Winter Operations
Ground De/Anti-icing
Initial training

2019-2020
Training Objective

Corporate Flight Management’s (CFM) Winter Operations Training will allow you to deice/anti-ice CFM’s aircraft and/or act as a Winter Operations Coordinator (WOC) /Operational Person In Charge.
Overview

The purpose of Corporate Flight Management’s Winter Operation’s program is to provide guidance and flight safety during winter conditions.

The focus of the program is to outline procedures and provide oversight that will ensure compliance with 14 CFR 121.629.

Please contact the Contour Airlines Airport Operations Training Division to schedule any additional training.

Training records are maintained by the CFM Training Department.
Overview

This training program is a review of the Winter Operations Manual. This training program will qualify those persons to De/Anti-Ice Corporate Flight Management (CFM) aircraft.

Winter Operations Manual
This Manual will be maintained in electronic format located at http://intranet.flycfm.com

Username: stationops   Password: flycfm

Go to the bottom center of the page and click on: Enter Employee Website

Go to the left hand side on the menu bar and at the bottom click on: Airport Operations
CORPORATE FLIGHT MANAGEMENT

CFM Intranet

CONTOUR

AS OF 11/15/2018 STATUS OF CONTOUR FACILITIES AND SYSTEMS:

OPERATIONAL

If You Have Comments, Suggestions, or Want To Report A Safety Issue
Click On The Safety Reporting Page Tab On The Left!

Downloads and Links

mail.flycfm.com

Adobe Reader   Current Local Radar
Yahoo          Company Phone List
Google         The Weather Channel
CFM Intranet
Additional resources available to the WOC are:

Station Operations Manual (SOM) for use and guidance primarily to ground handling agents

Ground Operations Manual (GOM) for use and guidance primarily for pilots
Manual Interfaces

The Corporate Flight Management Ground Deicing/Anti-icing Program (GDAP) outlines the policies and procedures that must be adhered to by all parties participating in the Ground Deicing/Anti-icing of CFM aircraft.

The following resources interface and include applicable instructions and information for the Winter Operations Program.

- Station Operations Manual (SOM)
- Ground Operations Manual (GOM)
- Flight Attendant Manual (FAM)
- General Maintenance Manual (GMM)
- Pilot Training Manual (PTM)
Federal Regulations

14 CFR 121.629 states that:

“No person may dispatch or release an aircraft, continue to operate an aircraft en route, or land an aircraft when in the opinion of the Pilot-In-Command or aircraft dispatcher, icing conditions are expected or met that might adversely affect the safety of the flight.”

“No person may take off an aircraft when frost, ice, or snow is adhering to the wings, control surfaces, propellers, engine inlets, or other critical surfaces of the aircraft or when the takeoff would not be in compliance with an approved winter operations program.”

“No person may dispatch, release, or take off an aircraft any time conditions are such that frost, ice, or snow may reasonably be expected to adhere to the aircraft, unless the certificate holder has an approved ground deicing/anti-icing program in its operations specifications and unless the dispatch, release, and takeoff comply with that program.”
Winter Operations Program

Corporate Flight Management’s Winter Operation Program manual complies with all applicable sections of 14CFR121.629.

Corporate Flight Management will accept other air carriers FAA approved aircraft ground deicing program under 14CFR121.629, if administered in accordance with this Corporate Flight Management’s Aircraft Specific Training program.

Approval of Corporate Flight Management’s Winter Operations Program is outlined in Operations Specifications A023.
Winter Operations Declaration

Winter Operations are declared to be in effect when conditions are such that deicing and/or anti-icing will be required.

Corporate Flight Management (qualified Winter Operations Coordinator) and/or the Pilot-In-Command will declare when Winter Operations conditions exist.

A decision to implement the Winter Operations Plan by either individual will prevail.
Winter Operations

Winter Operations is in effect whenever it is declared by the Pilot in Command. It may be declared anytime freezing conditions exist, regardless of the date.
What am I qualified to do?

Corporate Flight Management’s Winter Operations Training will allow you to deice/anti-ice CFM’s aircraft and/or act as a Winter Operations Coordinator (WOC) / Operational Person In Charge.

In locations where the aircraft is operating under the TSFFP (on-demand charter) the PIC will be the Winter Operations Coordinator (WOC).
What am I qualified to do?

As a certified Winter Operations Coordinator/Operational Person In Charge, you are qualified and responsible for:

1. Training all persons who will perform deicing and/or anti-icing of Corporate Flight Management aircraft.
2. Certifying as properly trained all persons who will perform deicing/anti-icing of Corporate Flight Management aircraft.
3. Overseeing the performance of all persons who perform deicing/anti-icing of Corporate Flight Management aircraft.
The Winter Operations Coordinator / Operational Person In Charge is responsible for all aspects of daily winter operations including:

- Ensure the station is prepared to deice/anti-ice aircraft and safely enplane and deplane customers in winter conditions.

