENCLOSED CABIN**.**

endothermic, **1.** [chemistry, thermodynamics] characterizes chemical reactions or physical processes that absorb heat from the surroundings. **2**. an endothermic reaction is a chemical reaction that absorbs heat from the surroundings; *photosynthesis is an endothermic reaction as the green plants absorb sunlight to synthesize products from carbon dioxide*. **3.** an endothermic process is a physical process that absorbs heat from the surroundings. – Compare EXOTHERMIC.[100,119] [Law, Rennie]

endurance time, **1.** [fluid testing] time that a fluid can resist defined precipitation and temperature conditions on standard flat plate tests, in the laboratory or in the field, until VISUAL FAILURE at a predefined level of frozen contamination occurs. **2.** time measured in tests described in ARP5485, ARP5945 and AS5901. **3.** time data on which REGRESSION ANALYSIS is performed to determine holdover times, excluding the data arising from the WATER SPRAY ENDURANCE TEST and HIGH HUMIDITY ENDURANCE TEST. – See STANDARD PLATE FAILURE.[67,108,129,136,138,139,140,174] [FAA AC120-112, Myers, SAE AIR6232, SAE ARP5485, SAE ARP5718, SAE ARP5945, SAE ARP6207, TC TP 14052]

***endurance time**, time that a fluid can endure defined and controlled temperature and precipitation conditions before visual failure. Endurance time tests are defined in ARP5485 and ARP5945. [SAE AIR6232]

***endurance time**, the time that a fluid can endure controlled and defined temperature and freezing precipitation conditions before attaining visual failure. [SAE ARP5485]

***endurance time**, the time that a fluid can endure controlled and defined temperature and freezing precipitation conditions before attaining visual failure. [SAE ARP5945]

***endurance time**, time that a fluid can endure defined and controlled temperature and precipitation conditions before visual failure. Endurance time tests are defined in ARP5485. [SAE ARP5718]

***endurance time**, time that a fluid can endure defined and controlled temperature and precipitation conditions before visual failure. Endurance time tests are defined in ARP5945. [SAE ARP6207]

endurance time regression analysis, a data analysis protocol used to analyze fluid endurance time data for the generation of holdover times for anti-icing fluids. – See ENDURANCE TIME.[67] [FAA AC120-112]

endurance time testing, **1.** testing performed to generate endurance time data that is then used to produce holdover times. **2.** endurance time testing nomenclature and rate boundaries, in many cases, are different from the meteorologically accepted definitions. – See ENDURANCE TIME.[30] [Bendickson]

engine barrel icing, [aircraft engine icing] a jet engine icing condition where ice accumulates on the ACOUSTIC LINER of the ENGINE INLET. This may occur when the engine is idling on the ground and the anti-icing capacity of the engine is overwhelmed by a combination of frozen precipitation, high humidity and wind (e.g., snow with an intensity > 14 g /dm^2/h, relative humidity ≥ 65%, wind ≥ 20 knots). When breakaway thrust is applied the engine blades may slightly move forward and strike the ice, resulting in engine vibrations or fan blade damage. Fan blade damage requires expensive repairs. – See OPERATIONAL ICE. Compare GROUND-ACCUMULATED ICE.[43,90] [Brown, Horrigan 2013]

engine core, [aircraft engine] the central part of the engine where the combustion of fuel takes place. It includes the combustion chamber, turbine section, and other components involved in the generation of power.

engine icing, [aircraft engine icing] the accumulation of icing on exposed engine parts. The accumulation may occur in flight or on the ground. Engine icing can affect several parts of the engine such as the ENGINE INLET, ACOUSTIC LINER, SPINNER, FAN BLADES, NACELLE, etc. – See FAN BLADE ICING, GROUND-ACCUMULATED ICE, OPERATIONAL ICE, ENGINE BARREL ICING.

engine inlet, [aircraft engine] the opening at the front of the engine that allows air to enter the engine. It is part of the NACELLE structure and is positioned before the INLET DUCT. The engine inlet is susceptible to icing.

entire plate failure, a fluid testing scenario in which 100 percent of the standard plate has reached a VISUAL FAILURE condition. – Synonyms: COMPLETE PLATE FAILURE, FULL PLATE FAILURE, TOTAL PLATE FAILURE.[108] [Myers]

environmental mitigation plan, [aircraft deicing] measures and strategies to minimize environmental impact of spent deicing fluid at an airport.

environmental property, **1.** [environmental science] characteristics that affect the environment impacting humans, organisms, and ecosystems. **2.** [deicing fluids] characteristics affecting organisms and ecosystems such as THEORETICAL OXYGEN DEMAND (ThOD), BIOCHEMICAL OXYGEN DEMAND (BOD), AQUATIC TOXICITY of the fully formulated fluids such as the EFFECTIVE CONCENTRATION 50% (EC_{50}) for *daphnia magna*) or LETHAL CONCENTRATION 50% (LC_{50}) for

fathead minnows and rainbow trout, effect on biological treatment systems, mammalian toxicity (usually available from SAFETY DATA SHEETs), and trace contaminants. – Compare PHYSICAL PROPERTY, PERFORMANCE PROPERTY, OPERATIONAL PROPERTY. SEE FLUID PROPERTIES.[65,130,131] [EEA Glossary, SAE AMS1424, SAE AMS1428]

ethylene glycol, **1.** [chemistry] Chemical Abstract registry number 107-21-1, alternate names: 1,2-ethanediol, EG, monoethylene glycol, MEG; molecular formula $C_2H_6O_2$; mol wt 62.07; bp 197.6 °C. **2.** [aircraft deicing] a FREEZING POINT DEPRESSANT used in the formulation of aircraft deicing/anti-icing fluids. – Compare PROPYLENE GLYCOL.[105] [Merck Index]

evaporation, [chemistry] the change of state from a liquid to a vapor at temperatures below the boiling point of the liquid.[119,156,162] [Rennie, Schaschke, SIAGDP]

exceptional adaptations, [safety science] deviations that occur in only rare or special circumstances. Individuals make such adaptations when they are problem solving in unusual situations in which they believe the known rules and procedures do not apply. – Compare ADAPTATIONS.[177] [TSB]

exhaust, [aircraft engine] the rear portion of the engine where the hot gases produced by combustion exit the engine. It is located at the aft end of the engine and can be seen at the rear of the NACELLE.

exposure to dry air, **1.** [thickened anti-icing fluids] a test for Type II/III/IV fluids to simulate the effect of overnight exposure to dry air. **2.** a PASS-FAIL TEST for Type II/II/IV fluids performed in INITIAL QUALIFICATION and classified as an OPERATIONAL PROPERTY.[131] [SAE AMS1428]

exothermic, **1.** [chemistry, thermodynamics] characterizes chemical reactions or physical processes that release heat to the surroundings. **2**. an exothermic reaction is a chemical reaction that releases heat to the surroundings; *the oxidation of methane and the burning of gasoline are exothermic reactions*. **3.** an exothermic process releases heat to its surroundings. – Compare ENDOTHERMIC. [100,119] [Law, Rennie]

FAA/Transport Canada lists of fluids, **1.** lists published by the FAA or Transport Canada in their *Holdover Time Guidelines* which include fluids tested for ENDURANCE TIMEs, ANTI-ICING PERFORMANCE and AERODYNAMIC ACCEPTANCE, without regulator verification that other requirements (MATERIALS COMPATIBILITY tests, aquatic toxicity tests and various other tests) required under SAE AMS1424 or SAE AMS1428 have been performed [as of August 2024, the FAA and Transport Canada lists of fluid are identical]. **2.** it is the user's responsibility to verify that all technical requirements of AMS1424 or AMS1428 are fulfilled. **3.** the fluids on these lists are intended for use with the holdover time guidelines published in the FAA and Transport Canada *Holdover Time Guidelines*. **4.** The FAA/Transport Canada lists of fluids provides for each fluid, as applicable, the FREEZING POINT DEPRESSANT used in the fluid, the fluid QUALIFICATION EXPIRY DATE, concentration (fluid/water ratio), LOWEST OPERATIONAL USE TEMPERATURE for low speed, middle speed and high speed ramps at the stated concentrations, the LOWEST ON-WING VISCOSITY and the HIGHEST ON-WING VISCOSITY. – See LIST OF FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE, HOLDOVER TIME, HOLDOVER TIME GUIDELINES. Compare LIST OF VALIDATED FLUIDS.[75,138,140,170] [FAA HOT, SAE ARP5718, SAE ARP6207. TC HOT]

***FAA and Transport Canada** publish **lists of fluids** annually as part of their holdover time guidelines publications. The requirement for inclusion on the FAA/Transport Canada lists of fluids is that fluids have been tested for endurance times (according to ARP5485), anti-icing performance (according to 3.2.4 of AMS1428 using the test method in AS5901) and aerodynamic acceptance (3.2.5 of AMS1428 using the test method in AS5900). Other AMS1428 technical requirements, such as fluid stability, materials compatibility and toxicity are not considered for the FAA/Transport Canada lists. It is the end user's responsibility to confirm that all technical requirements, including all those listed above, have been met before using a fluid. [SAE ARP5718]

failed fluid, **1.** fluid that has reached the fluid failure condition. **2.** an OFF SPEC fluid. – See FLUID FAILURE, FLUID FAILURE CRITERIA. Compare UNFAILED FLUID.[102,108] [Guide, Myers]

failure adhesion, the point at which ice crystals in a fluid bond to the surface, this occurs when the diluted fluid freezing point rises above the surface temperature at a NUCLEATION SITE on the surface.[108] [Myers]

failure front, see FLUID FAILURE FRONT.

fan blade icing, [aircraft engine] a jet engine icing condition where ice accumulates on the fan blades. See FAN BLADES, ENGINE ICING, GROUND-ACCUMULATED ICE, OPERATIONAL ICE.

fan blades, [aircraft engine] blades located at the front of the engine and part of the fan section. Fan blades draw in large amounts of air and provide the primary propulsion force in bypass engines. Fan blades are susceptible to icing. – See OPERATIONAL ICE, GROUND-ACCUMULATED ICE.

field, **1.** [experimental sciences] the natural, real-world environment where experiments are conducted, as opposed to a controlled laboratory setting; *a foaming test in the laboratory vs a foaming test on an aircraft in the field*. **2.** [psychology–system model of creativity] the social context or the community of experts, critics, and audience members who evaluate and recognize creative work within a domain. The field includes the social roles, norms, and institutions that influence how creative contributions are judged and accepted; *SAE G-12 is an organization acting as a field that influences how innovation is introduced in the domain of aircraft ground deicing*. **3.** [aviation] a short form for airfield. – Compare DOMAIN. See FIELD INSTRUMENT.[54,101] [Csikszentmihalyi, Lee]

field instrument, **1.** [chemistry] an instrument designed for non-laboratory setting, such as outdoors or an industrial environment, usually rugged, portable and simpler than a laboratory instrument; *digital and analog handheld refractometers are field instruments*. **2.** results from field instruments are generally less accurate or less precise than laboratory instruments. – Compare LABORATORY INSTRUMENT.

field test, [aircraft deicing] a test performed on-site at an airport, not with a laboratory instrument; *a foaming test spraying fluid on an aircraft, a refraction measurement with a handheld refractometer, a pH measured with a portable pH meter*.

fifth crosshair failure, **1.** the moment when the fifth crosshair is obscured by contamination on a standard test plate during endurance time testing. **2.** a criterion for visual fluid failure during a standard test plate endurance time test. – See CROSSHAIR, ENDURANCE TIME TESTING. Compare FOURTH CROSSHAIR FAILURE.[108] [Myers]

fin, [aircraft components] the fixed stabilizing surface forward part of the VERTICAL TAIL. – Synonym: VERTICAL STABILIZER.[71,158] [FAA H-8083-3C, Shevell]

finding, **1.** result of an audit presented as a conformity or nonconformity measured against audit criteria, or an opportunity for improvement; *a finding*. **2.** a factual account supported by evidence of how an organization is not in compliance with requirements. – See FINDINGS.[152,168] [SAE AS6332, TC AC SUR-002]

***finding**, the results of an evaluation of the collected audit evidence against audit criteria. A finding can indicate conformity or nonconformity with audit criteria, or opportunities for improvement. [SAE AS6332]

findings, the collective results of an audit; *the findings of an audit*. – See FINDING.[152] [SAE AS6332]

fire extinguishing agents, **1.** foam, dry chemicals, and solutions used to extinguish fires. **2.** [aircraft brakes] potential contaminants for carbon brakes.[126] [SAE AIR4904]

first icing event, **1.** the initial ice crystal formation generally occurring at surface discontinuities, such as gaps, and at the edges of surfaces, where the fluid is at its thinnest. **2.** the location, generally, from which areas of ice crystal coverage grow. **3.** first icing event, sometimes called first failure, may or may not be a significant event in the progression to fluid failure. – See FLUID FAILURE.[108] [Myers]

first failure, see FIRST ICING EVENT.

flaps, **1.** [aircraft components] moveable hinged portion of the TRAILING EDGE of the wing, usually between the AILERONS and the FUSELAGE. They are extended (deployed) to control lift during takeoff and landing. **2.** [aircraft deicing] when flaps (and SLATS) are kept extended (deployed) after deicing/anti-icing during taxi, the STANDARD HOLDOVER TIME and STANDARD ALLOWANCE TIME are reduced. – See ADJUSTED HOLDOVER TIME, ADJUSTED ALLOWANCE TIME, SLATS.[71,158] [FAA H-8083-3C, Shevell]

flash point, **1.** [chemistry] the lowest temperature at which a combustible product will produce enough vapor to ignite in air at a given pressure. Flash point is important for the safe storage and transportation of products. **2.** [aircraft deicing fluids and runway deicing products] flash point is a PASS-FAIL (minimum 100 °C) PHYSICAL PROPERTY measured on Type I/II/III/IV fluids and runway deicing products during qualification.[29,119,130,131,132,133,156] [Bell, Rennie, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435, Schaschke]

flight time, the time that elapses from the moment an aircraft first moves under its own power for the purpose of flight until the moment it comes to rest at the next point of landing.[1,174] [14 CFR § 1.1, TC TP 14052]

***flight time**, pilot time that commences when an aircraft moves under its own power for the purpose of flight and ends when the aircraft comes to rest after landing. [14 CFR § 1.1]

flightcrew, pilot, flight engineer, or flight navigator assigned to duty in an aircraft during FLIGHT TIME.[1] [14 CFR § 1.1]

f**lightcrew trainer**, [aircraft deicing] the person responsible for deicing/anti-icing training for flightcrews.[151] [SAE AS6286]

flightdeck, **1.** front part of an aircraft from which pilot and copilot control the aircraft, communicate with air traffic control and monitor the aircraft systems. **2.** flightdeck is also called the COCKPIT, particularly in smaller aircraft. – Flightdeck is a G-12 HARMONIZED TERM; cockpit is not.[157] [Harmonization]

flowoff, **1.** [aerodynamics] the shedding of deicing/anti-icing fluid from aircraft surfaces during the TAKEOFF GROUND ROLL, ROTATION, LIFTOFF, and INITIAL CLIMB. Speed and time to accelerate to ROTATION SPEED have an important effect on fluid flowoff. **2.** during flowoff the fluid sheds, forming waves that affect the BOUNDARY LAYER in a manner similar to solid roughness. **3.** before rotation much of the fluid sheds in what is described as the PRIMARY WAVE. **4.** at rotation or soon thereafter, a SECONDARY WAVE usually forms and flows back from near the LEADING EDGE. – See FLUID ELIMINATION, AERODYNAMIC ACCEPTANCE TEST, FLUID TRANSIENT EFFECTS, FLOWOFF FAILURE.[40,95,125,141] [Broeren, Koivisto, Runyan, SAE ARP6852]

flowoff failure, **1.** [aerodynamics of deicing/anti-icing fluids] condition that occurs when an insufficient amount of aircraft deicing/anti-icing fluid, with or without contamination, comes off the lifting surfaces (e.g., wing, horizontal stabilizer) during the TAKEOFF RUN. **2.** the history and the development of criteria for flowoff failure (and acceptable transient aerodynamic effects of fluids) are described in SAE ARP6852. **3.** in the laboratory, flowoff is verified in the AERODYNAMIC ACCEPTANCE TEST by measuring the BOUNDARY LAYER DISPLACEMENT THICKNESS and FLUID ELIMINATION. **4**. for ALLOWANCE TIME testing, flowoff is observed with anti-icing fluids contaminated with ice pellets and ice pellets mixed with other contaminants at the NRC wind tunnel in Ottawa. – See FLOWOFF, AERODYNAMIC DEGRADATION, AERODYNAMIC FAILURE. Compare TRANSIENT AERODYNAMIC EFFECTS OF FLUIDS.[124,141,145] [Ruggi 2021, SAE ARP6852, SAE AS5900]

fluid adhesion, [fluid failure] effective adhesion of a fluid layer to a surface (aircraft or standard plate) due to viscosity and SURFACE TENSION forces, often with a matrix of ice crystals in the fluid layer, impeding the fluid movement under shear.[108] [Myers]

fluid application guidelines, collective name given to the three tables providing the steps and conditions to follow when applying aircraft deicing fluids. These tables are published by the FAA and Transport Canada in their respective annual *Holdover Time Guidelines*. There is a table for the application of Type I, one for Type II and IV, and one for Type III fluid. – See FLUID COMPATIBILITY.[75,170] [FAA HOT, TC HOT]

fluid bleed-through, see BLEED-THROUGH.

fluid compatibility, **1.** [aircraft deicing fluids] expression to signify that a Type I fluid from one manufacturer does not unduly reduce the PROTECTION TIME or HOLDOVER TIME of a Type II/III/IV from another manufacturer when the Type I is applied in the first step of a two-step application. There is (yet) no published SAE agreed upon laboratory method of verifying this. **2**. historically, fluid compatibility started to be considered as a potential issue when users started to use Type I and Type II/II/IV fluids from different manufacturers in two-step applications. The regulators ask

users to verify fluid compatibility by contacting the respective fluid manufacturers. **3.** laboratory tests have been proposed (and performed) by independent laboratories to evaluate fluid compatibility such as: a) verifying that the WATER SPRAY ENDURANCE TIME of the thickened fluid in the second step application still fulfils the specification requirement, or b) verifying for significant decrease in ENDURANCE TIME from a subset of tests to generate the HOLDOVER TIME GUIDELINES. – See FLUID APPLICATION GUIDELINES.[12,32,56,74] [Asnytska, Blackburn, D'Avirro, FAA General Info]

fluid elimination, **1.** one of the two results (outputs) of the aerodynamic acceptance test, the other being the lowest aerodynamic acceptance temperature. **2.** the extent to which a fluid is removed from the wind tunnel test section during the aerodynamic acceptance test. **3.** fluid elimination is determined by measuring the average residual thickness of fluid remaining on the lower plate of the test section after the aerodynamic acceptance test and measured within 5 minutes of the end of the test. **4.** a PASS-FAIL TEST for Type I where the final thickness shall not exceed 400 µm for the high speed ramp, 500 µm for the middle speed ramp, and 600 µm for the low speed ramp. **5.** a pass-fail test for Type II/III/IV where the final thickness shall not exceed 520 µm for the HIGH SPEED RAMP and MIDDLE SPEED RAMP, and 860 µm for the LOW SPEED RAMP. – See AERODYNAMIC ACCEPTANCE TEST, LOWEST AERODYNAMIC ACCEPTANCE TEMPERATURE.[145] [AS5900]

***fluid elimination**, **(Type I)** final fluid thickness shall be calculated by determining the average thickness of fluid remaining on the lower plate of the test section. The final thickness of the fluid shall not exceed 400 µm for the high speed ramp test, 500 µm for the middle speed ramp test, and 600 µm for the low speed ramp test. Measurements shall be taken within 5 minutes of the end of the test at three locations along the flat plate, as follows: 1. On the centerline, 1400 mm ± 10 mm from leading edge of plate. 2. On the centerline, 750 mm ± 10 mm from leading edge of plate. 3. At 750 mm ± 10 mm from leading edge of plate and 2.5 mm ± 0.5 mm from the inside wall of the duct. [SAE AS5900]

***fluid elimination, (Type II/III/IV)** fluid elimination shall be calculated by determining the average thickness of fluid remaining on the lower plate of the test section. The final thickness of the fluid shall not exceed 520 µm for the high speed ramp test and middle speed ramp test and 860 µm for the low speed ramp test. Measurements shall be taken within 5 minutes of the end of the test at the same location than for Type I fluids. [SAE AS5900]

fluid failure, when a fluid is no longer able to perform according to one or a combination of failure criteria such as VISUAL FAILURE, AERODYNAMIC FAILURE, ADHESION FAILURE, FLOWOFF FAILURE, or WETTING FAILURE. – See FLUID FAILURE CRITERIA.[144,174] [SAE AS5681, TC TP 14052]

***deicing/anti-icing fluid failure**, when the deicing/anti-icing fluid can no longer absorb incoming precipitation and provide protection from the adherence of frozen contamination on treated surfaces. Characteristics of fluid failure can be surface freezing or snow accumulation, random snow accumulation, and/or dulling of surface reflectivity caused by the gradual deterioration of the deicing/anti-icing fluid, possibly indicated by the presence of frozen contamination in or on the de/anti-icing fluid. [SAE AS5681]

fluid failure criteria, the reasons or standards for considering a fluid failed after application on an aircraft, test AIRFOIL or STANDARD TEST PLATE, such as VISUAL FAILURE, AERODYNAMIC FAILURE, ADHESION FAILURE, FLOWOFF FAILURE, or WETTING FAILURE. – See AERODYNAMIC ACCEPTANCE TEST, FLOWOFF.[39,106] [Brittanica, MW]

fluid failure front, an advancing ice crystal layer front from thinner anti-icing fluid areas to thicker fluid areas as a result of uneven fluid application, gaps or recesses in the surface, or surface gradients; thinner fluid areas are diluted more rapidly by precipitation than thicker areas.[108] [Myers]

fluid flowoff, see FLOWOFF.

fluid manufacturer, [aircraft deicing fluids] a manufacturer of aircraft deicing fluids. A fluid manufacturer should normally provide a) a product information bulletin that should describe the FLUID PROPERTIES, including PERFORMANCE PROPERTIES, OPERATIONAL PROPERTIES, PHYSICAL PROPERTIES, and ENVIRONMENTAL PROPERTIES, b) a SAFETY DATA SHEET, and c) a SALES SPECIFICATION. – Compare ORIGINAL MANUFACTURER. See LICENSEE, SUBCONTRACTOR.

fluid properties, [aircraft deicing fluids] the collective properties of a deicing/anti-icing fluid comprising PHYSICAL PROPERTIES, PERFORMANCE PROPERTIES, OPERATIONAL PROPERTIES, and ENVIRONMENTAL PROPERTIES.

fluid quality inspector, person performing the quality control of fluids.[151] [SAE AS6286]

***fluid quality inspector**, the fluid quality inspector (laboratory staff) qualification (DI-L60) includes the performance of the quality control of fluids. The qualification shall include training covering related parts mentioned in the standard teaching plan. Local procedures shall be taken into account. International standards and auditing requirements regarding fluid quality shall be taken into account. Fluid-specific procedures shall be noted. In some cases, this qualification can be included in DI-L10 if local procedures so demand. However, appropriate training for quality checks and procedures shall be performed in any case. Both theoretical and practical training shall be performed. Local settings may demand more extensive training and these recommendations are not binding. The qualification must be renewed annually with a theoretical part including a written exam. Any new fluid or procedural requirements need special attention. [SAE AS6286]

fluid residue, an accumulation of dried-up thickened fluids in AERODYNAMICALLY QUIET AREAS of an aircraft that may rehydrate when exposed to rain or humidity to form a gel that may freeze and impede the free movement of control surfaces. – Compare RESIDUAL FLUID.[64,102,150] [EASA SIB 2008-29, Guide, SAE AS6285]

***residue/gel**, a buildup of dried out thickened fluids typically found in aerodynamically quiet areas of the aircraft. [SAE AS6285]

fluid-specific holdover time guideline, **1.** a holdover time guideline created and published for a specific Type II, III, or IV fluid, each with a unique name, that can only be used with that specific fluid and cannot be used with any other fluid. **2.** there are no Type I fluid-specific holdover times guidelines. – Compare GENERIC HOLDOVER TIME GUIDELINE.[138,140] [SAE ARP5718, SAE ARP6207]

***fluid-specific holdover time guideline**, a holdover time guideline that contains holdover times for a specific Type II, III, or IV fluid. A fluid-specific holdover time guideline can only be used with the specific fluid it is intended for; it cannot be used with any other fluid. [SAE ARP5718]

***fluid-specific holdover time (HOT) guideline**, a holdover time guideline that contains holdover times for a specific Type II, III, or IV fluid. A fluid-specific holdover time guideline can only be used with the specific fluid it is intended for; it cannot be used with any other fluid. Currently, no Type I fluids have fluid specific holdover times. [SAE ARP6207]

fluid aerodynamic transient effects, see TRANSIENT AERODYNAMIC EFFECTS OF FLUIDS.

fluid transfer system, any deicing/anti-icing apparatus (e.g., pumps, valves, nozzles, pipes, hoses, dry disconnect couplings, deicing unit) through which Type I/IV/III/IV is transferred, regardless as to the reason for or outcome of such transfer. – See SHEAR DEGRADATION, SHEAR FORCE.[150] [SAE AS6285]

***fluid transfer system**, the performance characteristics of Type II, III, and IV deicing/anti-icing fluids may be degraded by excessive mechanical shearing or chemical contamination. Therefore, only compatible pumps, control valves, piping, hoses, and application devices (nozzles) shall be used. The design of fluid transfer systems shall be in accordance with the fluid manufacturer's recommendations. Fluid transfer systems shall be dedicated to the specific fluid being handled to prevent inadvertently mixing

fluids of different Types or manufacturers. All fill ports and discharge points shall be clearly labeled to prevent inadvertent product mixing. All fill ports must be protected to prevent foreign contamination. [SAE AS6285]

foam stability, [aircraft deicing fluids] a DETERMINE AND REPORT TEST to establish the tendency to foam and measure foam stability of Type I fluids at 60 °C, mixing it in a Waring blender, pouring it on a cold inclined flat plate and estimating percent foam coverage on the plate after 15 minutes.[130] [SAE AMS1424]

fog, **1.** [meteorology] a visible suspension of small water droplets (5–15 µm in diameter) near the surface of the earth, reducing visibility to less than 5/8 mile (1/2 mile in Canada). **2.** [meteorology] visibility reduction in fog depends on concentration of cloud condensation nuclei and the resulting distribution of droplet sizes. **3.** [meteorology] when composed of ice crystals, it is termed ice fog. **4.** [meteorology] fog seldom forms when the DEWPOINT spread is greater than 4 °F (2 °C). **5.** [meteorology] an obscuration with METAR code FG at temperatures above freezing or when ice accretion is not observed. – Synonym: GROUND FOG. Compare ICE FOG.[8,62,93,113] [AMS Glossary, Dunlop, ICAO 9640, NOAA FMH-1]

***fog**, a visible aggregate of minute water particles (droplets) which are based at the Earth's surface and reduces horizontal visibility to less than 5/8 statute mile and, unlike drizzle, it does not fall to the ground. [NOAA FMH-1]

***fog**, shall only be reported when the prevailing visibility is reduced to ½ mi. or less at the earth's surface. [MANOBS]

folding wing, 1. a type of wing designed to fold in a specific manner to reduce the wingspan when not in flight; *the Boeing 777-8 incorporates folding wing in its design—extended its wingspan is 235 feet 5 inches and folded 212 feet 9 inches; special precautions need to be taken when deicing a folding wing to avoid washing away lubricants.*[37,150] [Boeing 777X, SAE AS6285]

follow-me vehicle, a specialized vehicle used at airports to guide aircraft during operations on the ground and normally equipped with identifiable lights, signage, and/or markings to make it easily recognizable.[84,159] [GTAA, Skybrary]

forced air, a method of deicing using a flow of air under pressure to remove frozen contamination from an aircraft; it may be used in conjunction with deicing or anti-icing fluids. – See SHEAR FORCE.[150] [SAE AS6285]

***forced air deicing method**, a method of deicing using a concentrated flow of air under pressure to remove frozen contamination from an aircraft; it may be used in conjunction with deicing fluids. [SAE AS6285]

form, **1.** [chemistry] physical form describes the state of matter (solid, liquid, gas, or plasma) or the crystalline structure of a substance. **2.** [chemistry] chemical form describes the molecular or structural arrangement of atoms in a compound; for example, PROPYLENE GLYCOL comes in three forms, the *dl*-form (racemic mixture), the *d*-form (dextrorotatory enantiomer) and the *l*-form (levorotatory enantiomer). **3.** [aircraft deicing fluids] it is a requirement of AMS1424 and AMS1428 that aircraft deicing fluids (Type I/II/III/IV) be in the form of a liquid. **3. [**runway deicing products] it is a requirement that runway deicing products fulfilling the requirements of AMS1431 be in the form of a solid and those fulfilling the requirements of AMS1435 be in the form of a liquid.[105,130,131,132,133] [Merck Index, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

foundation specification, **1.** a specification that establishes the requirements for all Type I or Type II/III/IV deicing/anti-icing fluids, defines glycol (conventional and non-conventional) based and non-glycol based fluids, and contains additional properties and requirements that apply to both glycol (conventional and non-conventional) and non-glycol based products. **2.** SAE AMS1424 and SAE AMS1428 are the only foundation specifications. **3.** SAE AMS1424/1, SAE AMS1424/2, SAE AMS1428/1 and SAE AMS1428/2 are not foundation specifications. – Compare CATEGORY SPECIFICATION. See GLYCOL (CONVENTIONAL), GLYCOL (NON-CONVENTIONAL), NON-GLYCOL.[130,131] [SAE AMS1424, SAE AMS1428]

***foundation specification** establishes the requirements for all Type I deicing/anti-icing fluids, defines glycol (conventional and non-conventional) based and non-glycol based fluids, and contains additional properties and requirements that apply to both glycol (conventional and non-conventional) and non-glycol based products. [SAE AMS1424]

***foundation specification** establishes the requirements for all Type II, III, and IV aircraft deicing/anti-icing fluids. It defines glycol (conventional and non-conventional) based fluids and non-glycol based fluids and contains additional properties and requirements that apply to both glycol (conventional and non-conventional) and non-glycol based products. [SAE AMS1428]

fourth crosshair failure, **1.** the moment when the fourth CROSSHAIR is obscured by CONTAMINATION on a STANDARD TEST PLATE during ENDURANCE TIME TESTING. **2.** not a criterion for visual fluid failure during a standard test plate endurance time test. – Compare FIFTH CROSSHAIR FAILURE.[108] [Myers]

frac tank, a large portable steel tank for storing bulk liquids that can normally be moved when empty.

freezing drizzle, **1.** [meteorology] uniform liquid precipitation composed of fine water droplets less than 0.5 mm in diameter but greater than 100 µm that freeze on impact with the ground or other exposed objects that are below 0 °C. **2.** [meteorology] freezing drizzle intensities are defined as light (-FZDZ) (the rate of fall from a trace to 0.3 mm (0.01 in.) h^{-1}), moderate (FZDZ) (the rate of fall from 0.3–0.5 mm (0.01–0.02 in.) h^{-1}), and heavy (+FZDZ) (the rate of fall greater than 0.5 mm (0.02 in.) h^{-1}). **3.** [endurance time testing] condition with a precipitation rate of 5–13 g/dm^2/h. **4.** [aircraft deicing] a precipitation condition with a holdover time. The freezing drizzle intensities in the freezing drizzle holdover time condition include light, moderate and heavy freezing drizzle. – See DRIZZLE.[30,62,75,93,136,150,151,162,170] [Bendickson, FAA HOT, Dunlop NOAA FMH-1, ICAO 9640, SAE ARP5485, SAE AS6285, SAE AS6286, SIAGDP, TC HOT]

***freezing drizzle**, a 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. [SAE AS6285, SAE AS6286]

***freezing drizzle**, drizzle that freezes upon impact with the ground, or other exposed object. [NOAA FMH-1]

***freezing rain** and **freezing drizzle**, rain or drizzle in the form of supercooled water drops which freeze upon impact with any surface. [ICAO 9640]

freezing fog, **1.** [meteorology] a fog formed of supercooled small water droplets which reduce visibility to less than 5/8 mile (1/2 mile in Canada) at the earth's surface and freeze upon contact with exposed objects below 0 °C and can form a coating of rime and/or glaze ice. **2.** [meteorology] a freezing OBSCURATION with METAR code FZFG. **3.** [endurance time testing] condition with precipitation rate of 2–5 g/dm^2/h. **4.** [aircraft deicing] a condition with a holdover time. – See FOG,

GLAZE, RIME.[30,62,93,113,136,150,162] [Bendickson, Dunlop, ICAO 9640, NOAA FMH-1, SAE ARP5485, SAE AS6285, SIAGDP]

***freezing fog**, a suspension of numerous very small water droplets which freeze upon impact with the ground or other exposed objects; generally reduces the horizontal visibility at the earth's surface to less than 1 km (5/8 mile). [SAE AS6285]

***freezing fog**, a suspension of numerous tiny water droplets that freeze upon impact with ground or other exposed objects, generally reducing the horizontal visibility at the earth's surface to less than 1 km (5/8 mile). [SAE AS6286]

***freezing fog**, suspension of numerous minute ice crystals in the air, or water droplets at temperatures below 0 °Celsius, based at the Earth's surface, which reduces horizontal visibility. [NOAA FMH-1]

***freezing fog**, a fog formed of supercooled water droplets which freeze upon contact with exposed objects and form a coating of rime/clear ice. [ICAO 9640]

***freezing fog**, a suspension of numerous minute ice particles in the air, reducing the visibility at the Earth's surface. [ICAO 9640]

***freezing fog**, this obstruction to vision consists mainly of super-cooled droplets that usually deposit rime or glaze on objects or surfaces with below freezing temperatures. The definition of freezing fog is the same as for fog, except that it occurs when the temperature is in the range of -0.1 °C to -30.0 °C and the visibility is ½ mi. or less. It may be reported at temperatures colder than -30.0 °C when there is clear physical evidence of ice accretion from the fog and the visibility is ½ mi. or less. [MANOBS]

freezing level, **1.** [meteorology] the lowest altitude in the atmosphere, over a given location, in the atmosphere at which air temperature is at 0 °C. **2**. the height of 0 °C constant temperature surface.[8,62] [AMS Glossary, Dunlop]

freezing mist, **1.** mist occurring at temperatures below freezing, resulting in ice buildup on objects. **2**. a condition not reported by METAR and best confirmed by visual observation. **3.** [aircraft deicing] a precipitation condition that has the same holdover time as FREEZING FOG and ICE CRYSTALS. – See MIST.[75,170] [FAA HOT, TC HOT]

freezing nucleus, [meteorology] any particle that will induce the crystallization of supercooled water. – Compare CONDENSATION NUCLEUS, DEPOSITION NUCLEUS. See NUCLEATION, NUCLEUS, ICE NUCLEUS.[8,39,62] [AMS Glossary, Britannica, Dunlop]

freezing point (fp), **1.** the temperature at which a liquid starts to become a solid as the temperature is lowered very slowly (at a given pressure, in the presence of a nucleation site). **2.** [aircraft deicing] the freezing point of a deicing fluid as determined by direct measurement of freezing point or, most often, indirectly through a measurement of refraction. **3.** freezing point is a PERFORMANCE PROPERTY of an aircraft deicing fluid and is needed to calculate its the LOWEST OPERATIONAL USE TEMPERATURE. **4.** freezing point is a PASS-FAIL TEST for aircraft deicing fluids and runway deicing products determined using ASTM D1177. – See FREEZING POINT CURVE, REFRACTION, SURROGATE. Compare POUR POINT.[14,102,130,131,132,174] [ASTM D1177, Guide, SAE AMS1424, SAE AMS1428, SAE 1431, SAE AMS1435, TC TP 14052]

***freezing point**, the temperature at which a liquid starts to become a solid. [SAE AS6285]

freezing point buffer, the difference between the FREEZING POINT of the fluid and the OUTSIDE AIR TEMPERATURE.[74,129,150,162,174] [FAA General Info, SAE AIR6232, SAE AS6285, SIAGDP, TC TP 14052]

***buffer**, the difference between the outside air temperature and the freezing point of the fluid used. [SAE AIR6232]

***freezing point buffer**, the difference between the outside air temperature (OAT) and the freezing point of the fluid used. [SAE AS6285]

freezing point curve, 1. [physical chemistry] the relationship between temperature and the PHASE TRANSITION of a substance as it freezes. **2.** [physical chemistry, freezing point depression] the relationship between temperature and the FREEZING POINT of a solution as a function of the concentration of a SOLUTE in a SOLVENT. **3.** [aircraft deicing fluids] MANDATORY INFORMATION of the freezing point relationship expressed as volume dilution, reported increments of 10% (or more) of the Type I deicing fluid concentrate with water. The relationship may be expressed in the form of an equation, a table or graph. – See FREEZING POINT DEPRESSION, REFRACTION.

freezing point depressant, [aircraft deicing] a component, usually a glycol, used the formulation of deicing or anti-icing fluids to lower the freezing point of water. – See FREEZING POINT DEPRESSION, GLYCOL.

freezing point depression, the lowering of the freezing point of a substance by adding another soluble substance to it. – See COLLIGATIVE PROPERTY.[102,119] [Guide, Rennie]

freezing rain, **1.** [meteorology] rain falling as liquid, typically supercooled, that freezes upon impact on objects that are below 0 °C, forming a layer of clear ice.

> *light freezing rain* (-FZRA)**, 2.** [meteorology] (qualitative intensity), scattered drops that do not completely cover a surface **3.** [meteorology] (quantitative intensity) freezing rain with an intensity of 2.5 mm/h or less. **4.** [endurance time testing] a precipitation with a rate of 13–25 g/dm^2/h. **5.** [aircraft deicing] a precipitation condition with a holdover time.
>
> *moderate freezing rain* (FZRA), **6.** [meteorology] (quantitative intensity) freezing rain with a precipitation rate of 2.5–7.6 mm/h (25–76 g/dm^2/h) **7**. [aircraft deicing] a precipitation condition without a holdover time.
>
> *heavy freezing rain* (+FZRA), **8.** [meteorology] (estimated intensity) freezing rain that seems to fall in sheets and where individual droplets may not be identifiable. **9.** [meteorology] (quantitative intensity) freezing rain with a precipitation rate > 7.6 mm/h (> 76 g/dm^2/h). **10.** [aircraft deicing] a precipitation condition without a holdover time.
>
> See RAIN ON COLD-SOAKED WING.[30,50,113,136,150,151,162,174] [Bendickson, MANOBS, NOAA FMH-1, SAE ARP5485, SAE AS6285, SAE AS6286, SIAGDP, TP 14052]

***light freezing rain**, 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/dm^2/h with a maximum of 0.25 mm (0.01 inch) in 6 minutes. [SAE AS6285, SAE AS6286]

***freezing rain**, rain that freezes upon impact and forms a glaze on the ground or exposed objects. [NOAA FMH-1]

***freezing rain** and **freezing drizzle**, rain or drizzle in the form of supercooled water drops which freeze upon impact with any surface. [ICAO 9640]

***freezing rain**, supercooled raindrops which freeze upon impact to form a coating of clear ice on the ground and/or on exposed objects. [ICAO 9640]

***heavy freezing rain**, 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. [SAE AS6285]

***moderate and heavy freezing rain**, 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 more than 2.5 mm/h (0.10 in/h) or 25 g/dm^2/h. [SAE AS6286]

***moderate freezing rain** 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. [SAE AS6285]

***heavy freezing rain,** 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. [SAE AS6285].

friction and wear modifiers, [aircraft brakes] fluids that can affect the coefficient of friction of aircraft brakes, aggravate the effect of absorbed water, or affect the friction interface in such a way as to impact brake vibration, brake torque performance, and/or brake wear characteristics.[127] [SAE AIR5490]

***friction and wear modifiers**, fluids that can affect the coefficient of friction aggravate the effect of absorbed water or affect the friction interface in such a way as to impact brake vibration, brake torque performance, and/or brake wear characteristics. [SAE AIR5490]

frontal fog, [meteorology] fog associated with frontal passages. Fog forms by either a) rain falling into cold air raising the DEWPOINT temperature, or b) the mixing of warm and cold air cooling the air over moist ground.[8,62] [AMS Glossary, Dunlop]

frost, **1.** [meteorology] white ice crystals formed by water vapor changing directly into ice without going through the liquid phase in a process called deposition (sometimes called desublimation) in the presence of nucleating sites on objects with temperatures at or below the frost point. **2.** [aircraft deicing] white ice crystal formed by the freezing of dew or the deposition of water vapor directly into ice. **3.** [runway contaminant], ice crystals formed from airborne moisture that forms on a surface whose temperature is below freezing. Frost differs from ice in that the frost crystals grow independently and therefore have a more granular texture. – Synonyms: HOARFROST, WHITE FROST. – See ACTIVE FROST, DEW, FROZEN DEW, FROST POINT, DEWPOINT, NUCLEUS, FREEZING NUCLEUS, THIN HOARFROST, DEPOSITION, DESUBLIMATION.[70,93,150,177] [FAA AC150/5300-14D, ICAO 9640, SAE AS6285, TSB]

***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. [SAE AS6285]

***frost**/hoar frost, ice crystals that form from ice saturated air at temperatures below 0 °C (32 °F) by direct deposition on the ground or other exposed objects. [SAE AS6286]

*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. [ICAO 9640]

frost point, the temperature at which unsaturated air must be cooled, at constant barometric pressure and constant water vapor content, to reach SATURATION with respect to ice. The frost point is generally above (warmer than) the dewpoint. – Compare DEWPOINT.[62,74,150,151,174,177] [Dunlop, FAA General Information, SAE AS6285, SAE AS6286, TC TP 14052, TSB]

***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. [SAE AS6285, SAE AS6286]

frozen contamination, any forms of frozen or semi-frozen deposits on an aircraft, such as FROST, SNOW, SLUSH, ICE, ICE PELLETS or HAIL within a fluid, frozen fluid or semi-frozen fluids (collectively referred to as frozen contamination or simply contamination) – See CONTAMINATION. Compare CHEMICAL CONTAMINATION.

frozen dew, **1.** [meteorology] ice formed by the freezing of dew on objects near the ground. **2.** [aircraft deicing] in the field of aircraft ground deicing, frozen dew is considered a form of frost. On aircraft surfaces, dew can become supercooled and is subject to sudden freezing induced by movement of the aircraft. – See DEW, FROST.[5,88] [Ahrens, Horrigan 2011]

fuel frost, see COLD-SOAKED FUEL FROST. – Synonym: NONENVIRONMENTAL FROST.[150] [SAE AS6285]

fuel temperature, **1.** [aircraft parameter] temperature of the aircraft fuel. **2.** some aircraft have temperature gauges allowing the pilot to monitor fuel temperature in-flight. **3.** the fuel in the aircraft can become cold due to a) the fuel having already been at low temperature during refueling, b) the aircraft sitting on the ground in cold temperatures, or c) because of prolonged flying in cold conditions, typically at high altitudes. **4.** cold fuel temperatures may cause COLD SOAKING.

full plate failure, a fluid testing scenario in which 100 percent of the plate has reached a VISUAL FAILURE condition. – Synonyms: COMPLETE PLATE FAILURE, ENTIRE PLATE FAILURE, TOTAL PLATE FAILURE.[108] [Myers]

function test, see FUNCTIONALITY CHECK.

functionality check, summary verification in the field that the instrument is functioning correctly. *For example, verify that the refraction of water measured on a refractometer reads zero Brix*. – Synonym: OPERATIONAL CHECK. Compare CALIBRATION. [150] [SAE AS6285]

fuselage, [aircraft components] body of the aircraft carrying crew and payload, passengers or cargo.[71,158] [FAA H-8083-3C, Shevell]

gas filled temperature gauge, a gauge in which gas expands as temperature increases, thereby creating a mechanical motion which is then read on an analog temperature numbered scale or digital readout. – See TEMPERATURE GAUGE.

generic, **1**. related to a whole group. **2.** not having a brand name. **3.** [aircraft deicing] said of the most conservative data derived from all the fluid specific (branded) Type II or Type IV fluids; *the generic Type IV holdover time guideline*. – See GENERIC HOLDOVER TIME, GENERIC HOLDOVER TIME GUIDELINE.[106] [MW]

generic holdover time, **1.** the shortest holdover time range for all fluid-specific Type II fluids or Type IV fluids within a specified temperature range and for a specific precipitation type and intensity. **2.** Type II generic holdover time ranges are used to build the Type II generic holdover time guideline and Type IV generic holdover time ranges are used to build the Type IV generic holdover time guideline. – See GENERIC, GENERIC HOLDOVER TIME GUIDELINE.[167] [TC AC 700-061]

generic holdover time guideline, **1.** a holdover time guideline derived from the shortest holdover time ranges for all fluid specific Type II fluids or all Type IV fluids. **2.** the Type II generic holdover time guidelines or the Type IV holdover time guideline. **3.** a holdover time guideline that can be used either with any brand name Type II or any brand name Type IV (but not both). – Compare FLUID-SPECIFIC HOLDOVER TIME GUIDELINE. See GENERIC, GENERIC HOLDOVER TIME.[138,140] [SAE ARP5718, SAE ARP6207]

***generic holdover time guideline**, a holdover time guideline that contains holdover times for a given fluid type (i.e., SAE AMS1428 Type II, Type III, or Type IV). A generic holdover time guideline can be used with any fluid that is qualified to be the same fluid type as the generic guideline. In the case of Type II, III, and IV fluids, the holdover times in the generic holdover time guideline represent the lowest holdover time performance (worst case) of all fluids separated by fluid type under all conditions. [SAE ARP5718]

***generic holdover time guideline**, a generic holdover time guideline can be used with any fluid that is qualified to be the same fluid type as the generic guideline. Unlike the Type II/IV generic HOT table values, there is no specific protocol in place for determining Type I generic HOT table values, however there is an existing and documented process for ensuring that the performance of a new Type I fluid is within the performance limits of historically tested and accepted Type I fluids. Also unlike the Type II/IV values, the Type I generic values are relatively static and do not change as new Type I fluids are added and removed from the list of qualified fluids. The reason for the static nature of the Type I generic table is that a significant body of research and testing conducted between the years of 1990s and 2000s has shown that all Type I fluids formulated with glycol perform in a similar manner from an endurance time perspective. [SAE ARP6207]

glass electrode, [chemistry] an electrode made of a glass tube (and other components) whose bottom bulb is thin enough for hydrogen ions to diffuse through. When this bulb is placed in a solution containing hydrogen ions, the glass electrode generates an electrical potential that depends on the concentration of the hydrogen ions. The glass electrode is a component of a pH meter where the electrical potential of the glass electrode is measured and expressed as a measure of pH. – See pH.[100,119] [Law, Rennie].

glaze, **1.** [meteorology] a transparent layer of ice formed by supercooled drizzle, fog, rain, or cloud droplets on objects below 0 °C. **2.** [aircraft deicing] a term rarely used in ground deicing (in the field of aircraft deicing the preferred term is clear ice). – Synonyms: GLAZE ICE, CLEAR ICE (when on the aircraft). See SUPERCOOLED WATER.[62] [Dunlop].

glaze ice, see GLAZE, CLEAR ICE.

global aircraft deicing standards, **1.** the three related SAE standards covering the processes of aircraft deicing (AS6285), how to train for those processes (AS6286), and the quality control of the processes (AS6332). **2.** the three global aircraft deicing standards, AS6285, AS6286, and AS6332, should be read in conjunction with each other.[150] [SAE AS6285]

global reporting format (GRF), an internationally accepted concept which utilizes visual inspection to report runway surface conditions.[166] [TC AC 300-019]

glycerine, see GLYCEROL

glycerol, **1.** [chemistry] Chemical Abstract registry number 56-81-5, alternate name: 1,2,3-propanetriol, trihydroxypropane, glycerin, glycerine; molecular formula $C_3H_8O_3$; mol wt 92.09; bp 290 °C. **2.** [runway deicing products] a FREEZING POINT DEPRESSANT used in runway deicing products usually in combination with salts (formates or acetates). – Compare SODIUM FORMATE, SODIUM ACETATE, POTASSIUM FORMATE, POTASSIUM ACETATE.[105] [Merck Index].

glycol, **1.** [chemistry] class of organic compounds with two hydroxyl groups (–OH) attached to different carbons; *ethylene glycol*, *propylene glycol*, *diethylene glycol*, *polyethylene glycol*, *polypropylene glycol*. **2.** [chemistry] term often applied to the simplest member of the class, ethylene glycol. **3.** [aircraft deicing] usually refers to ETHYLENE GLYCOL or PROPYLENE GLYCOL. **4.** [aircraft deicing] imprecise colloquial term for aircraft deicing/anti-icing fluids. – See FREEZING POINT DEPRESSANT. Compare NEW GLYCOL, RECYCLED GLYCOL.[39,119,156] [Brittanica, Rennie, Schaschke]

glycol (conventional), [aircraft deicing fluids] ethylene glycol, diethylene glycol, or propylene glycol. – Compare NON-GLYCOL, GLYCOL (NON-CONVENTIONAL). See ETHYLENE GLYCOL, DIETHYLENE GLYCOL, PROPYLENE GLYCOL. [130,131] [SAE AMS1424, SAE AMS1428]

***glycol (conventional)** is defined as ethylene glycol, diethylene glycol, or propylene glycol. [SAE AMS1424]

***glycol (conventional)** is defined as ethylene glycol, diethylene glycol, or propylene glycol. [SAE AMS1428]

glycol (non-conventional), [aircraft deicing fluids] organic non-ionic diols and triols, e.g., 1,3-PROPANEDIOL, GLYCERINE, and mixtures thereof, and mixtures with glycol (conventional). Compare GLYCOL (CONVENTIONAL), NON-GLYCOL.[130,131] [SAE AMS1424, SAE AMS1428].

***glycol (non-conventional)** is defined as organic non-ionic diols and triols, e.g., 1,3-propanediol, glycerine, and mixtures thereof, and mixtures with glycol (conventional). [SAE AMS1424]

***glycol (non-conventional)** is defined as organic non-ionic diols and triols, e.g., 1,3-propanediol, glycerine, and mixtures thereof, and mixtures with glycol (conventional). [SAE AMS1428]

glycol mitigation plan, a plan to capture and dispose of spent deicing/anti-icing fluids in an environmentally conscientious manner in accordance with the applicable regulations, standards and guidelines. – See SPENT DEICING FLUID. [84] [GTAA]

glycol recovery vehicle (GRV), a specialized vehicle designed to pick up SPENT DEICING FLUID from the ground, e.g., on ramps, at gates, deicing pads, or at central deicing facilities.

ground-accumulated ice, [aircraft engine icing] ice accumulated on the fan blades while the aircraft has been on the ground for a prolonged stop, such as an aircraft that has been parked overnight. Ground-accumulated ice in the engine must be removed before engine start. – Compare OPERATIONAL ICE. See ENGINE ICING, FAN BLADE ICING.[33] [Boeing 737-600 AMM]

ground coordinator, person responsible for coordination of ground deicing operations within a deicing facility.[137] [SAE ARP5660]

***ground coordina**tor, person responsible for coordination of ground deicing operations within a DDF. [SAE ARP5660]

ground deicing and anti-icing program, see GROUND DEICING PROGRAM (the HARMONIZED TERM is GROUND DEICING PROGRAM).

ground deicing program, **1.** a set of procedures, guidelines, processes, and training, all documented, to ensure that aircraft depart safely, according to regulations. **2.** airline or service provider documentation on ground deicing as required by the regulator. – Synonyms: GROUND ICING PROGRAM, GROUND DEICING AND ANTI-ICING PROGRAM.[68,74,152,172,174] [FAA AC 120-60B, FAA General Info, SAE AS6332, TC 622.11, TC TP 14052]

***ground icing program**, a ground icing program consists of a set of procedures, guidelines, and processes, documented in manuals, which ensure that aircraft do not depart with frost, ice, snow, or slush adhering to critical surfaces. [SAE AS6332]

ground fog, see FOG.

ground ice detection system (GIDS), an ice detection system used during aircraft ground deicing operations designed to detect frozen contamination on an aircraft.[63,64,167] [EASA EU Reg, EASA SIB 2008-29, TC AC 700-061]

ground icing, **1.** [meteorology] the accumulation of frost, ice, snow, or any freezing or frozen precipitation on the ground or on objects near the ground. **2.** [aircraft deicing] icing that occurs on the aircraft, propellers and engines (including rotors for rotorcraft) while the aircraft is on the ground. – See GROUND ICING CONDITIONS. Compare IN-FLIGHT ICING.

ground icing conditions, **1.** [aircraft deicing] conditions conducive to the presence of frozen contamination on an aircraft, propellers, rotors, instruments, or engines while on the ground including ice acquired in flight, freezing or frozen precipitation on the ground, frost, cold soaking, etc. **2.** conditions requiring the initiation of ground deicing operations. **3.** [aircraft and engine icing] ground icing conditions generally exist when the outside air temperature is 10 °C or below, and/or operating on ramps, taxiways, or runways where surface snow, ice, standing water, or slush, are present and may be ingested by engines. – Compare IN-FLIGHT ICING CONDITIONS. See GROUND ICING, AIRCRAFT ICING CONDITIONS.[152,161,172,174] [SAE AS6332, SW FOM, TC 622.11, TC TP 14052,]

***ground icing conditions**, with due regard to aircraft skin temperature and weather conditions, ground icing conditions exist when frost, ice, or snow is adhering or may adhere to the critical surfaces of an aircraft. Ground icing conditions also exist when active frost, frozen or freezing precipitation is reported or observed. [SAE AS6332]

ground icing program, see GROUND DEICING PROGRAM (the HARMONIZED TERM is ground deicing program; the Transport Canada designation is ground icing program).

ground roll, see TAKEOFF GROUND ROLL.

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.[150] [SAE AS6285]

***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. [SAE AS6285]

guard leg, [viscometry] a U-shaped band of metal that attaches to the viscometer and protects the SPINDLE and sensing shaft from accidental bumps and providing an outer boundary condition for the shearing action imparted to the fluid by the rotating spindle.[107] [McGregor]

guidance, **1.** advice or information aimed at resolving a problem or difficulty. **2.** [aircraft deicing] documentation from REGULATORs, aircraft manufacturers, fluid manufacturers, and other organizations, such as SAE and ICAO, to ensure safe departure in aircraft ground icing conditions.

gyroplane, a rotorcraft whose rotors are not engine-driven, except for initial starting, but are made to rotate by action of the air when the rotorcraft is moving; and whose means of propulsion, consisting usually of conventional propellers, is independent of the rotor system.[1] [14 CFR § 1.1]

hail, **1.** [meteorology] solid precipitation in the form of transparent or opaque small balls or irregular pieces of ice with a diameter of 5 mm or greater, falling from a convective cloud separately or frozen together. **2.** hail encompasses small hail, but the opposite is not true. **3**. the METAR code for hail in the United States is GR with remark ¼ or greater, in the rest of the world GR. **4.** [aircraft deicing] a precipitation for which there is no HOLDOVER TIME and no ALLOWANCE TIME except in the case of SMALL HAIL. **5.** [aviation] a type of precipitation that can cause impact damage to aircraft.[62,93,113,150,151,162,174,181] [Dunlop, ICAO 9640, NOAA FMH-1, SAE AS6285, SAE AS6286, SIAGDP, TC TP 14052, WestJet YYC]

***hail**, precipitation of small balls or pieces of ice with a diameter ranging from 5 to > 50 mm (0.2 to >2.0 in.) falling either separately or agglomerated. [SAE AS6285, SAE AS6286]

***hail**, precipitation in the form of small balls or other pieces of ice falling separately or frozen together in irregular lumps. Hail includes small hail, which is pellets of snow encased in a thin layer of ice which have formed from the freezing, either of droplets intercepted by the pellets, or of water resulting from the partial melting of the pellets. [NOAA FMH-1]

***hail**, precipitation of either transparent or partly or completely opaque particles of ice, usually spheroidal, conical or irregular in form with a diameter generally between 5 and 50 millimeters which fall from a cloud either separately or agglomerated into irregular lumps. [ICAO 9640]

hailstone, [meteorology] a single unit of hail, ranging in size from that of a pea to, on rare occasions, exceeding that of a grapefruit (i.e., from 5 mm to more than 15 cm in diameter).[8] [AMS Glossary]

hard water, **1.** water containing high concentration of naturally occurring salts, usually calcium or magnesium salts. **2.** [aircraft deicing fluids] divalent ions (e.g., calcium ions, magnesium ions) in hard water can interfere with the thickeners of Type II/III/IV fluids, thus reducing their viscosity. **3.** water with a high concentration of salts as defined in AMS1424 or AMS1428.[130,131] [SAE AMS1424, SAE AMS1428]

hard water stability, **1.** [unthickened aircraft deicing fluids] an ACCELERATED AGING Type I PASS-FAIL TEST that verifies the effect of HARD WATER (upon storage at high temperature for 30 days in a sealed container) on pH and the WATER SPRAY ENDURANCE TIME. **2.** [thickened aircraft deicing fluids] an accelerated aging test Type II/III/IV PASS-FAIL TEST (not normally performed on fluids intended for use only undiluted) that verifies the effect of hard water (upon storage at high temperature for 30 days in a sealed container) looking for separation, precipitation or insoluble deposits, and measuring pH and the water spray endurance time. [130,131] [SAE AMS1424, SAE AMS1428]

hard wing, **1.** a wing without a moveable LEADING EDGE device or SLAT. **2.** a wing with a fixed geometry leading edge.[68,74] [FAA General Info, FAA AC 120-60B]

harmonized term, [aircraft deicing] a word or combination of words representing a concept whose spelling is recommended by the SAE G-12 Steering Committee for use within the SAE G-12 documents and standards.[157] [Harmonization]

head of deicing training, the person responsible for ensuring effective delivery of deicing/anti-icing training to personnel for the whole organization and whose competence is documented. The head of deicing training may cumulate the positions of PROGRAM MANAGER, RESPONSIBLE PERSON or ACCOUNTABLE EXECUTIVE.[151] [SAE AS6286]

***head of deicing training**, the person responsible for ensuring the effective delivery of the deicing/anti-icing training of personnel for the whole organization. This person must have a complete understanding of the subject matter herein and a documented competence level. By agreement of the senior management team, this may also be the Program Manager/Responsible Person/Accountable Executive. [SAE AS6286]

heavy, see INTENSITY QUALIFIER.

heavy drizzle, see DRIZZLE.

heavy freezing drizzle, see FREEZING DRIZZLE.

heavy freezing rain, see FREEZING RAIN.

heavy rain, see RAIN.

heavy snow, see SNOW.

helicopter, **1.** means a rotorcraft that, for its horizontal motion, depends principally on its engine-driven rotors. **2.** a type of rotorcraft that uses powered rotors to achieve both lift and propulsion. Helicopters can hover, take off, and land vertically. – Compare ROTORCRAFT, POWERED-LIFT.[1] [14 CFR § 1.1]

helo, a colloquial word for HELICOPTER.

high concentration spent deicing fluid, fluid with glycol concentration suitable for recycling or anaerobic digestion.[135] [SAE ARP4902]

***high concentration fluids,** can be collected from active de/anti-icing and collected after a de/anti-icing event. These fluids may be suitable for recycling or anaerobic digestion. A Glycol Recovery Vehicle (GRV) can be used to vacuum deicing areas after spray. These vehicles can recover higher concentrations of glycol. It may be beneficial to slope and contour surfaces to allow collection of high concentrate at source. [SAE ARP4902]

high humidity, an atmospheric condition where the RELATIVE HUMIDITY is close to SATURATION.[93] [ICAO 9640]

high humidity endurance test (HHET), **1.** a laboratory test (intended to simulate frost conditions) that measures endurance time of anti-icing fluid under conditions of high humidity. **2.** a laboratory test defined in SAE AS5901. **3.** a PASS-FAIL TEST under AMS1424 and AMS1428. **4.** a test used to

classify Type I/II/III/IV fluids. **5.** one of the two tests that are used to evaluate fluids under the categorization "anti-icing performance." – The acronym HHET is used for both high humidity endurance test and high humidity endurance time. See ANTI-ICING PERFORMANCE.[99,130,131,138,140,146,174] [Laforte 1992, SAE AMS1424, SAE AMS1428, SAE ARP5718, SAE ARP6207, SAE AS5901, TC TP 14052]

high humidity endurance time (HHET), the result of the high humidity endurance test. – The acronym HHET is used for both high humidity endurance test and high humidity endurance time. See HIGH HUMIDITY ENDURANCE TEST, FLUID PROPERTIES.

high humidity on cold soaked wing, see RAIN ON COLD-SOAKED WING (the HARMONIZED TERM is rain on cold soaked wing).

high speed aircraft, 1. colloquial term for LARGE JET TRANSPORT AIRCRAFT as described in the AERODYNAMIC ACCEPTANCE TEST standard (SAE AS5900). **2.** an aircraft category defined by each aircraft manufacturer based on specific aircraft performance. – Compare MIDDLE SPEED AIRCRAFT, LOW SPEED AIRCRAFT. See HIGH SPEED RAMP TEST.[145] [SAE AS5900]

high speed ramp (HSR), see HIGH SPEED RAMP TEST.

high speed ramp test, **1.** an AERODYNAMIC ACCEPTANCE TEST performed to simulate LARGE JET TRANSPORT AIRCRAFT takeoffs, with rotation speeds exceeding 100 knots and a time from brake release to ROTATION SPEED greater than 20 seconds. **2.** a test conducted at 65 m/s (126 knots), representing a nominal speed at which an aircraft may safely become airborne with one engine inoperative (V_2), after a 25 second acceleration at 2.6 m/s^2. **3.** a test defined in AS5900. – See LOW SPEED RAMP TEST, MIDDLE SPEED RAMP TEST.[145] [SAE AS5900]

highest on-wing viscosity, **1.** the viscosity result as measured on the high viscosity sample, as defined in SAE AMS1428 during the initial Type II/III/IV qualification, subjected to several requirements including the AERODYNAMIC ACCEPTANCE TEST(s). **2.** viscosity result to which viscosity of samples from the field are compared to as an imperfect SURROGATE for aerodynamic acceptance testing of Type II/III/IV fluids. **3.** the upper limit of viscosity that must not be exceeded for sales specifications of Type II/III/IV fluids. – See SALES SPECIFICATION, VISCOSITY.[75,102,138,150,170] [FAA HOT, Guide, SAE ARP5718, SAE AS6285, TC HOT]

***highest on-wing viscosity** (HOWV), highest viscosity of a fluid which is still aerodynamically acceptable. [SAE AS6285]

***maximum on-wing viscosity** (MOWV): Refer to AMS1428 high viscosity. Fluids having a viscosity higher than the MOWV must not be used. [SAE ARP5718]

highest operational use concentration (HOUC) **of a Type I**, see TYPE I HIGHEST OPERATIONAL USE CONCENTRATION.

highest operational use refraction (HOUR) **of a Type I**, see TYPE I HIGHEST OPERATION USE REFRACTION.

highest usable precipitation rate (HUPR), the highest precipitation rate at which an endurance time data set can be used to determine holdover times.[138] [SAE ARP5718]

***highest usable precipitation rate** (HUPR), the highest precipitation rate at which an endurance time data set can be used to determine holdover times. [SAE ARP5718]

hindsight bias, **1.** [safety science, psychology] the tendency of an after-the-fact reviewer of an event to exaggerate his own ability to predict and prevent the outcome while not being aware of that bias. **2.** the tendency, after an event has occurred, to overestimate the extent to which the outcome could have been foreseen. Hindsight bias stems from (a) cognitive inputs—people selectively recall information consistent with what they now know to be true; (b) metacognitive inputs—people may misattribute their ease of understanding an outcome to its assumed prior likelihood; and (c) motivational inputs—people have a need to see the world as orderly and predictable. – See PLAN CONTINUATION BIAS.[10,60] [APA, Dekker 2014]

hoarfrost, **1.** [meteorology] a synonym for frost. **2.** [meteorology] a deposit of interlocking ice crystals (hoar crystals) formed by direct deposition on objects, usually those of small diameter freely exposed to the air, such as tree branches, plant stems and leaf edges, wires, poles, etc. **3.** [aircraft deicing] hoarfrost may form on the skin of an aircraft when a cold aircraft flies into air that is warm and moist or when it passes through air that is supersaturated with water vapor. The deposition of hoarfrost is similar to the process by which dew is formed, except that the frosted object must be below freezing. **4.** [aircraft deicing] term rarely used to describe white crystalline ice on an aircraft thin enough for surface features underneath, such as paint lines, markings, and lettering, particularly on the fuselage; more often it is called thin hoarfrost. – See THIN HOARFROST, FROST, DEWPOINT, FROST POINT, DEPOSITION, DEW, ICE CRYSTALS.[8,62,74,93,150,151,162,174] [AMS Glossary, Dunlop, FAA General Information, ICAO 9640, SAE AS6285, SAE AS6286, SIAGDP, TC TP 14052]

***frost/hoarfrost**, ice crystals that form from ice saturated air at temperatures below 0 °C (32 °F) by direct deposition on the ground or other exposed objects. [SAE AS6286]

***hoarfrost**, a synonym for frost. See frost/hoarfrost. [ŜAE AS6285]

***hoarfrost**, a greyish-white crystalline deposit of frozen water vapor formed on surfaces in clear, still weather. [ICAO 9640]

***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. [SAE AS6285]

holdover time (HOT), **1.** the estimated time between the initial application to an aircraft of an anti-icing fluid subjected to precipitation until its visual failure at a predefined level of frozen contamination on the treated aircraft surfaces. **2.** time ranges of estimated protection against precipitation as published in holdover time tables for specified precipitation conditions and ranges of outside air temperature. **3.** holdover time published in the holdover tables as derived from regression analysis of endurance times. **4.** a holdover time generated by a holdover time determination system. **5.** a holdover time estimated by the pilot-in-command based on situational awareness and the holdover time guidelines. **6.** for flight operations, the objective of holdover time is that it be equal to or greater than the estimated time from start of anti-icing to start of takeoff based on existing weather conditions. – See VISUAL FAILURE, SITUATIONAL AWARENESS. Compare ENDURANCE TIME, ALLOWANCE TIME, PROTECTION TIME.[63,64,68,70,93,108,138,140,150,151,167,172,174] [EASA EU Reg, EASA SIB 2008-09, FAA AC120-60B, FAA AC 150/5300-14D, ICAO 9640, Myers, SAE ARP5718, SAE ARP6207, SAE AS6285, SAE AS6286, Southwest FOM, TC 622.11, TC TP 14052]

***holdover time**, **e**stimated 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. [SAE AS6285]

***holdover time**, time, from the initial application of fluid, that an anti-icing fluid is expected to provide protection of an aircraft against freezing or frozen precipitation. Holdover times are derived primarily from visual inspection of fluids exposed to freezing and frozen precipitation. [SAE ARP5718]

***holdover time (HOT)**, time, from the initial application of anti-icing fluid, that a fluid is expected to provide protection of an aircraft against freezing or frozen precipitation. Holdover times are derived primarily from visual inspection of fluids exposed to freezing and frozen precipitation. [SAE ARP6207]

***holdover time,** the estimated time between the initial application to an aircraft of an anti-icing fluid subjected to precipitation until its visual failure at a predefined level of frozen contamination on the treated aircraft surfaces. [SAE ARP6852]

***holdover time,** the time between the fluid being applied and its eventual failure to prevent icing is known as the holdover time (HOT). [SAE AS6286]

***holdover time**, 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 aircraft. [ICAO 9640]

***holdover time**, the estimated time that an application of deicing/anti-icing fluid is effective in preventing frost, ice, or snow from adhering to treated surfaces. Holdover time is calculated as beginning at the start of the final application of deicing/anti-icing fluid and as expiring when the fluid is no longer effective. A holdover time may be one which is published by Transport Canada in the holdover timetables or one generated by a Holdover Time Determination System. [TC 622.11]

holdover time determination system (HOTDS), a near real-time automated system that samples numerous weather conditions and uses these in conjunction with holdover time regression curves for specific deicing/anti-icing fluids to produce a HOLDOVER TIME DETERMINATION SYSTEM REPORT.[167,172,174] [TC AC 700-061, TC 622.11, TC TP 104052]

***holdover time determination system** (HOTDS), means a near real-time system that samples a number of atmospheric inputs and uses these in conjunction with HOT regression curves and associated coefficients for specific de/anti-icing fluids to produce a holdover time determination report; a valid HOTDS will meet the Minimum Assurance Requirements and Performance Specifications for HOTDS as set out by the Minister. [TC 622.11]

holdover time determination system report (HOTDR), a holdover time generated by a HOLDOVER TIME DETERMINATION SYSTEM.[172] [TC 622.11]

holdover time guideline, a table with holdover times for various precipitation conditions and temperatures along with cautions and notes giving guidance to deicing crew and flightcrew. – Synonym: HOLDOVER TIME TABLE. See HOLDOVER TIME GUIDELINES.

holdover time guidelines, **1.** plural of holdover time guideline. **2**. set of holdover time guidelines published annually by the FAA and Transport Canada along with other ground deicing guidance such as adjusted holdover times guidelines, allowance times, adjusted allowance time guidelines, FLUID APPLICATION GUIDELINES, list of qualified fluids, fluid qualification expiry dates, fluid manufacturer viscosity measurement methods, snowfall intensity vs visibility table, list of testing laboratories, and list of fluid manufacturers. – See HOLDOVER TIME GUIDELINE, QUALIFICATION EXPIRY DATE. [75,108,129,138,140,150,170,174] [FAA HOT, Myers, SAE AIR6232, SAE ARP5718, SAE ARP6207, SAE AS6285, TC HOT, TC TP 14052]

***holdover time guideline**, a table giving the holdover time for various precipitation conditions and temperatures, with cautions and notes, giving guidance to ground deicing/anti-icing crews and pilots. The "holdover time guideline" is also often referred to as the "holdover time table". [SAE AIR6232]

***holdover time guideline**, a table giving the holdover time for various precipitation conditions and temperatures with cautions and notes giving guidance to ground deicing/anti-icing crews and pilots. The "holdover time guideline" is also often referred to as "holdover time table." [SAE ARP5718]

***holdover time guideline**, a table giving the holdover time for various precipitation conditions and temperatures with cautions and notes giving guidance to ground deicing/anti-icing crews and pilots. The "holdover time guideline" is also often referred to as "holdover time table".[SAE ARP6207]

***holdover time guidelines** give an indication as to the time frame of protection that could reasonably be expected under conditions of precipitation. However, due to the many variables that can influence holdover time, these times should not be considered as minima or maxima, as the actual time of protection may be extended or reduced, depending upon the particular conditions existing at the time, such as strong winds, jet blast, etc. Aircraft surfaces with steeper angles (e.g., vertical stabilizer, deployed flaps, etc.) might also have an effect on holdover times that needs to be considered. [SAE AS6285]

***holdover time guidelines** are established and published by the FAA and TC. The responsibility for the application of this data remains with the user. [SAE AS6285]

holdover time range, the time interval given numerically in hours and minutes by the two holdover times presented in a holdover time table for a given precipitation for a given temperature range; *the holdover time range for Type I on aluminum surfaces for freezing drizzle at -3 °C and above is 0:09–0:13*.[68,75,170] [FAA 120-60B, FAA HOT, TC HOT]

holdover time regression curve, graphical representation of temperature and precipitation rate generated in REGRESSION ANALYSIS using power law based models.[167] [TC AC700-061]

holdover time table, see HOLDOVER TIME GUIDELINE.[151] [SAE AS6286]

holdover time tables, see HOLDOVER TIME GUIDELINES.[67,172,174] [FAA AC 120-112, TC 622.11, TC TP 14052]

horizontal stabilizer, [aircraft components] a fixed stabilizing surface part of the HORIZONTAL TAIL.[158] [Shevell]

horizontal tail, [aircraft components] a stabilizing surface at the rear of the aircraft often divided into smaller parts, such as a forward fixed part called the HORIZONTAL STABILIZER and a moveable control surface called the ELEVATOR.[158] [Shevell]

hotel mode, activating the propeller brake allowing the engine to run while the propeller is stationary; *hotel mode allows engines-on deicing*.[25,26,177] [ATR42-300, ATR42-500, TSB]

hydrogen embrittlement, **1.** [metallurgy] a phenomenon where hydrogen is absorbed and diffuses in metals, leading to a decrease in mechanical properties such as ductility, toughness, and strength, and contributing to crack growth, fracture initiation, and ultimately catastrophic failure of high strength materials. **2.** [aircraft deicing fluids, runway deicing products**]** hydrogen embrittlement is included in the requirements for deicing/anti-icing fluids and is generally classified under MATERIALS COMPATIBILITY. **3.** [deicing fluids] hydrogen embrittlement is tested according to ASTM F519.[17,130,131,132,133,160] [ASTM F519, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS 1435, Sobola]

hydrometeors, [meteorology] atmospheric water in any form, whether as solid, liquid or vapor.[62] [Dunlop]

hydrophilic, having an affinity for water.[156] [Schaschke]

hydrophilic surface, [surface chemistry] a surface producing a CONTACT ANGLE of $\theta < 90$ degrees.[129] [SAE AIR6232]

***hydrophilic surface**, a surface producing a contact angle of $\theta < 90$ degrees. [SAE AIR6232]

hydrophobic, lacking an affinity for water.[156] [Schaschke]

hydrophobic surface, [surface chemistry] a surface producing a CONTACT ANGLE of $\theta > 90$ degrees.[129] [SAE AIR6232]

***hydrophobic surface**, a surface producing a contact angle of $\theta > 90$ degrees. [SAE AIR6232]

hygroscopic, describing a substance that can absorb and retain water.[156] [Schaschke]

ice, **1.** the solid PHASE of water. **2.** [runway contaminants] the solid FORM of frozen water.[69,108,174] [FAA AC 150/5200-30D, Myers, TC TP 14052]

ice crystals, **1.** [meteorology] a fall of unbranched (snow crystals are branched) ice crystals in the form of needles, columns, or plates. **2.** a precipitation with METAR code IC. **3.** [aircraft deicing] a precipitation condition that has the same holdover times as FREEZING FOG and FREEZING MIST. – Synonym: DIAMOND DUST (METAR code IC).[75,113,170] [FAA HOT, NOAA FMH-1, TC HOT]

***ice crystals**, a fall of unbranched (snow crystals are branched) ice crystals in the form of needles, columns, or plates. [NOAA FMH-1]

ice crystals mixed with freezing fog or mist, a precipitation condition used with the holdover time of FREEZING FOG.[75,170] [FAA HOT, TC HOT]

ice fog, [meteorology] a type of fog, composed of suspended particles of ice, partly ice crystals 20 to 100 µm in diameter but chiefly when dense, ice crystals 12–20 µm in diameter. – Compare FOG.[8] [AMS Glossary].

ice melting capacity, [runway deicing products] the ratio of the mass of ice melted divided by the mass of the runway deicing product as performed in the ICE MELTING TEST.[146] [SAE AS6170]

ice melting test, **1.** [runway deicing products] a quantitative comparative test to evaluate the amount of ice melted by a runway deicing product as a function of time and temperature. The tests are performed with the runway deicing product and a reference control solution, potassium acetate 25% weight/weight, at -2 °C and -10 °C and for 5, 10 and 30 minutes. The output of this test is the ICE MELTING CAPACITY which is the (mass of ice melted)/(mass of runway deicing product) and presented in table form and in a graph comparing ice melting capacity of the tested product to that of the control solution. **2.** a DETERMINE AND REPORT TEST for runway deicing products in AMS1431 and AMS1435. –Compare ICE PENETRATION TEST, ICE UNDERCUTTING TEST.[132,133,147] [SAE AMS1431, SAE AMS1435, SAE AS6170]

ice nucleus, [meteorology] any airborne particle that serves as a nucleus leading to the formation of ice crystals without first forming water droplets. – Synonym: DEPOSITION NUCLEUS.[8] [AMS Glossary]

ice pellets, **1.** [meteorology] transparent or translucent particles of ice that are round or irregular, rarely conical, and have a diameter of 5 mm (0.2 inch) or less. Ice pellets consist of frozen raindrops or largely melted and refrozen snowflakes and may or may not have a liquid core. **2.** METAR code for ice pellets PL (formerly PE). **3.** [aircraft deicing] a precipitation with allowance times. – See ALLOWANCE TIME.[50,93,113,150, 151,162,174] [ICAO 9640, MANOBS, NOAA FMH-1, SAE AS6285, SAE AS6286, SIAGDP, TC TP 14052]

***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. [SAE AS6285, SAE AS6286]

***ice pellets**, hard grains of ice consisting of frozen raindrops, or largely melted and refrozen snowflakes. Ice pellets are transparent or translucent pellets of ice, which are round or irregular, rarely conical, and which have a diameter of 0.2 inch (5 mm), or less. [NOAA FMH-1]

***ice pellets**, precipitation of transparent ice particles which fall from a cloud. These particles are usually spheroidal or irregular, rarely conical. Their diameter is less than 5 millimeters. [ICAO 9640]