- Station operational status is communicated to all employees and dispatch as well as deicing/anti-icing personnel through the Field Condition Report or Movement Messages.

- Coordinate with all departments to ensure that once deicing/anti-icing conditions have been declared, all aircraft are deiced/anti-iced until declaring that conditions no longer require such procedures.

- Ensure completion of all reports associated with winter operations.
WOC Responsibilities

• The Station Manager of each station will appoint Winter Operations Coordinators/ Operational Person In Charge.

• A Winter Operations Coordinator/ Operational Person In Charge **MUST** receive training for the 2019-2020 Winter Operations Program.

• During Winter Operations, stations must have a Winter Operations Coordinator/ Operational Person In Charge designated on the daily schedule during hours of scheduled operations.
Duties and Responsibilities
Deicing/Anti-Icing Personnel

• Must communicate with flight crew for specific requirements for deicing/anti-icing.
• Ensure that fluid is prepared, heated, tested, and documented.
• Ensure that aircraft is deiced/anti-iced according to all CFM’s policies and procedures as detailed in the Winter Operations Program.
Duties and Responsibilities
Station Management

The Station Manager or a company designee must ensure:

- Adequate supplies of deicing/anti-icing fluids are available and labeled.
- Deicing/anti-icing equipment is available and properly maintained.
- Deicing/anti-icing personnel are properly trained, coordinated, and overseen.
- Trained personnel fulfill the duties of a Winter Operations Coordinator/Operational Person In Charge.
- Local airport authorities agree on locations, policies and procedures.
- Fluid storage meets all applicable requirements.
Duties and Responsibilities
Pilot-In-Command (PIC)

- Determines the need for deicing/anti-icing.
- Determines whether aircraft is safe for flight.
- Determines fluid holdover time.
- Communicates to the Winter Operations Coordinator / Operational Person In Charge any need for performance of additional deicing/anti-icing procedures.

Obtains from anti-icing personnel the:
- Fluid type (s) used.
- Fluid/water mixture used.
- The employee number of the person certifying that the aircraft is clean and safe for flight.
- Time last deicing/anti-icing step began.
Winter Operations Safety

Ramp areas should be cleared of accumulations of snow and ice in cooperation with the local airport authority. Doors, stairs, and pathways used for boarding must be shoveled, scraped, chopped, or covered with sand to prevent passenger injury.

Note: Passengers must be carefully monitored while on the ramp during enplaning and deplaning.
Pre-Deicing Snow Removal

- Broom only when snow may be safely reached from the ground or from the deicing unit.
- DO NOT walk or stand on non-approved surfaces.
- Never strike an aircraft with a broom or other object to remove ice.
- Use extra care in the area of static wicks and lenses.
Pre-Deicing Snow Removal

Manually remove accumulations from engine air intakes and exhaust areas with a soft bristle broom.
Pre-Deicing Snow Removal

To prevent fluid waste heavy accumulations of snow should be removed using brooms before spraying fluids.

• Only soft-bristle brooms may be used.

• Snow removal brooms must never be used for any other purpose.

• Heavy accumulations of snow dictate that deicing begin with removal of materials on the tail and horizontal stabilizer, to prevent the aircraft from being tail heavy and tipping back.

• Sweep from the leading to the trailing edges of aircraft.
Forced Air Snow Removal

- Cool forced air is authorized for use for removal of loose snow on aircraft surfaces prior to deicing procedures.
- It is not authorized in lieu of performing deicing procedures.
- The same equipment may be used, but this procedure is strictly for snow removal.

Forced Air Deicing is not authorized on CFM Aircraft.
Aircraft Frost

Frost does not change the basic aerodynamic shape of the wing, but the roughness of its surface spoils the smooth flow of air thus causing a slowing of the airflow. This slowing of the air causes early air flow separation over the affected airfoil resulting in a loss of lift.
Aircraft Icing

Ice destroys the smooth flow of air over the wings/tail, increasing drag while decreasing the ability of the airfoils to produce lift. The actual weight of the ice on the aircraft is secondary to the disruption it causes.
Aircraft Icing

Ice accumulates on every exposed frontal surface of the airplane – not just wings, propellers, and windshields, but also on the antennas, vents, intakes, and cowlings.
## Types of Ice

<table>
<thead>
<tr>
<th>Types of Ice</th>
<th>Description</th>
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<tbody>
<tr>
<td>Structural Ice</td>
<td>Ice that sticks to the outside of the aircraft. It can be rime, clear, glazed, or mixed.</td>
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<tr>
<td>Rime Ice</td>
<td>Rough milky white appearance. Much can be removed by deice or anti-ice.</td>
</tr>
<tr>
<td>Clear or Glaze Ice</td>
<td>Smooth and generally follows the contours of the surface closely.</td>
</tr>
<tr>
<td>Mixed Ice</td>
<td>A combination of rime and clear ice.</td>
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</table>
Deicing VS. Anti-Icing

**Deicing:** is the process of removing all deposits of frost, ice or snow from aircraft surfaces prior to takeoff.

**Anti-icing:** is a procedure used to apply anti-icing fluid to all required aircraft flight control surfaces to prevent reformation of frost, ice or snow adhering to the aircraft.