***ice pellets**, precipitation of transparent or translucent pellets of ice that are spherical or irregular, rarely conical, having a diameter of 5 mm or less. Ice pellets are subdivided into two main types: a) frozen raindrops, or snowflakes that have largely melted and then refrozen, the freezing process usually taking place near the ground (they generally fall as continuous precipitation), b) pellets of snow encased in a thin layer of ice that has formed from the freezing, either of droplets intercepted by the pellets, or of water resulting from the partial melting of the pellets (they occur as showers). [MANOBS]

ice penetration test, **1.** [runway deicing products] a quantitative comparative test to evaluate the amount of ice penetration by a runway deicing product as a function of time and temperature. The tests are performed with the runway deicing product and a reference control solution, potassium acetate 25% weight/weight, at -2 °C and -10 °C and for 5, 10 and 30 minutes. The tests are done in quadruplicate using four test tubes for the test solution and the control solution. The output of this test is the ice penetration average in mm for each set of four test tubes and presented in table form and in a graph comparing ice penetration of the tested product and that of the control solution. **2**. a DETERMINE AND REPORT TEST for runway deicing products in AMS1431 and AMS1435. – Compare ICE MELTING TEST, ICE UNDERCUTTING TEST. [132,133,149] [SAE AMS1431, SAE AMS1435, SAE AS6211]

ice undercutting test, **1.** [runway deicing products] a quantitative comparative test to evaluate the amount of ice undercutting by a runway deicing product as a function of time and temperature. The tests are performed with the runway deicing product and a reference control solution, potassium acetate 50% weight/weight, at -2 °C and -10 °C and for 5, 10 and 30 minutes. The output of this test is the ice undercutting area presented in table form and in a graph comparing ice undercutting area of the tested product and that of the control solution. **2**. a DETERMINE AND REPORT TEST for runway deicing products in AMS1431 and AMS1435. – Compare ICE MELTING TEST, ICE PENETRATION TEST.[132,133,148] [SAE AMS1431, SAE AMS1435, SAE AS6172]

icehouse, **1.** the control center at a deicing facility that coordinates and monitors all operations. **2.** the building that houses the control center.[137,143,174] [SAE ARP5660, SAE AS5635, TC TP 14052]

***icehouse**, the building housing the control center (and possibly vehicle garaging, fluid storage, and personnel facilities) at the deicing facility. [SAE AS5635]

***icehouse**, generalized term to describe DDF tower coordination center, remotely dedicated office space, or mobile supervisory vehicle which coordinates operations at the assigned deicing facility. [SAE ARP5660]

***icehouse**, the building housing the control center (and possibly vehicle garaging, fluid storage, and personnel facilities) at the deicing facility. [SAE AS5635]

iceman, **1.** synonym for DEICING COORDINATOR. **2.** callsign assigned to the deicing coordinator at any deicing facility including, CENTRAL DEICING FACILITY, DESIGNATED DEICING FACILITY, TERMINAL DEICING FACILITY, REMOTE DEICING FACILITY, or DEICING BAY.[137] [SAE ARP5660]

***iceman**, coordinator of specific deicing/anti-icing ground positions. The iceman is located in the icehouse and is a person who communicates with the PIC via VHF radio and/or new communication platforms that utilize EFBs (e.g., electronic tablets/iPads) in cockpits and deicing vehicles. The iceman (icehouse personnel) can interact with the flightcrew and deicers using web-based dispatching. For pad operations, including movement configuration and guidance, electronic message boards are now commonly used at DDFs. The iceman provides general deicing/anti-icing information and provides directions to the PIC before making contact with the ground coordinator and/or with the deicing coordinator. [SAE ARP5660]

icephobic surface, a surface producing a reduction in ice adhesion.[129] [SAE AIR6232]

icing conditions, a combination of GROUND ICING CONDITIONS and IN-FLIGHT ICING CONDITIONS.

illuminance, the amount of visible light power incident per unit area of a surface measured in lux (lumens/meter^2) or foot-candles (lumens/foot^2).[144] [SAE AS5681]

impact ice, colloquial name for ice forming on aircraft in flight, mainly because of supercooled water droplets, freezing of liquid water, or the transition of water vapor directly to ice. – See ACCRETION ICE, IN-FLIGHT ICING, SUPERCOOLED WATER.

impingement, **1.** [mechanical engineering] fluid striking a surface. **2.** [aircraft deicing] a cause of permanent (irreversible) viscosity reduction when Type II//III/IV hit a surface with excessive force (e.g., a sample bottle held too close to a nozzle). – See SHEAR DEGRADATION, SHEAR FORCE.[24] [Atkins]

independent laboratory, a subset of INDEPENDENT TEST FACILITY.

independent test facility, **1.** a research laboratory or test facility that operates without affiliation to manufacturers, suppliers, or developers of the products it evaluates. **2.** [aircraft deicing, runway deicing] a test facility not involved in the development, formulation, or commercialization of deicing products ensuring that its testing, analysis, and qualification processes remain objective, unbiased, and compliant with industry standards. Independent test facilities play a critical role in verifying the performance, environmental impact, and regulatory compliance of deicing and anti-icing products, adhering to standardized methodologies established by industry organizations and regulators. – Quasi synonym: INDEPENDENT LABORATORY.[130,131] [SAE AMS1424, SAE AMS1428]

index of refraction, see REFRACTIVE INDEX.[102] [Guide]

in-flight icing, ice forming on aircraft in flight (colloquially called IMPACT ICE), mainly as a result of supercooled water droplets, freezing of liquid water, or the transition of water vapor directly to ice – See IN-FLIGHT ICING CONDITIONS. Compare GROUND ICING, ENGINE ICING, PROPELLER ICING.[177] [TSB]

in-flight icing conditions, conditions when the TOTAL AIR TEMPERATURE is 10° C or below and VISIBLE MOISTURE is present. – Compare GROUND ICING CONDITIONS, AIRCRAFT ICING CONDITIONS. See IN-FLIGHT ICING, GROUND ICING, ENGINE ICING, PROPELLER ICING.[161] [SW FOM]

infrared heat deicing, a method of deicing using infrared (IR) thermal energy.[174] [TC TP 14052]

infrared temperature gun, colloquial name for INFRARED THERMOMETER.

infrared thermometer, **1.** an instrument used to indirectly measure surface temperature from a distance (non-contact) that works by measuring the emitted infrared radiation wavelength and power emitted by an object. **2.** [aircraft deicing] an instrument used to measure the temperature of fluid (usually Type I) coming out of a nozzle. This method of measuring is subject to error as a) it needs adjustment for the surface being measured, b) it does not measure internal temperature but rather surface temperature, and c) it is affected by frost, moisture, steam and rapid changes in temperature. When inaccuracy or error is suspected, a measurement with contact, such as with a BULB THERMOMETER or THERMOCOUPLE, is preferred. – Colloquial names for infrared thermometer: INFRARED TEMPERATURE GUN, LASER THERMOMETER, POINT AND SHOOT THERMOMETER. See THERMOMETER.[52] [Claus]

initial aircraft deicing fluid qualification, see INITIAL QUALIFICATION.

initial climb, phase of flight that begins when the aircraft leaves the surface, and a climb pitch attitude has been established. Normally, it is considered complete when the airplane has reached a safe maneuvering altitude or an enroute climb has been established. See CLIMB, PITCH, ATTITUDE.[71] [FAA H-8083-3C]

initial qualification (IQ), **1.** [aircraft deicing fluids and runway deicing fluids] process by which a product is tested for all technical requirements of the specification and for which qualification test reports are issued. **2.** for Type I the initial qualification tests are described in AMS1424, for Type II/III/IV in AMS1428, for solid runway deicing products in AMS1431, and for liquid runway deicing products in AMS1435. **3.** to commercialize Type I fluids it is also necessary to perform endurance time testing described in ARP5945 to obtain holdover times—the entire qualification process is described in ARP6207. **4.** to commercialize Type II/III/IV fluids it is also necessary to perform endurance time testing described in ARP5485 to obtain holdover times—the entire qualification process is described in ARP5718. **5.** the first manufacturer to obtain an initial qualification for given product is the ORIGINAL MANUFACTURER or ORIGINAL VENDOR. **6.** initial qualification is subject to an expiration date which can be extended by performing a periodic requalification in a timely manner. **7.** initial qualification samples are often prepared in the laboratory. Thus, it is generally necessary to obtain not only an initial qualification but also to qualify a sample from a production unit as either a SITE QUALIFICATION or UNIT QUALIFICATION. – See QUALIFICATION TEST REPORT. Compare PERIODIC REQUALIFICATION, MULTIPLE LOCATION

QUALIFICATION.[130,131,132,133,136,138,139,140] [SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435, SAE ARP5485, SAE ARP5718, SAE ARP5945, SAE ARP6207].

initial qualification training, [aircraft deicing] mandatory training program that ensures that new personnel involved in deicing operations, including flightcrews, are instructed with the latest procedures, safety protocols, and best practices. *For example (taken from AS6286), this training covers topics such as basic knowledge of aircraft performance, the effects of frozen contamination on aircraft performance, the CLEAN AIRCRAFT CONCEPT, meteorological considerations for ice formation, how to check CRITICAL SURFACES, removal of frozen contamination, deicing/anti-icing with fluids, characteristics of deicing/anti-icing fluids, types of fluid checks, deicing equipment, fluid application, HOLDOVER TIMES and ALLOWANCE TIMES, communication procedures, critical surfaces and instruments, safety precautions and human factors, environmental impact and mitigation, deicing facility operations, quality management, local rules and restrictions, and airport procedures.* – Compare ANNUAL RECURRENT TRAINING.[74, 151,172] [FAA General Info, SAE AS6286, TC 622.11]

initial runway deicing product qualification, see INITIAL QUALIFICATION.

initial shipment, [aircraft deicing fluids, runway deicing products] describes the shipment of deicing fluid or runway deicing product the first time it is shipped by a vendor (original manufacturer or licensee) from a production unit or site to a purchaser. The product from each site and/or production unit must be qualified before an initial shipment is made from that production unit or site. – See INITIAL QUALIFICATION, MULTIPLE LOCATION QUALIFICATION, SITE QUALIFICATION, UNIT QUALIFICATION.[130,131,132,133] [SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

inlet duct, [aircraft engine] a passage that directs and guides the incoming air towards the engine compressor section. It is typically located at the front of the engine, attached to the engine NACELLE. The inlet duct is susceptible to icing.

in-service limits, **1.** a set of quality control limits for fluid sampled from storage tanks, trucks, and nozzles of users, airlines or service providers. **2.** in-service limits are related to sales specification limits but take into consideration that in-service tests are measured with FIELD INSTRUMENTs whereas generally SALES SPECIFICATION tests use LABORATORY INSTRUMENTs. – Synonym: IN-USE LIMITS.[102,150] [Guide, SAE AS6285]

intake, [aircraft engine] the part of the engine that consists of the INLET DUCT, ENGINE INLET, and other components responsible for directing and channeling the incoming air into the ENGINE CORE. The engine intake is susceptible to icing.

intensity qualifier, [meteorology] a way to describe current weather in terms of its intensity. The intensity qualifiers are light (-), moderate (no METAR symbol used), and heavy (+); *light snow (-SN), moderate snow (SN), heavy snow (+SN).*[113] [NOAA FMH-1]

intermediate bulk container (IBC), an industrial grade container for handling, transporting and storing liquid containing of a capacity less than 3000 liters; common sizes are 1000 liters (about 275 USG) and 1200 liters (about 330 USG). IBCs are designed to be handled by forklifts or pallet

jacks, and include a metal framework on the bottom that makes them easy to move and stack. – Synonym: TOTE.[27,175] [Basco, TC IBC]

in-truck proportional mixing, a system on board a DEICING VEHICLE to mix a deicing/anti-icing fluid with water to achieve a target concentration or freezing point. – Compare DEICING FLUID BLENDER. Quasi synonym: PROPORTIONAL MIXING.

in-use limits, see IN-SERVICE LIMITS (the preferred term is in-service limit).[102] [Guide]

is/are required, **1.** required. **2.** [aircraft deicing regulatory] mandatory term to convey the intent of meeting a regulatory requirement or other requirement, e.g., SAE STANDARD. – See MUST, SHALL.[75,170] [FAA HOT, TC HOT]

ISO container, see ISOTAINER.

ISO tank container, see ISOTAINER,

ISOtainer, an intermodal container for liquids or gases, typically with a capacity of 14,000 to 28,000 liters (about 3700 to 6900 USG). Synonyms: ISO container or ISO tank container.[53] [Container]

issue date, [SAE] see SAE STANDARD.

key performance indicator (KPI), a quantifiable measure used to evaluate the success of an organization, employee, operation, etc., in meeting objectives for performance.[137] [SAE ARP5660]

***key performance indicator** (KPI), a quantifiable measure used to evaluate the success of an organization, employee, operation, etc., in meeting objectives for performance. [SAE ARP5660]

laboratory instrument, [chemistry] a measurement instrument designed for use within controlled laboratory conditions, used for precise and accurate measurement, typically more complex and sensitive than field instruments; *an Abbe refractometer*, *a Brookfield viscometer*, *and a RHEOMETER are examples of laboratory instruments* – Compare FIELD INSTRUMENT. See FIELD TEST.

laminar flow, **1.** [qualitative definition] flow regime of a fluid (gas or liquid) that flows in the direction of flow, smoothly and regularly, without fluctuations or turbulence. In laminar flow the fluid particles flow in layers, each layer moving smoothly past the other with minimal lateral mixing. **2.** in laminar flow, viscous forces dominate over the kinetic energy forces. The flow is predictable and stable. **3.** increased flow rates or irregularities, such as roughness, on the surface over which the particles flow can initiate disturbances and create turbulence. – Compare TURBULENT FLOW. See TRANSITION, REYNOLDS NUMBER.[24,106,156,158] [Atkins, MW, Schaschke, Shevell]

laboratory batch, **1.** [manufacturing] a small scale limited quantity of product that is made in a laboratory setting. Laboratory batches play a critical role in ensuring the feasibility and quality of product before a full scale industrial scale begins. **2.** [aircraft deicing fluids] the INITIAL QUALIFICATION of Type I//II/III/IV fluids is made on product produced in the laboratory. It must

be followed by a production UNIT QUALIFICATION or SITE QUALIFICATION. – Compare PRODUCTION BATCH. See BATCH, LOT. [130,131] [SAE AMS1424, SAE AMS1428]

large jet transport aircraft, see HIGH SPEED AIRCRAFT.

large turboprop aircraft, see MIDDLE SPEED AIRCRAFT.

laser thermometer, colloquial name for INFRARED THERMOMETER.

latent failure, [fluid failure] a latent failure is one that is inherently undetected when it occurs.[144] [SAE AS5681]

***latent failure**, a latent failure is one that is inherently undetected when it occurs. [SAE AS5681]

latent heat, **1.** [chemistry] the quantity of heat released or absorbed as a substance changes phase at constant temperature, e.g., from solid to liquid, from liquid to solid, from liquid to gas or vapor, from gas or vapor to liquid, from solid to gas or vapor, from gas or vapor to solid (heat released). **2.** [meteorology] latent heat as it applies to the three phases of water: ice, liquid water and water vapor. **3.** [aircraft deicing] in the formation of frost on an aircraft the energy released by the freezing of water or direct DEPOSITION of ice can slow the initial rate of freezing or deposition but it will not prevent it as this latent heat will be diffused by convection or conduction.[62,119,177] [Dunlop, Rennie, TSB]

latent heat of fusion, latent heat of a substance changing phase from solid to liquid or liquid to solid.

latent heat of sublimation, latent heat of a substance changing phase from solid to gas or vapor, or gas or vapor to solid.

latent heat of vaporization, latent heat of a substance changing phase from liquid to gas or vapor, or from gas or vapor to liquid.

lateral axis, [aerodynamics] an imaginary line passing through the center of gravity of an airplane and extending across the airplane from wingtip to wingtip. See AXES OF AN AIRCRAFT.[71] [FAA H-8083-3C]

layered contaminant [runway contaminant], a combination of the definitions for each of the contaminants. For example, the definition of "wet snow over ice" is "snow that has grains coated with liquid water, which bonds the mass together, but that has no excess water in the pore space" over "the solid form of frozen water." [69] [FAA 150-5200-30D]

leading edge, **1.** [aircraft component] the part of the AIRFOIL that meets the airflow first; *the leading edge of the wing, the leading edge of the horizontal stabilizer, the leading edge of the vertical stabilizer*. 2. the front part of an airfoil upon which an oncoming flow divides.[24, 71] [Atkins, FAA H-8083-3C]

lethal concentration 50% (LC_{50}), [ecotoxicity] the concentration that causes death in 50% of the test population. – Compare EFFECTIVE CONCENTRATION 50%. See AQUATIC TOXICITY.

licensee, **1.** [aircraft deicing fluids and runway deicing products] an organization, independent from the original manufacturer, that has obtained an authorization (license) from the ORIGINAL MANUFACTURER to produce an aircraft deicing fluid or a runway deicing product. The licensee must qualify the product manufactured at its site(s); *a licensee purchasing an additive package from an original manufacturer to produce a recycled Type I fluid*. **2.** for Type I aircraft deicing fluids the licensee site qualification consists of a) an initial qualification if the manufacturing process (including materials) is not essentially the same as of the original fluid manufacturer or b) aerodynamic test(s) and a single water spray endurance time (three panels only) if the manufacturing process is essentially the same as the original manufacturer. **3.** for Type II/III/IV aircraft deicing fluids the licensee site qualification consists of a) an initial qualification if the manufacturing process (including materials) is not essentially the same as of the original fluid manufacturer or b) aerodynamic test(s), a single water spray endurance time (three panels only), and viscosity if the manufacturing process is essentially the same as the original manufacturer. **4.** for runway deicing products, the licensee site qualification consists of an initial qualification. – See INITIAL QUALIFICATION, PERIODIC REQUALIFICATION, MULTIPLE LOCATION QUALIFICATION, SUBCONTRACTOR, ORIGINAL MANUFACTURER. Compare VENDOR, DISTRIBUTOR, PURCHASER.[130,131,132,133] [SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

lift, **1.** [aerodynamics] an aerodynamic force acting on the aircraft (or body) in a direction perpendicular (normal or vertically upward) to its relative motion through the air (or fluid). **2**. one of the main four forces acting upon an aircraft, the others being DRAG, THRUST, and WEIGHT.[24,71,110,158] [Atkins, FAA H-8083-3C, NASA Lift, Shevell]

liftoff, [aerodynamics] when the wings are lifting the aircraft off the ground. This is generally the result of the pilot rotating the nose up to increase the ANGLE OF ATTACK. – See LIFTOFF SPEED.[71] [FAA H-8083-3C]

liftoff speed (V_{lof}), [aerodynamics] the speed at which the aircraft becomes airborne (i.e., leaves the ground). – See MINIMUM CONTROL SPEED, TAKEOFF DECISION SPEED, ROTATION SPEED, MINIMUM UNSTICK SPEED, TAKEOFF SAFETY SPEED.[145,158] [SAE AS5900, Shevell]

light, see INTENSITY QUALIFIER.

light drizzle, see DRIZZLE.

light freezing drizzle, see FREEZING DRIZZLE.

light freezing rain, see FREEZING RAIN.

light hoarfrost, see THIN HOARFROST.

light rain, see RAIN.

light snow, see SNOW.

light snow grains, see SNOW GRAINS.

light snow pellets, see SNOW PELLETS.

liquefaction, the process of conversion of a gas into a liquid using vapor compression, refrigeration, ADIABATIC expansion, or gas expansion through a porous plug. The process of dissolving a salt in water is dissolution, not liquefaction. – Compare DISSOLUTION.[102,119] [Guide, Rennie]

liquid filled temperature gauge, a gauge in which liquid expands as temperature increases, thereby creating a mechanical motion which is then read on an analog temperature numbered scale or digital readout. – See TEMPERATURE GAUGE.

liquid water equivalent (LWE) **rate**, the real-time rate of liquid water equivalent accumulation of freezing or frozen precipitation in $g/dm^2/h$ where liquid water equivalent refers to the amount of water in freezing precipitation or the amount of liquid water produced if the frozen precipitation were melted.[67] [FAA 120-112]

liquid water equivalent system (LWES), **1.** an automated weather measurement system that determines the real-time liquid water equivalent precipitation rate in conditions of frozen or freezing precipitation and provides flightcrews with continuously updated information on the fluid holdover time under varying weather conditions. **2.** when using a liquid equivalent system for the determination of holdover time, pilots should always consider METAR reports and visual observation to verify the LWES report. – See HOLDOVER TIME, ALLOWANCE TIME, METAR.[63,67,76,93] [EASA EU Reg, FAA 120-112, FAA InFO 25003, ICAO 9640]

***liquid water equivalent system** (LWES), an automated weather measurement system that determines the liquid water equivalent (LWE) rate of the frozen or freezing precipitation. The LWE rate is then used by the system together with the appropriate anti-icing fluid endurance time data to determine the HOT. This information is typically presented electronically to the pilot as a HOT value or similar concepts that also incorporate the time of anti-icing fluid application. [ICAO 9640]

list of fluids tested for anti-icing performance and aerodynamic acceptance, lists of fluids (Type I, II, III and IV) meant to be used with the holdover times published in the FAA and Transport Canada *Holdover Time Guidelines*. This list is updated at least annually. These lists are often referred to as the FAA/TRANSPORT CANADA LISTS OF FLUIDS – Compare LIST OF VALIDATED FLUIDS.[75,170] [FAA HOT, TC HOT]

list of validated fluids, a list of fluids meant to be used with the allowance times published in the FAA and Transport Canada *Holdover Time Guidelines*. This list is updated at least annually. Generally, the FAA list and the Transport Canada list of validated fluids are identical – Compare FAA/TRANSPORT CANADA LISTS OF FLUIDS. See VALIDATED FLUID.[75,170] [FAA HOT, TC HOT]

lo**calized frost**, [aircraft deicing] the limited formation of frost in localized wing areas that have been cooled by cold fuel or large masses of cold metal in the wing structure; this type of frost does not cover the entire wing. – See COLD-SOAKED FUEL FROST.[150] [SAE AS6285]

***localized frost**, 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. [SAE AS6285]

longitudinal axis, an imaginary line through an aircraft from nose to tail, passing through its center of gravity. Movement of the AILERONS rotates an airplane about its longitudinal axis. – Synonym: ROLL AXIS. See AXES OF AN AIRCRAFT.[71] [FAA H-8083-3C]

lot, **1.** a quantity of material assumed to be a single population for sampling purposes; a lot may consist of one or several batches. **2.** a lot will be assigned a LOT NUMBER which ensures traceability. – Compare BATCH. See LOT ACCEPTANCE TESTS. [102,88,130,131.132,133] [Guide, Hibbert, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

***lot**, product produced in one continuous manufacturing operation from the same batches of raw materials and presented for vendor's inspection at one time. [SAE AMS1431, SAE AMS1435]

***lot, Type I**, fluid produced in one continuous manufacturing process from the same batches of raw materials and presented for the vendor's inspection at one time. [SAE AMS1424]

***lot, Type IV** fluid produced in one continuous manufacturing process from the same batches of raw materials and presented for the vendor's inspection at one time. [SAE AMS1428]

lot acceptance tests, **1.** series of tests conducted on a sample from a production lot to determine if it is acceptable or not. **2.** [aircraft deicing fluids, runway deicing products] the series of tests on a REPRESENTATIVE SAMPLE as defined in AMS1424, AMS1428, AMS1431 or AMS1435 to accept a production lot. These specifications require the lot acceptance test results to be written up in a CERTIFICATE OF ANALYSIS. **3.** [aircraft deicing fluids, runway deicing products] the manufacturers of aircraft deicing fluids and runway deicing products set up their lot acceptance criteria in a SALES SPECIFICATION. The production lots are tested and the results documented in certificate of analysis. – See LOT, BATCH, PRODUCTION BATCH, PRODUCTION LOT. [58,130,131,132,133] [DAU, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

lot number, a number assigned to a LOT to ensure traceability.

low concentration spent deicing fluid, fluid with glycol concentration suitable (such as snow melting, subsurface retention, and rain events) for sending to sanitary sewers (with appropriate agreement between deicing service provider and the water treatment plant), or to a waste disposal provider. – See SPENT DEICING FLUID. [135] [SAE ARP4902]

***low concentration fluids**, (snow melting, subsurface retention, and rain events) may be sent to municipal sanitary sewers (with appropriate agreement between DDF operator and water treatment plant), or to a waste provider for destruction. [SAE ARP4902]

low shear rate viscosity, **1.** (aircraft deicing fluids) a VISCOSITY measured on Type II/III/IV fluids at low shear rate using a Brookfield ROTATIONAL VISCOMETER (or equivalent) at a ROTATIONAL RATE of 0.3 rpm. **2.** the other measurement parameters are set by the fluid manufacturers and must be reported with the VISCOSITY value. **3.** the measurement parameters are: a) the type of fluid container (low form Griffin beaker, tall form (Berzelius) beaker, SMALL SAMPLE ADAPTER, or big sample adapter), b) the SPINDLE (LV-1 with or without GUARD LEG, LV2-disc with or without guard leg, SC1-31/13R, or SC4-34/13R), c) the fluid volume (575 mL, 425 mL, 55 mL, 60 mL, 135 mL, 10 mL, 9 mL), d) rotational rate of 0.3 rpm, e) temperature (0 or 20 °C), f) duration of rotation (10.0, 15.00, 30.0, 33.3, or 65 minutes). **3.** the respective shear rates for LV1 with guard leg, SC4-31/13R, SC434/13R are 0.066, 0.102, and 0.084 s^{-1}; the shear rate for the LV2-disc is undefined. **4.** the fluid manufacturer low shear rate viscosity measurement parameters are published in the FAA and Transport Canada *Holdover Time Guidelines*. **5.** the low shear rate viscosity as measured on the qualification sample used to generate the endurance times for a given fluid is known as its LOWEST ON-WING VISCOSITY. **6.** the low shear rate viscosity of Type II/II/IV fluids is considered (an imperfect) SURROGATE for the WATER SPRAY ENDURANCE TIME, ENDURANCE TIMEs and HOLDOVER TIMEs. **7.** the low shear rate viscosity from samples in the field are measured regularly

to ensure they are equal to or above the lowest on-wing viscosity. **8.** fluid manufacturers do set in their SALES SPECIFICATION a lower limit on the low shear rate viscosity of their THICKENED FLUIDS.[11,41,75,130,131,136,138,145,146,150,153] [Ametek Brookfield, Brookfield Spindles, FAA HOT, SAE AMS1428, SAE ARP5718, SAE ARP5485, SAE AS5900, SAE AS5901, SAE AS6285, SAE AS9968

low speed aircraft, **1.** colloquial term for COMMUTER TURBOPROP AIRCRAFT as described in the aerodynamic acceptance test standard AS5900. **2.** an aircraft category defined by each aircraft manufacturer based on specific aircraft performance. **–** Compare HIGH SPEED AIRCRAFT, MIDDLE SPEED AIRCRAFT. See LOW SPEED RAMP TEST**.**[145] [SAE AS5900]

low speed ramp (LSR), see LOW SPEED RAMP TEST.

low speed ramp test, **1.** an AERODYNAMIC ACCEPTANCE TEST performed to simulate COMMUTER TURBOPROP AIRCRAFT takeoffs, with rotation speeds between 60 knots and 100 knots, and a time from brake release to ROTATION SPEED between 15 seconds and 20 seconds. **2.** a test is conducted at 35 m/s (70 knots), representing the liftoff speed (Vlof), after a 17 second acceleration at 2.1 m/s^2. **3.** a test defined in AS5900. – Compare HIGH SPEED RAMP TEST, MIDDLE SPEED RAMP TEST. [130.131,145] [SAE AMS1424, SAE AMS1428, SAE AS5900]

low visibility operations (LVO), [FAA] airport operations conducted at visibilities less than runway visual range (RVR) 1200.[77,161] [FAA Order 8000.94, SW FOM]

lower sales specification viscosity limit, viscosity set by the fluid manufacturer for its sales specification. This viscosity must be equal to or higher than the viscosity of the AMS1428 INITIAL QUALIFICATION low viscosity sample. The viscosity of AMS1428 initial qualification low viscosity sample is not the lowest on-wing viscosity. – See LOWEST ON-WING VISCOSITY, SALES SPECIFICATION.[138] [SAE ARP5718]

***lower sales specification viscosity limit**, viscosity set by the fluid manufacturer for its sales specification. This viscosity must be equal to or higher than the AMS1428 low viscosity and must be higher than the lowest on-wing viscosity. [SAE ARP5718]

lowest aerodynamics acceptance temperature (LAAT), **1.** [aircraft deicing fluids] the lowest temperature at which a Type I/II/III/IV fluid does not cause unacceptable lift loss as measured in the AERODYNAMIC ACCEPTANCE TEST for the HIGH SPEED RAMP, MIDDLE SPEED RAMP or LOW SPEED RAMP. **2.** the lowest aerodynamic acceptance temperature may be measured by the aerodynamic acceptance test with the high speed ramp, and/or middle speed ramp, and/or low speed ramp. **3.** a fluid may have more than one lowest aerodynamic acceptance temperature as it may have been tested in more than one ramp. – Compare LOWEST OPERATIONAL USE TEMPERATURE.[102,145] [Guide, SAE AS5900]

lowest on-wing viscosity (LOWV), **1.** the low shear rate viscosity as measured on a Type II/III/IV fluid initial qualification sample that is used to test for endurance time and from which fluid-specific holdover times are derived. **2.** value reported in the FAA and Transport Canada *Holdover Time Guidelines* for each Type II/III/IV with the applicable measurement method. **3.** the inferior limit of viscosity of a Type II/III/IV fluid for which the applicable holdover time or allowance time table can be used. **4.** the inferior limit viscosity for sales specifications of Type II/III/IV fluids; generally, it is preferable for the lower end of viscosity sales specifications be set somewhat higher

than the lowest on-wing viscosity to allow for in-the-field viscosity degradation. – See SHEAR DEGRADATION, SURROGATE, LOW SHEAR RATE VISCOSITY.[129,138,150,174] [SAE AIR6232, SAE ARP5718, SAE AS6285, TC TP10452]

***lowest on-wing viscosity** (LOWV), lowest viscosity of a thickened deicing/anti-icing fluid for which the applicable holdover timetable can still be used. [SAE AS6285]

***lowest on-wing viscosity** (LOWV), lowest viscosity of a fluid for which the applicable holdover time table can be used. [SAE AIR6232]

***lowest on-wing viscosity** (LOWV), viscosity reported by the laboratory performing the testing under 3.1.3 of ARP5485. The lowest on-wing viscosity is published with the specific holdover time guideline for that fluid. Fluids having an on-wing viscosity less than the lowest on-wing viscosity cannot be used with holdover time guidelines. The lowest on-wing viscosity must be below the lower sales specification viscosity limit. [SAE ARP5718]

lowest operational use temperature (LOUT), **1.** [aircraft deicing fluids] in broad terms, the lowest operational use temperature generally means the lowest ambient temperature (a SURROGATE for the aircraft surface temperature) at which a specific fluid may be used at a given concentration for a given type of aircraft (high speed, middle speed or low speed). There are exceptions to this general definition, for instance if the fluid concentration is above its highest operational use concentration, it cannot be used; when there is cold soaking one cannot assume that the aircraft surface temperature is equal to ambient temperature. **2.** the lowest operational use temperature needs to be determined for each specific fluid at the dilution to be used. In other words, when the specific fluid changes freezing point upon dilution or increased concentration, it may change the lowest operational use temperature. **3.** the formal definition of lowest operational use temperature is: for fluids whose glycol concentration is equal to or less than the concentration at which the AERODYNAMIC ACCEPTANCE TEST was performed (known as the HIGHEST OPERATIONAL USE CONCENTRATION), it is the higher (warmer) of a) the LOWEST AERODYNAMIC ACCEPTANCE TEMPERATURE at which the fluid meets the high speed, middle speed, or low speed AERODYNAMIC ACCEPTANCE TEST according to AS5900 for a given type of aircraft or b) the freezing point of the fluid plus the FREEZING POINT BUFFER of 10 °C (18 °F) for Type I fluid and 7 °C (13 °F) for Type II, III, or IV fluids. **4.** [aircraft deicing operations] the lowest operational use temperature is an operational value that must be determined by users (e.g., airlines, SERVICE PROVIDERs) of deicing/anti-icing fluids in the FIELD. For more details see TYPE I LOWEST OPERATIONAL USE TEMPERATURE and TYPE II/III/IV LOWEST OPERATIONAL USE TEMPERATURE. – Compare LOWEST AERODYNAMIC ACCEPTANCE TEMPERATURE. [63,64,74,75,140,141,150,152,162,170,174] [EASA EU Reg, EASA SIB 2008-29, FAA General Info, FAA HOT, SAE ARP6207, SAE ARP6852, SAE AS6332, SAE AS6285, SIAGDP, TC HOT, TC TP 14052]

***lowest operational use temperature** (LOUT), the higher (warmer) of a) 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 b) 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. [SAE AS6285]

***Type II/III/IV **lowest operational use temperature** (LOUT), the higher of: a) the lowest temperature at which it meets the aerodynamics acceptance test (AS5900) for a given type of aircraft or b) the freezing point of the fluid plus the freezing point buffer of 7 °C (about 13 °F). [SAE ARP5718]

*Type I **lowest operational use temperature** (LOUT)**,** the lowest operational use temperature of a Type I fluid is generally recognized as the higher of: a. The lowest temperature at which it meets the aerodynamics acceptance test (AS5900) for a given type of aircraft, or b. The freezing point of the fluid plus the freezing point buffer of 10 °C (about 18 °F). [SAE ARP6207]

***lowest operational use temperature** (LOUT)**,** The lowest operational use temperature (LOUT) is the higher (warmer) of (a) the lowest temperature at which the fluid meets the AAT (according to AS5900) for a given type (high speed, middle speed, or low speed) of aircraft, or (b) the freezing point of the fluid plus the freezing point buffer of 10 °C (18 °F) for Type I fluid and 7 °C (13 °F) for Type II, III, or IV fluids. [SAE ARP6852]

***lowest operational use temperature** (LOUT The lowest temperature at which a Type I/II/III/IV fluid can be used on an aircraft, generally recognized as the higher of: a) the lowest temperature at which it meets the aerodynamics acceptance test (AS5900) for a given type of aircraft; or b) the freezing point of the fluid plus the freezing point buffer of 7 °C for Type II/III/IV fluids, or 10 °C for Type I fluids.). [SAE AS6332]

lowest usable precipitation rate (LUPR), the lowest precipitation rate at which an endurance time data set can be used to determine holdover times.[138] [SAE ARP5718]

***lowest usable precipitation rate** (LUPR), the lowest precipitation rate at which an endurance time data set can be used to determine holdover times. [SAE ARP5718]

mandatory documentation¸ [aircraft deicing fluids, runway deicing products] mandatory information presented in the form of a document. – Quasi synonym: MANDATORY INFORMATION.[130.131,132133] [SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

mandatory information, [aircraft deicing fluids, runway deicing products] information that must be provided by the VENDOR that is neither subject to a DETERMINE AND REPORT TEST nor a PASS-FAIL TEST. For example, compositional information such as the freezing point depressant must be known to determine if the fluid is glycol (conventional), glycol (non-conventional) or non-glycol based. Other examples of mandatory information are a SAFETY DATA SHEET and label information. – Quasi synonym: MANDATORY DOCUMENTATION.[130,131,132,133] [SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

maneuvering area, part of an airport used for the takeoff, landing and taxiing of aircraft, excluding APRONs.[174] [TC TP 14052]

material safety data sheet (MSDS), former name for safety data sheet. See SAFETY DATA SHEET.

materials compatibility, 1. [aircraft engineering] the ability of different materials used in the fabrication of or application on an aircraft to coexist and function together without causing issues such as performance degradation, safety risks, structural problems, corrosion or cosmetic issues. **2.** [aircraft deicing fluids, runway deicing products] the collective name given to technical requirements in AMS1424, AMS1428, AMS1431, and AMS1435 related to the effect of fluids on aircraft materials such as SANDWICH CORROSION, TOTAL IMMERSION CORROSION, CORROSION OF LOW-EMBRITTLING PLATE, STRESS-CORROSION RESISTANCE, HYDROGEN EMBRITTLEMENT, EFFECT ON TRANSPARENT PLASTICS, EFFECT ON PAINTED SURFACES, EFFECT ON UNPAINTED SURFACES, and RUNWAY CONCRETE SCALING RESISTANCE. – Synonym: EFFECT ON AIRCRAFT MATERIALS. See OPERATIONAL PROPERTY.[75,130,131,132,133,170] [FAA HOT, SAE AMS1424, SAE AMS1428, AMS1431, SAE AMS1435, TC HOT]

maximum detection angle, the maximum angle at which a remote on-ground ice detection system sensor can directed and expected—without loss of functionality—to achieve the performance specified in AS5681.[144] [SAE AS5681]

***maximum detection angle**, the maximum angle with respect to the surface being monitored that a remote on-ground ice detection system sensor can be aimed and still be expected to achieve the performance specified in this MOPS. [SAE AS5681]

maximum detection distance, the farthest distance from its point of monitoring that a remote on-ground ice detection system sensor can be while continuing to meet the performance specified in AS5681.[144] [SAE AS5681]

***maximum detection distance**, The furthest the ROGIDS sensor can be from the surface being monitored that the ROGIDS sensor can be aimed and still be expected to achieve the performance specified in this MOPS. [SAE AS5681]

maximum on-wing viscosity, replaced by HIGHEST ON-WING VISCOSITY (do not use the expression maximum on-wing viscosity; the HARMONIZED TERM is highest on-wing viscosity).

may, means the practice is encouraged and/or optional.[150] [SAE AS6285]

***may**, means the practice is encouraged and/or optional. [SAE AS6285]

mean camber line, see CAMBER LINE.

measurement accuracy, see ACCURACY.

measurement precision, see PRECISION.

measurement repeatability, see REPEATABILITY.

measurement reproducibility, see REPRODUCIBILITY.

melting point (mp), **1.** [chemistry] the temperature at which a solid starts to melt as the temperature is increased slowly. If the heat is gradually and uniformly supplied to a pure substance, the rise in temperature stops at the melting point until the melting process is complete. – Compare FREEZING POINT.[119] [Rennie]

METAR, acronym for Meteorological Aerodrome Report or Meteorological Terminal Air Report. A routine weather report issued usually at hourly to sub-hourly intervals that provides a description of the meteorological elements observed at an airport at a specific time.[93,113] [ICAO 9640, NOAA FMH-1]

METAR code, acronyms and abbreviations used in METAR and TAF weather reports.[50,113] [MANOBS, NOAA FMH-1]

METAR code UP, UP means unknown precipitation when observation is done by an automatic observing system. A mixture of rain and snow can create a UP observation in a METAR.

METAR descriptor, see DESCRIPTOR.

middle speed aircraft, 1. colloquial term for LARGE TURBOPROP AIRCRAFT as described in the AERODYNAMIC ACCEPTANCE TEST standard (AS5900). **2.** an aircraft category defined by each aircraft manufacturer based on specific aircraft performance. – Compare HIGH SPEED AIRCRAFT, LOW SPEED AIRCRAFT. See MIDDLE SPEED RAMP TEST.[145] [SAE AS5900]

middle speed ramp (MSR), see MIDDLE SPEED RAMP TEST.

middle speed ramp test, **1.** an AERODYNAMIC ACCEPTANCE TEST performed to simulate LARGE TURBOPROP AIRCRAFT takeoffs, with rotation speeds between 80 knots and 100 knots and a time from brake release to ROTATION SPEED between 16 seconds and 20 seconds. **2.** a test conducted at 46 m/s (90 knots), representing the LIFTOFF SPEED (Vlof), after an 18 second acceleration at 2.6 m/s^2. **3.** a test defined in AS5900. – See HIGH SPEED RAMP TEST, LOW SPEED RAMP TEST.[130,131,145] [SAE AMS1424, SAE AMS1428, SAE AS5900]

minimum control speed (V_{mc}), **1.** [aerodynamics] the aircraft speed at which it is possible to maintain control of the aircraft with one engine inoperative and maintain straight flight with a bank angle not more than 5 degrees and with l50 lb or less of rudder control force. **2.** [aerodynamics] the aircraft speed below which the force of the AILERONS or RUDDER can apply to the aircraft is not large enough to counteract asymmetrical thrust (with an inoperative engine) at maximum power. If an engine fails and the aircraft is at a speed below the minimum control speed, the pilot may not be able to maintain control of the aircraft. See TAKEOFF DECISION SPEED, ROTATION SPEED, MINIMUM UNSTICK SPEED, LIFTOFF SPEED, TAKEOFF SAFETY SPEED.[3,145,158] [14 CFR § 25.149, SAE AS5900, Shevell]

minimum detection angle, the minimum angle at which a REMOTE ON-GROUND ICE DETECTION SYSTEM sensor can directed and expected—without loss of functionality—to achieve the performance specified in AS5681.[144] [SAE AS5681]

***minimum detection angle, t**he minimum angle with respect to the surface being monitored that the ROGIDS sensor can be aimed and still be expected to achieve the performance specified in this MOPS. [SAE AS5681]

minimum detection distance, the closest distance from its point of monitoring that a REMOTE ON-GROUND ICE DETECTION SYSTEM sensor can be while continuing to meet the performance specified in AS5681.[144] [SAE AS5681]

***minimum detection distance**, the closest the ROGIDS sensor can be to the surface being monitored that the ROGIDS sensor can be aimed and still be expected to achieve the performance specified in this MOPS. [SAE AS5681]

minimum unstick speed (V_{mu}), the lowest speed at which an aircraft can safely lift its nose wheel off the ground during takeoff, even with one engine inoperative. – See MINIMUM CONTROL SPEED, TAKEOFF DECISION SPEED, ROTATION SPEED, TAKEOFF SAFETY SPEED.[145,158] [SAE AS5900, Shevell]

miscible, [chemistry] describing liquids capable of mixing in any ratio without phase separation.[102] [Guide]

mist, **1.** [meteorology] a suspension of small water droplets of about 0.02 mm reducing visibility between 5/8 mile to 7 miles. **2.** [meteorology] an obscuration with METAR code BR [French: bruine]. – See FREEZING MIST, FOG, FREEZING FOG.[50,113,177] [MANOBS, NOAA FMH-1, TSB]

***mist**, (listed under obscuration) a visible aggregate of minute water particles suspended in the atmosphere that reduces visibility to less than 7 statute miles but greater than or equal to 5/8 statute miles. [NOAA FMH-1]

***mist**, the definition of mist is the same as for fog, except that mist reduces visibility to the range ⅝ mi. to 6 mi. inclusive. [MANOBS]

mixed phase precipitation, [meteorology] the simultaneous occurrence of at least two precipitation types, with at least one type of precipitation occurring in liquid form and at least one type of precipitation occurring in solid form.

moderate, see INTENSITY QUALIFIER.

moderate drizzle, see DRIZZLE.

moderate freezing drizzle, see FREEZING DRIZZLE.

moderate freezing rain, see FREEZING RAIN.

moderate rain, see RAIN.

moderate snow, see SNOW.

moderate snow grains, see SNOW GRAINS.

moderate snow pellets, see SNOW PELLETS.

mole (mol)**,** an amount of substance that contains 6.02214976 x 10^{23} elementary entities where elementary entities may be atoms, molecules, ions, electrons or a specified group of particles. – See AVOGADRO'S NUMBER, MOLECULAR WEIGHT.[44] [Bureau]

molecular weight (mol wt), [chemistry] the sum of atomic weights (based on the weighted average atomic mass of naturally occurring isotopes) in a molecule expressed in grams per mole; *the molecular weight of ethylene glycol ($C_2H_6O_2$) is 62.07, the molecular weight of propylene glycol ($C_3H_8O_2$) is 76.10.* – See MOLE.[24,105] [Atkins, Merck Index]

monitored surface, the aircraft surface of concern regarding ice hazard.[144] [SAE AS5681]

***monitored surface,** the surface of concern regarding ice hazard. [SAE AS5681]

mud wet, [runway contaminant] sticky, soft earth material.[69] [FAA AC 150-5200-30D]

multiple location qualification, **1.** [aircraft deicing fluid] process whereby the ORIGINAL MANUFACTURER (from its own manufacturing site or a SUBCONTRACTOR site) or a LICENSEE submits a sample for qualification for each production unit, at each site, prior to initial shipment from said site or production unit. **2.** [aircraft deicing fluid] multiple location qualifications are subject to either the initial qualification process or simplified qualification process (the simplified qualification process is almost always used). – See UNIT QUALIFICATION, SITE QUALIFICATION, INITIAL SHIPMENT. Compare INITIAL QUALIFICATION, PERIODIC REQUALIFICATION.[130,131] [SAE AMS1424, SAE AMS1428]

must, **1.** required. **2.** [aircraft deicing] mandatory term to convey the intent of meeting a regulatory requirement or other requirement, e.g., SAE STANDARD. – See IS/ARE REQUIRED, SHALL.[75,150,170] [FAA HOT, SAE AS6285, TC HOT]

***must** this means the practice is mandatory. – Synonym: SHALL. [SAE AS6285]

NACA duct, [aircraft engine] a common form of low-drag air inlet design. When properly implemented, a NACA duct allows air to flow into an internal duct, often for cooling purposes, with a minimal disturbance to the flow. Synonyms: NACA SCOOP, NACA INLET.

NACA inlet, see NACA DUCT.

NACA scoop, see NACA DUCT.

nacelle, [aircraft components] a streamline enclosure or cowling that surrounds the aircraft engine.[71,158] [FAA H-8083-3C, Shevell]

neat, **1.** free from dilution; *she likes her scotch neat*. **2.** [aircraft deicing] a neat Type II/III/IV fluid is as delivered by the fluid manufacturer, without added water by the user; *neat Type IV fluid*; *in the second step, the Type IV was applied neat*. **3.** [aircraft deicing] for Type II/III/IV, the numerical expression for neat is (100/0) meaning 100 parts of Type II/III/IV as delivered by the manufacturer and 0 parts water added by the user; *Type IV (100/0)*. **4.** the word *neat* is not used to describe Type I. **5.** Since the publication of AS6285E in May 2023, the preferred word to express Type II/III/IV without water added by the user is the term undiluted. – Synonym: UNDILUTED. See TYPE II/III/IV NEAT, TYPE II/III/IV UNDILUTED, TYPE II/III/IV (100/0). Compare CONCENTRATE.[102,145] [Guide, SAE AS6285]

negative freezing point buffer, condition when the FREEZING POINT of a deicing/anti-icing fluid is above (warmer than) the OUTSIDE AIR TEMPERATURE.[150] [SAE AS6285]

***negative freezing point buffer**, Condition when the freezing point of a deicing/anti-icing fluid is above the OAT. [SAE AS6285]

new glycol, glycol from the glycol manufacturer that has not been used in any industrial application. – Compare RECYCLED GLYCOL.

newton, the SI unit of force (newton spelled without a capital; symbol N) being the force required to give a mass of one kilogram an acceleration of 1 m/s^2. Named after SIR ISAAC NEWTON.[44] [Bureau]

Newton, Sir Isaac, (1642-1727) English mathematician and physicist. He formulated Newton's law of gravitation and Newton's laws of motion, and made significant contributions to the field of fluid dynamics.[100,119] [Law, Rennie]

Newtonian fluid, **1.** a fluid whose viscosity remains unchanged when a shear force is applied. **2.** [aircraft deicing] characteristic of a Type I fluid. – See SHEAR FORCE. Compare NON-NEWTONIAN FLUID.[70,102,119,130] [FAA AC150-5300-14D, Guide, Rennie, SAE AMS1424]

nitrogen blanketing, see NITROGEN PADDING.

nitrogen padding, [chemical industry] a process by which nitrogen fills the vapor space of a vessel containing a liquid to reduce the risk of fire hazard or prevent oxidation; *nitrogen padding of uninhibited propylene glycol*. – Synonym: NITROGEN BLANKETING.[156] [Schaschke]

nonconformance, failure of a product, process, or service to meet specified requirements or standards.[9] [ASQ Glossary]

nonconformity, condition of not conforming to established requirements, specifications, or standards. Nonconformity may not necessarily result in immediate failures or defects but indicates a departure from the expected or prescribed norms. Nonconformities are identified through audits, inspections, or monitoring processes within a QUALITY MANAGEMENT SYSTEM.[9,152] [ASQ Glossary, SAE AS6332]

***nonconformity**, the non-fulfilment of a requirement. [SAE AS6332]

nonenvironmental frost, see COLD-SOAKED FUEL FROST.[150] [SAE AS6285]

***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. [SAE AS6285]

non-conventional glycol, see GLYCOL (NON-CONVENTIONAL).

non-glycol, [aircraft deicing fluids] all that is not glycol (conventional or non-conventional), such as organic salts, e.g., SODIUM FORMATE, SODIUM ACETATE, POTASSIUM FORMATE, POTASSIUM ACETATE, and any mixtures thereof. Mixtures of glycol (conventional and/or nonconventional) and non-glycol are defined as non-glycol. – Compare GLYCOL (CONVENTIONAL), GLYCOL (NON-CONVENTIONAL).[130,131] [SAE AMS1424, SAE AMS1428]

***non-glycol**, is defined as all that is not glycol (conventional and non-conventional), such as organic salts, e.g., sodium formate, sodium acetate, potassium formate, potassium acetate, and any mixtures thereof. Mixtures of glycol (conventional and non-conventional) and non-glycol are defined as non-glycol. [SAE AMS1424]

***non-glycol**, is defined as all that is not glycol (conventional and non-conventional), such as organic salts, e.g., sodium formate, sodium acetate, potassium formate, potassium acetate, and any mixtures thereof. Mixtures of glycol (conventional and non-conventional) and non-glycol are defined as non-glycol. [SAE AMS1428]

non-Newtonian fluid, **1.** a fluid whose viscosity changes when a shear force is applied (e.g., ketchup). **2.** characteristic of Type II/III/IV fluids. – See SHEAR FORCE. Compare NEWTONIAN FLUID.[102,131] [Guide, SAE AMS1428]

***non-Newtonian fluid**, a non-Newtonian fluid exhibits a different apparent viscosity value when tested at the same temperature, using the same viscometer and spindle in a predetermined volume when the only variant is the rotational speed of the spindle. Typically, the non-Newtonian fluid shear stress is not in direct proportion to its rate of flow. [SAE AMS1428].

non-standard dilution of Type II/III/IV fluid, a product/water ratio by volume other than 100/0, 72/25, or 50/50. – Compare STANDARD DILUTION OF TYPE II/III//IV.[102] [Guide]

nozzle sample, **1.** a SAMPLE taken from a nozzle. **2.** [aircraft deicing fluids] Type II/III/IV are subject to SHEAR DEGRADATION caused by pumps and nozzles. To ensure compliance, nozzle samples are taken to verify that the viscosity is within the IN-USE LIMITS. **3.** Type I nozzle samples are taken from DEICING VEHICLEs with PROPORTIONAL MIXING to verify the TYPE I CONCENTRATE/water ratio. **4.** nozzle samples are taken to verify the temperature of fluids. – Compare RETAINED SAMPLE. See SAMPLING GUIDELINE, SAMPLING PROCEDURE, LOWEST ON-WING VISCOSITY.[102] [Guide]

nucleation, **1.** [chemistry] the initiation of crystallization from solution, from liquid or vapor; the initiation can be from tiny solid particles (NUCLEUS), the surface of the container (e.g., the aircraft surface) **2.** [meteorology] the facilitation of PHASE TRANSITION of water vapor to liquid, or liquid water to ice, or water vapor directly to ice, often by tiny solid particles. – See SUPERCOOLED WATER.[39,62,177] [Britannica, Dunlop, TSB]

nucleation site, site where nucleation occurs. – See NUCLEATION**.**

nucleus, **1.** [chemistry] usually a solid or crystalline particle, or freshly exposed surface that facilitates PHASE TRANSITIONs such as liquid to solid (crystallization or freezing). **2.** [meteorology] usually tiny liquid or solid particles facilitating CONDENSATION (vapor to liquid), DEPOSITION (vapor to solid) or freezing (liquid water to ice). – Plural is nuclei. See NUCLEATION SITE.[62] [Dunlop]

numerical quantity value, [metrology] number in the expression quantity value, other than any number serving as the reference; *for the quantity value 5 °C, the numerical quantity value is **5**; for the quantity value 40,000 mPa·s, the numerical quantity value is **40,000**; for the quantity value 2.2 kg, the numerical quantity value is **2.2**–the same quantity value can be expressed as **2200** g in which case the numerical quantity value is **2200**; for the quantity value 510 m^2, the numerical quantity value is **510**,* the measurement unit is m^2, *the number 2 serves as a reference and is not part of the numerical quantity value*. [French: valeur numérique]. – Synonyms: NUMERICAL VALUE OF A QUANTITY, NUMERICAL VALUE. – See QUANTITY VALUE.[94] [JCGM]

numerical value, [metrology] [French: valeur numérique] see NUMERICAL QUANTITY VALUE.

numerical value of quantity, [metrology] [French: valeur numérique d'une grandeur] see NUMERICAL QUANTITY VALUE.

obscuration, [meteorology] obstruction to vision (METAR code): mist (BR), fog (FG), smoke (FU), volcanic ash (VA), widespread dust (DU), sand (SA), haze (HZ), spray (PY). Potentially any precipitation type can also be considered an obscuring phenomena.[50,113] [MANOBS, NOAA FMH-1]

observation, [audit] a statement of fact made during an audit and substantiated by objective evidence. What the auditor observed whether positive or negative without implying the need for a CORRECTIVE ACTION. – Compare OPPORTUNITY FOR IMPROVEMENT.[152] [SAE AS6632]

***observation/opportunity for improvement**, a statement of fact made during an audit and substantiated by objective evidence. [SAE AS6332]

off spec, **1.** an informal expression meaning that some or all the results of analysis fail to meet the requirements of the specification. **2.** short form for off specification. – Compare ON SPEC.[102] [Guide]

offseason, [aircraft deicing] predetermined period when deicing services require advance notice or are not readily available; *the offseason at Toronto Pearson Airport is May 01 to September 31*. – Compare DEICING SEASON.[84] [GTAA]

oil, [runway contaminant] a viscous liquid derived from petroleum or synthetic material, especially for use as a fuel or lubricant.[69] [FAA AC 150-5300-30D]

on spec, **1.** an informal expression meaning that all the results of analysis are within the requirements of the specification. **2.** short form for on specification or within specification. – Compare OFF SPEC.[102] [Guide]

one-step deicing/anti-icing, procedure is carried out with a heated fluid that remains on the aircraft surfaces to provide anti-icing capability.[93] [ICAO 9640]

***one-step deicing/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. [ICAO 9640]

open basket deicing unit, aircraft ground deicing equipment, self-propelled or towable, equipped with a basket to perform aircraft deicing/anti-icing and associated CHECKs. – Colloquial synonym: OPEN BUCKET DEICING UNIT. Compare ENCLOSED CABIN DEICING UNIT.[119,179] [Polar, Vestergaard]

open bucket, See BASKET

open bucket deicing unit, see OPEN BASKET DEICING UNIT.

operational check, see FUNCTIONALITY CHECK.

operational ice, [aircraft engine icing] ice accumulated on FAN BLADES while the engine is running at idle (with the aircraft on the ground). Timely engine runups during taxi are considered a means of operational ice removal. – Compare GROUND-ACCUMULATED ICE. See ENGINE BARREL ICING, ENGINE ICING, FAN BLADE ICING.[33] [Boeing 737-600 AMM].

operational property, **1.** [material science and engineering] characteristic of a material or system affecting operations. **2.** [aircraft deicing fluids] characteristic of a deicing anti-icing fluid to a) affect the application of the fluid (e.g., COLOR, BLEED-THROUGH, APPEARANCE, SUSPENDED MATTER, FOAM STABILITY, HARD WATER STABILITY, THERMAL STABILITY–ACCELERATED AGING, STORAGE STABILITY), or b) its EFFECT ON AIRCRAFT MATERIALS—also known as MATERIALS COMPATIBILITY—including SANDWICH CORROSION, TOTAL IMMERSION CORROSION, CORROSION OF LOW-EMBRITTLING CADMIUM PLATE, STRESS-CORROSION RESISTANCE, HYDROGEN EMBRITTLEMENT, EFFECT ON TRANSPARENT PLASTICS, EFFECT ON PAINTED SURFACES, EFFECT ON UNPAINTED SURFACES, SUCCESSIVE DRY-OUT AND REHYDRATION. – Compare PHYSICAL PROPERTY, PERFORMANCE PROPERTY, ENVIRONMENTAL PROPERTY. See FLUID PROPERTIES.[130,131] [SAE AMS1424, SAE AMS1428]

operations bulletins, [Transport Canada] a method of formally advising employees of procedural changes or new information related to local deicing operations.[174] [TC TP 14052]

operations specifications (OpSpec), [FAA] the authorizations, limitations, and certain procedures under which each kind of operation, if applicable, is to be conducted.[2,4] [14 CFR § 1.2, 14 CFR § 119.7]

operator, **1.** [aircraft deicing] familiar term to designate someone who operates deicing equipment such as snow plow, snow sweeper. **2.** [Transport Canada] in respect of an aircraft, means the person that has possession of the aircraft as owner, lessee or otherwise.[174] [TC TP 14052]

operator certificate, **1.** [Transport Canada] a certificate issued under Canadian Aviation Regulations that authorizes the holder of the certificate to operate a commercial air service. **2.** short form for air operator certificate. – See AIR OPERATOR CERTIFICATE.[174] [TC TP 14052]

opportunity for improvement, [audit] suggested areas where the organization could enhance its processes, procedures, or practices to achieve better performance or compliance. An opportunity for improvement goes beyond mere observation. – Compare OBSERVATION.

optimizing adaptations, [safety science] deviations that are actioned to achieve a personal or organizational goal, including decisions that are in the person's or organization's perceived best interest. – See ADAPTATIONS.[177] [TSB]

original manufacturer, [aircraft deicing fluids, runway deicing products] the manufacturer who completes the first INITIAL QUALIFICATION for a given product. – Synonym: ORIGINAL VENDOR. Compare LICENSEE, SUBCONTRACTOR.[130,131,132,133] [SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435.

original vendor, see ORIGINAL MANUFACTURER.

outside air temperature (OAT), **1.** [aviation] the temperature of air around an aircraft, unaffected by the movement of the aircraft. **2.** [aircraft deicing] outside air temperature is an imperfect SURROGATE for the aircraft skin temperature. – See STATIC AIR TEMPERATURE, COLD SOAKING, FUEL TEMPERATURE.

oxidation, **1.** [chemistry] a chemical reaction with oxygen. **2.** [inorganic chemistry] loss of electrons and an increase in oxidation number. **3.** [organic chemistry] the conversion of a functional group of an organic compound into a functional group with a higher oxidative state. *The ranking of the functional groups from a lower oxidation number to higher oxidation number is approximately as follows: alkane < alkene < alkyne < alcohol < glycol < aldehyde < carboxylic acid < carbon dioxide*; *example: ethane < ethylene < ethanol < ethylene glycol <acetaldehyde <glyoxal < glycolic acid < acetic acid < oxalic acid < carbon dioxide.*[104,119] [March, Rennie]

oxidation of carbon brakes, the reaction between carbon and oxygen resulting in the loss of mass.[127] [SAE AIR5490]

***oxidation**, the reaction between carbon and oxygen resulting in the loss of mass. [SAE AIR5490]

pad control, **1.** the actions to manage and supervise what happens on deicing bays to achieve the desired outcome **2.** call sign of the operating position that controls aircraft entering a deicing facility and exiting the deicing bays.[137] [SAE ARP5660]

***pad control**, radio call sign of the operating position in the icehouse that controls aircraft entering the DDF and exiting the deicing bays. [SAE ARP5660]

pad leadership, any positions of leadership at a deicing facility, such as the DEICING COORDINATOR.[137] [SAE ARP5660]

***pad leadership**, any of the following positions of leadership: bay lead, lead truck, crew chief, deicing pad team leader, primary deicing coordinator, etc. [SAE ARP5660]

partial pressure, [chemistry, meteorology] the pressure that a component of a gaseous mixture would have if it alone occupied the same volume at the same temperature as the mixture.[8] [AMS Glossary]

pass-fail test, [deicing fluids, runway deicing products] a type of test where the outcome is binary—either it passes or fails. *Examples of such tests are flash point, pH, color, appearance, viscosity, shear stability, hard water stability, exposure to dry air, dry-out exposure to cold air, anti-icing performance, freezing point, fluid elimination, thermal stability-accelerated aging, sandwich corrosion, total immersion corrosion, corrosion of low-embrittling cadmium plate, hydrogen embrittlement, effect on transparent plastics, effect on painted surfaces, effect on unpainted surfaces, chloride content, runway concrete surface scaling resistance, etc.* – Compare DETERMINE AND REPORT TEST, MANDATORY INFORMATION, MANDATORY DOCUMENTATION.[106,130,131,132,133] [MW, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

peak precipitation rates, [fluid testing] precipitation rates measured over a fixed period, usually by accumulating precipitation continuously and weighing at short intervals. The peak values are very sensitive to the length of the interval.[108] [Myers]

performance property, **1.** [material science and engineering] characteristic of a material or system to perform its intended function. **2.** [deicing fluids] characteristic of a deicing/anti-icing fluid related to deicing/anti-icing and aerodynamic performance; *examples of performance properties are high humidity endurance time, water spray endurance time, endurance time, high speed ramp lowest aerodynamic acceptance temperature, middle speed ramp lowest aerodynamic acceptance temperature, low speed ramp lowest aerodynamic acceptance temperature, elimination, temperature (for deicing), and freezing point*. **3.** [deicing fluids] a physical property may be used as SURROGATE for performance properties (e.g., low shear rate viscosity for endurance time) or as a marker for composition (refraction for glycol/water ratio). – Compare PHYSICAL PROPERTY, OPERATIONAL PROPERTY, ENVIRONMENTAL PROPERTIES, MATERIALS COMPATIBILITY. See FLUID PROPERTIES.[130,131,136,139,145] [SAE AMS1424, SAE AMS1428, SAE ARP5485, SAE ARP5945, SAE AS5900]

periodic qualification, see PERIODIC REQUALIFICATION.

periodic requalification (PR), **1.** [aircraft deicing fluids, runway deicing products] the process of extending the aircraft deicing/anti-icing fluid or runway deicing product QUALIFICATION EXPIRY DATE by performing either an initial qualification or specified tests (usually less tests that an initial qualification) and for which the qualification test reports are issued. **2.** [aircraft deicing fluids and runway deicing products] periodic qualifications are performed approximately two years after initial qualification and approximately every four years thereafter. **3.** [aircraft deicing fluids] for Type I fluids the requalification tests are the ANTI-ICING PERFORMANCE test and the AERODYNAMIC ACCEPTANCE TEST(s); for Type II/III/IV fluids the periodic requalification tests are viscosity, anti-

icing performance test, aerodynamic acceptance test(s). **4.** [runway deicing products] for solid runway deicing products the periodic requalification tests are: EFFECT ON TRANSPARENT PLASTICS, EFFECT ON PAINTED SURFACES, EFFECT ON UNPAINTED SURFACES, RUNWAY CONCRETE SCALING RESISTANCE, ASPHALT CONCRETE DEGRADATION RESISTANCE (for products used in Europe), and effect on aircraft metals; for liquid runway deicing products, the periodic requalification tests are the same as for the solid runway deicing products plus freezing point determination and RINSIBILITY. – See QUALIFICATION TEST REPORT. Compare INITIAL QUALIFICATION, SITE QUALIFICATION.[130,131,132,133] [SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

pH, **1.** stands for potential of hydrogen. **2.** a scale to express the acidity of a solution. Strictly speaking it is meant to represent the activity of hydrogen ions (H^+) in solution. Since hydrogen ion activity cannot be measured, as an approximation, the pH of a solution is defined as the negative logarithm of the hydrogen ion concentration in mole per liter [H^+]:

$$pH = - \log [H^+]$$

A neutral solution is defined as one in which the hydrogen ion concentration at 25 °C is 10^{-7} mole per liter, thus the pH is 7. Acidic solutions at 25° C will have a higher concentration of hydrogen ions and thus a pH lower than 7. Basic (alkaline) solutions at 25° C will have a lower concentration of hydrogen ions and thus a pH higher than 7. **3.** at temperatures other than 25 °C, a neutral solution will have a different hydrogen ion concentration, thus a different pH; in other words, pH is temperature dependent. **4.** the pH of aqueous solutions is normally measured using a GLASS ELECTRODE. The glass electrode is effective at measuring hydrogen ions in dilute aqueous solutions. When measuring pH in organic solvents (e.g., ethylene glycol or propylene glycol), the activity of the hydrogen ions and the glass electrode are affected, leading to shift in readings, longer response time and variable results. **5.** [aircraft deicing] pH measurement is part of the QUALIFICATION, SALES SPECIFICATION and IN-SERVICE LIMITS for Type I/II/III/IV fluids. **6.** [aircraft deicing fluids, runway deicing products] pH is a DETERMINE AND REPORT TEST for the INITIAL QUALIFICATION but thereafter the value measured in the initial qualification becomes a reference point and pH becomes a PASS-FAIL TEST. **7.** when aircraft deicing fluids are overheated for a long period, pH may go down due to the formation of organic acids caused by the oxidative degradation of glycols. **8**. the pH scale was introduced by Søren Sørensen in 1909.[119,121,130,131,132,133] [Rennie, Reynolds, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

pH litmus paper, a simple means of measuring whether a solution is acidic or basic. It does not give a pH value. It is a general indicator. The use of litmus paper is not recommended for use with deicing anti-icing fluids. Compare PH PAPER STRIP. See pH.[103] [Malesky]

pH paper strip, a means for measuring approximately PH. The use of pH paper strips is not recommended for use with deicing/anti-icing fluids. – Compare PH LITMUS PAPER. See GLASS ELECTRODE. [150] [AS6285]

phase, 1. [thermodynamics] each chemically or physically distinct, homogenous and mechanically separable part of a system. The three fundamental phases of matter are solid, liquid and gas. *Example 1: a saturated aqueous solution of NaCl in a closed vessel has 3 phases, solid NaCl, aqueous solution of NaCl and water vapor. Example 2: ice in contact with water saturated air has 3 phases, solid H_2O, air saturated H_2O liquid, air saturated with water vapor. Example 3: air, one phase since all the components are miscible.* 2. [meteorology] the state of aggregation of a substance, for example, solid, liquid or gas.[8,122] [AMA Glossary, Rock]

phase transition, [chemistry] the change from one phase to another such as solid to liquid, solid to gas, liquid to gas, gas to a solid; *the deposition of water vapor in the air to make clear ice on a wing is a phase transition*. – Compare TRANSITION [aerodynamics]. See EXOTHERMIC, ENDOTHERMIC, NUCLEUS.[156] [Schaschke]

physical property, **1.** [chemistry] characteristic of matter that can be measured by a physical means without changing the chemical composition of the material being studied. **2.** [deicing fluids] characteristic of the composition or state of a deicing/anti-icing fluid such as SPECIFIC GRAVITY, REFRACTION, SURFACE TENSION, pH, LOW SHEAR RATE VISCOSITY, TEMPERATURE, and RHEOLOGICAL PROFILE. **3.** [deicing fluids] physical properties are used as surrogate for performance properties (e.g., low shear rate viscosity for endurance time) or as a marker for composition (refraction for glycol/water ratio). **4.** when a physical properties affects the operational ability of a fluid, it may be classified as operational property. – Compare PERFORMANCE PROPERTY, OPERATIONAL PROPERTY, ENVIRONMENTAL PROPERTY. See SURROGATE, FLUID PROPERTIES.[29,130,131] [Bell, SAE AMS1424, SAE AMS1428]

pilot-in-command (PIC), the pilot that is responsible for the operation and safety of an aircraft during flight time. – See FLIGHT TIME.[174] [TC TP 14052]

pink snow, snow contaminated with aircraft deicing/anti-icing fluid.[137] [SAE ARP5660]

pitch, **1.** [aerodynamics] the rotation of an aircraft about its lateral axis. **2.** one of the three dimensions of aircraft movement, the others being ROLL and YAW. **3.** for a propeller, the blade angle as measured from the plane of rotation.[71] [FAA H-8083-3C]

plan continuation bias, [safety science] the tendency to continue with the original plan even when changing circumstances require a new plan; it is a form of CONFIRMATION BIAS. An example would be an airline pilot who unexpectedly encounters bad weather at the scheduled destination but decides to land anyway rather than divert to another location. Plan continuation bias appears to be particularly strong toward the end of the activity and has been theorized to result from the interaction of such factors as cognitive load, task demands, and social influences. – Synonym: CONTINUATION BIAS. See HINDSIGHT BIAS.[10,177] [APA, TSB]

planetary boundary layer, [meteorology] the layer of the atmosphere closest to the Earth's surface and subject to turbulence, friction effects, and surface heating, typically 500 meters over the oceans and 15000 meters over land. – Synonym: ATMOSPHERIC BOUNDARY LAYER. See BOUNDARY LAYER.[62] [Dunlop]

plate failure, usually the same as STANDARD PLATE FAILURE.[108] [Myers]

point and shoot thermometer, colloquial name for INFRARED THERMOMETER.

positive hold, [deicing operations] all means to ensure that the aircraft will remain stationary (hold) and is configured for deicing to allow deicing crew and equipment to safely approach the aircraft until the deicing crew and equipment have gone to their safety zones away from the aircraft, the aircraft has received its final release, and is safe to move. [137] [SAE ARP5560]

***positive hold**, the requirement to provide both verbal and visual communication to aircraft at a deicing facility such that no movement upon the aircraft is permitted until the flightcrew confirming it is safe to do so.[137] [SAE ARP5560]

postapplication check, see POSTDEICING/ANTI-ICING CHECK (the HARMONIZED TERM is postdeicing/anti-icing check).[68] [FAA AC 120-60B]

postdeicing check, an external examination of the aircraft after deicing only to ensure that the aircraft was correctly deiced (no anti-icing) and that there is no residual unallowed frozen contamination. – Compare POSTDEICING/ANTI-ICING CHECK.[68] [FAA AC 120-60B]

postdeicing/anti-icing check, an external examination of the aircraft after deicing and or anti-icing to ensure that the aircraft was correctly deiced and or anti-iced and that there is no residual unallowed frozen contamination. – Synonyms: POSTAPPLICATION CHECK, POST-TREATMENT CHECK (the HARMONIZED TERM is postdeicing/anti-icing check).[63,64,68,144,150] [EASA EU Reg, EASA SIB 2008-29, FAA AC 120-60B, SAE AS5681, SAE AS6285,]

***postdeicing/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. [SAE AS6285]

***postdeicing 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. [SAE AS6285]

***postdeicing check**, an examination of an aircraft's wings and/or other critical surfaces after a deicing has been performed to determine the presence of any remaining frozen contamination. [SAE AS5681]

postdeicing/anti-icing report, a report given to the flightcrew confirming that deicing/anti-icing has been carried out, detailing of the deicing/anti-icing procedure that was applied (anti-icing code), and confirming completion of the POSTDEICING/ANTI-ICING CHECK was performed. – See ANTI-ICING CODE. – Compare POSTDEICING REPORT. [150] [SAE AS6285]

***postdeicing/anti-icing report**, a 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. [SAE AS6285]

postdeicing report, when there is no holdover time nor allowance time following a deicing-only procedure, the report given to the flightcrew is called a postdeicing report—as opposed to a POSTDEICING/ANTI-ICING REPORT when there is a holdover time or allowance time. [SAE AS6286]

post-treatment check, see POSTDEICING/ANTI-ICING CHECK (the HARMONIZED TERM is postdeicing/anti-icing check).

potassium acetate, **1.** [chemistry] Chemical Abstract registry number 127-08-2, alternate name: acetic acid potassium salt (1:1); molecular formula $C_2H_3KO_2$; molecular weight 98.14. **2.** [runway deicing products] a FREEZING POINT DEPRESSANT used in runway deicing products. – Compare POTASSIUM FORMATE, SODIUM ACETATE, SODIUM FORMATE.[105] [Merck Index]

potassium formate, **1.** [chemistry] Chemical Abstract registry number 590-29-4, alternate name: formic acid potassium salt (1:1); molecular formula $CHKO_2$; molecular weight 84.12. **2.** [runway deicing products] a FREEZING POINT DEPRESSANT used in runway deicing products. – Compare POTASSIUM ACETATE, SODIUM ACETATE, SODIUM FORMATE.[105] [Merck Index]

powered-lift, a heavier-than-air aircraft capable of vertical takeoff, vertical landing, and low speed flight that depends principally on engine-driven lift devices or engine thrust for lift during these flight regimes and on nonrotating airfoil(s) for lift during horizontal flight. – Compare ROTORCRAFT, HELICOPTER.[1] [14 CFR § 1.1]

pour point, [chemical industry] for substances that do not crystallize at all or not readily, the temperature at which they fail to flow and set up as a glass. – Compare FREEZING POINT.[102] [Guide]

pre/post deicing inspector, a person trained and qualified to verify for the presence or absence of contamination on an aircraft.[151] [SAE AS6286]

***pre/post deicing inspector**, **DI-L30B**, this level of qualification includes the Contamination Check (check for the need to deice the aircraft) and the pre/post deicing/anti-icing checks. This level is more limited than the DI-L30 and is only focused on duties to determine the need for deicing/anti-icing and the checking procedures. There shall be a note of restriction to this qualification if some of the duties are not performed as mentioned. The person determining the need for deicing/anti-icing and performing the required checks shall receive training covering relevant parts mentioned in the standard teaching plan. Local procedures shall be taken into account and emphasized more than others where relevant. [SAE AS6286]

precipitation discriminator, [meteorology] the sensor on an automated weather station that determines the type of precipitation that is occurring.

precipitation intensity, [meteorology] an indication of the amount of precipitation collected per unit time interval. It is expressed in METAR/SPECI with intensity qualifiers, light (-), moderate (no symbol) 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, snow pellets, and drizzle. The rate of fall criterion is based on time and does not accurately describe the intensity at a particular time of observation. – See INTENSITY QUALIFIER, PRECIPITATION RATE.[93,113] [ICAO 9640, NOAA FMH-1]

***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. [ICAO 9640]

precipitation rate, **1.** [meteorology] the rate at which precipitation is falling as measured quantitatively or estimated from visibility. **2.** [meteorology] amount of water, liquid or solid, that reaches the ground in a specified period, normally expressed as liquid water in mm/h. **3.** [aircraft deicing] rate of any liquid, frozen or freezing precipitation, falling or forming, including any wind-induced deposition, on aircraft or standard test plates, expressed in $g/dm^2/h$. **4.** precipitation rate in mm/h can be converted to $g/dm^2/h$ by multiplying by a factor of ten, e.g., 5 mm/h = 50 $g/dm^2/h$. – See PRECIPITATION INTENSITY, SNOWFALL VISIBILITY TABLE.[113,174] [NOAA FMH-1, TC TP 14052]

precision, [chemistry, engineering, metrology] closeness of agreement between measured quantity values obtained by replicate measurements on the same or similar objects under specified conditions—the reproducibility of a measurement under unchanged conditions. Precision measures how close observations are to each other. Precision is usually expressed numerically by standard deviation, variance or coefficient of variation. Precision is used to define REPEATABILITY and REPRODUCIBILITY. – Synonym: MEASUREMENT PRECISION [French: fidélité, fidélité de mesure]. Compare ACCURACY.[24,29,94] [Atkins, Bell, JCGM]

predeicing check, see PREFLIGHT CONTAMINATION CHECK (the HARMONIZED TERM is preflight contamination check).

predeicing 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.[150] [SAE AS6285]

***predeicing 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. [SAE AS6285]

preflight contamination check, a CHECK performed by the FLIGHTCREW or GROUNDCREW prior to departure to verify the presence of FROZEN CONTAMINATION in order to establish the need for deicing/anti-icing. It may be part of the flightcrew walk-around before the flight. – Synonyms: PREDEICING CHECK, CONTAMINATION CHECK (the HARMONIZED TERM is preflight contamination check). Compare PRETAKEOFF CONTAMINATION CHECK.[144,150,151] [SAE AS5681, SAE AS6285, SAE AS6286]

***preflight 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. [SAE AS6285]

***preflight contamination check**, a check of aircraft surfaces and components for contamination to establish the need for deicing. [SAE AS6286]

***contamination check**, a check of aircraft surfaces and components for contamination to establish the need for deicing. [SAE AS6285]

***predeicing check**, an examination of aircraft's wings and/or other critical surfaces to check for the presence of frozen contamination, usually performed to determine the need for deicing. [SAE AS5681]

pretakeoff 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 accompanied by a continuous assessment of the conditions that affect holdover time and includes an assessment and adjustment of holdover time. – Compare PRETAKEOFF CONTAMINATION CHECK.[63,64,68,150] [EASA EU Reg, EASA SIB 2008-29, FAA AC 120-60B, SAE AS6285]

***pretakeoff 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. [SAE AS6285]

pretakeoff contamination check, **1.** a check of the critical surfaces for adhering contamination accomplished after the holdover time has been exceeded and that must be completed within five minutes of the beginning of takeoff. **2.** [FAA] a check (conducted after the aircraft's HOT has been exceeded) to ensure the aircraft's wings, control surfaces, and other critical surfaces, as defined in the certificate holder's program, are free of all frozen contaminants. This check must be completed within 5 minutes before beginning takeoff and from outside the aircraft, unless the certificate holder's FAA-approved program specifies otherwise. **3.** [Transport Canada] see PRETAKEOFF CONTAMINATION INSPECTION.[63,64,68,150,174] [EASA EU Reg, EASA SIB 2008-29, FAA AC 120-60B, SAE AS6285, TC TP 14052].