*This process provides a specified time period (called a holdover time (HOT)) that the control surfaces are estimated to remain free of any frost, ice or snow during the taxi/takeoff phase of the flight.*
Deicing/Anti-Icing Procedures

• **One-step deicing/anti-icing** cleans the aircraft surfaces and protects those surfaces in one application of a fluid specifically formulated to provide both deice and anti-ice capabilities.

• **Two-step deicing/anti-icing** consists of separate steps to ensure the aircraft is free from contamination. The first step (deicing, as above) is followed by a second step (anti-icing) as a separate fluid application. Anti-icing fluid is applied to protect the critical surfaces, thus providing maximum possible anti-ice capability.
When to Deice/Anti-ice

- On first flight of the day, deicing is accomplished as early as practical with the understanding that further deicing may be required prior to departure.
- The two-step anti-icing of an aircraft arriving and departing a station will be coordinated with the Pilot-in-Command.
- Deicing/anti-icing should be accomplished as close to departure as practical.
- An aircraft that has been previously anti-iced shall **not** receive a further spray of anti-icing fluid directly on top of the contaminated film.
- Use hot water or Type I fluid to remove the first contaminated coating.
- If additional protection is necessary before flight, a complete de-icing/anti-icing procedure MUST be performed.
When to Deice/Anti-ice

- Conditions may require that deicing/anti-icing be accomplished after all passengers have boarded an aircraft. The main cabin door must be closed.
- Deicing/anti-icing of turn aircraft should never begin without the verbal or signaled approval of the PIC.
Before Spraying

Before spraying any fluids:

• Obtain verbal or signaled approval from the Pilot-in-Command.

• Ensure all aircraft doors are closed.

• In the event the aircraft will or has taxied over a slush covered tarmac, examine the landing gear wheel well areas for ice and snow collection and packing. If necessary, lightly spray with heated TYPE I fluid.

• Avoid spraying hydraulic seals or exposed piston struts.
Procedures for Fluid Application-Turbo Prop

- The deicing/anti-icing will be conducted with the engines shut down.
- If maintenance constraints require the deicing/anti-icing to be conducted with the engine running, contact CFM training (615) 534-1954 and dispatch (615) 220-1765 to obtain authorization for deicing with single engine running.
Procedures for Fluid Application- Jet Aircraft

- The **preferred** method for deicing and anti-icing at airports where the Airport Authority allows engines to be running, is to deice with an engine running at idle.

- The **alternate** method of deicing/anti-icing would be at airports where the Airport Authority does not allow engines to be running. At these locations, the engines are shutdown and the APU remains operating.
Procedures for Fluid Application

All personnel involved in the deicing/anti-icing process MUST exercise extreme caution when in the vicinity of an operating engine’s inlet and exhaust area.
Procedures for Fluid Application

Deicing/anti-icing of AIRCRAFT

• Should begin at the flight deck where signaled or approval will be obtained from the Pilot-in-Command.

• Proceed around the aircraft in a counter-clockwise direction until returned to the flight deck, where it will be communicated via hand signals or verbal approval that the procedure has been completed.
Procedures for Fluid Application

• Directing the spray at one location should loosen snow and ice not easily removed by spraying.

• The heat and fluid will spread along the aircraft surface beneath the material loosening it thereby allowing it to be sprayed off in solid masses rather than using larger quantities of fluid to melt ice and/or snow accumulations.

• Once the accumulation has been removed, apply spray to ensure that any unseen material is washed away.
Procedures for Fluid Application

• High-pressure spray of heated fluids onto aircraft surfaces should be directed in the same pattern as air flows during flight.
• Spraying of wings and horizontal stabilizers should be from tip to root.
• Spray aircraft surfaces with heated deicing fluid and allow time for the fluid heat to melt foreign materials.
• Loose snow may be removed by spraying heated fluid across aircraft surfaces.
Procedures for Fluid Application

1 Truck
Procedures for Fluid Application

2 Trucks
Procedures for Fluid Application

3 Trucks
Procedures for Fluid Application

Due to Facility limitations/capabilities, some operations may find it necessary to alter de/anti-ice path around the aircraft. This is acceptable, as long as, the following conditions are met:

- The deicing crew must be aware of the spray pattern taken and this information must be relayed to the flight crew.
- The application of the fluid is in adherence to all other applicable sections of the approved program.
Aircraft Critical Surfaces (General)

- Control Surfaces
- Engine inlets
- Horizontal Stabilizer
- Upper surfaces of the fuselage
- Vertical Stabilizer
- Wings
Aircraft Critical Spray Areas

**Leading & Trailing Edges of the wing**
Spray from the tip inboard to the root, sweeping from the leading edge to the trailing edge.
No frozen contamination is allowed on the wing upper surface or the horizontal stabilizer lower surface.
Aircraft Critical Spray Areas

All areas of the Tail and Elevator

Start at the top and work your way down. All areas of the tail and elevator. Please ensure that you deice/anti-ice the entire tail surface (top, bottom, and leading edge) to ensure complete removal of all traces of snow, slush, ice and/or frost accumulation.
Spray Recommendations

- Straight spraying Recommended
- 45-degree spraying Recommended
- Cross spraying Recommended
- Low-Angle Side spraying Recommended
Aircraft Sensitive Areas (General)

- Aircraft doors
- Brakes
- Engine & APU Intakes
- Heated sensors (i.e. pitot tubes, TAT sensor, Angle of attack probe, static ports)
- Landing gear-mounted sensors
- Nose wheel steering actuators
- Static Wicks
- Windshields and Cabin Windows
- Propellers
Aircraft Sensitive Areas

Main Gear and Switches receives low pressure spray.
Aircraft Sensitive Areas

Landing Gears & Gear Doors
Application of fluid in this area must be kept to a minimum.
Do not allow water or fluid mixture on wheels or brakes.
Aircraft Sensitive Areas

Propellers receive low pressure spray.
Aircraft Sensitive Areas

Fuselage
Remove all snow accumulating on the nose to avoid snow blowing back during takeoff. Fluid should be sprayed ONLY along the top centerline of the fuselage and then outboard, letting the fluid cascade down and across the windows. Fluids must NOT be sprayed directly on windows, window seals, doors, door seals, or air inlets.
Aircraft Sensitive Areas

Pitot Tubes, Angle of Attack and Sensors
Aircraft Sensitive Areas

Engine Air Intake
Aircraft Sensitive Areas

Engine exhaust area
Aircraft Sensitive Areas

Inlet
Flight Deck Windows

Do not apply fluids to flight deck windows. If requested by flight deck personnel, deicing/anti-icing personnel must wash fluid off flight deck windows using an approved window cleaner and clean cloth.
Aircraft Brakes

Do not spray aircraft brakes!
Aircraft Differences

- Jetstream 31/32
- CRJ-200
- EMB 135
Jetsteam 31/32

Manufacturer: British Aerospace
Engines: Honeywell TPE 331
Range: 640 nm (19 pax)
Length: 47 ft. 2 in.
Wing Span: 52 ft. 0 in.
Tall Height: 17 ft. 7 in.
Exits: J-31 has 2 Emergency exits
        J-32 has 3 Emergency exits
Seating: 8 / 9 / 19 Passengers
Crew: Captain and First Officer

CORPORATE FLIGHT MANAGEMENT
Jetstream 31/32 Critical Control Surfaces
CRJ-200

Manufacturer: Bombardier
Engines: 2 GE CF34-3B1 Turbofans
Range: 1,800 Miles
Length: 87 ft. 10 in.
Wing Span: 69 ft. 7 in.
Tall Height: 20 ft. 5 in.
Exits: 4 Emergency exits
Seating: 16-30 Customers
Crew: Captain, First Officer,
      30 seat Flight Attendant (1)
      16 seat Flight Attendant (0)
CRJ-200 Critical Control Surfaces

- Pitot / Static Port
- TAT Probe
- AOA Probe
- Passenger Door
- Antennas
- Overwing Emergency Door
- Winglets
- Ice Detectors
- Static Pressure Ports
- Antennas
- APU Cooling Air Inlet
## EMB 135

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
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<tbody>
<tr>
<td>Engines</td>
<td>Rolls-Royce</td>
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<tr>
<td>Range</td>
<td>1745 NM</td>
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<tr>
<td>Length</td>
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<tr>
<td>Wing Span</td>
<td>65’ 9”</td>
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<tr>
<td>Tall Height</td>
<td>22’</td>
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<tr>
<td>Exits</td>
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<tr>
<td>Seating</td>
<td>30 – 37 seats</td>
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<tr>
<td>Jump seats</td>
<td>Flight Deck</td>
</tr>
<tr>
<td>Crew</td>
<td>Captain, First Officer, Flight Attendant</td>
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</tbody>
</table>
EMB 135 Critical Control Surfaces
Cold Soak

When aircraft operate at high altitudes for extended periods of time, they are exposed to temperatures at -25 degrees or lower.

This extended exposure causes major components of the airframe and fuel to be cooled to below freezing temperatures. When the aircraft lands, these areas of the aircraft remain below freezing temperatures, especially the area surrounding the wing fuel tanks. During times of precipitation and in locations of high humidity, frost or ice will form as a result of the below freezing temperature emanating from these cold areas. This phenomenon is known as “cold soak”.
Cold Soak Procedures

When frost is present due to fuel cold soak, it may be necessary to deice the affected area.