***pretakeoff 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. [SAE AS6285]

pretakeoff contamination inspection, [Transport Canada] an inspection, mandatory under certain circumstances, conducted by a qualified person, immediately prior to takeoff, to determine if the aircraft critical surfaces are contaminated by frost, ice, slush or snow. – The HARMONIZED TERM is PRETAKEOFF CONTAMINATION CHECK.[172,174] [TC 622.11, TC TP 14052]

***pretakeoff contamination inspection**, an inspection conducted by a qualified person, immediately prior to take-off, to determine if an aircraft's critical surfaces are contaminated by frost, ice, or snow. [TC 622.11]

pretakeoff contamination report, [Transport Canada] report that must be made to the PILOT-IN-COMMAND following the PRETAKEOFF CONTAMINATION INSPECTION describing how the inspection was conducted. The report must also confirm that all critical surfaces are free of CONTAMINATION for the takeoff to occur.[174] [TC TP 14052]

preventive action, a proactive process focusing on negative trends that attempts to stop a potential problem from occurring or from becoming too severe.[152] [SAE AS6332]

***preventive action**, a proactive process and is initiated to stop a potential problem from occurring or from becoming too severe. Preventive action focuses on identifying negative trends and addressing them before they become significant.[152] [SAE AS6332]

previous load, **1.** [logistics] the content of a bulk container immediately before the current load. **2.** [logistics] in day-to-day use, the terms *prior load* and *previous load* may be used interchangeably. **3.** [chemical industry] chemical manufacturers may have a list of forbidden prior and previous loads. – See PRIOR LOAD, WASH CERTIFICATE.

primary wave, [fluid behavior subjected to aerodynamic forces] term to describe the initial flow of fluid that occurs as the aircraft accelerates for its takeoff run. – See FLOWOFF, SECONDARY WAVE.[40,95,125] [Broeren, Koivisto, Runyan]

prior load, **1.** [logistics] the content of a bulk container before its current content, not necessarily the load immediately before the current load. **2.** [logistics] in day-to-day use, the terms *prior load* and *previous load* may be used interchangeably. **3.** [chemical industry] chemical manufacturers may have a list of forbidden prior load contents seeking to avoid product incompatibilities. – See WASH CERTIFICATE, PREVIOUS LOAD.[102] [Guide]

pristine fluid, [endurance time testing] fluid that is entirely uncontaminated by frozen or liquid precipitation (the expression pristine fluid does not imply on spec or off spec). – Compare ON SPEC, OFF SPEC.[108] [Myers]

probes attached to the strut, [aircraft engine] various sensors or probes attached to the STRUT, which is a supporting structure that connects the engine to the WING or FUSELAGE. These probes can include instruments for measuring TEMPERATURE, pressure, or airflow. These probes are susceptible to icing.

production batch, 1. [manufacturing] a large scale specific quantity of goods or materials produced during a single manufacturing process or production run on an industrial scale for commercial manufacturing. It represents a distinct unit of production, typically grouped together for consistency in quality, materials, and processes. **2.** a production batch shares the same production conditions, raw materials, equipment setting and production dates. **3.** the focus of a production batch is efficiency, consistency and output. **4.** [aircraft deicing fluids] for Type

I/II/III/IV fluids each production unit or site (where production batches are made) must receive a UNIT QUALIFICATION or SITE QUALIFICATION (as the case may be). – Compare PRODUCTION LOT LABORATORY BATCH. See BATCH, LOT.[130,131] [SAE AMS1424, SAE AMS1428]

production lot, a production lot may consist of several production batches. Compare PRODUCTION BATCH. See BATCH, LOT, LOT ACCEPTANCE TESTS.

production unit qualification, see UNIT QUALIFICATION.

program manager, [aircraft deicing] the person responsible for ensuring that the process needed to maintain the quality of systems necessary to deliver the CLEAN AIRCRAFT CONCEPT during winter operations is established and maintained. – Synonyms: WINTER PROGRAM MANAGER, RESPONSIBLE PERSON, ACCOUNTABLE EXECUTIVE, ACCOUNTABLE PERSON.[151,152] [SAE AS6286, SAE AS6332]

***winter program manager/responsible person/accountable executive/accountable person**, the person responsible for ensuring that the process needed to maintain the quality of systems to deliver the clean aircraft concept during winter operations is established and maintained. [SAE AS6286, SAE AS6332]

propeller contamination, see PROPELLER ICING.

propeller icing, accumulation of frozen precipitation on a propeller; *propeller icing disrupts the airflow over the propeller blades, reducing their efficiency and potentially causing vibrations*. **2.** propeller icing may pose safety hazards to personnel on the ground as dislodged ice could contact personnel or damage the fuselage. – Synonym: PROPELLER CONTAMINATION. See ENGINE ICING, GROUND ICING, IN-FLIGHT ICING, ROTOR ICING.

proportional mixing, 1. [aircraft deicing] the process of blending deicing fluid with water in precise ratios to achieve the desired FREEZING POINT. **2.** [aircraft deicing units] proportional mixing blending system (also called IN-TRUCK PROPORTIONAL MIXING) installed on deicing units that adjusts the freezing point of aircraft deicing fluids based on the OUTSIDE AIR TEMPERATURE (OAT) and the FREEZING POINT BUFFER, or at a set freezing point defined by the SERVICE PROVIDER.

propylene glycol, **1.** [chemistry] Chemical Abstract registry number 57-55-6, alternate names: 1,2-propanediol, PG, MPG; molecular formula $C_3H_8O_2$; molecular weight 76.10. **2.** [aircraft deicing] a FREEZING POINT DEPRESSANT used in the formulation of aircraft deicing/anti-icing fluids. – Compare ETHYLENE GLYCOL.[105] [Merck Index]

protection time, the period that an anti-icing treatment protects aerodynamically critical surfaces from the adhesion of contamination and the resulting roughness that could cause a premature stall or result in loss of control and prevent the crew from safely operating the aircraft. – Compare HOLDOVER TIME.[108] [Myers]

proximity sensor, **1.** [deicing unit] a safety feature on deicing unit that, upon activation, disengages relevant systems, preventing damage from physical contact between the deicing unit components (e.g., spray nozzle, FORCED AIR nozzle, operator BASKET) and aircraft surfaces. **2.** when a proximity sensor is activated it is commonly referred to as a TUSK OUT which requires communications between the flightcrew and groundcrew.[83,150] [GTAA 2022, SAE AS6285]

***proximity sensor**, 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.). [SAE AS6285]

pseudoplastic fluid, a fluid whose viscosity decreases when a shear force is applied. – See NON-NEWTONIAN FLUID.[102,131] [Guide, SAE AMS1428]

***pseudoplastic fluid**, a pseudoplastic fluid exhibits reduced apparent viscosity values as the spindle speed is increased and revert to original flow behavior when the shear stress is removed. [SAE AMS1428]

purchaser, **1.** [business] the organization or person who buys something. **2.** [aircraft deicing fluids, runway deicing products] term used in AMS1424, AMS1428, AMS1431 and AMS1435 for an organization buying aircraft deicing fluids or runway deicing products from a VENDOR. Typically, the purchaser is an airline, a SERVICE PROVIDER, or an airport. – See REJECTION.[48,130,131,132,133] [Cambridge, SAE AMS1424, SAE AMS1428, AMS1431, SAE AMS1435]

pylon, [aircraft engine] a structural component that connects an aircraft engine to the WING or FUSELAGE. It provides a mounting point for the engine, as well as a means of transferring the engine thrust to the AIRFRAME.[158] [Shevell]

qualification, **1.** the process of ensuring that a person, system, product or process meets certain standards or requirements. **2.** a condition that must be met before the authorization is granted to enter a certain group or perform certain tasks. – Compare CERTIFICATION. See INITIAL QUALIFICATION, MULTIPLE LOCATION QUALIFICATION, PERIODIC REQUALIFICATION, QUALIFICATION TEST REPORT.[82,151] [Gorse, SAE AS6286]

qualification expiry date, **1.** for Type I/II/III/IV fluids, the earlier of expiry dates of either the qualification test reports for the AERODYNAMIC ACCEPTANCE TEST(s) or the ANTI-ICING PERFORMANCE (WATER SPRAY ENDURANCE TEST and HIGH HUMIDITY ENDURANCE TEST). **2.** qualification expiry dates can be found on the AMIL web site and in the FAA/Transport Canada list of fluids in the *Holdover Time Guidelines*. – Compare SHELF LIFE.[75,102,170] [FAA HOT, Guide, TC HOT]

qualification test report, **1.** a qualification test report issued for an INITIAL QUALIFICATION, PERIODIC REQUALIFICATION, SITE QUALIFICATION, or PRODUCTION UNIT QUALIFICATION. **2.** a report usually issued by the Anti-Icing Materials Laboratory (AMIL) for either the AERODYNAMIC ACCEPTANCE TEST(s) and ANTI-ICING PERFORMANCE (WATER SPRAY ENDURANCE TEST and HIGH HUMIDITY ENDURANCE TEST). **3.** a report usually issued by SMI for MATERIALS COMPATIBILITY. – See QUALIFICATION.[75,130,131,170] [FAA HOT, SAE AMS1424, SAE AMS1428, TC HOT]

qualified, having complied with certain standards or requirements. See QUALIFIED FLUID, QUALIFIED RUNWAY DEICING PRODUCT. – Compare CERTIFIED.

qualified fluid, **1.** [aircraft deicing] a fluid that fulfills the requirements of AMS1424 for Type I or AMS1428 for Type II/III/IV. **2.** a fluid qualified to be on the fluid list of the FAA/Transport Canada *Holdover Time Guidelines*, that is a fluid with currently valid qualification test reports for

the AERODYNAMIC ACCEPTANCE TEST(s) and ANTI-ICING PERFORMANCE (WATER SPRAY ENDURANCE TEST and HIGH HUMIDITY ENDURANCE TEST) and that has been tested for ENDURANCE TIME.[75,141,170] [FAA HOT, SAE ARP6852, TC HOT]

***qualified fluid**, a fluid that has passed the tests and other requirements of AMS1424 or AMS1428 and is used in accordance with AS6285. [SAE ARP6852]

qualified personnel, [aircraft deicing] persons that have successfully completed theoretical and/or practical training requirements, including examinations.[152] [SAE AS6332]

***qualified staff**, trained staff who have passed theoretical and practical training tests and have been qualified for performing this type of job; refer to AS6286. [SAE AS6285]

***qualified personnel**, trained personnel that have successfully completed theoretical and/or practical training requirements and certification (including examinations, evaluations, etc.). Refer to AS6286 for further requirements as applicable to the specific occupational requirements. [SAE AS6332]

qualified runway deicing product, a product that fulfills the requirements of AMS1431 or AMS1435.[132,133] [SAE AMS1431, SAE AMS1435]

qualified staff, see QUALIFIED PERSONNEL.

quality assurance (QA), **1.** the part of quality management focused on providing confidence that quality requirements will be fulfilled; the confidence provided by quality assurance is twofold—internally to management and externally to customers, government agencies, regulators, certifiers, and third parties. **2.** all the planned and systematic activities implemented within the quality system that can be demonstrated to provide confidence that a product or service will fulfill requirements for quality. **3.** a proactive process focused on preventing quality issues. **4.** a subset of QUALITY MANAGEMENT SYSTEM. **5.** a superset of QUALITY CONTROL.[9,152,156] [ASQ, SAE AS6332, Schaschke]

***quality assurance**, Quality assurance is a way of preventing mistakes or defects in products and avoiding problems when delivering services to customers; which ISO 9000 defines as "part of quality management focused on providing confidence that quality requirements will be fulfilled." This defect prevention in quality assurance differs subtly from defect detection and rejection in quality control as it focuses on quality earlier in the process. Quality assurance is a proactive process (process driven). [SAE AS6332]

***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”). [SAE AS6285]

quality control (QC), **1.** part of quality management focused on fulfilling quality requirements. **2.** set of planned procedures or system activities used to ensure that products (e.g., fluid) or results from a process (e.g., deicing) or a service meet a defined set of requirements, involving sampling, inspections and testing. **3.** a subset of QUALITY ASSURANCE and of QUALITY MANAGEMENT SYSTEM.[150,152,156] [SAE AS6285, SAE AS6332, Schaschke]

***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”). [SAE AS6285]

***quality control**, Quality control is a process by which entities review the quality of all factors involved in production or in the provision of services. ISO 9000 defines quality control as "A part of quality management focused on fulfilling quality requirements." Quality control is a reactive process (identify and correct). [SAE AS6332]

quality improvement, the actions taken throughout an organization to increase the effectiveness of activities and processes to provide added benefits to both the organization and its customers.[152] [SAE AS6332]

***quality improvement**, the actions taken throughout an organization to increase the effectiveness of activities and processes to provide added benefits to both the organization and its customers. [SAE AS6332]

quality management system (QMS), **1.** a formalized system that documents processes, procedures, and responsibilities for achieving quality policies and objectives. A quality management system helps coordinate and direct an organization's activities to meet customer and regulatory requirements and improve its effectiveness and efficiency on a continuous basis. **2.** quality management ensures that an organization, product, or service is consistent. It has four main components, quality planning, quality assurance, quality control and quality improvement. Quality management is focused not only on product and service quality, but also on the means to achieve it. Quality management, therefore, uses quality assurance and control of processes as well as products to achieve more consistent quality. **3.** a formal system that includes quality assurance and quality control. – Compare SAFETY MANAGEMENT SYSTEM. See QUALITY ASSURANCE, QUALITY CONTROL.[9,151,152][ASQ, SAE AS6286, SAE AS6332]

***quality management system**, the ability to demonstrate both management commitment to and the organizational ability to deliver the required level of product or service. [SAE AS6286]

***quality management system**, the ability to demonstrate both management commitment to and the organizational ability to deliver the required level of product or service. [SAE AS6332]

quality manual, the central document that brings together all the aspects necessary to demonstrate control, conformance and continual improvement over aircraft deicing and anti-icing. The contents of a quality manual may be included as part of a GROUND DEICING PROGRAM.[152] [SAE AS6332]

*quality manual, the central document that brings together all the aspects necessary to demonstrate control, conformance and continual improvement over aircraft deicing and anti-icing. [SAE AS6332]

quantity value, number and reference together expressing magnitude of quantity; *length of an aircraft* **76.3 m**, *aerodynamic acceptance temperature* **-30 °C**, *viscosity of a sample* **47,800 mPa·s**, *water spray endurance time* **80 minutes**, *refraction* **32°Brix**, refractive index **1.3200** (the measurement unit is generally not indicated for DIMENSIONLESS QUANTITIES, such as ratios of two quantities of the same kind). [French: valeur d'une grandeur]. – Synonyms: VALUE OF A QUANTITY, VALUE. Compare NUMERICAL QUANTITY VALUE.[94] [JCGM]

radiation fog, [meteorology] fog produced over a land area when RADIATIONAL COOLING reduces the air temperature below the DEWPOINT.[8,62] [AMS Glossary, Dunlop]

radiational cooling, **1.** [meteorology] cooling of the ground or objects by emitting infrared radiation to space, particularly on cloudless nights. **2.** [aircraft deicing] a process involved in frost formation. – See ACTIVE FROST.[8,62] [AMS Glossary, Dunlop]

rain, **1.** [meteorology] 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. **2.** [meteorology] rain intensities are defined as light (-RA) (a rate of fall from a trace to 2.5 mm (0.1

in.) h^{-1}), moderate (RA) (a rate of fall of 2.5–7.5 mm (0.11–0.3 in.) h^{-1}), and heavy (+RA) (a rate of fall greater than 7.5 mm (0.3 in.) h^{-1}).[93,113] [NOAA FMH-1, ICAO 9640]

rain and snow, precipitation in the form of a mixture of rain and snow. – See MIXED PHASE PRECIPITATION.[162] [SIAGDP]

rain on cold-soaked surface, the laboratory endurance time precipitation condition to simulate rain on cold-soaked wing is variously called *rain on cold-soaked surface* (because it is performed on a plate) or simply *rain on cold-soaked wing* (the expression used in the FAA/Transport Canada *Holdover Time Guidelines* is rain on cold soaked wing). – See RAIN ON COLD-SOAKED WING.

rain on cold-soaked wing, **1.** a holdover time precipitation condition for OUTSIDE AIR TEMPERATURE above 0 °C. **2.** [endurance time testing] precipitation with a precipitation rate of 5–75 g/dm^2/h, a range encompassing DRIZZLE (5–13 g/dm^2/h), LIGHT RAIN (13–25 g/dm^2/h), and MODERATE RAIN (25–75 g/dm^2/h).[30,75,136,162,170] [Bendickson, FAA HOT, SAE AS5485, SIAGDP, TC HOT]

ram rise (RR), **1.** [in-flight parameters] the increase in air temperature caused by compression (ADIABATIC increase in temperature) and friction (kinetic heating) of air at high velocities. This occurs when an aircraft moves at high speed. **2.** ram rise equals the TOTAL AIR TEMPERATURE minus STATIC AIR TEMPERATURE.[72] [FAA H-8083-31B]

rate of fall, [meteorology] see PRECIPITATION RATE.[50,113] [MANOBS, NOAA FMH-1]

rationale, [SAE documentation] a section that must appear in SAE standards defining the need for developing a standard, the factor(s) which prompt a revision of a document, or the reason for any changes that may have occurred in the document. It appears as an unnumbered section before any front matter such as a foreword, table of content or scope.[155] [SAE Style Manual]

ready-to-use Type I, a Type I fluid as sold by the fluid manufacturer that does not require to be diluted. – Synonym: TYPE I READY-TO-USE. Compare CONCENTRATE.

rear-mounted engine, [aircraft structure] an engine mounted at the rear of the fuselage *for example, the MD-11 has one rear-mounted engine (and two wing-mounted engines), the Bombardier (now Mitsubishi) CRJ and Embraer ERJ aircraft have two rear-mounted engines*. – Synonym: AFT-MOUNTED ENGINE.

receding contact angle, **1.** [surface chemistry] a measurement of dewetting behavior. **2.** the angle formed by a liquid and a solid which has already been wetted by the liquid and which is in the process of being dewetted as it recedes (retracts) out on a surface. **3.** receding contact angle is influenced by factors such as surface chemistry (hydrophilicity, hydrophobicity), contamination on the surface, SURFACE TENSION, and roughness. – See CONTACT ANGLE, CONTACT LINE, WETTING.[129] [SAE AIR6232]

***receding contact angle**, the receding angle is smallest angle which can be measured when liquid is removed from the drop. Similarly, it is the minimum angle attained by the receding front on an inclined surface before the motion of the contact line. [SAE AIR6232]

recycled glycol, **1.** [aircraft deicing] typically ETHYLENE GLYCOL or PROPYLENE GLYCOL recovered from SPENT DEICING FLUID that has been subjected to filtration, water evaporation, fractional distillation and decolorization to remove contaminants and achieve the desired purity. **2.** [aircraft deicing] the fluid manufacturer must report a) the presence of recycled glycol and b) whether the recycled glycol is from an airport, from a non-airport, or a mixture of both. – Compare NEW GLYCOL. See RECYCLED TYPE I.[130] [SAE AMS1424]

recycled Type I, **1.** a fluid fulfilling the requirements of AMS1424 made from either recycled ethylene glycol or recycled propylene glycol, but not both at the same time. **2.** the fluid manufacturer has the obligation to inform fluid users of a) the presence of recycled glycol and b) whether the recycled glycol is from an airport, from a non-airport, or a mixture of both. – See RECYCLED GLYCOL.[102,130] [Guide, SAE AMS1424]

refraction, **1.** the bending of light as it passes from one transparent substance into another. **2.** for SOLUTIONs, the refraction varies 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. **3.** 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). **4.** [aircraft deicing] a measurement to determine the concentration of glycol in a deicing fluid, and thus its freezing point. **5.** a temperature sensitive measurement requiring carefully controlled temperature in the laboratory for the best ACCURACY. **6.** [aircraft deicing fluids] a SURROGATE for FREEZING POINT. – See BRIX, REFRACTIVE INDEX, REFRACTOMETER, DIMENSIONLESS QUANTITY.[29,102,150] [Bell, Guide, SAE AS6285]

***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). [SAE AS6285]

refractive index, **1.** unit of measurement of refraction expressed in the form of a dimensionless number which is the ratio of the speed of light in vacuum over the speed of light in the substance. **2.** a dimensionless number greater than 1.000 since the speed of light in the substance will be greater than the speed of light in vacuum. **3.** [aircraft deicing] a unit of measurement of refraction calibrated to the glycol concentration or freezing point of a deicing fluid. **4.** [aircraft deicing fluids] a SURROGATE for FREEZING POINT. – Synonym: INDEX OF REFRACTION. See REFRACTION, DIMENSIONLESS QUANTITY.[29,102,150] [Bell, Guide, SAE AS6285]

***refractive index**, unit of measurement of refraction expressed in the form of a dimensionless number. See also refraction and refractometer. [SAE AS6285]

refractometer, **1.** an optical instrument used to measure REFRACTION. **2.** an instrument whose result of measurement can be expressed as a dimensionless number (index of refraction) or as a scale of concentration, e.g., degree BRIX (°Brix), or freezing point (°C or °F). **3.** a laboratory instrument, field portable instrument or fixed inline instrument. **4.** a laboratory instrument (e.g., Abbé refractometer) with carefully controlled temperature for the greatest ACCURACY and

PRECISION. **5.** a portable field instrument, analog or digital, with or without temperature compensation. **6.** [aircraft deicing] an inline instrument to measure concentration in blending systems. – See LABORATORY INSTRUMENT, FIELD INSTRUMENT.[102,150] [Guide, SAE AS6285]

***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). [SAE AS6285]

regulator, an organization authorized to supervise, manage and enforce rules and standards within a specific sector or industry; *the FAA, CAAC, CAB, EASA, and Transport Canada are the respective regulators for civil aviation in the United States, China, Japan, Europe and Canada*.

regression analysis, **1.** a set of statistical methods utilized to estimate the relationship between dependent and/or independent variables. **2.** a statistical procedure to find the best fit between a dependent variable and one or more independent variables so their relationship can be expressed as a mathematical model; *the general form of the regression equation holdover time in snow is* $t = 10^{I} R^{A} (2\text{-}T)^{B}$ *where t is the holdover time, R the rate of precipitation, T the temperature, I, A, and B are coefficients determined from the regression.* **3.** [aircraft deicing] regression analysis of endurance times used to estimate the relationship between fluid visual failure, outdoor ambient temperature, precipitation condition and rate, and whose final output is HOLDOVER TIME.[67,167] [FAA AC 120-112, TC AC 700-061]

rejection, [SAE Aerospace Material Specifications] the process of refusing or not accepting product that fails to the specification or modifications authorized by the PURCHASER.[130,131,132,133] [SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

relative humidity, **1.** the ratio of the existing amount of water vapor in the air at a given temperature to the maximum amount that could exist at that temperature (expressed in percentage). **2.** [meteorology] the ratio of the vapor pressure to the SATURATION vapor pressure with respect to water (expressed in percentage).[156] [Schaschke]

relative wind, direction and speed experienced by an object moving through air. For an aircraft in flight, relative wind flows in a direction parallel with and opposite to the direction of flight.[71] [FAA H-8083-3C]

remote deicing facility, a deicing facility for single or multiple aircraft located away from the terminal or other area where aircraft loading activities normally take place.[135,137] [SAE ARP4902, SAE ARP5660]

***remote deicing facility**, a deicing facility for single or multiple aircraft located away from the terminal or other area where aircraft loading activities normally take place. [SAE ARP4902]

***remote deicing facility**, designated airport infrastructure facility designed to conduct deicing/anti-icing of aircraft preferably close to the take-off runway threshold. The operation is controlled by an individual pad control facility and is designed to permit aircraft engines-on operation while fulfilling all operational, safety, and environmental requirements. [SAE ARP5660]

remote on-ground ice detection system (ROGIDS), a system or device that makes a remote measurement of a monitored surface to determine whether frozen contamination is present. One of the intended functions of remote on-ground detection systems is the detection of CLEAR ICE.[144] [SAE AS5681]

***ROGIDS**, a system or device that makes a remote measurement of a monitored surface to determine whether frozen contamination is present. For the purpose of this Aerospace Standard, the intended function of the ROGIDS is the detection of clear ice. [SAE AS5681]

remote on-ground ice detection system false negative, an indication of the absence of frozen contamination when frozen contamination is present on the reference surface.[144] [SAE AS5681]

***false negative**, an indication of the absence of frozen contamination when frozen contamination is present on the reference surface. [SAE AS5681]

remote on-ground ice detection system false positive, an indication of the presence of frozen contamination when no frozen contamination is present on the reference surface.[144] [SAE AS5681]

***false positive**, an indication of the presence of frozen contamination when no frozen contamination is present on the reference surface. [SAE AS5681]

repeatability, [chemistry, engineering, metrology] the precision of replicate measurements on the same or similar object over a short period of time under a set of conditions that includes the same measurement procedure, same operators, same measuring system, same operating conditions, and same location. [French: répétabilité.] – Synonym: MEASUREMENT REPEATABILITY. Compare REPRODUCIBILITY. See PRECISION.[29,94,156] [Bell, JCGM, Schaschke]

representative sample, a sample intended to be representative of the larger quantity. – See SAMPLE.[102,156] [Guide, Schaschke]

representative surface, **1.** a portion of the aircraft that can be readily and clearly observed by the flightcrew from inside the aircraft and is used to judge whether or not critical surfaces have become contaminated. **2.** a representative surface if used for general situational awareness by the flightcrew need not be approved by the regulator—if used for decision making it needs to be approved by the regulator based on recommendation by the aircraft manufacturer. – See SITUATIONAL AWARENESS.[74,174] [FAA General Info, TC TP 14052]

reproducibility, [chemistry, engineering, metrology] the precision of replicate measurements on the same or similar object under a set of conditions that includes different operators, measuring systems, and locations. [French: reproductibilité]. – Synonym: MEASUREMENT REPRODUCIBILITY. Compare REPEATABILITY. See PRECISION.[94,156] [JCGM, Schaschke]

requalification, [aircraft deicing fluids and runway deicing products] see PERIODIC REQUALIFICATION.

residual fluid, **1.** Type I/II/III/IV fluid that is left on the aircraft during or after flight, usually on aerodynamically quiet surfaces, and generally considered a normal occurrence. **2.** fluid remaining on the lower plate of the wind tunnel test section after an AERODYNAMIC ACCEPTANCE TEST run. The average thickness of the residual fluid is used to compute the FLUID ELIMINATION. **3.** the fluid remaining after each aerodynamic acceptance test run is tested for water content and compared to the fluid before the test run. **4.** fluid remaining on the wing or wing test section after a test run in the determination of ALLOWANCE TIMEs. – See AERODYNAMICALLY QUIET SURFACE. Compare FLUID RESIDUE.[102,145] [GUIDE, RUGGI 2009, SAE AS5900]

residue, see FLUID RESIDUE. – Compare RESIDUAL FLUID.

responsible person, see PROGRAM MANAGER.

retained sample, [chemical industry] a SAMPLE kept under ideal storage conditions for an eventual further verification of product quality.[102] [Guide]

revision date, [SAE] see SAE STANDARD.

Reynolds number, a dimensionless number representing the ratio of inertial forces to viscous forces for a given flow. Mathematically the Reynolds number is calculated as a characteristic length multiplied by a characteristic speed divided by viscosity. The magnitude of the Reynolds number is often related to transition to turbulence and boundary-layer SEPARATION. – See LAMINAR FLOW, TURBULENT FLOW, TRANSITION, DIMENSIONLESS QUANTITY.

rheology, the science of deformation and flow of matter. – See RHEOMETER, VISCOMETER.[27] [Barnes]

rheological profile, [aircraft anti-icing fluid rheology] name given to viscosity vs shear stress curves of a thickened anti-icing fluid produced with a rotational RHEOMETER. Rheological profiles of a thickened anti-icing fluid have been correlated to the high speed aerodynamic acceptance results. – See RHEOMETER.[145,178] [SAE AS5900, Venckeleer]

rheometer, 1. [rheology] a laboratory device to measure how a viscous fluid responds to applied forces. Rheometers that control the applied shear stress or shear strain are called rotational or shear rheometers whereas rheometers that apply extensional stress or strain are called extensional rheometers. **2.** [aircraft anti-icing fluid rheology] rotational rheometers can be used to generate viscosity vs shear stress curves, or RHEOLOGICAL PROFILES, of a thickened anti-icing fluid which have been correlated to the high speed aerodynamic acceptance results. – Compare VISCOMETER.[145,178] [SAE AS5900, Venckeleer]

rime, [meteorology] a rough, granular, opaque, milky or white ice formed by the instantaneous freezing of SUPERCOOLED WATER droplets upon contact with objects at temperatures below freezing. Trapped pockets of air cause the rime to be white and opaque. – Compare CLEAR ICE.[50,62,93,113,150] [MANOBS, Dunlop, ICAO 9640, NOAA FMH-1, SAE AS6285]

***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. [SAE AS6285]

***rime,** this deposit is a white or milky and opaque "granular" deposit of ice formed by the rapid freezing of super-cooled water drops as they contact an exposed object. [MANOBS]

***rime**, a deposit of ice, produced by freezing of 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. [ICAO 9640]

rinsibility, [liquid runway deicing products] a DETERMINE AND REPORT TEST in which the liquid runway deicing product is poured onto a clear glass panel in the horizontal position and subsequently inclined at an angle of 45° for ten minutes, then placed in the horizontal position for 24 hours at room temperature. After the 24-hour exposure the plate is rinsed for five minutes with tap water, followed by a rinse on ASTM D1193 Type IV water and allowed to dry, then examined for visible traces of the runway deicing product.[133] [SAE AMS1435]

risk management, see SAFETY RISK MANAGEMENT.

roll, **1.** [aerodynamics] the motion of the aircraft about the LONGITUDINAL AXIS. **2.** [aerodynamics] one of the three dimensions of aircraft movement, the others being YAW and PITCH. **3.** roll is primarily controlled by AILERONS. **4.** the result of roll about the longitudinal axis produces a turn of the aircraft.[71,158] [FAA H-8083-3C, Shevell]

roll axis, see LONGITUDINAL AXIS.

roll-off angle, [surface chemistry] the tilt angle of a surface relative to horizontal at which the water drop starts to slide on the surface and varies between 0 and 90 degrees. – Synonym: SLIDING ANGLE.[129] [SAE AIR6232]

***roll-off angle**, the tilt angle of a surface relative to horizontal at which the water drop starts to slide on the surface and varies between 0 and 90 degrees. Also called sliding angle. [SAE AIR6232]

root cause, factor(s), under the control of the organization, that caused a NONCONFORMANCE that should be addressed with a CORRECTIVE ACTION.[9,152,168] [ASQ Glossary, SAE AS6332, TC AC SUR-002]

rotorcraft, **1.** a heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors. **2.** any aircraft that generates lift through rotating blades or rotors, powered or unpowered. It includes helicopters, autogyros, and tiltrotors (like the V-22 Osprey). – Compare HELICOPTER, POWERED-LIFT.[1,24] [Atkins, 14 CFR § 1.1]

rotary-wing aircraft, see ROTORCRAFT.

rotation, **1.** [aerodynamics] the act of lifting the nose of the aircraft off the runway. The moment at which the control inputs can be applied to pitch up the nose, that is to rotate, is a predetermined speed called the ROTATION SPEED (V_r). **2.** [viscometry] motion given to the SPINDLE in ROTATIONAL VISCOMETERS.

rotation speed 1. [aerodynamics] (V_r), the speed at which the pilot begins to apply control inputs to cause the aircraft nose to pitch up, after which it will leave the ground. **2.** [viscometry] expression sometimes used to mean ROTATIONAL RATE. – See ROTATION, MINIMUM CONTROL SPEED, TAKEOFF DECISION SPEED, LIFTOFF SPEED, MINIMUM UNSTICK SPEED, TAKEOFF SAFETY SPEED. [145,158] [SAE AS5900, Shevell].

rotational rate, – [viscometry] the rate at which the SPINDLE turns in ROTATIONAL VISCOMETERs, generally expressed in revolution per minute (rpm); *in the LOW SHEAR RATE VISCOSITY measurement of Type II/III/IV fluids the rotational rate is 0.3 rpm*. – Synonyms: ROTATIONAL SPEED, ROTATION SPEED.

rotational speed, [viscometry] often used as synonym for ROTATIONAL RATE. [Rotational speed might imply a unit of length per unit of time–that is not the case here. Rotational speed is usually expressed as rotation per minute (rpm). It would seem preferable to use rotational rate as it would be a more accurate term].

rotational viscometer, **1.** [viscometry] type of viscometer relying on rotational motion to achieve simple shearing flow. To induce the flow, either the SPINDLE is driven at a known ROTATIONAL RATE and the resulting couple measured or else a couple is applied and the subsequent rotational rate is measured. **2.** [viscometry of deicing fluids] generally rotational viscometers (e.g., Brookfield or equivalent) are used for measuring the viscosity of aircraft anti-icing fluids. The rotational rate is set and the couple measured. – See LOW SHEAR RATE VISCOSITY. [11,27,153] [Ametek Brookfield, Barnes, SAE AS9968]

rotor ice protection system (RIPS), a system designed to prevent the formation of ice during flight on the rotor blades of HELICOPTERs and other ROTORCRAFT.

rotor icing, [rotorcraft] accumulation of frozen precipitation on a rotor. *rotor icing disrupts the airflow over the rotor reducing its efficiency and potentially causing vibrations*. See ENGINE ICING, GROUND ICING, IN-FLIGHT ICING, PROPELLER ICING.

roughness, see AERODYNAMIC ROUGHNESS.

routine adaptations, [safety science] deviations repeated over time, which have become standard practice. – See ADAPTATIONS.[177] [TSB]

rubber, [runway contaminant] a tough elastic polymeric substance made from the latex of a tropical plant or from synthetic material.[69] [SAE AC 150/5200-30D]

rudder, **1.** [aircraft component] a vertical moveable control surface part of the VERTICAL TAIL, normally hinged to the rear of the vertical FIN. **2.** movement of the rudder rotates the aircraft about its vertical axis, controlling YAW.[71,158] [FAA H-8083-3C, Shevell]

runway concrete surface scaling resistance, **1.** a test method covering the determination of the resistance to scaling of a horizontal concrete surface exposed to freezing-and-thawing cycles in the presence of deicing chemicals. It is intended for use in evaluating this surface resistance qualitatively by visual examination. **2.** [deicing fluids, runway deicing products] a PASS-FAIL TEST classified under MATERIALS COMPATIBILITY to evaluate the effect of aircraft deicing fluid or runway deicing products on runway surfaces according to ASTM C672.[13,130,131,132,133,] [ASTM C672, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

runway deicing products, **1.** FREEZING POINT DEPRESSANT solids or solutions applied to runway or other airport paved surfaces for the purpose of preventing and removing frozen deposits. **2.** [aircraft brakes] a potential contaminant for carbon brakes.[127,132,133] [SAE AIR5490, SAE AMS1431, SAE AMS1435]

***runway anti-icing/deicing solids and fluids**, chemical solutions applied to a runway surface for the purpose of preventing and removing frozen deposits of frost and ice.

SAE, **1.** acronym for Society of Automotive Engineers. **2.** short for SAE International.