- Ensure that the deicing fluid is properly tested and heated.
- Proceed with the following if a deicing unit is not available:
  - Utilize a hand sprayer containing a 50/50 mix of water and Type I fluid to spray the affected area.
  - Log Type I usage as indicated in the record keeping section of this program.
  - Information must be given to the flight deck crew (i.e., name, employee number, fluid type & mixture, and start and stop times).
Pre-treatment Procedures

R.O.N. (Remain Over Night) Aircraft

• When freezing precipitation is forecasted for the overnight, an CFM aircraft may be pre-treated with Type IV anti-icing fluid in order to minimize adhesion of frozen precipitation on the aircraft during the overnight.

• Pre-treatment requires the approval of the OCC. Station Personnel must call the dispatcher responsible for the flight for aircraft pretreatment within two hours of departure time.
Pre-treatment Procedures

- Anytime an aircraft receives deicing/anti-icing treatment during the absence of a flight crew, the outbound crew the next day must be notified when they arrive. Station personnel may use the deicing/anti-icing log or an alternate means to communicate to other station personnel that the procedure was performed and must develop a process to ensure that during a shift change, the oncoming personnel are notified the pre-treatment occurred.

- If a station pre-treats a RON aircraft, and Winter Operations has not been declared when the crew arrives at the aircraft for departure, deicing procedures must be used to remove the pre-treatment prior to takeoff.
Pre-treatment Procedures

• If icing conditions do not exist, and are not forecasted for the head start departure, the station may deice the aircraft prior to crew arrival.
• Any Pre-treatment requires the completion of the Deice/Anti-icing logs.
• Anytime a RON aircraft is sprayed with deice/anti-ice fluid in the morning, the flight crew must be notified.
• Deicing/Anti-icing times and fluid mixture (as recorded on the deice log) must be given to the incoming flight crew of any aircraft that was pretreated the previous night.

Note: Any fluid applied for pre-treatment of RON aircraft must be removed prior to flight.
Pre-treatment Procedures

Extended Ground Stay/Delay

• Should an aircraft remain on the ground for an extended period of time during the day and ground icing conditions exist, station personnel are permitted to pre-treat the aircraft with fluid to minimize adhesion of frozen contaminants during that time.

• If the crew is present, station personnel should notify the crew of their intentions.

• If the Captain is not present, pre-treatment will require the approval from the Dispatcher.
Pre-treatment Procedures

• Deicing/anti-icing fluid that is applied during extended ‘ground stay’ must be removed prior to takeoff if ground icing conditions exist and the published holdover time has been exceeded.

• Station personnel may use the deicing/anti-icing log (or alternate means) to communicate pre-treatment in the event of a shift change in the station.

• If the Captain is not present during deicing/anti-icing pre-treatment, station personnel must advise him/her the aircraft was pre-treated upon their arrival at the aircraft.
Post De/Anti-Icing Check

POST DEICE CHECKS
• Both VISUAL and TACTILE checks are performed by deicing personnel to ensure removal of frost, snow, & ice.
• These checks must be performed whether or not anti-icing fluid is applied.

POST ANTI-ICE CHECK
• A VISUAL check is performed by anti-icing personnel, after application of anti-ice fluid, to ensure ‘
• The anti-ice fluid is applied evenly and symmetrically to all critical surfaces, and
• The aircraft is clean and safe for flight.

NOTE: Tactile inspection required only if you are not able to visually verify above.
Exterior Tactile Inspection

The Exterior Tactile Inspection is performed from outside the aircraft to ensure that the critical surfaces are still free of frost, ice and snow.

The Exterior Tactile Inspection requires trained and authorized ground personnel to place a gloved hand on the aircraft’s upper wing surface to confirm no contaminants are present and the aircraft is safe for flight.
Exterior Tactile Inspection

In the event that one of the following occurs after either the Post Deice or Post Anti-ice check is completed, an EXTERIOR TACTILE INSPECTION must be performed:

- The calculated holdover time has expired (and ground icing conditions are still present), or
- The pre-takeoff Check determines the initial holdover time is no longer valid due to changing conditions, or
- The flight is operating in metrological conditions which require the conduct of a tactile check prior to takeoff
Exterior Tactile Inspection

- Takeoff must be within 5 minutes of inspection.
- Perform inspection as close to runway as possible.
- Use thin rubber or surgical style gloves while performing inspection.
- Use flashlight if needed.
- Do not remove or disturb any appreciable amount of Type IV fluid from the surface.
- Flight-crew may require others areas to be checked other than the left wing surfaces.
Tactile Inspection- Procedure

• The flight deck will coordinate with the lead operations agent if inspection is needed.
• The operations agent will coordinate the communications between the flight deck crew and those equipment operators performing the inspection.
• Upon verification from the flight deck that the engines are at idle and the parking brake has been set, the driver of the open bucket deicing vehicle (or other approved vehicle) may position themselves in the vicinity of the left wing’s leading edge.
Tactile Inspection- Procedure

From the Mid-point of the left wing, the wing surface should be gently touched, with a gloved finger, paying particular attention to the leading edge, forward upper chord area, and rear upper wing area ensuring that there is no contamination adhering to the wings surface.