SAE standard, **1.** any document published by SAE International in the form of an aerospace material specification (AMS), aerospace standard (AS), aerospace information report (AIR), or aerospace recommended practice (ARP). **2.** any SAE International document that goes through a

formal balloting process at two levels, at the committee level and the Aerospace Council level. **3.** document available for a fee from SAE International. **4.** document normally subject to a five-year committee review unless canceled or stabilized. **5.** revised standards are indicated sequentially by letters, the letter A for the first revision, the letter B for the second revision, and so forth (the letters I and Q are not used); *AMS1424 is the first issue, AMS1424A the first revision, AMS1424B the second revision*. **6.** normally SAE standards come with a (first) issue date, a revision date (if not the first issue), and an effective date—when there is no effective date on a standard, the revision date is taken to be the effective date; *SAE AS6285E was issued 2016-08, revised 2023-05, and became effective 2023-08*; *SAE AMS1424S was issued 1992-01 and revised 2023-03*. **7.** an SAE standard may be stabilized—that is frozen at the last active revision level—when the committee decides to no longer maintain the document for instance when the technology, product, or process is mature and not likely to change in the foreseeable future. It is given a new sequential letter and a stabilization date: *AIR5704A was stabilized 2023-11*. **8.** an SAE standard may be canceled when it is deemed not fit for use. It is given a new sequential letter and a cancelation date; *AS8243A was canceled 2010-04*.[126] [SAE Aerospace Council]

SAE website, see STANDARDSWORKS.

safety data sheet (SDS), **1.** standardized regulated mandatory documentation associated with a product (chemical) including the name of the product and its supplier, the properties of the major chemicals comprising the product, the physical, health, and environmental hazards, protective measures, and safety precautions for handling, storing, and transporting. **2.** safety data sheet was formerly known as material safety data sheet or MSDS. **3.** safety data sheets are MANDATORY DOCUMENTATION for aircraft deicing fluids and runway deicing products.[49,116,117,130,131,132,133] [CCOHS, OSHA 2012, OSHA 2016, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

safety management system (SMS), **1.** a systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies, and procedures. **2.** the formal, top-down, organization-wide approach to managing safety risk and assuring the effectiveness of safety risk controls. It includes systemic procedures, practices, and policies for management of safety risk. – Compare QUALITY MANAGEMENT SYSTEM.[47,78,152] [CARs 101.01, FAA SAS, SAE AS6332]

***safety management system**, systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies, and procedures. [SAE AS6332]

***safety management system** (SMS), the formal, top-down, organization-wide approach to managing safety risk and assuring the effectiveness of safety risk controls. It includes systemic procedures, practices, and policies for management of safety risk. [FAA SAS]

***safety management system**, a systematic approach to managing safety, including. the necessary organizational structures, accountability, responsibilities, policies and procedures. [Transport Canada, online https://tc.canada.ca/en/aviation/general-operating-flight-rules/aviation-safety-management/basic-definition-safety-management-systems]

***safety management system**, means a documented process for managing risks that integrates operations and technical systems with the management of financial and human resources to ensure aviation safety or the safety of the public. [CARs 101.01]

safety risk management, **1.** [safety science] assessment and mitigation of safety risks involving the systematic application of management policies, procedures, and practices to ensure that risk is

reduced as low as reasonably practicable. **2.** [safety science] the process of describing the system, identifying the hazards, and analyzing, assessing, and controlling risk.[78,177] [FAA SAS, TSB]

sales specification, **1.** [aircraft deicing fluids, runway deicing products] a set of quality control limits established by a manufacturer for fluid to be sold. **2.** sales specification limits are related to but not necessarily the same as the IN-SERVICE LIMITS.[102] [Guide]

sample, a small portion of a larger quantity of a product used to evaluate quality. – See REPRESENTATIVE SAMPLE.[102,156] [Guide, Schaschke]

sampling guideline, [deicing fluids] a document, usually prepared by fluid manufacturers, explaining in general terms how to safely proceed to obtain representative samples – Compare SAMPLING PROCEDURE. See SAMPLE, REPRESENTATIVE SAMPLE.[102] [Guide]

sampling procedure, a site-specific and/or equipment-specific procedure used to obtain representative samples. – Compare SAMPLING GUIDELINE. See SAMPLE, REPRESENTATIVE SAMPLE.[102] [Guide]

sand, **1.** [runway contaminant] a sedimentary material, finer than a granule and coarser than silt. **2.** an ice control product applied to movement areas at airports.[69,173] [FAA AC150/5200-30D, TC TP 312]

sandwich corrosion, 1. [metallurgy] the corrosive attack that occurs at the interface between two metal surfaces when a corrosive or conductive material is present between them. **2.** [aircraft deicing fluids, runway deicing, products] a PASS-FAIL TEST classified under MATERIALS COMPATIBILITY and performed according to ASTM F1110.[22,130,131,132133] [ASTM F1110, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

saturation, [meteorology] the theoretical limit to the amount of water vapor in the air at any given temperature and pressure; the saturation limits differ depending on whether one is considering transition into liquid water or into ice. – See DEWPOINT, FROST POINT.[156,177] [Schaschke, TSB]

secondary wave, **1.** [fluid behavior subjected to aerodynamic forces] expression to describe the flow of fluid at or soon after rotation. **2.** the formation of the secondary wave is dependent on the geometry of the leading edge (e.g., with or without SLATS, high lift device, or HARD WING). **3.** the secondary wave plays a significant role in the transient lift degradation caused by fluids. – See FLOWOFF, PRIMARY WAVE, TRANSIENT AERODYNAMIC EFFECTS OF FLUIDS, ROTATION.[40,95,125] [Broeren, Koivisto, Runyan]

secure identification display area (SIDA), [FAA] a portion of an airport, specified in the airport security program, in which security measures specified in this part are carried out. This area includes the secured area and may include other areas of the airport.[176] [49 CFR § 1540.5]

senior management, a team of individuals at the highest level of management of an organization who are responsible for ensuring the proper delegation and delivery of performance for the day-to-day tasks of managing the winter operation.[151,152] [SAE AS6286, SAE AS6332]

***senior management team,** a team of individuals at the highest level of management of an organization who are responsible for ensuring the proper delegation and delivery of performance for the day-to-day tasks of managing winter operations. [SAE AS6286]

***senior management**, a team of individuals at the highest level of management of an organization who are responsible for ensuring the proper delegation and delivery of performance for the day-to-day tasks of managing the winter operation. [SAE AS6332]

separation, 1. [aerodynamics] the phenomenon where the boundary-layer flow over a body (e.g., a wing) breaks away from the surface, in other words when the BOUNDARY LAYER can no longer continue around the body. The location where this happens is called the boundary-layer separation point. Beyond the separation point, the flow may stagnate or reverse direction as there is no fluid from the front filling the space–the flow is unstable and breaks up into eddies. 2. [chemistry] the parting of materials into constituent parts; *examples of separation processes are chromatography, distillation, filtration, centrifugation, precipitation, evaporation, drying, electrolysis, decantation, and desorption*.[156,158] [Schaschke, Shevell]

service provider, [aircraft deicing] the organization responsible for the aircraft deicing/anti-icing operations at an airport.[152,174] [SAE AS6332, TC TP 14052]

***deicing service provider**, the company responsible for aircraft deicing/anti-icing operations. This may include contracted service providers, or where the air carrier/operator or airport authority performs these services internally. [SAE AS6332]

shall, **1.** required. **2.** [aircraft deicing] mandatory term to convey the intent of meeting a regulatory requirement or other requirement, e.g., SAE STANDARD. – Synonyms: IS/ARE REQUIRED, MUST.[75,150,170] [FAA HOT, SAE AS6285, TC HOT]

***shall**, this means the practice is mandatory. – A synonym for must. [SAE AS6285]

shear degradation, **1.** [aircraft deicing] the undesirable process of reducing permanently and irreversibly the viscosity of Type II/III/IV fluids through the application of excessive shear force. **2.** [aircraft deicing] a degradative process causing irreversible damage to the thickeners in Type II/III/IV fluids. **3.** shear degradation is thickener specific, in other words some fluid will shear degrade more easily than others; *this Type IV is more sensitive to shear degradation than that Type IV*. – See SHEAR FORCE, NOZZLE SAMPLE[102] [Guide]

shear force, **1.** [engineering] an applied force to a material that acts in the direction that is parallel to a plane rather than perpendicular. **2.** [aircraft deicing] when acceptable shear force applied to Type II/III/IV, the viscosity of the fluid decreases and recovers when the shear force is no longer applied. **3.** [aircraft deicing] when excessive shear force is applied to Type II/III/IV fluids, an unwanted irreversible viscosity reduction may occur. **4.** [aircraft deicing] excessive shear force may be applied to Type II/III/IV fluids whenever the fluid is pumped (e.g., gear pump, centrifugal pump), forced through an orifice or restriction (e.g., nozzle, restriction in a pipe, sharp bend in piping, dry disconnect coupling), or when subjected to impingement (e.g., fluid hitting a surface at high velocity pushed by FORCED AIR application or fluid hitting a sample container too close to a nozzle). – See SHEAR DEGRADATION, IMPINGEMENT.[93,156] [ICAO 9640, Schaschke]

shear rate, **1.** the difference in velocity of any two layers of fluid over the distance separating the two layers. **2.** the SI unit for shear rate is the reciprocal second, s^{-1}.[102,156] [Guide, Schaschke]

shear stress, **1.** a force per unit area acting parallel to the surface. **2** the SI units for shear stress are newton/meter square, N/m^2.[102,156] [Guide, Schaschke]

shear thinning fluid, a fluid whose viscosity decreases when a shear force is applied.[102] [Guide]

shelf life, **1.** the time a product is expected to be usable or saleable when stored under appropriate conditions. **2.** [aircraft deicing] an unpublished internal tool for fluid manufacturers to set the time of product verification for a certain period after production or retesting at fluid manufacturer storage sites. **3.** [aircraft deicing] an external tool for fluid manufacturers to recommend product verification after a certain period of storage at customer sites; *when a product is within shelf life, it does not necessarily mean it is on spec*. – Compare ON SPEC, OFF SPEC.[82,102,150] [Gorse, Guide, SAE AS6285]

***shelf life**, deicing/anti-icing fluids may degrade even when stored under appropriate conditions. Fluid manufacturers may assign a shelf life which is the time for which a product is expected to be useable or saleable when stored under appropriate conditions. For a deicing/anti-icing fluid, shelf life sets the time after which a fluid, under appropriate storage conditions, should be retested to verify that it still meets specification requirements. Consult the fluid manufacturer for further information. [SAE AS6285]

should, **1.** [SAE] to express or strongly encourage a practice **2.** [regulatory] that would meet or exceed the intent of a recommendation of a method of achieving safety unless an alternative method were implemented.[75,150,170] [FAA HOT, SAE AS6285, TC HOT]

***should** this means the practice is recommended or strongly encouraged. [SAE AS6285]

significant figures, **1.** indication of the precision of a measurement or calculation by showing the numbers known reliably plus one estimated or uncertain number. **2.** digits of a number or value beginning farthest to the left that is not zero and ending with the last digit farthest to the right that is not zero or a zero that is considered certain or estimated; *a measurement of 1.234 grams has four significant figures, 1.27 grams has three significant figures, 1.4 grams has two significant figures, 3.1 x 10^3 has two significant figures, 3.10 x 10^3 has three significant figures, 3.100 x 10^3 has four significant figures*. **3.** the concept of significant figures in measurements relates to the fact that a measured value cannot be more precise than the equipment being used to make the measurement and should not be reported in such a manner that it implies more precision that there really is.[29,164] [Bell, Stewart]

site qualification (SQ), **1.** [aircraft deicing fluids] process by which a fluid is qualified at a manufacturing site. If there is more than one production unit at a site, each unit needs to be qualified. **2.** [runway deicing products] for runway deicing products, if produced by a LICENSEE or SUBCONTRACTOR, the site needs to perform the test of an initial qualification. Compare INITIAL QUALIFICATION, PERIODIC REQUALIFICATION, MULTIPLE LOCATION QUALIFICATION, UNIT QUALIFICATION.[130,131,132,133] [SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

situational adaptations, [safety science] deviations occurring when there is pressure to get the job done and/or there are constraints on the availability of resources, including the design and condition of the work area, equipment availability and design, time pressure, number of staff, supervision, and external environmental factors. – See ADAPTATIONS.[177] [TSB]

situational awareness, the continuous extraction of environmental information, the integration of this information with previous knowledge to form a coherent mental picture, and the use of that picture in directing further perception and anticipating future events; *being aware of weather changing; colloquially: keep your head on a swivel when you are on a deicing pad; you are*

situationally aware when what you believe is happening overlaps with what is actually happening.[165,177] [Thomson, TSB]

slats, **1.** [aircraft component] moveable surfaces on the leading edge of the WING, normally with a carefully designed gap between the extended (deployed) surface and the wing to control lift during takeoff and landing. **2.** [aircraft deicing] when slats (and FLAPS) are kept extended (deployed) after deicing/anti-icing during taxi, the STANDARD HOLDOVER TIME and STANDARD ALLOWANCE TIME are reduced. – See ADJUSTED HOLDOVER TIME, ADJUSTED ALLOWANCE TIME.[71,158] [FAA H-8083-3C, Shevell]

sliding angle, [surface chemistry] the tilt angle at which a water drop starts to slide on the surface and varies between 0 and 90 degrees. – Synonym: ROLL-OFF ANGLE.[129] [SAE AIR6232]

slippery when wet, [runway contaminant] a wet runway where the surface friction characteristics would indicate diminished braking action as compared to a normal wet runway.[69] [FAA AC150/5200-30D]

slot management, departure allocation program intended to meter departing air traffic.[137] [SAE ARP5660]

***slot management**, departure allocation program intended to meter departing air traffic. [SAE ARP5660]

slush, 1. a watery mixture of partly melted snow, with or without FREEZING POINT DEPRESSANTs; *slush covered sidewalk, slush on the wing*. **2.** [meteorology] snow or ice on the ground that has been reduced to a soft watery mixture by rain, warm temperature, and/or chemical treatment. **3.** [runway contaminant] snow that has water content exceeding a freely drained condition such that it takes on fluid properties (e.g., flowing and splashing). Water will drain from slush when a handful is picked up. This type of water-saturated snow will be displaced with a splatter by a heel and toe slap-down motion against the ground.[8,69,93,108,150,162,174] [AMS Glossary, FAA AC150/5200-30D, ICAO 9640, Myers, SAE AS6285, SIAGDP, TC TP 14052]

***slush**, snow or ice that has been combined with water. [SAE AS6285]

***slush**, water-saturated snow which with a heel-and-toe slap-down motion against the ground will be displaced with a splatter. [ICAO 9640]

slush over ice, [runway contaminant] snow that has water content exceeding a freely drained condition such that it takes on fluid properties (e.g., flowing and splashing) over the solid form of frozen water.[69] [FAA AC150/5200-30D]

small hail, **1.** [meteorology] pellets of snow encased in a thin layer of ice which have formed from the freezing, either of droplets intercepted by the pellets, or of water resulting from the partial melting of the pellets with diameter generally smaller than 5 mm. **2.** hail includes small hail, but the reverse is not true. **3.** METAR code in the US is GR with remark less than ¼, in Canada SHGS with remark stating the diameter of hail, in Europe GS. **4.** [aircraft deicing] a precipitation with allowance times.[50,75,93,113,170] [MANOBS, FAA HOT, ICAO 9640, NOAA FMH-1, TC HOT]

***small hail**, pellets of snow encased in a thin layer of ice which have formed from the freezing, either of droplets intercepted by the pellets, or of water resulting from the partial melting of the pellets. [NOAA FMH-1]

***small hail**stones (SHGS), small hailstones meet the criteria for hail, except that the diameter of the largest stones is smaller than 5 mm. Small hailstones shall be abbreviated as SHGS. Unlike ice pellets, small hailstones may be irregular in shape; it is composed of alternating or concentric layers of transparent and translucent ice. [MANOBS]

***small hail**, precipitation of translucent ice particles that fall from a cloud. These particles are almost always spherical and sometimes have conical tips. Their diameter may attain and even exceed 5 millimeters. [ICAO 9640]

small sample adapter, [viscometry] a viscometer accessory used to measure the viscosity of small sample volumes, typically ranging from 2 to 16 mL. It consists of a cylindrical sample chamber and a torpedo shaped SPINDLE providing a defined geometry system for accurate viscosity measurements at precise shear rates. The design allows for easy changing and cleaning of the sample chamber without disturbing the viscometer setup, ensuring consistent measurement conditions. The sample chamber can be fitted into a double wall jacket in which a heat exchange fluid circulates for precise temperature control when connected to a circulating temperature bath.[42] [Brookfield SSA]

snow, **1.** [meteorology] precipitation composed of white or translucent ice crystals, mostly branched in the form of six-pointed or hexagonal stars. At temperatures higher than about -5 °C, the crystals are generally clustered to form snowflakes. **2.** [aircraft deicing] precipitation whose intensity for holdover times is determined from the snowfall visibility table and not directly from the METAR intensity qualifier. **3.** [endurance time testing] the snowfall intensities for endurance testing are very light, light, and moderate snow.

> *very light snow*, **4.** [endurance time testing] an endurance time testing condition with a precipitation rate of 3–4 g/dm^2/h. **5.** [aircraft deicing] a precipitation condition with a holdover time where the precipitation intensity is obtained from METAR/SPECI or flightcrew observed visibility using the snowfall visibility table.
>
> *light snow*, **6.** [meteorology] a precipitation METAR code -SN. 8. [endurance time testing] endurance time testing condition with a precipitation rate of 4–10 g/dm^2/h. **7.** [aircraft deicing] a precipitation condition with a holdover time where the precipitation intensity is obtained from METAR/SPECI or flightcrew observed visibility using the snowfall visibility table.
>
> *moderate snow*, **8.** [meteorology] a precipitation with METAR code SN. **9.** [endurance time testing] endurance time testing condition with a precipitation rate of 10–25 g/dm^2/h. **10.** [aircraft deicing] a precipitation condition with a holdover time where the precipitation intensity is obtained from METAR/SPECI or flightcrew observed visibility using the snowfall visibility table.
>
> *heavy snow*, **11.** [meteorology] a precipitation with METAR code +SN. **12.** [aircraft deicing] a precipitation condition without a holdover time.
>
> – See SNOWFALL VISIBILITY TABLE, BLOWING SNOW.[30,50,93,113,136,150,151,162] [Bendickson, MANOBS ICAO 9640, NOAA FMH-1, SAE ARP5485, SAE AS6285, SIAGDP]

***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. [SAE AS6285, SAE AS6286]

***snow**, precipitation of snow crystals, mostly branched in the form of six-pointed stars; for automated stations, any form of frozen precipitation other than hail. [NOAA FMH-1]

***snow**, precipitation of ice crystals, mostly branched in the form of six-pointed stars. The crystals are isolated or agglomerated to form snowflakes. [ICAO 9640]

***snow**, precipitation of ice crystals, singly or agglomerated, which fall from a cloud. [ICAO 9640]

***snow**, precipitation of mainly hexagonal ice crystals, most of which are branched (star-shaped). The branched crystals are sometimes mixed with unbranched crystals. At temperatures higher than about -5 °C, the crystals are generally clustered to form snowflakes. [MANOBS]

snow accompanied by blowing snow or drifting snow, [aircraft deicing] a precipitation condition with a holdover time where the precipitation intensity is obtained from METAR/SPECI or flightcrew observed visibility using the SNOWFALL VISIBILITY TABLE.[75,170] [FAA HOT, TC HOT]

snow desk, **1.** operational position at a deicing facility control center where all aircraft deicing operations are coordinated, and equipment is dispatched. **2.** control position, person, or desk for all the activities at an airport (e.g., snow plows, snow removal, gate control, deicing) related to a snow event.[137] SAE [ARP5660]

***snow desk**, operational position within an airport authority operations control center where all snow removal operations are coordinated and equipment, logistics and removal methods are dispatched. [SAE ARP5660]

snow grains, **1.** [meteorology] precipitation in the form of very small, white, opaque particles of ice; the solid equivalent of DRIZZLE. These resemble SNOW PELLETS in appearance but are more flattened and elongated, and generally have diameters of less than 1 mm. When the grains hit hard ground, they do not bounce or shatter. **2.** [aircraft deicing] precipitation whose intensity for holdover times is determined from the snowfall visibility table and not directly from the METAR intensity qualifier. **3.** [endurance time testing] the snow grains intensities for endurance testing are very light, light, and moderate snow grains.

> *very light snow grains*, **4.** [endurance time testing] an endurance time testing condition with a precipitation rate of 3–4 g/dm^2/h. **5.** [aircraft deicing] a precipitation condition with a holdover time where the precipitation intensity is obtained from METAR/SPECI or flightcrew observed visibility using the snowfall visibility table.
>
> *light snow grains*, **6.** [meteorology] a precipitation METAR code -GS. **7.** [endurance time testing] endurance time testing condition with a precipitation rate of 4–10 g/dm^2/h. **8.** [aircraft deicing] a precipitation condition with a holdover time where the precipitation intensity is obtained from METAR/SPECI or flightcrew observed visibility using the snowfall visibility table.
>
> *moderate snow grains*, **9.** [meteorology] a precipitation with METAR code GS. **10.** [endurance time testing] endurance time testing condition with a precipitation rate of 10–25 g/dm^2/h. **11.** [aircraft deicing] a precipitation condition with a holdover time where the precipitation intensity is obtained from METAR/SPECI or flightcrew observed visibility using the snowfall visibility table.

heavy snow grains, **12.** [meteorology] a precipitation with METAR code +GS. **13.** [aircraft deicing] a precipitation condition without a holdover time.

– See SNOWFALL VISIBILITY TABLE.[50,62,75,93,113,150,151,162,170] [FAA HOT, MANOBS, Dunlop, ICAO 9640, NOAA FMH-1, SAE AS6285, SAE AS6286, SIAGDP, TC HOT]

***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. [SAE AS6285, SAE AS6286]

***snow grains**, precipitation of very small, white, and opaque grains of ice. [NOAA FMH-1]

***snow grains**, precipitation of very small white and opaque grains of ice. These grains are fairly flat or elongated; their diameter is generally less than 1 mm. When the grains hit hard ground, they do not bounce or shatter. They usually fall in very small quantities, mostly from Stratus or occasionally from fog, and never in the form of a shower. [MANOBS]

***snow grains**, precipitation of very small opaque white particles of ice which fall from a cloud. These particles are fairly flat or elongated; their diameter is generally less than 1 millimeter. [ICAO 9640]

snow grains accompanied by blowing snow or drifting snow, [aircraft deicing] a precipitation condition with a holdover time where the precipitation intensity is obtained from METAR/SPECI or flightcrew observed visibility using the SNOWFALL VISIBILITY TABLE.[75,170] [FAA HOT, TC HOT]

snow mixed with ice crystals or freezing fog, [aircraft deicing] a precipitation condition with a holdover time where the precipitation intensity is obtained from METAR/SPECI or flightcrew observed visibility using the SNOWFALL VISIBILITY TABLE.[75,170] [FAA HOT, TC HOT]

snow pellets, **1.** [meteorology] precipitation of white and opaque particles of ice; these ice particles are either round or conical, their diameter is approximately 2–5 mm. Snow pellets are brittle and easily crushed; when they fall on hard ground, they bounce and often break up. **2.** [aircraft deicing] precipitation whose intensity for holdover times is determined from the snowfall visibility table and not directly from the METAR intensity qualifier. **3.** [endurance time testing] the intensities for snow pellets endurance testing are very light, light, and moderate.

very light snow pellets, **4.** [endurance time testing] an endurance time testing condition with a precipitation rate of 3–4 g/dm^2/h. **5.** [aircraft deicing] a precipitation condition with a holdover time where the precipitation intensity is obtained from METAR/SPECI or flightcrew observed visibility using the snowfall visibility table.

light snow pellets, **6.** [meteorology] a precipitation METAR code -GR. **7.** [endurance time testing] endurance time testing condition with a precipitation rate of 4–10 g/dm^2/h. **8.** [aircraft deicing] a precipitation condition with a holdover time where the precipitation intensity is obtained from METAR/SPECI or flightcrew observed visibility using the snowfall visibility table.

moderate snow pellets, **9.** [meteorology] a precipitation with METAR code GR. **10.** [endurance time testing] endurance time testing condition with a precipitation rate of 10–25 g/dm^2/h. **11.** [aircraft deicing] a precipitation condition with a holdover time where the precipitation intensity is obtained from METAR/SPECI or flightcrew observed visibility using the snowfall visibility table.

heavy snow pellets, **12.** [meteorology] a precipitation with METAR code +GR. **13.** [aircraft deicing] a precipitation condition without a holdover time.

– See SNOWFALL VISIBILITY TABLE.[50,62,75,93,113,150,162,170] [FAA HOT, MANOBS, Dunlop, ICAO 9640, NOAA FMH-1, SAE AS6285, SIAGDP, TC HOT]

***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. [SAE AS6285]

***snow pellets**, precipitation of white, opaque grains of ice. The grains are round or sometimes conical. Diameters range from about 0.08 to 0.2 inch (2 to 5 mm). [NOAA FMH-1]

***snow pellets**, precipitation of white and opaque particles of ice; these ice particles are either spherical or conical; their diameter is about 2 mm to 5 mm. Snow pellets are brittle and easily crushed; when they fall on hard ground, they bounce and often break up. Snow pellets always occur in showers and are often accompanied by snowflakes or rain drops, when the surface temperature is around 0 °C. [MANOBS]

snow pellets accompanied by blowing snow or drifting snow, [aircraft deicing] a precipitation condition with a holdover time where the precipitation intensity is obtained from METAR/SPECI or flightcrew observed visibility using the SNOWFALL VISIBILITY TABLE.[75,170] [FAA HOT, TC HOT]

snowfall intensities as a function of prevailing visibility, see SNOWFALL VISIBILITY TABLE.

snowfall intensity, **1.** [aircraft deicing] intensities obtained by converting METAR/SPECI reported prevailing visibility or flightcrew observed visibility for snow, snow grains, or snow pellets accompanied by blowing snow or drifting snow, snow mixed with ice crystals or freezing fog using the snowfall visibility table. **2.** [aircraft deicing] the snowfall intensities to be used with the Type I/II/III/IV holdover time guidelines are very light, light, moderate, and heavy. **3.** the holdover time snowfall intensities (very light, light, moderate, heavy) are different from the meteorological intensity qualifiers (light (-), moderate (no symbol), heavy (+)). – See INTENSITY QUALIFIER, SNOWFALL VISIBILITY TABLE.[74,75,170] [FAA GENERAL, FAA HOT, TC HOT]

snowfall visibility table, **1.** [holdover time] the short form for the table entitled "Snowfall intensities as a function of prevailing visibility" published in the FAA and Transport Canada *Holdover Time Guidelines*. **2.** [holdover time] table used to convert METAR/SPECI reported prevailing visibility or flightcrew observed visibility for snow, snow grains, snow pellets precipitation conditions. The snowfall visibility table is also used when snow, snow grains, or snow pellets are accompanied by blowing or drifting snow, or when snow is mixed with ice crystal or freezing fog in the METAR/SPECI. – See SNOWFALL INTENSITY.[74,75,170] [FAA GENERAL FAA HOT, TC HOT]

snowflake, [meteorology] an ice crystal, or aggregation of ice crystals that fall from a cloud.[8] [AMS Glossary]

sodium acetate, **1.** [chemistry] Chemical Abstract registry number 127-09-3, alternate name: acetic acid sodium salt (1:1); molecular formula $C_2H_3NaO_2$; molecular weight 82.03. **2.** [runway deicing products] a FREEZING POINT DEPRESSANT used in runway deicing products. – Compare SODIUM FORMATE, POTASSIUM ACETATE.[105] [Merck Index]

sodium formate, **1.** [chemistry] Chemical Abstract registry number 141-53-7, alternate name: formic acid sodium salt (1:1); molecular formula $CHNaO_2$; molecular weight 68.01. **2.** [runway deicing products] a FREEZING POINT DEPRESSANT used in runway deicing products. – Compare SODIUM ACETATE, POTASSIUM ACETATE.[105] [Merck Index]

solute, [chemistry] the substance dissolved in a SOLVENT forming a SOLUTION.[119] [Rennie]

solution, [chemistry] the resultant homogeneous mixture of a SOLVENT and a SOLUTE.[102,119] [Guide, Rennie]

solvent, [chemistry] a liquid that dissolves another substance or substances.[119] [Rennie]

specific gravity, 1. [chemistry] the dimensionless ratio of the mass of a volume of a substance to the same volume of another reference substance. The usual reference substance is water. The substance and the reference substance may be at the same or different temperatures. The measurement temperatures must be specified with the result. **2.** [aircraft deicing fluids] a PHYSICAL PROPERTY used as SURROGATE for glycol concentration and FREEZING POINT in aircraft deicing fluids. It is a DETERMINE AND REPORT TEST in INITIAL QUALIFICATION and a PASS-FAIL TEST in subsequent tests. The SAE G-12 Aircraft Deicing Fluids Committee resolved to abandon this measurement in AMS1424 and AMS1428 as it is redundant with the measurement of REFRACTION. – Synonyms: apparent specific gravity, relative density, relative volumic mass.[79,82,119,130,131,154] [Fenna, Gorse, Rennie, SAE AMS1424, SAE AMS1428, SAE G-12 ADF 20240513]

specimen sheet, **1.** [training] a reference list containing the signatures and the initials of employees. New hire employees are added to the sheet at the completion of training. The purpose of the specimen sheet is to verify an employee's signature or initials against what is recorded on the record of procedural changes and other official documentation and therefore the validity of the entry. **2.** digital signatures linked to employee numbers.[174] [TC TP 14052]

spent deicing fluid, **1.** sprayed deicing/anti-icing fluid that has fallen to the ground. **2.** sprayed deicing/anti-icing fluid that may be recovered and recycled. – See LOW CONCENTRATION SPENT DEICING FLUID, COMPLIANT SPENT DEICING FLUID, HIGH CONCENTRATION SPENT DEICING FLUID.

spindle, **1.** [viscometry] interchangeable component of a rotational viscometer that is immersed in the fluid being tested with a stem that connects it mechanically or magnetically to the viscometer. **2.** [viscometry of thickened fluids] typically the spindles used for measuring the viscosity of Type II/III/IV fluids have different geometries such as the cylindrical LV-1 and LV-2, the disk LV2 which is a disk, and the torpedo shaped SC4-31/13R and SC4-34/13R inserted in a cylindrical container called the sample chamber. The torpedo shaped spindle and the sample chamber together are called the SMALL SAMPLE ADAPTER. **3.** the spindle rotates at a controlled ROTATION RATE (expressed as rotation per minute) generating a couple from which the shear viscosity is calculated. – See LOW SHEAR RATE VISCOSITY. [41] [Brookfield Spindles]

spinner, [aircraft engine] a cone-shaped component located at the front of the engine, covering the hub and the base of the fan blades. Its purpose is to improve the aerodynamic flow into the engine. The spinner is susceptible to icing.[90] [Horrigan 2013]

splash filling, see SPLASH LOADING.

splash loading, [chemical industry] loading a tank from the top without a vertical fill pipe going down into the tank such that the filling is above the liquid surface during much of the filling, increasing turbulence and agitation, often causing air entrapment in the fluid. – Synonym: SPLASH FILLING. Compare SUBMERGED LOADING, BOTTOM LOADING.

spreading rate, [runway deicing products] refers to the quantity of a deicing product applied per unit area of a runway surface. It is typically measured in grams per square meter (g/m^2) or pounds per square foot (lb/ft^2).

spoiler check, [aircraft deicing] the verification of a spoiler panel for contamination; considered a last-chance check for surface contamination before takeoff.[177] [TSB]

spoilers, [aircraft component] high-drag devices that can be raised into the air flowing over an AIRFOIL, reducing lift and increasing drag. Spoilers are used for roll control on some aircraft. Deploying spoilers on both wings at the same time allows the aircraft to descend without gaining speed. Spoilers are also used to shorten the ground roll after landing. – See SPOILER CHECK.[71,158] [FAA H-8083-3C, Shevell]

stabilization date, see SAE STANDARD.

staging area, [aircraft deicing] dedicated area behind and/or adjacent to each deicing bay, where aircraft await approval to enter the deicing bay.[137] [SAE ARP5660]

***staging area**, dedicated area behind and/or adjacent to each deicing bay, where aircraft await approval to enter the deicing bay. [SAE ARP5660]

staging bay, [aircraft deicing] a dedicated area behind and adjacent to each deicing bay, where aircraft await approval to enter the deicing bay.[174] [TC TP 14052]

stall, [aerodynamics] a rapid decrease in lift caused by the separation of airflow from the wing surface brought on by exceeding the CRITICAL ANGLE OF ATTACK.[71,158] [FAA H-8083-3C, Shevell]

standard allowance time, an ALLOWANCE TIME that is not adjusted. – Compare ADJUSTED ALLOWANCE TIME.[102] [Guide]

standard aluminum test plate, aluminum test plate surface used for endurance time testing of Type I and Type II/III/IV fluids in accordance with ARP5945 and ARP5485. – Synonym: STANDARD TEST PLATE.[129] [SAE AIR6232]

***standard aluminum test plate**, aluminum test plate surface used for endurance time testing of Type I and Type II/III/IV fluids in accordance with ARP5945 and ARP5485. [SAE AIR6232]

standard dilution of Type II/III/IV fluid, a product/water ratio by volume of 100/0, 72/25, or 50/50. – Compare NON-STANDARD DILUTION OF TYPE II/III/IV FLUID.[102] [Guide]

standard holdover time, a holdover time that is not adjusted. – Compare ADJUSTED HOLDOVER TIME.[102] [Guide]

standard plate failure, **1.** [fluid testing] the visual failure of one third of the test plate. **2.** when the failure front on the plate crosses the 15 cm (6 in.) line, when contamination is visible on 5 of the 15 crosshairs, or when it is estimated that the contamination covers one third of the test plate surface. **3.** standard plate failure is a visual failure based on the comparison to conditions on full-scale aircraft. – See STANDARD TEST PLATE.[108] [Myers]

standard test plate, **1.** [fluid testing] a plate used for endurance time testing. **2.** an aluminum alloy plate 50 cm (20 in.) long and 30 cm (12 in.) wide adopted by SAE for the evaluation and qualification of deicing/anti-icing fluids. **3.** Along the top and two sides a line is marked 2.5 cm (1 in.) from the edge; ice crystals commencing in these zones are ignored as outside the test area. The bottom edge is unmarked. The test area of the test plate is about 75 percent of the total area. The plate is marked with horizontal lines parallel to the top edge at 7.5 cm (3 in.), 15 cm (6 in.), 22.5 cm (9 in.), 30 cm (12 in.), and 37.5 cm (15 in.). On each of these lines are marked three cross hairs, one in the middle of the line and the other two evenly spaced 7.5 cm (3 in.) each side of it for a total of 15 crosshairs. **4.** for endurance time testing it is mounted at ten degrees (10°) to the horizontal. – Synonym: STANDARD ALUMINUM TEST PLATE. See STANDARD PLATE FAILURE.[108] [Myers]

StandardsWorks, the name of the SAE website where SAE Committees hold information such as minutes of meetings, ballot documents, maintain documents available to the public, etc. https://standardsworks.sae.org/standards-committees/g-12adf-aircraft-deicing-fluids.

static air temperature (SAT), [in-flight parameters] the temperature of undisturbed air, which is the temperature that could be read if you could suspend a thermometer out in the air without having the effect of temperature rise due to the movement of the aircraft. Static air temperature is the TOTAL AIR TEMPERATURE minus RAM RISE. – See OUTSIDE AIR TEMPERATURE. [72] [FAA H-8383-31B]

stoichiometry, [chemistry] the quantitative study of the relative proportion of reactants and products in chemical reactions.[119,156] [Rennie, Schaschke]

storage stability, **1.** [material science] constancy of a property over time. **2**. the ability of a product to be within established parameters, such as chemical, physical, or mechanical properties, over a specified time under specified conditions. **3. [**aircraft deicing fluids, runway deicing products] the ability of the product to be within the specified performance, operational or physical property over a specified time under specified conditions.[88] [Hibbert, SAE AMS1424, SAE AMS1428, SAE AMS1435]]

storage tank, **1.** usually a large vessel for holding fluids that can be fixed or moveable such as FRAC TANKs or ISOTAINERs not used for transportation, excluding mobile equipment used for transportation such as TANK TRUCKs. **2.** any vessel used for storage; *this tote is used as a storage tank.*[150] [SAE AS6285]

***storage tank**, a vessel for holding fluid that can be fixed, or mobile; includes rolling tanks (ISO tanks), totes, tank trucks, or drums. [SAE AS6285]

storage vessel, any vessel used for storage. – See STORAGE TANK.

stormwater, the portion of water from rainstorms or melting snow which flows over land into storm drains or surface waters.[51,118] [Calgary, Park]

***stormwater**, water from rainstorms melting snow that goes into the storm drains in the road through an underground pipe system to our rivers. [Calgary]

strake, a vertical component of the wingtip device installed outboard extending downward and therefore unobservable from inside the aircraft.[174] [TC TP 14052]

stress, **1.** [engineering] a force per unit area; the unit of stress is the newton per square meter (N/m^2) or pascal (P). **2.** [human factors] the physiological or psychological response to internal or external stressors.[10,102] [APA, Guide]

stress-corrosion resistance, **1.** [aircraft materials] the ability of a material to withstand stress corrosion cracking, a type of failure caused by the combined effects of tensile stress and a corrosive environment. Stress corrosion cracking can lead to sudden and catastrophic failure of components, even if the overall corrosion damage appears minimal. **2.** [aircraft deicing fluids and runway deicing products] a PASS-FAIL TEST classified under MATERIALS COMPATIBILITY that determines the propensity of a product to cause stress corrosion in AMS4911 titanium alloy and is performed according to ASTM F945.[20,130,131,132,133][ASTM F945, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

strut, **1.** [aircraft components] a structural component used in various parts of the aircraft. **2.** a strut that connects the engine to the aircraft WING or FUSELAGE is also known as a PYLON. It provides support and stability for the engine.

subcontractor, **1.** an individual or firm that does part or all of a job for which another individual or firm is responsible. **2.** [aircraft deicing fluid and runway deicing products] an organization manufacturing an aircraft deicing fluid or runway deicing product on behalf of the original manufacturer or licensee. The original manufacturer or licensee (as the case may be) must qualify the product manufactured at the subcontractor site(s). **3.** for Type I aircraft deicing fluids the subcontractor site qualification consists of either a) an initial qualification if the manufacturing process (including materials) is not essentially the same as of the original fluid manufacturer or b) aerodynamic test(s) and a single water spray endurance time (three panels only) if the manufacturing process is essentially the same as the original manufacturer. **4.** for Type II/III/IV aircraft deicing fluids the licensee site qualification consists either of a) an initial qualification if the manufacturing process (including materials) is not essentially the same as of the original fluid manufacturer or b) aerodynamic test(s), a single water spray endurance time (three panels only), and viscosity, if the manufacturing process is essentially the same as the original manufacturer. **5.** for runway deicing products, the subcontractor site qualification consists of an initial qualification. – Compare ORIGINAL MANUFACTURER, LICENSEE, VENDOR, PURCHASER.[48,106,130,131,132,133] [Cambridge, MW, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

sublimate, [meteorology and chemistry] a solid formed through the process of DEPOSITION; *frost is a sublimate caused by cold soaking or radiational cooling.*[62,119,156] [Dunlop, Rennie, Schaschke]

sublimation, [meteorology and chemistry] the direct change from solid phase to vapor phase without appearance of a liquid state. – See SUBLIMATE. Compare DEPOSITION.[62,119,156,162] [Dunlop, Rennie, Schaschke, SIAGDP]

submerged filling, see SUBMERGED LOADING.

submerged loading, loading a tank from the top but with a fill pipe going below the fluid level, minimizing air entrapment. – Synonym: SUBMERGED FILLING. Compare SPLASH LOADING, BOTTOM LOADING.

substantiation, **1.** [law] to establish the existence or truth of a fact, etc., by evidence which (in criminal matters) involves three concepts: relevance, admissibility and probative value. **2.** [science] the process of providing data, observations, experiments, logical reasoning, or evidence to support a hypothesis, theory, or claim. **3.** [holdover times] expression used in the early 1990's to describe the process of converting holdover times that had been put together from operational qualitative observations to holdover times put together from quantitative field and laboratory data.[36,81,97,169] [Boilard, Garner, Kuperman, TC ACAC 0027]

successive dry-out and rehydration, **1.** [thickened fluids] a test to simulate the formation of dried-out FLUID RESIDUES and for such dried-out residues to form gels upon rehydration. **2.** a PASS-FAIL TEST for Type II/III/IV fluids whose result is classified as an OPERATIONAL PROPERTY. **3.** a test sometimes named the Buehler test, after Rolf Buehler who developed the test and explained its significance. – Synonym: BUEHLER TEST.[131] [SAE AMS1428].

supercooled liquid, the state of a substance in liquid form below its freezing point. – Synonym: SUPERCOOLING. See SUPERCOOLED WATER.[102,177] [Guide, TSB]

supercooled water, also referred to as liquid supercooled water, water in liquid form at temperature below its freezing point; *water on a wing at -2 ˚C; in the absence of nucleation supercooled water droplets can exist at temperatures as low as -40 ˚C*.[62,102,156] [Dunlop, Guide, Schaschke]

supercooling, see SUPERCOOLED LIQUID.

superhydrophobic surface, [surface chemistry] a surface producing a static CONTACT ANGLE of $\theta > 150$ degrees and a ROLL-OFF ANGLE of less than 10 degrees.[129] [SAE AIR6232]

***superhydrophobic surface**, a surface producing a static contact angle of $\theta > 150$ degrees and a roll-off angle of less than 10 degrees. [SAE AIR6232]

supersaturation, [meteorology] a state when the relative humidity of air is greater than 100%, meaning it contains more water vapor that is needed to produce SATURATION with respect to liquid water or ice. This occurs generally because there are no nuclei to assist in the PHASE TRANSITION from vapor to liquid water or ice. – See NUCLEUS.[8,62] [AMS Glossary, Dunlop]

surface boundary layer, [meteorology] the thin lowermost layer of the atmosphere in immediate contract with the ground and loosely defined as below 10 meters. – See BOUNDARY LAYER.[62] [Dunlop]

surface coating, see AIRCRAFT SURFACE COATING.

surface finish, see AIRCRAFT SURFACE COATING.

surface tension, **1.** the force that acts on the surface of a liquid, tending to minimize the surface area. This force results from intermolecular forces: a molecule in the interior of a liquid experiences interactions from other molecules equally from all sides, whereas a molecule at the surface is only affected by molecules below it in the liquid. Surface tension is measured by the CONTACT ANGLE of a drop of liquid on a surface or using the Du Nouy tensiometer which consists of a ring placed on the surface of the fluid and measuring the force required to lift it off the surface. The unit of measurement is the newtons per meter (N/m). **2.** [aircraft deicing] surface tension is related to the ability of a liquid to wet a surface. **3.** surface tension is a PHYSICAL PROPERTY that is measured for Type I/II/II/IV during initial qualification. It is a SURROGATE for wetting. It is a DETERMINE AND REPORT TEST in INITIAL QUALIFICATION and a PASS-FAIL TEST in subsequent tests. The SAE G-12 Aircraft Deicing Fluids Committee resolved to abandon this measurement as a technical requirement in AMS1424 and AMS1428 due to its redundancy with the WATER SPRAY ENDURANCE TEST which evaluates WETTING.[119,130,131,154,156] [Rennie, SAE AMS1424, SAE AMS1428, SAE G-12 ADF 20240513, Schaschke]

surrogate, [experimental sciences, aircraft deicing] a proxy measure for an attribute of true interest that is too difficult, time consuming, or costly to measure directly. Surrogacy is extensively utilized in experimental sciences. *For instance, determining the freezing point of an aircraft deicing fluid is essential for performing aircraft deicing operations. However, the standard freezing point determination method is cumbersome and time-consuming. As a result, refraction measurement with a proper calibration curve is employed both in laboratories and in the field as a surrogate for freezing point determination. Another example is using the LOWEST ON-WING VISCOSITY, as measured with a Brookfield viscometer at low shear rate, as surrogate to indicate that ANTI-ICING FLUID PERFORMANCE (comprised of WATER SPRAY ENDURANCE TIME and ENDURANCE TIMEs), and HOLDOVER TIMES should be within the expected range*.[114,130,131,153] [O'Loughlin, SAE AMS1424, SAE AMS1428, SAE AS9968]

suspended matter, **1.** [chemical industry] solid particles that are not dissolved in a liquid but are distributed throughout it. These particles may be large enough to be visible to the naked eye, and they can be separated through processes like sedimentation or filtration. **2.** [deicing fluids] it is not an uncommon occurrence to have small amounts of particles of iron in Type I//II/II/IV fluids, often because of storage in carbon steel vessels (tanks, piping, etc.). Some fluid manufacturers set the pass-fail criterion for suspended matter in aircraft deicing fluids as "substantially free".

symmetrical deicing, the removal of contamination or the prevention against contamination with anti-icing fluids in a manner that does not differ between the two sides of the aircraft, including the WING, HORIZONTAL STABILIZER and VERTICAL STABILIZER. – Compare ASYMMETRICAL DEICING.[93,115,150,151,174] [ICAO 9640, Oda, SAE AS6285, SAE AS6286, TC TP 14052]

system, **1.** a combination of components which are inter-connected to perform one or more functions. **2.** a group of inter-dependent processes and people working together to achieve a defined result. A system comprises policies, processes and procedures. **3.** [safety science] a group of interrelated processes which are a combination of people, procedures, materials, tools,

equipment, facilities, and software operating in a specific environment to perform a specific task or achieve a specific purpose, support, or mission.[78,143,144,168] [FAA SAS, SAE AS5635, SAE AS5681, TC AC SUR-002].