Upon completion of this check, the lead operations agent should be advised of the inspection and the results. The operations agent shall log the exact time of which the test was completed.
## POST DE/ANTI-ICING WORKSHEET

<table>
<thead>
<tr>
<th>Date Performed</th>
<th>Station</th>
<th>Flight Number</th>
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<thead>
<tr>
<th>Aircraft Tail Number</th>
<th>Fluid Type (Type I, II, III, or IV)</th>
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<tr>
<th>Outside Air Temperature (OAT) at the time of De/Anti-icing Event</th>
<th>Degrees F</th>
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<thead>
<tr>
<th>Current Tested Freeze Point of the Type I De/Anti-icing Fluid in the De/Anti-icing Unit</th>
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<table>
<thead>
<tr>
<th>Glycol / Water % (For Type II or IV if anything other than 100% used)</th>
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<thead>
<tr>
<th>Manufacturer’s Name and Brand Name of Fluid Used (For Type II or IV Only)</th>
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<table>
<thead>
<tr>
<th>Check Only If Post De/Anti-Icing Check Was Completed</th>
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<tr>
<th>Print Name of Agent Performing the Post De/Anti-Icing Check On Aircraft</th>
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<tr>
<th>Signature of Agent Performing the Post De/Anti-Icing Check On Aircraft</th>
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<th>Employee # of Agent Performing the Post De/Anti-Icing Check On Aircraft</th>
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<th>Original: 10/01/18</th>
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Fluid Types

Type I

Type II

Type III

Type IV
Type I

- The Type I fluid is utilized by CFM.
- Type I glycol flows easily in response to gravity similar to water.
- Type I glycol works best at removing foreign material when heated and applied through a hose and nozzle.
- Type I fluids should never be used in full strength on CFM aircraft. The recommended mixture is 50/50 (50% Type I fluid to 50% water).
- Thin fluids that are primarily used as de-icing agents.
- Form a very thin wetting film on aircraft surfaces.
- Type I fluid is distributed in two forms:
  - Pre-diluted (50/50 glycol to water ratio) solutions.
  - Concentrate (more than 80% glycol) forms which must be diluted with water.
- Type I fluid is normally heated prior to application. This fluid provides very limited holdover protection during freezing precipitation conditions.
- This fluid is orange or can be clear in color.
Type II

- Thickened fluid that is primarily used during anti-icing following an application of heated water or de-icing fluid solution.
- High in viscosity and its use is limited to aircraft with minimum rotation speeds of 85 knots.
- Contains about 50% glycol, the remaining consisting of thickening agents and water.
- Usually applied undiluted, unheated and provides much longer holdover times (HOTs) than provided by Type 1 fluid.
- This fluid is clear or pale straw in color.
Type III

- Similar to Type I, this fluid is designed to be applied as a ready-mix, or undiluted, and may be applied heated when used as a de-icing agent followed with a second application (heated or unheated) as step two of a two step process to provide anti-icing protection.

- Although Type III fluid may be pumped through equipment used to supply Type I fluid without fluid degradation, to utilize the Type III HOTs, the fluid must be used following de-icing with either heated Type I, Type III or water.

- HOTs apply whether applied heated or unheated.

- Type III fluid is yellow in color.
Type IV

- Enhanced performance fluid with characteristics similar to Type II fluids.
- Offer greater thermal and shear stability which allow its use as both an anti-icing fluid and as a high performance de-icing fluid which can be used diluted with water and heated.
- When used in 100% concentration, the anti-icing effectiveness is superior to Type II fluids and HOT is increased by a significant factor.
- Fluid remains stable when heated and has the lowest freezing point of any other anti-icing fluid.
- Type IV fluid is clear or green in color Type IV fluids can be used in equipment normally used for de-icing that are equipped with transfer systems with low-shear or air pressure pumps (i.e. diaphragm or progressive-cavity pumps). The fluid shows minimal degradation when passed through a low-shear centrifugal pump; however, fluid cycling should be limited. **DO NOT** use high-shear centrifugal pumps unless approved by the anti-icing fluid or equipment manufacturer.
Deicing/Anti-Icing Receipts

Type I and Type III Receipts

- The supplier is to certify that each shipment of fluid meets applicable specification AMS 1424 (current revision) or ISO 11075.
- The supplier must submit a Certificate of Conformance (COC) or Certificate of Analysis (COA) and copy of the fluid batch test report ensuring that the fluid meets the applicable material specification.
Deicing/Anti-Icing Receipts

• The supplier is to certify that each shipment of fluid meets applicable specification AMS 1424 (current revision) or ISO 11075.
• The supplier must submit a Certificate of Conformance (COC) or Certificate of Analysis (COA) and copy of the fluid batch test report ensuring that the fluid meets the applicable material specification.
• The supplier at each delivery will submit a copy of the test report identifying pH factor, viscosity and refractive index.
Testing Fluids

The fluid used to *anti-ice* aircraft must test to a temperature that is at least 18 degrees Fahrenheit below the outside air temperature. This is the freezing point of the glycol mixture.