***system,** a combination of components which are inter-connected to perform one or more functions. [SAE AS5635]

***system**, a combination of components which are inter-connected to perform one or more functions. [SAE AS5681]

tactile check, **1.** process by which a person touches specific aircraft surfaces. A tactile check, 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 postdeicing/anti-icing check to ensure the critical surfaces are free of frozen contaminants. **2.** [Transport Canada] see TACTILE INSPECTION.[137,150,174] [SAE ARP5660, SAE AS6285, TC TP 14052]

***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. [SAE AS6285]

***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. [SAE ARP5660]

tactile inspection, Transport Canada term for tactile check. – See TACTILE CHECK.[174] [TC TP 14032]

tails, [aircraft components] stabilizing surfaces at the rear of the aircraft consisting of the HORIZONTAL TAIL and the VERTICAL TAIL; *"deice the wings and tails"*.[158] [Shevell]

takeoff decision speed (V_1), [aerodynamics] the speed of the aircraft beyond which the takeoff should not be aborted. – See MINIMUM CONTROL SPEED, ROTATION SPEED, MINIMUM UNSTICK SPEED, LIFTOFF SPEED, TAKEOFF SAFETY SPEED.[145,158] [SAE AS5900, Shevell]

takeoff ground roll, **1.** [aerodynamics] the portion of the takeoff procedure during which the airplane is accelerated from a standstill to an airspeed that provides sufficient lift for it to become airborne. **2.** the distance an aircraft travels on the runway from the point where the aircraft begins its ground roll until it lifts off the ground. – Synonyms: GROUND ROLL, TAKEOFF ROLL, TAKEOFF RUN.[71,158] [FAA H-8083-3C, Shevell]

takeoff roll, see TAKEOFF GROUND ROLL.

takeoff run, see TAKEOFF GROUND ROLL

takeoff safety speed (V_2), [aerodynamics] the speed of an aircraft at 35-foot altitude for civil turbine-powered aircraft (or 50-foot altitude for other aircraft) when climbing with one engine inoperative and able to maintain that speed. – See MINIMUM CONTROL SPEED, TAKEOFF DECISION SPEED, ROTATION SPEED, MINIMUM UNSTICK SPEED, LIFTOFF SPEED.[145,158] [SAE AS5900, Shevell]

tandem deicing, [aircraft deicing] the conducting of deicing operations simultaneously in both the staging and deicing bays at a deicing facility. – See STAGING BAY, DEICING BAY.[137] [SAE ARP5660]

***tandem deicing**, the conducting of deicing operations simultaneously in both the staging and deicing bays. Tandem deicing operations requires additional procedures and training to address the variations of operation versus regular CDF/DDF operations. [SAE ARP5660]

tank truck, [chemical industry] vehicle designed to carry bulk liquids or gases whose typical capacity for liquids is 19,000–35,000 liters (5,000–9200 USG). – Compare TOTE.

taxiway, a defined path on airport land established for the taxiing of aircraft and intended to provide a link between one part of the airport and another.[174] [TC TP 14052]

temperature, **1.** a measurement of how hot or cold a substance is. **2.** a measure of the overall kinetic energy of a substance. **3.** [thermodynamics] a measure of the intensity of heat flowing in or out of a body and in which direction the heat flows. If there is no flow of heat, the bodies are at thermodynamic equilibrium. When they are not at equilibrium, heat flows spontaneously from the higher (hotter) to the lower (colder) temperature body. **4.** [temperature scales] several temperature scales can be used to quantify temperature, such as the degree Celsius, degree Fahrenheit and degree Kelvin. **5.** [meteorology] in meteorology, temperature is measured with a thermometer. – See THERMOMETER, TOTAL AIR TEMPERATURE, RAM RISE, STATIC AIR TEMPERATURE.[8,24,44,62,119,156] [AMS Glossary, Atkins, Bureau, Dunlop, Rennie, Schaschke]

temperature buffer, see FREEZING POINT BUFFER**.**

temperature gauge, **1.** usually a device showing temperature on a numbered dial. There are several different kinds of temperature gauges, e.g., bimetallic temperature gauge, liquid filled temperature gauge, gas filled temperature gauge. **2.** [aircraft deicing] fixed temperature gauges are used to measure inline deicing fluid temperature in deicing units. – See BIMETALLIC TEMPERATURE GAUGE, LIQUID FILLED TEMPERATURE GAUGE, GAS FILLED TEMPERATURE GAUGE, THERMOMETER.[52,100] [Claus, Law]

temperature indication markers, **1.** [aircraft brakes] crayons with specified melting points used to determine brake temperatures. **2.** potential contaminants for carbon brakes.[127] [SAE AIR5490]

***temperature indication markers**, crayons with specified melting points used to determine brake temperatures. [SAE AIR5490]

terminal deicing facility, a deicing facility for one or several aircraft located at or near the terminal or other location where aircraft loading activity normally takes place.[135,174] [SAE ARP4902, TC TP 14052]

***terminal deicing facility**, a deicing facility for one or several aircraft located at or near the terminal or other location where aircraft loading activity normally takes place. [SAE ARP4902]

theoretical oxygen demand (ThOD), [environmental science] calculated amount of oxygen to completely oxidize a compound to its final oxidation products. The calculation is based on the chemical formula of the compound and the STOICHIOMETRY of the oxidation reactions. – Compare BIOCHEMICAL OXYGEN DEMAND, TOTAL OXYGEN DEMAND, CHEMICAL OXYGEN DEMAND.

thermal degradation, breakdown of a material due to exposure to high temperatures. This process can result in the decomposition of the material into smaller molecules or different substances.[82] [Gorse]

thermal oxidation, oxidation accelerated as the result of exposure to elevated temperatures.[127] [SAE AIR5490]

***thermal oxidation**, oxidation that is accelerated as the result of exposure to elevated temperatures. [SAE AIR5490]

thermal stability, the ability of a material, compound, or system to maintain its chemical structure, physical properties, or function when exposed to high temperatures. – See THERMAL STABILITY–ACCELERATED AGING, ACCELERATED AGING.

thermal stability–accelerated aging, [aircraft deicing fluids] a PASS-FAIL TEST designed to simulate the long-term stability of heated storage without water loss.[130,131] [SAE AMS1424, SAE AMS1428]

thermocouple, **1.** a temperature sensing element that transforms thermal energy into electrical energy. **2.** a temperature measuring device consisting of a probe in which two dissimilar metals or semi-conductors are joined together in a closed loop circuit with a second similar junction that is called the reference junction maintained at a reference temperature or that has a secondary measurement to compensate for temperature variation in the reference junction. A voltage proportional to the difference in temperature between the probe junction and the reference junction is generated. Measurement of the voltage is correlated to temperature using a CALIBRATION CURVE. – See THERMOMETER.[8,24,39,62,100,156] [AMS Glossary, Atkins, Britannica, Dunlop, Law, Schaschke]

thermometer, **1.** any instrument used to measure temperature according to a scale such as the Celsius scale. **2.** an instrument used to measure temperature based on the expansion of gas or liquid. Commonly used liquid-in-glass thermometers consist of a bulb containing a liquid such as mercury or alcohol with a dye and a long graduated capillary. As the temperature rises, the liquid expands out of the bulb and rises along the graduated scale (also known as BULB THERMOMETER). **3.** other principles of operation include the expansion of metal, bimetallic materials (used in temperature gauge), thermocouples and infrared emissivity measurement devices (infrared thermometer). See TEMPERATURE, THERMOCOUPLE, TEMPERATURE GAUGE, INFRARED THERMOMETER.[8,39,62,119] [AMS Glossary, Britannica, Dunlop, Rennie]

thickened fluid, **1.** a fluid that contains polymeric thickeners. **2.** [aircraft deicing] any AMS1428 Type II, III, or IV fluid as they contain polymeric thickeners. – Compare with UNTHICKENED FLUID.[131,141,150] [SAE AMS1428, SAE ARP6852, SAE AS6285]

***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. [SAE AS6285]

***thickened fluid(s)**, fluid(s) that contain polymeric thickeners; that is, AMS1428 Types II, III, and IV fluids. [SAE ARP6852]

thin hoarfrost, **1.** [aircraft deicing] a white crystalline deposit of ice which usually develops uniformly on exposed surfaces and is so thin that surface features, such as lines and markings, can be distinguished beneath it. **2.** on some specific aircraft, thin hoarfrost is permitted on the upper surface of the fuselage if all vents and ports are clear. – See FROST, HOARFROST.[6,34,35,150] [Airbus AMM, Boeing 737-MAX AMM, Boeing 737-NG AMM, SAE AS6285]

thrust, **1.** mechanical force generated by the engines to move the aircraft forward through the air. **2.** one of the main four forces acting upon an aircraft, the others being DRAG, LIFT, WEIGHT.[24,71,111] [Atkins, FAA H-8083-3C, NASA Thrust]

thrust reverser, [aircraft engine] a system that redirects the engine exhaust forward, helping to slow down the aircraft upon landing. It is typically located around the exhaust area and is composed of cascades, blocker doors, and other mechanisms.[71] [FAA H-8083-3C]

top loading, **1.** [chemical industry] the process of loading a bulk container, such as a TANK TRUCK, tank container (tanktainer, ISOTAINER) or rail car with the same product as the previous load, without washing. **2.** [aircraft deicing] the process of loading a bulk container from the top. – Compare BOTTOM LOADING, SPLASH LOADING. – See WASH CERTIFICATE.[102] [Guide]

top offloading, [chemical industry] the process of unloading a rail car from the top, utilizing a stationary pipe (a dip leg) that extends from the lowest point of the rail car (the sump) to the top, allowing for transfer of liquids.[80] [Fishwick]

total air temperature (TAT), [in-flight parameters] the STATIC AIR TEMPERATURE plus any rise in temperature caused by the highspeed movement of the aircraft through the air. The increase in temperature is known as RAM RISE.[72] [FAA H-8083-31B]

total immersion corrosion, **1.** [material science] a type of corrosion that occurs when a material, typically a metal or alloy, is submerged in a liquid environment. The material is exposed to uniform or localized electrochemical reactions across its surface due to the surrounding liquid, leading to deterioration. The rate and type of total immersion corrosion depend on several factors, such as the chemical composition and temperature of the liquid, the material's properties, like its composition and surface finish, the presence of dissolved oxygen, salts, or other reactive substances in the liquid. Preventative measures, such as coatings, corrosion-resistant materials, or inhibitors, are commonly used to mitigate its effects. **2.** [aircraft deicing fluids, runway deicing, products] a PASS-FAIL TEST classified under MATERIALS COMPATIBILITY and performed according to ASTM F483.[18,130,131,132,133] [ASTM F483, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435]

total oxygen demand (TOD), [environmental science] a measure of the amount of oxygen to completely oxidize organic compounds in water or wastewater. It is useful for real-time monitoring of organic contamination in wastewater as it can be measured using automated online analyzers. – Compare BIOCHEMICAL OXYGEN DEMAND, CHEMICAL OXYGEN DEMAND, THEORETICAL OXYGEN DEMAND.

total plate failure, [fluid testing] a fluid testing scenario in which 100 percent of the plate has reached a VISUAL FAILURE condition. – Synonyms: COMPLETE PLATE FAILURE, ENTIRE PLATE FAILURE, FULL PLATE FAILURE.[108] [Myers]

total water content, [solid runway deicing products] a DETERMINE AND REPORT test for solid runway deicing products determined in accordance with ASTM E203.[15,132] [ASTM E203, SAE AMS1431]

tote, [chemical industry] an industrial-grade container used for handling, transporting, and storing liquids with a capacity of less than 3000 liters. Common sizes include 1000 liters (approximately 275 USG) and 1200 liters (approximately 330 USG). Totes are designed for handling by forklifts or pallet jacks and feature a metal framework at the base, facilitating efficient movement and stacking. – Synonym: INTERMEDIATE BULK CONTAINER. (IBC).

trace contaminants, **1.** impurities found in small concentration. **2.** [aircraft deicing fluids] the collective expression for percentage in weight or in parts per million of sulfur, halogens, total phosphorus, nitrate, total nitrogen, lead, chromium, cadmium and mercury in the aircraft deicing fluids. **3. [**runway deicing products] the collective expression for the percentage of sulfur, halogens, total phosphate, nitrate, lead, chromium, cadmium and mercury in the runway deicing products. **4.** trace contaminants are a DETERMINE AND REPORT TEST whose results are classified under ENVIRONMENTAL PROPERTY of aircraft deicing fluids and runway deicing products.[39,130,131,132,133] [Britannica, SAE AMS1424, SAE AMS1428, SAE AMS1431, SAE AMS1435.]

trailing edge, **1.** the portion of the AIRFOIL where the airflow of the upper surface rejoins the lower surface airflow. **2.** the rear edge of the airfoil.[24,71] [Atkins, FAA H-8083-3C]

transfer point, location on apron, ramp, or taxiway where responsibility for the aircraft is transferred between controlling agencies.[137] [SAE ARP5660]

***transfer point**, location on apron, ramp, or taxiway where responsibility for the aircraft is transferred between controlling agencies. [SAE ARP5660]

transient aerodynamic effects of fluids, 1. [aerodynamics] the temporary decreasing aerodynamic effects of deicing/anti-icing during the TAKEOFF GROUND ROLL, continuing throughout ROTATION, LIFTOFF, INITIAL CLIMB, and beyond, as more and more fluid shears off the wing, thus decreasing the aerodynamic effects caused by the fluid on the wings. **2.** the transient aerodynamic effects of fluids can be evaluated in the field by aircraft manufacturers according to the protocols described in SAE ARP6852. In the laboratory these effects are assessed by performing the AERODYNAMIC ACCEPTANCE TEST on deicing/anti-icing fluids. – See FLOWOFF.[141,145] [SAE ARP6852, SAE AS5900]

transition, [aerodynamics] the process of changing from laminar to turbulent flow. – See LAMINAR FLOW, TURBULENT FLOW, REYNOLDS NUMBER. Compare PHASE TRANSITION [chemistry].[158] [Shevell]

treated surface, **1.** [aircraft surface coatings] a surface treated with an aircraft surface coating of any thickness. **2.** [aircraft deicing] a surface covered with a deicing/anti-icing fluid. **3.** [runway deicing product] a runway, apron, or taxiway treated with a runway deicing product. – Compare UNTREATED SURFACE.[129] [SAE AIR6232]

***treated surface**, a surface treated with an aircraft surface coating of any thickness. [SAE AIR6232]

tribology, the study of friction, wear and lubrication between moving surfaces such as bearings and gears.[24,106,127,156] [Atkins, MW, SAE AIR5490, Schaschke]

***tribology**, the study of friction, wear, lubrication. [SAE AIR5490]

turbulent flow, **1.** (qualitative definition) fluid (gas or liquid) flow regime characterized by disorderly fluctuating velocity and direction. **2.** in turbulent flow the motion of the particles (kinetic energy) overcome the viscous forces which tend to smooth out the flow. **3.** the transition from laminar flow to turbulent flow can be triggered by irregularities on the surface over which the particles pass over; *an irregularity (e.g., wave in a moving fluid over the surface of the wing) or roughness (e.g., frost, snow) on a wing can initiate the turbulent flow of air*. – See TRANSITION. Compare LAMINAR FLOW.[24,156,158] [Atkins, Schaschke, Shevell]

tusk out, expression used when a deicing unit PROXIMITY SENSOR is activated.[83] [GTAA 2022]

turbidity, **1.** [chemistry] a transparency reduction in an inherently transparent fluid due to light scattering by tiny suspended or trapped particles of solid, gas bubbles, or liquid droplets. **2.** [aircraft deicing fluids] an appreciation of the clarity or cloudiness of samples when verifying for APPEARANCE of Type II/III/IV fluids. **3.** [liquid runway deicing products] increase in turbidity is one of the pass-fail criterion for the storage stability test of liquid runway deicing products.[24,131,133] [Atkins, SAE AMS1428, SAE AMS1435]

two-step deicing/anti-icing, a procedure to remove and protect an aircraft against precipitation in two distinct steps; the first step, deicing, is followed by the second step, anti-icing. – See FLUID COMPATIBILITY.[93] [ICAO 9640]

***two-step deicing/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. [ICAO 9640]

Type I, **1**. a fluid fulfilling the requirements of SAE AMS1424. **2.** a Type I fluid listed in the FAA and Transport Canada *Holdover Time Guidelines*. To be listed in the FAA and Transport Canada list of fluids the Type I must be qualified for aerodynamic acceptance in the HIGH SPEED RAMP TEST, MIDDLE SPEED RAMP TEST and/or LOW SPEED RAMP TEST, for ANTI-ICING PERFORMANCE and ENDURANCE TIME. **3.** Type I fluids are classified as Newtonian fluids as they do not contain thickeners. **4.** Type I fluid as concentrate, ready-to-use or diluted. **5.** Type I as described with its concentrate/water volume ratio; *Type I (70/30)*. **6.** the freezing point depressant in Type I may be new glycol, recycled glycol or both. – See NEW GLYCOL, RECYCLED GLYCOL, RECYCLED TYPE I, CONCENTRATE. Compare TYPE I CONCENTRATE, TYPE I DILUTED. TYPE I READY-TO-USE.[130] [SAE AMS1424]

Type I concentrate, [aircraft deicing] a form of Type I fluid usually containing 80, 88 or 92 percent glycol by weight and that must be diluted before use. – Compare TYPE I DILUTED, TYPE I READY-TO-USE. [130] [SAE AMS1424]

Type I diluted, **1.** a form of Type I that has been diluted. **2.** the amount of dilution is expressed as a ratio by volume of the Type I concentrate to water added by the user; *for example, Type I (75/25) means a volume ratio of 75 parts of the Type I concentrate mixed with 25 parts of water; Type I (57/43) means a volume ratio of 57 parts of the Type I concentrate mixed with 43 parts of water*. – Compare TYPE I CONCENTRATE, TYPE I READY-TO-USE, [130] [SAE AMS1424]

Type I highest operational use concentration (Type I HOUC), **1.** the highest glycol concentration at which a Type I can be used. **2.** the Type I highest operational use glycol

concentration is usually expressed as the ratio of Type I concentrate/water by volume; *example for a mixture of 75 parts of Type I concentrate with 25 parts water by volume, the expression would be Type I (75/25)*. **3.** the Type I highest operational use concentration may also be expressed as an upper limit on refractive index or refraction in degrees Brix, see TYPE I HIGHEST OPERATIONAL USE REFRACTION (HOUR). – Compare TYPE I LOWEST OPERATIONAL USE TEMPERATURE.[102] [Guide]

Type I highest operational use refraction (Type I HOUR), **1.** the highest refraction at which a Type I can be used; *for example, the highest operational use refraction of this Type I is 42 °Brix*. **2.** an alternative way to express the TYPE I HIGHEST OPERATIONAL USE CONCENTRATION. See TYPE I LOWEST OPERATIONAL USE TEMPERATURE.[102] [Guide]

Type I lowest operational use temperature (Type I LOUT), **1.** [aircraft deicing fluids] in broad terms, the lowest operational use temperature generally means the lowest ambient temperature (a SURROGATE for the aircraft surface temperature) at which a specific fluid may be used at a given concentration for a given type of aircraft (high speed, middle speed or low speed). There are exceptions to this general definition; for instance: a) if the fluid concentration is above its highest operational use concentration, it cannot be used or b) when there is cold soaking one cannot assume that the aircraft surface temperature is equal to ambient temperature. **2.** the lowest operational use temperature needs to be determined for each specific fluid at the dilution to be used. In other words, when the specific fluid changes freezing point upon dilution or increased concentration, it may change its lowest operational use temperature. **3.** the formal definition of a Type I lowest operational use temperature is: For fluids whose glycol concentration is equal to or less than the concentration at which the AERODYNAMIC ACCEPTANCE TEST was performed (known as the HIGHEST OPERATIONAL USE CONCENTRATION), it is the higher (warmer) of a) the LOWEST AERODYNAMIC ACCEPTANCE TEMPERATURE at which the fluid meets the high speed, middle speed, or low speed AERODYNAMIC ACCEPTANCE TEST according to AS5900 for a given type of aircraft or b) the freezing point of the fluid plus the FREEZING POINT BUFFER of 10 °C (18 °F) for a Type I fluid; *for example, adding a freezing point buffer of 10 °C (about 18 °F) to Type I concentrate/water blend with a freezing point of -40 °C (-40 °F) would result in a temperature of -30 °C (-22 °F)*. **4.** the lowest operational use temperatures for Type I at fixed dilutions are published in the FAA and Transport Canada *Holdover Time Guidelines*. For other dilutions the lowest operational use temperature should be determined by users in the FIELD. **5.** in the field, to determine the Type I lowest operational use temperature, the user must ascertain: 1) the concentration at which the fluid high speed, middle speed, or low speed aerodynamic acceptance was run and provided by the fluid manufacturer as either the TYPE I HIGHEST OPERATIONAL USE CONCENTRATION (concentrate/water ratio) or the TYPE I HIGHEST OPERATIONAL USE REFRACTION (an upper limit of refractive index or refraction in °Brix) to ensure the fluid is not above the concentration tested in the aerodynamic acceptance test, 2) the applicable speed ramp for the aircraft to be sprayed, 3) the LOWEST AERODYNAMIC ACCEPTANCE TEMPERATURE for the appropriate speed ramp as provided by the fluid manufacturer, 4) the freezing point of the fluid (obtained by a refraction measurement and calibration curve–available from the fluid manufacturer) plus a freezing point buffer of 10 °C (see an example of the calculation above), and 5) outside air temperature (OAT) as a surrogate for wing temperature when there is no COLD SOAKING. **6.** when there is cold soaking, the aircraft surface temperature must be taken into consideration. **7.** the applicable ramp for a given aircraft may depend on the time to rotation and speed at rotation which are predicated on runway length and the aircraft takeoff weight; in other words, the same aircraft may be able to use data from different ramps depending on takeoff conditions. – See TYPE I, LOWEST OPERATIONAL USE TEMPERATURE, HIGH SPEED RAMP, MIDDLE

SPEED RAMP, LOW SPEED RAMP. Compare TYPE II/III/IV LOWEST OPERATIONAL USE TEMPERATURE.[150] [SAE AS6285]

Type I ready-to-use, a Type I fluid as sold by the fluid VENDOR (fluid manufacturer, licensee, or distributor) that does not require to be diluted. – Compare TYPE I CONCENTRATE, TYPE I DILUTED.[130] [SAE AMS1424]

Type II/III/IV, **1**. a fluid fulfilling the requirements of SAE AMS1428. **2.** a Type II/III/IV fluid listed in the FAA and Transport Canada *Holdover Time Guidelines*. **3.** Type II/III/IV qualified in a) the undiluted (100/0) form, or b) undiluted and 75/25, or c) undiluted, 75/25 and 50/50. **4.** Type II/III/IV are qualified for at least one given type of aircraft (high speed, middle speed, or low speed). – Compare Type II/III/IV (100/0), TYPE II/III/IV (75/25), TYPE II/III/IV (50/50).[131] [SAE AMS1428]

Type II/III/IV (50/50), a standard dilution of Type II/III/IV with a 50/50 volume ratio of (undiluted product as delivered by the manufacturer) / (water added by the user).[75,131,170] [FAA HOT, SAE AMS1428, TC HOT]

Type II/III/IV (75/25), a standard dilution of Type II/III/IV with a 75/25 volume ratio of (undiluted product as delivered by the manufacturer) / (water added by the user).[75,131,170] [FAA HOT, SAE AMS1428, TC HOT]

Type II/III/IV (100/0), Type II/III/IV as delivered by the manufacturer without dilution—that is 100 parts of the fluid, and no water (0 parts) added by the user. – Synonyms: TYPE II/III/IV NEAT, TYPE II/III/IV UNDILUTED.[75,131,170] [FAA HOT, SAE AMS1428, TC HOT]

Type II/III/IV lowest operational use temperature (LOUT), **1.** the higher (warmer) of: a) the lowest temperature at which a thickened fluid meets the AERODYNAMICS ACCEPTANCE TEST (AS5900) for the HIGH SPEED RAMP TEST, MIDDLE SPEED TEST and/or LOW SPEED RAMP TEST, or b) the freezing point of the fluid plus the freezing point buffer of 7 °C (about 13 °F); *for example, adding a freezing point buffer of 7 °C (about 13°F) to Type IV undiluted with a freezing point of -37 °C (-35 °F) would result in a temperature of -30 °C (-22 °F)*. **2.** the Type II/III/IV lowest operational use temperature for the high speed ramp, middle speed ramp and low speed ramp (as applicable) at standard concentrations (100/0, 75/25, 50/50, as applicable) are published in the FAA and Transport Canada *Holdover Time Guidelines*. **3.** users of undiluted or of standard dilutions of thickened fluids, must verify the applicable Type II/III/IV lowest operational use temperature as published by the FAA and Transport Canada for, 1) the applicable concentration (100/0, 75/25, or 50/50) to ensure the correct fluid concentration is selected in the FAA/Transport Canada table, 2) the applicable speed ramp for the aircraft to be sprayed, 3) the outside air temperature (OAT) as a surrogate for wing temperature when there is no COLD SOAKING. **4.** when there is cold soaking, the aircraft surface temperature must be taken into consideration. **5.** the applicable ramp for a given aircraft may depend on the time to rotation and speed at rotation which are predicated on runway length and the aircraft takeoff weight; in other words, the same aircraft may be able to use data from different ramps depending on takeoff conditions. **6.** for non-standard dilutions of Type II/III/IV, refer to regulatory guidance. – See LOWEST OPERATIONAL USE TEMPERATURE, HIGH SPEED RAMP TEST, MIDDLE SPEED RAMP TEST, LOW SPEED RAMP TEST. Compare TYPE I LOWEST OPERATIONAL USE TEMPERATURE.[75,131,170] [FAA HOT, SAE AMS1428, TC HOT

Type II/III/IV neat, Type II/III/IV as delivered by the manufacturer without dilution—that is no water added by the user. – Synonym: TYPE II/III/IV (100/0), TYPE II/III/IV UNDILUTED.[75,131,170] [FAA HOT, SAE AMS1428, TC HOT]

Type II/III/IV undiluted, Type II/III/IV as delivered by the manufacturer without dilution—that is no water added by the user. – Synonym: TYPE II/III/IV (100/0), TYPE II/III/IV NEAT.[75,131,170] [FAA HOT, SAE AMS1428, TC HOT]

undiluted, **1.** not diluted. **2.** [aircraft deicing] Type II/III/IV as delivered by the fluid manufacturer, without added water by the user. **3.** [aircraft deicing] for Type II/III/IV the term *undiluted* can be expressed as the volume ratio of product/water (100/0), meaning 100 parts Type II/III/IV and 0 parts water added by the user; *Type IV (100/0)*. 4. generally for Type I fluids, the term undiluted is not used, the word CONCENTRATE is preferred. – See NEAT, TYPE II/III/IV UNDILUTED, TYPE II/III/IV (100/0), TYPE II/III/IV NEAT.[150,102] [SAE AS6285, Guide]

unfailed fluid, [fluid failure] **1.** a fluid that has not been subjected to precipitation; *flight tests on unfailed fluids led to the development of the aerodynamic acceptance test criteria*. **2.** fluid subjected to precipitation that has not visually failed; *unfailed fluid remained on the wing following the takeoff test run*. – See FLUID FAILURE, FLUID FAILURE CRITERIA. Compare FAILED FLUID.[31,55,57] [Bernier, Davies, Dawson]

unit qualification (UQ), [aircraft deicing fluids] process by which a fluid is qualified at a manufacturing unit. When there is only one production unit at a site, the qualification is usually called a site qualification. If there is more than one production unit at a site, each unit has to be qualified, in which case it is called a unit qualification. Compare SITE QUALIFICATION, MULTIPLE LOCATION QUALIFICATION. Synonym: PRODUCTION UNIT QUALIFICATION.[131] [SAE AMS1428]

unknown precipitation (UP), precipitation type that is reported if the automated station detects the occurrence of precipitation but the PRECIPITATION DISCRIMINATOR cannot recognize the type. This is typically due to singular or multiple precipitation types the precipitation discriminator does not recognize or precipitation occurring at the thresholds of detection for the precipitation discriminator.[113] [NOAA FMH-1]

unthickened fluid, a fluid that does not contain a thickener, e.g., Type I fluid.[130] [SAE AMS1424]

untreated surface, **1.** [aircraft surface coatings] a surface in its original condition from the aircraft manufacturer, or a surface that has been painted with a coating qualified by the manufacturer for use on that surface which has not been treated with an aircraft surface coating. **2.** [aircraft deicing] an aircraft surface that has not been treated with deicing/anti-icing fluids. **3.** [runway deicing product] a runway, apron, or taxiway untreated with a runway deicing product.[129] [SAE AIR6232]

***untreated surface**, a surface in its original condition from the airplane manufacturer, or a surface that has been painted with a coating qualified by the manufacturer for use on that surface, that has not been treated with an aircraft surface coating. [SAE AIR6232]

upper sales specification viscosity limit, viscosity set by the fluid manufacturer for its sales specification. This viscosity should be equal to or lower than the SAE AMS1428 high viscosity or highest on-wing viscosity.[138] [SAE ARP5718]

***upper sales specification viscosity limit,** viscosity set by the fluid manufacturer for its sales specification. This viscosity must be equal to or lower than the AMS1428 high viscosity or MOWV. [SAE ARP5718]

upslope fog, [meteorology] fog formed when air flows upward over rising terrain and is consequently cooled by expansion to or below its DEWPOINT.[8,62] [AMS Glossary, Dunlop]

validated fluid, an anti-icing fluid that can be used with the ALLOWANCE TIMEs published in the FAA and Transport Canada *Holdover Time Guidelines*. – See LIST OF VALIDATED FLUIDS.[75,170] [FAA HOT, TC HOT]

value, [metrology] [French: valeur] see QUANTITY VALUE.

value of a quantity, [metrology] [French: valeur d'une grandeur] see QUANTITY VALUE.

vanes, [aircraft engine] stationary airfoils that guide and direct the airflow within the engine. They can be found in various sections, including the compressor and turbine sections, and their purpose is to optimize the efficiency of the engine.

vendor, **1.** an organization or someone that vends or sells something. **2.** [aircraft deicing fluids, runway deicing products] term used in AMS1424, AMS1428, AMS1431 and AMS1435 for an organization selling aircraft deicing fluid or runway deicing products to a purchaser. The vendor can be a FLUID MANUFACTURER, runway deicing product manufacturer, LICENSEE or DISTRIBUTOR. – Compare PURCHASER.[48,130,131,132,133] [Cambridge, SAE AMS1424, SAE AMS1428, AMS1431, SAE AMS1435]

vertical axis, [aerodynamics] an imaginary line passing vertically through the center of gravity of an aircraft. – Synonyms: Z-AXIS, YAW AXIS. – See AXES OF AN AIRCRAFT.[71] [FAA H-8083-3C]

vertical stabilizer, [aircraft components] a fixed stabilizing surface part of the VERTICAL TAIL – Synonym: FIN.[158] [Shevell]

vertical tail, [aircraft components] a stabilizing surface at the rear of the aircraft often divided into smaller parts, such as a forward fixed part called the FIN or VERTICAL STABILIZER, and a moveable control surface called the RUDDER.[158] [Shevell]

very light snow, see SNOW.

very light snow grains, see SNOW GRAINS.

very light snow pellets, see SNOW PELLETS.

virgin glycol, [aircraft deicing] a colloquial term, which may be considered inappropriate in a formal or professional setting, for NEW GLYCOL.

viscometer, an instrument to measure VISCOSITY. – Compare RHEOMETER.[27] [Barnes]

viscosity, **1.** [qualitative definition] the physical property of a fluid that characterizes its resistance to flow (a sort of internal friction). **2.** [quantitative definition] the ratio of shear stress over shear rate. **3.** [aircraft deicing] the unit of viscosity for aircraft deicing/anti-icing fluids is the millipascal

second, mPa·s. – See PHYSICAL PROPERTY, FLUID PROPERTIES, VISCOMETER, RHEOMETER, LOW SHEAR RATE VISCOSITY.[11,27,102] [Ametek Brookfield, Barnes, Guide]

visible contamination, [aircraft deicing] a visible accumulation of ice, snow, slush on an aircraft or a deicing/anti-icing fluid. – Compare CLEAR ICE.[108] [Myers]

visible moisture, **1.** any condition such as fog, rain, snow, sleet, high humidity (condensation on surfaces) and ice crystals that can produce visible moisture on aircraft and airport paved surfaces exposed to and contaminated by these conditions. **2**. visible moisture includes clouds, visibility less than one mile, rain, snow, sleet, ice crystals, mist.[93,161] [ICAO 9640, SW FOM]

***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. [ICAO 9640]

visual failure, **1.** [fluid failure] a predefined level of visible frozen contamination, such as snow bridging or slush, when the contamination is no longer being absorbed by fluid and building up on the treated surfaces as precipitation continues. **2.** the mode of failure on standard test plates used to establish endurance times from which holdover times are derived. – See FLUID FAILURE, STANDARD PLATE FAILURE.[108] [Myers]

warm front, [meteorology] any non-occluded front, which moves in such a way that warmer air replaces colder air at the surface.[62] [Dunlop]

wash certificate, a document as evidence that a TANK TRUCK is clean, dry and odor free, stating the date, the organization that performed the wash, the location of the wash, the kind of wash, name of the tank truck carrier, and tank truck identification number. – Synonym: CLEANING CERTIFICATE. See PRIOR LOAD.

water, **1.** [chemistry] Chemical Abstract registry number 7732-18-5, molecular formula H_2O, mol wt 18.02. **2.** water in the liquid state. **3.** [runway contaminant] water in a liquid state. For purposes of condition reporting and airplane performance, water is greater than 1/8 inch (3 mm) in depth. – Compare HARD WATER.[69,105] [FAA AC150/5200-30D, Merck Index,]

water spray endurance test (WSET), **1.** a laboratory test that measures the endurance time of anti-icing fluids under conditions of light freezing precipitation (freezing fog). **2.** a laboratory test defined in AS5901. **3.** a PASS-FAIL TEST under AMS1424 and AMS1428. **4.** test used to classify Type I/II/III/IV fluids. **5.** one of the two tests that are used to evaluate fluids under the categorization ANTI-ICING PERFORMANCE. – The acronym WSET is used for both water spray endurance test and WATER SPRAY ENDURANCE TIME. See.[98,130,131,138,140,146,174] [Laforte 1990, SAE AMS1424, SAE AMS1428, SAE ARP5718, SAE ARP6207, SAE AS5901, TC TP 14052]

***water spray endurance test** (WSET), a performance test defined in AS5901. [SAE ARP5718, SAE ARP6207]

water spray endurance time (WSET), the result of the water spray endurance time in minutes. – The acronym WSET is used for both water spray endurance test and water spray endurance time. See WATER SPRAY ENDURANCE TEST.

water vapor, the gaseous phase of water.[62] [Dunlop]

water vapor pressure, **1.** the partial pressure exerted by water vapor in the air. **2.** [meteorology] in meteorology, vapor pressure is used almost exclusively to denote the partial pressure of water vapor in the atmosphere.[8,177] [AMS Glossary, TSB]

weight, 1. the force generated by the gravitational attraction of the earth on the aircraft. Force is a vector quantity with a magnitude and a direction. For an aircraft, weight is always directed towards the center of the earth. The magnitude of this force depends on the mass of all the parts of the airplane itself, plus the amount of fuel, plus any payload on board (people, baggage, freight, etc.). The weight is distributed throughout the airplane, but we can often think of it as collected and acting through a single point called the center of gravity. In flight, the airplane rotates about the center of gravity, but the direction of the weight force always remains toward the center of the earth. **2.** one of the main four forces acting upon an aircraft, the others being DRAG, LIFT, THRUST.[24,71,112] [Atkins, FAA H-8083-3C, NASA Weight]

Wenzel state, **1.** [surface chemistry] a stable configuration of a liquid on a solid surface with complete wetting; *a well wetting fluid on a wing*. **2.** in Wenzel state the liquid fills the voids on the solid. – Compare CASSIE STATE.[129] [SAE AIR6232]

***Wenzel state**, when the liquid of a drop fills the voids in the solid on which it sits, the opposite of Cassie. [SAE AIR6232]

wet ice, **1.** [runway contaminant] ice that is melting or ice with any depth of water on top. **2.** a term used to describe runway, apron, or taxiway condition.[69] [FAA AC150/5200-30D]

wet runway, [runway contaminant] a runway is wet when it is neither dry, nor contaminated. For purposes of condition reporting and airplane performance, a runway can be considered wet when more than 25 percent of the runway surface area (within the reported length and the width being used) is covered by any visible dampness or water that is 1/8 inch (3 mm) or less in depth.[69] [FAA AC150/5200-30D]

wet snow, **1.** [aircraft deicing] snow which contains a great deal of liquid water. **2.** [runway contaminant] snow that has grains coated with liquid water, which bonds the mass together, but that has no excess water in the pore space. A well-compacted, solid snowball can be made, but water will not squeeze out.[69,93] [FAA AC150/5200-30D, ICAO 9640]

wetting, **1.** [surface chemistry] the ability of a liquid to spread and stay in contact with a solid. **2.** a measure of wetting is the contact angle. **3.** complete wetting is called spreading. **4.** [aircraft deicing] the ability of a deicing/anti-deicing fluid to spread and stay in contact with the aircraft surface or standard plate to be protected. **5.** [meteorology] refers to the moisture from precipitation that collects on the non-measuring components of a precipitation gauge. – Compare DEWETTING. See ADVANCING CONTACT ANGLE, CONTACT ANGLE, WETTING FAILURE, SURFACE TENSION.[24,96,119,156] [Atkins, Krüss, Rennie, Schaschke]

wetting agent, **1.** [chemistry] a surface active agent (surfactant), that reduces SURFACE TENSION of a liquid allowing it to spread over a flat area. **2.** a surface active agent, usually added to a liquid, which reduces the tendency of a surface to repel the liquid. **3.** [aircraft deicing] a component of deicing fluids.

wetting angle, see CONTACT ANGLE.

wetting failure, **1.** [fluid failure] failure mode when a fluid fails to wet the surface it is meant to protect. **2.** a failure mode caused by a) the surface being HYDROPHOBIC due to hydrophobic contamination or an unsuitable coating, b) the fluid being contaminated with a hydrophobic substance, or c) for lack of an efficient WETTING AGENT in the fluid. – See FLUID FAILURE CRITERIA

white frost, see FROST.

windrow, a row of snow created by snow removal equipment during snow removal.[137] [SAE ARP5660]

***windrow**, a row of snow created by snow removal equipment during snow removal. [SAE ARP5660]

wing, [aircraft components] the surface providing LIFT.[158] [Shevell]

winglet, small, nearly vertical airfoil attached to the wingtip of an aircraft to improve fuel efficiency and overall performance. The winglet blocks some of the leakage from the high pressure side to the low pressure side, reducing wingtip vortices and drag.[24] [Atkins]

wingtip, the outermost edge of an aircraft wing.

wingtip device, any modification or extension attached to the wingtip of an aircraft to improve its aerodynamic efficiency by reducing drag. Examples include WINGLETS, raked wingtips, STRAKE, and split scimitar winglets.

winter operations, an operational period where ground icing conditions are present or could occur, and aircraft deicing/anti-icing services may be required.[152] [SAE AS6332]

***winter operations**, an operational period where ground icing conditions are present or could occur, and aircraft deicing/anti-icing services may be required. [SAE AS6332]

winter program manager, see PROGRAM MANAGER.