In the event that temperatures are forecast lower than your minimum application temperature, verify that your back up vendor has an adequate mixture. If you cannot secure an adequate mixture, you CANNOT anti-ice the aircraft until the outside air temperature meets the minimum application temperature.
Testing Fluids

Fluids will be tested:

Each time the deicing unit is turned on and heated in preparation for use.

Whenever fluid is added to the holding tank.

Whenever there is a significant change in temperature.

Record test results on the appropriate Glycol Solution Test Record.

Vendors may use Airline specific deicing / anti-icing logs and will be retained as outlined on the individual log.

**CFM will retain De-ice logs until the beginning of the next de/anti-deicing season**
## Glycol/Refractometer/Harness Testing

### Harness Lanyard Refractometer Fluid Inspection

Must maintain a minimum of 18 degree buffer between the Type I freeze point and OAT.

<table>
<thead>
<tr>
<th>Date</th>
<th>Harness Lanyard Pass/Fail</th>
<th>Refractometer Pass/Fail</th>
<th>OAT (degrees F at time of event)</th>
<th>TYPE I Fluid Freeze Point</th>
<th>Type I Visual Inspection</th>
<th>TYPE IV Refractive Index</th>
<th>Type IV Visual Inspection</th>
<th>Inspection completed by (Signature and Employee Number)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Fluid Acceptance

- Must have a Certificate of Conformity (COC) or Certificate of Analysis (COA)
- Must have a Bill of Lading (BOL)
- Must Conduct a Visual Inspection
- Must verify the refractive index (RI) of the fluid meets the standards on the COC/COA
- Forms are located Intranet.Flycfm.com/Airport Operations/Winter Operations
- All documentation must be kept on file at the receiving station until the product in a given shipment is complete plus 60 days.
# Fluid Acceptance Log

Fluid Acceptance

<table>
<thead>
<tr>
<th>Date</th>
<th>Certificate of Analysis Conformity Yes/No</th>
<th>Bill of Lading Yes/No</th>
<th>Type I Visual Inspection Pass/Fail</th>
<th>Type I Freeze Point or Refractive Index</th>
<th>Type I Gallons Received</th>
<th>Type IV Refractive Index</th>
<th>Type IV Visual Inspection Pass/Fail</th>
<th>Type IV Gallons Received</th>
<th>Fluid Accepted by Signature and Emp Number</th>
</tr>
</thead>
</table>
RefRACTOMETERS

Misco Refractometer Model Number 7084VP

Misco Refractometer Model Number 10431VP

Note: Model 7084VP is only good for 60% glycol mixtures or less.
Refractometer Parts
Refractometer Cleaning

Refractometers must be cleaned before and after each use.

• Swing back the plastic cover at the tapered end of the unit.
• Use a tissue or soft cloth to wipe the underside of the plastic cover and the measuring window.
• The sample tube from the refractometer must also be cleaned - rinse the tube with water after each use.
Refactometer Testing

Refactometers should be tested to ensure accuracy.

Using room temperature **DISTILLED** water:

- Lift the measuring window
- Place a drop of water onto the measuring window
- Lower the plastic cover over the window
- Hold the eye piece to your eye; notice a contrast between the upper and lower ends of the scale
- The dividing line between the two portions is the measurement you seek
- The reading should be 32 degrees Fahrenheit
- If using the Brix scale the reading should be zero
RefRACTOMETER TESTING - STEP #1
Refractometer Testing - Step #2
Refractometer Testing- Step #3
Refractometer Testing- Step #4

Note: If you are testing propylene based glycol using the MISCO 7084VP be sure to take the reading from the right side of the scale (-5 degrees F).
Digital Refractometer

Misco Digital Refractometer Model Number DFR 211
Digital Refractometer

Digital Refractometers must be cleaned before and after each use:
• Use a wet, soft cloth or paper towel to clean the sensor window
• Keep the sensor window clean and free of residue at all times
• Use a tissue or soft cloth to wipe the cover and the measuring window.
• The entire instrument may be cleaned with a soft cloth dampened with water - a mild soap may also be used.

Note: Do not use petroleum based cleaners or fully submerge the instrument in any solution.
Digital Refractometer Testing – DFR

211

Digital Refractometers should be tested to ensure accuracy:

• Inspect the sensor window to ensure it is clean and undamaged
• Turn the unit on by pressing the on/clear button
• Press the select button until the unit of measurement scale you seek is displayed

EG – Ethylene Glycol Freeze Point in Fahrenheit
PC – Propylene Glycol Freeze Point in Fahrenheit
Brix – Degrees in Brix
RI – Refractive Index
Using room temperature “Distilled” water:

- Insert the sensor end of the instrument into the fluid and wait for the temperature to equalize. Do not place the sensor directly on the bottom of the container.
- Press and release the read button.
- The reading should be 32 degrees Fahrenheit, Using Brix scale the reading should be 0, which corresponds to a refractive index of 1.333.
Testing Fluids – DFR 211

Fluids must be tested to ensure adequate freeze points:

- Inspect the sensor window to ensure it is clean and undamaged.
- Turn the unit on by pressing the on/clear button.
- Press the select button until the unit of measurement scale you seek is displayed.
- Insert the sensor end of the instrument into the fluid and wait for the temperature to equalize. Do not place the sensor directly on the bottom of the container.
- Press and release the read button.

**EG** – Ethylene Glycol Freeze Point in Fahrenheit
**PC** – Propylene Glycol Freeze Point in Fahrenheit
**Brix** – Degrees in Brix
**RI** – Refractive Index
Digital Refractometer

Misco Digital Refractometer Model Number PALM ABBE PA203
Digital Refractometer Cleaning

Digital Refractometers must be cleaned before and after each use:

• Use a wet, soft cloth or paper towel to clean the sensor window.
• Keep the sensor window clean and free of residue at all times.
• Use a tissue or soft cloth to wipe the underside of the plastic cover and the measuring window.
• The entire instrument may be cleaned with a soft cloth dampened with water - a mild soap may also be used.

Note: Do not use petroleum based cleaners or fully submerge the instrument in any solution.
Digital Refractometer Testing – Palm Abbe

Digital Refractometers should be tested to ensure accuracy:

• Inspect the sensor window to ensure it is clean and undamaged.
• Transfer a few drops of water onto the measuring surface with a pipette.
• Close the sample cover and allow time for the temperature of the fluid and the instrument to equalize.
• Press and release the <MENU> button until “Set Zero?” is displayed.
• Press and release the <GO> button and a zero reading should be displayed on the LCD display.
Testing Fluids- Palm Abbe

Fluids must be tested to ensure adequate freeze points:

• Inspect the sensor window to ensure it is clean and undamaged.
• Press the <MENU> button to select the unit of measure (scale) you wish to have displayed.
• Transfer a few drops of fluid onto the measuring surface with a pipette.
• Close the sample cover and allow time for the temperature of the fluid and the instrument to equalize. This could take as long as sixty seconds for hot fluids.
Data Discrepancies

• Discrepancies between nozzle and tank test results may indicate inadequate mixing of fluids within the tank.
• When discrepancies occur, operate the mixing unit of the deicer hold tank before re-testing the fluids.
• Addition of water or fluids to alter the mixture should not be performed until proper mixing has been verified.
• Once the mixture is re-tested and the results are adequate, record them on the appropriate form.
• Records will be retained at the station or with dispatch for until the beginning of the next de/anti-icing season.
Fluid Failure

Signs of Deice/Anti-ice fluid failure:

  – Ice can be seen in fluid.
  – Fluid appears to be opaque rather than transparent.
  – You are unable to discern structural details (rivets, screws, seams).

Failed Type I Fluid

Note: A glossy smooth, wet surface indicated the anti-ice fluid is still effective.
Fluid Failure

Failed Type IV Fluid- Note a glossy-smooth, wet surface indicates the anti-ice fluid is still effective.
Ground Service Equipment

- Should be stored in a heated garage if available.
- Should be cleared of accumulations of ice and snow before use.
- Should never move in excess of 5 miles per hour near an aircraft.
- Should never approach closer than 10 feet to any part of an aircraft while deicing/anti-icing.
- The bucket/boom of a deicer will never be closer than 5 feet to any part of an aircraft.
- For safety, no agent will go up in a deicing bucket or tower unless another agent is present on the ground.
Ground Service Equipment

- When available, radio headsets should be used for efficient communications.
- The agent in the deicing unit, bucket, or tower will utilize safety equipment installed in that unit.
- This may include a fall restraining harness and/or fall restraining lanyard.
- Equipment that is unsafe must be properly tagged and taken out of service.
Lavatory Procedures

• Upon arrival of a RON, drain the lavatory of the de-germ mixture.
• Prior to departure of a head start flight, refill the lavatory with de-germ mixture.
• You may refill the lavatory at night with a mixture of de-germ and Type I deice fluid (4 parts de-germ to 1 part Type I fluid).

Note: The Lavatory cart should be properly emptied before nightly storage.
Potable Water Procedures

• Upon arrival of a RON, fully drain the potable water into an appropriate container.
• Prior to departure of a head start flight, refill with potable water.
• The potable water cart should be stored with approximately 5 inches of water in the tank.
• The potable water cart should be plugged in overnight for heating and recharging.

Note: If the potable water port is frozen, contact CFM dispatch and the local equipment manager.
Questions?