***winter program manager / responsible person /accountable executive /accountable person**, the person responsible for ensuring that the processes needed to maintain the quality of systems to comply with the Clean Aircraft Concept during winter operations. [SAE AS6286]

yaw, **1.** [aerodynamics] rotation about the VERTICAL AXIS of the aircraft. **2.** one of the three dimensions of aircraft movement, the others being ROLL and PITCH.[71] [FAA H-8083-3C]

yaw axis, see VERTICAL AXIS.

z-axis, see VERTICAL AXIS.

zero freezing point buffer, [aircraft deicing] a condition where the difference between OUTSIDE AIR TEMPERATURE and the FREEZING POINT of the fluid is 0 °C.[102] [Guide]

zone sampler, an apparatus used to sample a tank at different depths, facilitating the obtention of representative samples. – See REPRESENTATIVE SAMPLE.[102] [Guide]

References

1. *Aeronautics and Space*, 14 CFR § 1.1. [14 CFR § 1.1]
2. *Aeronautics and Space*, 14 CFR § 1.2. [14 CFR § 1.2]
3. *Aeronautics and Space*, 14 CFR § 25.149 [14 CFR § 25.149]
4. *Aeronautics and Space*, 14 CFR § 119.7. [14 CFR § 119.7]
5. Ahrens, C. Donald, *Meteorology Today, an Introduction to Weather, Climate and the Environment*, 8th ed (Thomson, California: Thomson Brooks/Cole, 2007). [Ahrens]
6. Airbus, *Airbus A318/A319/A320/A321 Aircraft Maintenance Manual*, section 12-31 (rev. 1 November 2017). [Airbus AMM]
7. Allaby, Michael, *Dictionary of Geology and Earth Sciences*, 5th ed (Oxford: Oxford University Press, 2020). [Allaby]
8. American Meteorological Society, *Glossary of Meteorology*, https://glossary.ametsoc.org/wiki/Welcome. [AMS Glossary]
9. American Society for Quality, https://asq.org/quality-resources/quality-assurance-vs-control. [ASQ]
10. American Psychological Association, *APA Dictionary*, https://dictionary.apa.org. [APA]
11. Ametek Brookfield, *More Solutions to Sticky Problems: A Guide to Getting More From Your Brookfield Viscometer & Rheometer* (Middleboro MA: Ametek Brookfield, 2024), mohttps://www.brookfieldengineering.com/-/media/ametekbrookfield/tech%20sheets/more%20solutions%202017.pdf?la=enre solutions 2017.pdf. [Ametek Brookfield]
12. Asnytska, Yelyzaveta, Stephanie Bendickson, Benjamin Bernier, Chloë Bernier, John D'Avirro, Marco Ruggi, and David Youssef, *Aircraft Ground Icing Research General Activities During the 2014-15 Winter*, TP 15323E (Ottawa: Transportation Development Centre, Transport Canada, 2016) at section 15 and appendix M. [Asnytska]
13. ASTM International, ASTM C672/C672M-03, "Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals (Withdrawn 2012)" (West Conshohocken PA: ASTM, 2012), https://store.astm.org/c0672_c0672m-03.html. [ASTM C672]
14. ASTM International, ASTM D1177-22, "Standard Test Method for Freezing Point of Aqueous Engine Coolant" (West Conshohocken PA: ASTM, 2022), https://store.astm.org/d1172-15.html. [ASTM D1177]
15. ASTM International, ASTM E203-24, "Standard Test Method for Water Using Volumetric Karl Fischer Titration" (West Conshohocken PA: ASTM, 2024), https://store.astm.org/e0203-16.html. [ASTM E203]
16. ASTM International, ASTM E699–16, "Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufacturing Building Components" (West Conshohocken PA: ASTM, 2016), https://store.astm.org/e0699-16.html. [ASTM E699]
17. ASTM International, ASTM F519-23, "Standard Test Method for Mechanical Hydrogen Embrittlement Evaluation of Plating/Coating Processes and Service Environments" (West Conshohocken PA: ASTM, 2023), https://store.astm.org/f0519-23.html. [ASTM F519]
18. ASTM International, ASTM F483-09 (2020), "Standard Practice for Total Immersion Corrosion Test for Aircraft Maintenance Chemicals" (West Conshohocken PA: ASTM, 2020), https://store.astm.org/f0483-09r20.html. [ASTM F483]

19. ASTM International, ASTM F484-08 (2019), "Standard Test Method for Stress Crazing of Acrylic Plastics in Contact with Liquid or Semi-Liquid Compounds" (West Conshohocken PA: ASTM, 2019), https://store.astm.org/f0484-08r19.html. [ASTM F484]
20. ASTM International, ASTM F502-08 (2019), "Standard Test Method for Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces" (West Conshohocken PA: ASTM, 2019), https://store.astm.org/f0502-08r24.html. [ASTM F502]
21. ASTM International, ASTM F945-22 (2022), "Standard Test Method for Stress-Corrosion of Titanium Alloys by Aircraft Engine Cleaning Materials" (West Conshohocken PA: ASTM, 2020), https://store.astm.org/f0945-22.html. [ASTM F945]
22. ASTM International, ASTM F1110-09 (2020), "Standard Test Method for Sandwich Corrosion Test" (West Conshohocken PA: ASTM, 2020), https://store.astm.org/f1110-09r20.html. [ASTM F1110]
23. ASTM International, ASTM F1111-08b (2019), "Standard Test Method for Corrosion of Low-Embrittling Cadmium Plate by Aircraft Maintenance Chemicals" (West Conshohocken PA: ASTM, 2019), https://store.astm.org/f1111-08br19.html. [ASTM F1111]
24. Atkins, Tony and Marcel Escudier, *Dictionary of Mechanical Engineering,* 2nd ed (Oxford: Oxford University Press, 2019). [Atkins]
25. Avions de transport régional, *ATR42-300 Aircraft Maintenance Manual*, Job Instruction Cards 12-31-12 PTN 10000-003 (Blagnac, France: ATR, 1 January 2019) at p 6. [ATR42-300]
26. Avions de transport régional, *ATR42-500 Aircraft Maintenance Manual*, Job Instruction Cards 12-31-12 PTN 10000-003 (Blagnac, France: ATR, 1 January 2019) at p 6. [ATR42-500]
27. Barnes, H.A. J.F. Hutton and K. Walters, *An Introduction to Rheology,* 3rd impression (Amsterdam: Elsevier, 1993). [Barnes]
28. Basco, "What is the most common IBC volume size?", https://bascousa.com/blog/what-is-the-most-common-ibc-volume-size, (11 August 2022). [Basco]
29. Bell, Suzanne, *Dictionary of Forensic Science* (Oxford: Oxford University Press, 2012). [Bell]
30. Bendickson, Stephanie, *Aircraft Ground De/Anti-icing Holdover Time Development Program for the 2016-17 Winter*, TP 15372E (Ottawa: Transportation Development Centre (TDC), Transport Canada, January 2018). [Bendickson]
31. Bernier, Benjamin, "Documentation of Fluid Failure: Test Surfaces and On-Wing" (presentation delivered at the SAE G-12 Holdover Time Committee, Montreal, 8 November 2023, unpublished). [Bernier]
32. Blackburn, Caroline, "Two-Step Procedure when the First Step is Performed with Deicing Fluid" (12 March 2024) via email, communicated to J. Leroux and others. [Blackburn]
33. Boeing, *Boeing 737-600/700/800/900 Aircraft Maintenance Manual AMM ASA D633A101-ASA*, rev. 80, section TASK 12-33-01-600-802, Cold Weather Maintenance Procedure (15 February 2023). [Boeing 737-600 AMM].
34. Boeing, *Boeing 737-MAX (7/8/9) Aircraft Maintenance Manual*, section 12-33-01 Cold Weather Procedures. [Boeing 737-MAX AMM]
35. Boeing, *Boeing 737-NG (-600/700/800/900) Aircraft Maintenance Manual*, section 12-33-01 Cold Weather Procedures. [Boeing 737-NG AMM]
36. Boilard, Jean-Guy, *Guide to Criminal Evidence*, loose-leaf issue 89 (Montreal: Thomson Reuters, March 2017) at section 0.001. [Boilard]

37. Boeing, *Boeing Technical Specs 777*, https://www.boeing.com/commercial/777x#technical-specs. [Boeing 777X]
38. Boyer, R.R. et al, "Materials Considerations for Aerospace Applications", MRS Bulletin, vol 40, issue 12, December 2015, https://doi.org/10.1557/mrs.2015.278. [Boyer]
39. *The Britannica Dictionary*, https://www.britannica.com/dictionary. [Britannica]
40. Broeren, Andy P. and James T. Riley, "Review of the Aerodynamic Acceptance Test and Application to Anti-Icing Fluids Testing in the NRC Propulsion and Icing Wind Tunnel" NASA/TM–2012-216014, DT/FAA/TC-12332 (Washington: NASA, August 2012) at p 8. [Broeren]
41. Brookfield Engineering, *Spindles*, undated, https://www.brookfieldengineering.com/-/media/ametekbrookfield/tech%20sheets/spindles.pdf?la=en. [Brookfield Spindles]
42. Brookfield Engineering, *Small Sample Adapter*, https://store.brookfieldengineering.com/small-sample-adapter (accessed 29 March 2025). [Brookfield SSA]
43. Brown, Jason and Sam Charbel, "Winter Ops–Barrell Icing" (paper presented at the SAE G-12 Deicing Facilities Committee Meeting, Athens, 22 May 2017, unpublished). [Brown]
44. Bureau international des poids et mesures, *Le système international d'unités – The International System of Units*, 9th ed (Sèvres, France: BIPM, 2019), https://www.bipm.org/documents/20126/41483022/SI-Brochure-9.pdf/fcf090b2-04e6-88cc-1149-c3e029ad8232?version=1.18&t=1645193776058&download=true. [Bureau]
45. Butterfield, Andrew, Gerard Ekembe Ngondi, and Anne Kerr, eds, *A Dictionary of Computer Science*, 7th ed (Oxford: Oxford University Press, 2016). [Butterfield]
46. *Canadian Aviation Regulations*, SOR/96-433, s 106.02 (1) (a), https://laws-lois.justice.gc.ca/PDF/SOR-96-433.pdf. [CARs 106.02]
47. *Canadian Aviation Regulations*, SOR/96-433, s 101.01, https://laws-lois.justice.gc.ca/PDF/SOR-96-433.pdf. [CARs 101.01]
48. *Cambridge Dictionary*, https://dictionary.cambridge.org/dictionary/. [Cambridge]
49. Canada, Canadian Centre for Occupational Health and Safety, *WHMIS – Safety Data Sheets* (Hamilton ON, Canadian Centre for Occupational Health and Safety, 30 March 2023), https://www.ccohs.ca/oshanswers/chemicals/whmis_ghs/sds.pdf [CCOHS]
50. Canada, Environment and Climate Change Canada, *MANOBS Manual of Surface Weather Observation Standards*, 8th ed (Gatineau QC: Environment and Climate Change Canada, February 2019). [MANOBS]
51. City of Calgary, https://www.calgary.ca/water/stormwater.html. [Calgary]
52. Claus, Paul, "Type I Temperature Verification" (presented at the SAE G-12 Equipment Committee Meeting, Helsinki, Finland, 23 May 2023, unpublished). [Claus]
53. Container Xchange, "Understanding ISOtainer: Your guide to common uses, benefits, and price", https://www.container-xchange.com/blog/isotainer/ (accessed 20 March 2025). [Container]
54. Csikszentmihalyi, Mihaly, *Creativity: The Psychology of Discovery and Invention* (New York: Harper, 2013). [Csikszentmihalyi]
55. Davies, Lynn and Thomas A. Zierten, "Ground Ice-Detection Systems: An Aircraft Manufacturer's Perspective" (presentation delivered at the FAA In-Flight Icing Ground Deicing International Conference, Chicago, 19 June 2003, unpublished). [Davies]
56. D'Avirro, John, "Two-Step Procedure when the First Step is Performed with Deicing Fluid" (12 March 2024) via email, communicated to J. Leroux and others. [D'Avirro]

57. Dawson, Peter, Medhat Hanna, and Michael Chaput, *Contaminated Aircraft Takeoff Test for the 1997/1998 Winter*, TP 13316E (Montreal, Transportation Development Centre, Transport Canada, December 1998). [Dawson]
58. Defense Acquisition University, *Glossary, sub verbo* lot acceptance, https://www.dau.edu/glossary/lot-acceptance?form=MG0AV3. [DAU]
59. Dekker, Sidney, *Drift Into Failure: From Hunting Broken Components to Understanding complex Systems* (Boca Raton FL: CRC Press, 2011) pp 90–93. [Dekker 2011]
60. Dekker, Sidney, *The Field Guide to Understanding "Human Error"*, 2nd ed (Burlington VT: Ashgate Publishing, 2014) pp 128–132. [Dekker 2014]
61. Dekker, Sidney, *Foundations of Safety Science: A Century of Understanding Accidents and Disasters* (Boca Raton FL: CRC Press, 2019) pp 308–310, 320, 325. [Dekker 2019]
62. Dunlop, Storm, *Oxford Dictionary of Weather,* 2nd ed (Oxford: Oxford University Press, 2008). [Dunlop]
63. EASA, EU Regulation 965/2012 and EASA Decision 2014/015/R: rule point CAT.OP.MPA.250 "Ice and other contaminants – ground procedures" and Guidance Material GM 1 to 3 to CAT.OP.MPA.250, as last amended. [EASA EU Reg]
64. EASA, Safety Information Notice SIB 2008-29, "Ground De- / Anti-icing of Aeroplanes; Intake / Fan-blade Icing and effects of fluid residues on flight controls – replacing EASA SIN No. 2006-09 issued 26 September 2006 (4 April 2008). [EASA SIB 2008-29]
65. European Environmental Agency, *Glossary,* https://www.eea.europa.eu/help/glossary/eea-glossary. [EEA Glossary]
66. FAA. "Advanced Air Mobility / Air Taxis", https://www.faa.gov/air-taxis?form=MG0AV3&form=MG0AV3 (accessed 6 March 2025). [FAA AAM]
67. FAA, Advisory Circular AC 120-112, "Use of Liquid Water Equivalent System to Determine Holdover Times or Check Times of Anti-icing Fluids" (14 July 2015). [FAA AC120-112]
68. FAA, Advisory Circular AC 120-60B, "Ground Deicing and Anti-icing Program" (20 December 2004). [FAA AC 120-60B]
69. FAA, Advisory Circular AC 150/5200-30D, "Airport Field Condition Assessments and Winter Operations Safety" (29 October 2020). [FAA AC150/5200-30D]
70. FAA, Advisory Circular AC 150/5300-14D, "Design of Aircraft Deicing Facilities" (17 March 2020). [FAA AC 150/5300-14D]
71. FAA, *Airplane Flying Handbook*, FAA-H-8083-3C (Oklahoma City OK: FAA, Airman Testing Standards Branch, 2016). [FAA H-8083-3C]
72. FAA, *Aviation Maintenance Technician Handbook – Airframe*, FAA H-8083-31B (Oklahoma City OK: FAA, Airman Testing Standards Branch, 2023). [FAA H-8083-31B]
73. FAA, *Certificate Management Office*, https://www.faa.gov/about/office_org/field_offices/cmo. [FAA CMO]
74. FAA, *Ground Deicing Program, General Information*, issue 2 (6 August 2024), https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/deicing/24-25_FAA_General_Information_Document.pdf. [FAA General Info]
75. FAA, *Holdover Time Guidelines, Winter 2024-2025*, original issue (6 August 2024), https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/deicing/24-25_FAA_Holdover_Tables.pdf. [FAA HOT]
76. FAA, Information for Operators, InFO 25003, "Use of Liquid Water Equivalent System (LWES)", (Washington: FAA Flight Standard Service, 3 April 2025),

https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/InFO25003.pdf. [FAA InFO 25003]
77. FAA, Order 8000.94, "Procedures for Establishing Airport Low-Visibility Operations and Approval of Low-Visibility Operations/Surface Movement Guidance and Control System Operations" (21 August 2012). [FAA Order 8000.94]
78. FAA, *SAS (Safety Assurance System) Acronyms and Definitions* (25 July 2022) https://www.faa.gov/about/initiatives/saso/sasdeployment/sas-acronyms-and-definitions. [FAA SAS]
79. Fenna, Donald, *Dictionary of Weights, Measures and Units* (Oxford: Oxford University Press, 2002). [Fenna]
80. Fishwick, Tony, "Loading and Unloading of Road and Rail Tankers—Hazards, Good Practice and Case Studies", Loss Prevention Bulletin, issue 250 August 2016, 15–20, Institution of Chemical Engineers, https://www.icheme.org/media/2088/lpb250pg15.pdf. [Fishwick]
81. Garner, Bryan A., editor, *Black's Law dictionary*, 9th ed [St. Paul MN: West, 2009). [Black's]
82. Gorse, Christopher, David Johnston, and Martin Pritchard, *Dictionary of Construction, Surveying, & Civil Engineering*, 2nd ed (Oxford: Oxford University Press, 2020). [Gorse]
83. Greater Toronto Airport Authority, *Central Deicing Facility Keeps You Moving*, (Toronto: Greater Toronto Airport Authority, 22 August 2022). [GTAA 2022]
84. Greater Toronto Airport Authority, *Station Deicing Plan Winter 2024-2025*, version 10.0 (Toronto: Greater Toronto Airport Authority, 2024). [GTAA]
85. Greaves, Matthew, *Acoustic Liners of Jet Engines*, (Ph.D. Thesis, Loughborough University, 15 October 2002) https://hdl.handle.net/2134/33817. [Greaves]
86. Greenhalgh, Emile S., ed., *Failure Analysis and Fractography of Polymer Composites* (Boca Raton FL: CRC Press, Woodhead Publishing, 2009), https://doi.org/10.1533/9781845696818.164. [Greenhalgh]
87. Hansard, Jerry, and Ken Heath, *De-Ice Boot Maintenance 101: The Why and How of Pneumatic Boot Care and Repair*, (Uniontown OH: Collins Aerospace, 1 January 2018) https://www.goodrichdeicing.com/company/news-events/article/de-ice-boot-maintenance-101-the-why-and-how-of-pneumatic-de-ice-boot-care-a. [Hansard]
88. Hibbert, David Brynn, Ernst-Heiner Korte and Ulf Örnemark, "Metrological and quality concepts in analytical chemistry (IUPAC Recommendations 2021)" (2021) Pure and Applied Chemistry 93:9 pp 997-1048. https://doi.org/10.1515/pac-2019-0819
89. Horrigan, John, "Critical Surface Contamination in Clear Weather: Understanding and Dealing with Active Frost" (paper delivered at the Air Canada Pilots Association International Winter Operations 2011 Conference, Montreal, 5 October 2011, unpublished). [Horrigan 2011]
90. Horrigan, John, "Turbofan Ice Damage" (paper delivered at the Air Canada Pilots Association International Winter Operations Conference, Vancouver, 9 October 2013, unpublished). [Horrigan 2013]
91. Horrigan, John, "Concerning Glossary" (18 April 2024) via email, communicated to J. Leroux. [Horrigan 2024]
92. IATA, *IATA Reference Manual for Audit Programs*, 13th ed (Montreal: International Air Transport Association, 1 April 2023). [IATA]

93. ICAO, Doc 9640-AN/940, "Manual of Aircraft Ground De-icing/Anti-icing Operations", 3 ed (advance unedited) (Montreal: ICAO, 2018). [ICAO 9640]
94. Joint Committee for Guides in Metrology (JCGM), *International Vocabulary of Metrology – Basic and General Concepts and Associated Terms (VIM)*, JCGM 200:2012 (Sèvres, France: Bureau international des poids et mesures, 2012). [JCGM]
95. Koivisto, Pekka, Eric Soinne and Juha Kivekäs, "Anti-Icing Fluid Secondary Wave and Its Role in Lift Loss During Takeoff" (2018) 55 Journal of Aircraft, https://arc.aiaa.org/doi/10.2514/1.C034694. [Koivisto]
96. Krüss, Glossary, https://www.kruss-scientific.com/en/know-how/glossary. [Krüss]
97. Kuperman, M. H. and R. K. Moore, "Deicing/Anti-icing Fluid Holdover Time Measurements, Aircraft and Frosticator Panel Correlation – Snow Conditions" (paper delivered at the SAE Aircraft Ground Deicing Conference, Salt Lake City, UT, June 1993), reprinted in TP 11836E (Montreal: Transportation Development Centre (TDC), Transport Canada, October 1993) at Appendix F. [Kuperman]
98. Laforte, Jean-Louis, Patrick. R. Louchez, Gilles Bouchard and Frank Ma, "A facility to evaluate performance of aircraft ground de/anti-icing fluids subjected to freezing rain" (1990) 18 Cold Regions Science and Technology, 161-171. [Laforte 1990]
99. Laforte, Jean-Louis, Patrick. R. Louchez and Gilles Bouchard, "Cold and humid environment simulation for de/anti-icing fluids evaluation" (1992) 20 Cold Regions Science and Technology, 195-206. [Laforte 1992]
100. Law, Jonathan, ed., *A Dictionary of Science*, 7th ed (Oxford, UK: Oxford University Press, 2017). [Law]
101. Lee, Tori, "Field Experiments, Explained", UChicago News, (Chicago, University of Chicago, 2025), https://news.uchicago.edu/what-are-field-experiments?form=MG0AV3. [Lee]
102. Leroux, Jacques, *Guide to Aircraft Ground Deicing*, issue 21.1 (Montreal, November 2024), https://standardsworks.sae.org/standards-committees/g-12-aircraft-ground-deicing-steering-group#resources&publicResource=0345186a-0cf5-4918-95d5-3fee7d32df27&fileResourceId=7115665d-82c8-4224-9ca0-2fe99f4c3e02. [Guide]
103. Malesky, Mallory, "What are the Differences Between Litmus Paper and pH Strips" Sciencing, (updated 22 March 2022) https://www.sciencing.com/differences-between-litmus-paper-ph-strips-13673/?form=MG0AV3. [Malesky]
104. March, Jerry, *Advanced Organic Chemistry: Reactions, Mechanisms, and Structure* (New York: McGraw-Hill, 1968). [March]
105. Maryadele J. O'Neil, ed, *The Merck Index*, 15th ed (Cambridge, UK: The Royal Society of Chemistry, 2013). [Merck Index]
106. Merriam-Webster Dictionary, https://www.merriam-webster.com/. [MW]
107. McGregor, Robert G., *Get It Right: The "Guard Leg" Can Make a Difference*, (Middleboro MA: Brookfield Engineering, 11 May 2009) https://www.brookfieldengineering.com/-/media/ametekbrookfield/articles/viscosity/get-it-right-the-guardleg-can-make-a-difference.pdf. [McGregor]
108. Myers, Barry B., *Aircraft Anti-icing Fluid Endurance, Holdover, and Failure Times Under Winter Precipitation Conditions*, TP 13832E (Montreal: Transportation Development Centre, Transport Canada, November 2001). [Myers]
109. NASA, Glenn Research Center, Beginners Guide to Aeronautics, "What is Drag", https://www1.grc.nasa.gov/beginners-guide-to-aeronautics/what-is-drag/. [NASA Drag]

110. NASA, Glenn Research Center, Beginners Guide to Aeronautics, "What is Lift", https://www1.grc.nasa.gov/beginners-guide-to-aeronautics/what-is-lift/. [NASA Lift]
111. NASA, Glenn Research Center, Beginners Guide to Aeronautics, "What is Thrust", https://www1.grc.nasa.gov/beginners-guide-to-aeronautics/what-is-thrust/. [NASA Thrust]
112. NASA, Glenn Research Center, Beginners Guide to Aeronautics, "What is Weight", https://www1.grc.nasa.gov/beginners-guide-to-aeronautics/what-is-weight/. [NASA Weight]
113. NOAA, *Federal Meteorological Handbook No. 1, Surface Weather Observations and Reports* (Washington: U.S. Department of Commerce/NOAA, 24 July 2019). [NOAA FMH-1]
114. O'Loughlin, Luke S. et al., "Surrogates Underpin Ecological Understanding and Practice", *BioScience* 68, issue 9 (September 2018) at 640, https://doi.org/10.1093/biosci/biy080. [O'Loughlin]
115. Oda, Haruiko et al, "Safe Winter Operations", (2010) Q4 Boeing Aero Magazine article 2. [Oda]
116. OSHA, OSHA Brief "Hazard Communication Standard: Safety Data Sheets", DSGBR-3514 (Washington: Occupational Safety and Health Administration, February 2012), https://www.osha.gov/sites/default/files/publications/OSHA3514.pdf. [OSHA 2012]
117. OSHA, OSHA Quick Card "Hazard Communications Safety Data Sheets", 3493-01R (Washington: Occupational Safety and Health Administration, 2016), https://www.osha.gov/sites/default/files/publications/OSHA3493QuickCardSafetyDataSheet.pdf. [OSHA 2016]
118. Park, Chris and Michael Allaby, *Dictionary of Environment & Conservation,* 2nd ed (Oxford: Oxford University Press, 2013). [Park]
119. Polar, "Artic Fox, Towable Aircraft Deicing Unit", https://polardeicer.com/arctic-fox/ (accessed 24 March 2025). [Polar]
120. Rennie, Richard, ed, *Dictionary of Chemistry,* 8th ed (Oxford: Oxford University Press, 2020). [Rennie]
121. Reynolds, Charles A., *Principles of Analytical Chemistry,* (Boston: Allyn and Bacon, 1966). [Reynolds]
122. Rock, Peter A., *Chemical Thermodynamics: Principles and Applications* (Toronto: Macmillan Collier, 1969). [Rock]
123. Ruggi, Marco, *Research for Further Development of Ice Pellet Allowance Times: Aircraft Trials to Examine Anti-icing Fluid Flow-Off Characteristics Winter 2007-08,* TP 14871E (Montreal: Transportation Development Centre (TDC), Transport Canada, March 2009). [Ruggi 2009]
124. Ruggi, Marco, *Wind Tunnel Trials to Support Further Development of Ice Pellet Allowance Times: Winter 2020-21,* TP 15497E, (Ottawa: Transportation Development Centre (TDC), Transport Canada, October 2021). [Ruggi 2021]
125. Runyan, L. James, Thomas A, Zierten, Eugene G. Hill and Harold E. Addy. Jr., "Lewis Icing Research Tunnel Test of the Aerodynamic Effects of Aircraft Ground Deicing/Anti-Icing Fluids", NASA Technical Paper 3238 (Washington: NASA, August 1992) p 11, https://ntrs.nasa.gov/api/citations/19920021152/downloads/19920021152.pdf. [Runyan]
126. SAE Aerospace Council, *Organization and Operating Procedures,* 9th revision (Pittsburgh: SAE International, August 2020). [SAE Aerospace Council]
127. SAE AIR5490A Carbon Brake Contamination (12 April 2016). [SAE AIR5490]

128. SAE AIR5567A Test Method for Catalytic Brake Oxidation (16 September 2020). [SAE AIR5567]
129. SAE AIR6232 Aircraft Surface Coating Interaction with Aircraft Deicing/Anti-Icing Fluids (issued 12 August 2013, reaffirmed 2 April 2019). [SAE AIR6232]
130. SAE AMS1424S Fluid, Aircraft Deicing/Anti-icing, SAE Type I (3 July 2023). [SAE AMS1424]
131. SAE AMS1428L Fluid, Aircraft Deicing/Anti-Icing, Non-Newtonian (Pseudoplastic), SAE Types II, III, and IV (14 February 2023). [SAE AMS1428]
132. SAE AMS1431F Solid Runway Deicing/Anti-Icing Product (12 March 2024). [SAE AMS1431]
133. SAE AMS1435E Liquid Runway Deicing/Anti-Icing Product (12 March 2024). [SAE AMS1435]
134. SAE AMS5886 Alloy Bars, Forgings, and Rings, Corrosion and Heat Resistant 50Ni - 20Cr - 20Co - 5.8Mo - 2.2Ti - 0.45Al Consumable Electrode or Vacuum Induction Melted 2100°F (1155°C) Solution Heat Treated (10 April 2020). [SAE AMS5856]
135. SAE ARP4902C Design of Aircraft Deicing Facilities (15 February 2018). [SAE ARP4902]
136. SAE ARP5485B Endurance Time Test Procedures for SAE Type II/III/IV Aircraft Deicing/Anti-Icing Fluids (10 October 2017). [SAE ARP5485]
137. SAE ARP5660B Deicing Facility Operational Procedures (24 July 2023). [SAE ARP5660]
138. SAE ARP5718B Qualifications Required for SAE Type II/III/IV Aircraft Deicing/Anti-Icing Fluids (7 December 2017). [SAE ARP5718]
139. SAE ARP5945A Endurance Time Tests for SAE Type I Aircraft Deicing/Anti-Icing Fluids (10 October 2017). [SAE ARP5945]
140. SAE ARP6207 Qualifications Required for SAE Type I Aircraft Deicing/Anti-Icing Fluids (10 October 2017). [SAE ARP6207]
141. SAE ARP6852E Methods and Processes for Evaluation of Aerodynamic Effects of SAE-Qualified Aircraft Ground Deicing/Anti-Icing Fluids (1 April 2024). [SAE ARP6852]
142. SAE AS5537A Weather Support to Deicing Decision Making (WSDMM) Winter Weather Nowcasting System (10 February 2021). [SAE AS5537]
143. SAE AS5635A Message Boards (MBs) (9 June 2022). [SAE AS5635]
144. SAE AS5681C Minimum Operational Performance Specification for Remote On-Ground Ice Detection Systems (12 August 2024). [SAE AS5681]
145. SAE AS5900E Standard Test Method for Aerodynamic Acceptance of SAE AMS1424 and SAE AMS1428 Aircraft Deicing/Anti-Icing Fluids (19 August 2021). [SAE AS5900]
146. SAE AS5901D Water Spray and High Humidity Endurance Test Methods for SAE AMS1424 and SAE AMS1428 Aircraft Deicing/Anti-Icing Fluids (4 September 2019). [SAE AS5901]
147. SAE AS6170 Ice Melting Test Method for AMS1431 and AMS1435 Runway Deicing/Anti-Icing Products (28 October 2021). [SAE AS6170]
148. SAE AS6172 Ice Undercutting Test Method for AMS1431 and AMS1435 Runway Deicing/Anti-Icing Products (28 October 2021). [SAE AS6172]
149. SAE AS6211 Ice Penetration Test Method for AMS1431 and AMS1435 Runway Deicing/Anti-Icing Products (16 November 2021). [SAE AS6211]

150. SAE AS6285E Aircraft Ground Deicing/Anti-Icing Processes (22 May 2023). [SAE AS6285]
151. SAE AS6286D Aircraft Ground Deicing/Anti-Icing Training and Qualification Program (1 August 2024). [SAE AS6286]
152. SAE AS6332 Aircraft Ground Deicing/Anti-Icing Quality Management (29 August 2017). [SAE AS6332]
153. SAE AS9968, Laboratory Viscosity Measurement of Thickened Aircraft Deicing/Anti-Icing Fluids with a Viscometer (23 July 2021). [SAE AS9968]
154. SAE G-12 Aircraft Deicing Fluids Committee, Minutes of Meeting held at Fort Lauderdale, 13 May 2024, unpublished. [SAE G-12 ADF 20240513]
155. SAE International, *Standards Development Style Manual*, January 2022 ed (Warrendale PA: SAE International, January 2022) [SAE Style Manual]
156. Schaschke, Carl, *Dictionary of Chemical Engineering* (Oxford: Oxford University Press, 2014). [Schaschke]
157. Schock, Chris, Roy Smith, David Tisch and Jacques Leroux, *Harmonization and Quality Criteria for SAE G-12 Standards*, issue 2 (22 April 2025), https://standardsworks.sae.org/standards-committees/g-12-aircraft-ground-deicing-steering-group. [Harmonization]
158. Shevell, Richard S., *Fundamentals of Flight*, 2nd ed (Upper Saddle River NJ: Prentice Hall, 1989). [Shevell]
159. Skybrary, "Follow Me Vehicle Procedures", https://skybrary.aero/articles/follow-me-vehicle-procedures (accessed 24 March 2025). [Skybrary]
160. Sobola, D and R. Dallaev, "Exploring Hydrogen Embrittlement: Mechanisms, Consequences, and Advances in Metal Science", Energies 2024, 17, 2972, https://doi.org/10.3390/en17122972. [Sobola]
161. Southwest Airlines, *Flight Operations Manual*, rev. 24-02 (Dallas: Southwest Airlines, 2024). [SW FOM]
162. *Standardized International Aircraft Ground Deicing Program (SIAGDP)*, revision 1 July 2021, https://www.faa.gov/sites/faa.gov/files/2022-09/SIAGDP%20ES%20Manual.pdf. [SIAGDP]
163. Standard Methods Committee of the American Public Health Association, American Water Works Association, and Water Environment Federation. "4500-Cl^- chloride" in: Standard Methods For the Examination of Water and Wastewater. Lipps WC, Baxter TE, Braun-Howland E, editors, 24th ed (Washington DC: APHA Press, 2023). [APHA 4500-Cl]
164. Stewart, Ken, "Significant Figures" Encyclopaedia Britannica (22 February 2023, last updated 16 December 2024). https://www.britannica.com/science/significant-figures. [Stewart]
165. Thomson, Stephen, "The Human Factor in Aircraft Ground Deicing" (paper delivered at the SAE G-12 Training Committee Meeting, Fort Lauderdale, 16 May 2024, unpublished). [Thomson]
166. Transport Canada, Advisory Circular AC 300-019 "Global Reporting Format (GRF) for Runway Surface Conditions", issue 02 (21 February 2021), https://tc.canada.ca/en/aviation/reference-centre/advisory-circulars/advisory-circular-ac-no-300-019. [TC AC 300-019]
167. Transport Canada, Advisory Circular AC 700-061, "Degree-Specific Holdover Times", issue 01 (16 July 2021). [TC AC 700-061]

168. Transport Canada, Advisory Circular AC SUR-002, “Root Cause Analysis and Corrective Action for TCCA Findings”, issue 01 (15 September 2015). [TC AC SUR-002]
169. Transport Canada, Air Carrier Advisory Circular ACAC 0027, “Winter Operations – New Information on Holdover Times” (18 November 1991). [TC ACAC 0027]
170. Transport Canada, *Holdover Time (HOT) Guidelines Winter 2024-2025*, original issue (6 August 2024), https://tc.canada.ca/en/aviation/general-operating-flight-rules/holdover-time-hot-guidelines-icing-anti-icing-aircraft. [TC HOT]
171. Transport Canada, Service Difficulty Advisory AV-2009-03, “Catalytic Oxidation of Aircraft Carbon Brakes due to Runway De-icing (RDI) Fluids” (26 June 2009). [TC AV-2009-03]
172. Transport Canada, Standard 622.11, “Ground Icing Operations”, Canadian Aviation Regulations (9 December 2020). [TC 622.11]
173. Transport Canada, TP 312, “Aerodrome Standards and Recommended Practices”, 5th ed (updated 15 January 2020), https://tc.canada.ca/sites/default/files/2023-06/TP312-ENG-05-amendment-1-15jan2020.pdf. [TC TP 312]
174. Transport Canada, TP 14052E, “Guidelines for Aircraft Ground Icing Operations”, issue 9 (October 2024), https://tc.canada.ca/en/aviation/publications/guidelines-aircraft-ground-icing-operations-tp-14052. [TC TP 14052]
175. Transport Canada, “UN intermediate bulk containers (IBCs)”, https://tc.canada.ca/en/dangerous-goods/containers/intermediate-bulk-containers-ibcs (accessed 24 March 2025).
176. *Transportation*, 49 CFR § 1540.5. [49 CFR § 1540.5]
177. Transportation Safety Board of Canada, *Air Transportation Safety Investigation Report A17C0146* (Gatineau, QC: Transportation Safety Board of Canada, 28 October 2021) https://www.tsb.gc.ca/eng/enquetes-investigations/aviation/2017/a17c0146/a17c0146.html. [TSB]
178. Venckeleer, Sarah, “Aerodynamic Acceptance and Rheology of UCAR ENDURANCE™ EG106 ADF/AAF” (presentation delivered at the SAE G-12 Aircraft Deicing Fluids Committee meeting, Helsinki, 22 May 2023, unpublished). [Venckeleer]
179. Vestergaard, “The Elephant MY”, https://vestergaardcompany.com/product/aircraft-deicing/the-elephant-my/ (accessed 24 March 2025). [Vestergaard]
180. WestJet, section “The WestJet Safety Promise”, https://www.westjet.com/en-ca/who-we-are/our-suppliers. [WestJet]
181. WestJet, WestJet Service Update: YYC Operations Impacted by Severe Strom System. (Calgary: WestJet, 6 August 2024), https://www.westjet.com/en-ca/news/2024/westjet-service-update--yyc-operations-impacted-by-severe-storm-#:~:text=On%20the%20evening%20of%20August%205%2C%202024%2C%20the,have%20been%20cancelled%20on%20Tuesday%2C%20August%206%2C%202024. [WestJet YYC]

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