Snow Removal and Ice Control Standards at Canadian Airports

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Snow removal and ice control levels of service at Canadian airports are defined in terms of the maximum allowable snow accumulation and the maximum allowable snow clearance time. The influence of airport category, aircraft type and the relative importance of a surface area, on the level of service of snow removal, are explained.

Factors affecting the provision of resources for snow removal and ice control are outlined, such as the desired level of service, air traffic and equipment performance characteristics.

The standard methods of snow removal and ice control practised at Canadian airports are discussed, which are casting, hauling and compacting of snow and prevention, removal and sanding for ice.

Priority areas of an airport are defined in terms of the minimum operational requirements that must be satisfied during a defined maximum snowstorm.

The methodology for determining the type and number of equipment for snow removal for a given airport is developed which can be applied to a computer program. The computer input consists of: the maximum allowable snow accumulation, the size of the area to be maintained, the rate of snowfall, the average operational speed of equipment, the clearing width of the equipment, the average runway occupancy time and the average number of aircraft movements per active runway.

The approved materials for the prevention, removal and control of ice are described along with the required performance standards for chemicals and materials.

The procedures, equipment and responsibility for the measurement, reporting and dissemination of runway surface condition during winter operations are outlined.

Introduction

Objective and Scope

Snow removal and ice control is the major winter operational activity at Canadian airports.

The basic objective of snow removal and ice control is to ensure that safe and efficient aircraft and vehicle manoeuvring surfaces exist in accordance with stated level of service.

Levels of Service

The level of service of snow and ice control is expressed in terms of "how fast" and "how well" the service is provided. It refers to the maximum snow accumulation that will be permitted to occur on a maintained area during a storm, or the maximum time that will be allowed for the clearance of the storm's accumulation after the end of the storm.

The level of service of snow and ice control will vary for different areas, depending on the category of the airport, the type of aircraft and the relative importance or priority of the area.

Factors Affecting Provision of Resources

The factors which determine the provision of resources for snow removal and ice control (equipment, materials, manpower) at an airport are:

(a) the level of service;
(b) surface areas to be cleared;
(c) climatic conditions;
(d) aircraft traffic density;
(e) equipment performance characteristics.

Snow Removal Methods

The methods used to remove snow from airport operational areas are more varied in speed, capacity and type of equipment than those used in municipal or highway operations.

There are three basic methods to remove and/or control snow: casting, hauling and snow compaction.
(a) The casting method which is the fastest and most economical method is used on most areas on the airside such as runways, taxiways and portions of aprons.
(b) Hauling is normally employed to remove snow from portions of aprons and groundside areas.
(c) The object of snow compaction is to provide a sufficiently hard surface of snow on which aircraft or vehicles can safely operate. Snow compaction is generally practiced at arctic airports having gravel runways and is also employed on unpaved airside service roads and for snow control.

Snow Disposal

In cases where casting methods are used, snow disposal is not required. When hauling methods are used, means of disposal are necessary and normally consist of establishment of snow dumping areas.

Snow Removal Equipment

The mobile equipment generally employed at Canadian airports consists of truck-mounted plows, towed runway sweepers and self-propelled snow blowers.

Ice Control

Ice on aircraft manoeuvring surfaces creates an unsafe condition for aircraft operations and thus it requires removal or control. Ice is controlled by the use of sand and chemicals.

Operational Standards

Although Canadian winters range from extreme cold and heavy snow to moderate temperatures with little or no snow, the operational standard for active runways which we aim for is published in the IFR Supplement of Canada Air Pilot, "Insofar as practicable, snow removal and ice control are carried out to provide airport surfaces which will permit safe operational use at all times." The active runway, adjoining taxiways and access to the terminal apron and aircraft parking areas are maintained in a serviceable condition on a "priority one" basis. The remaining manoeuvring and movement areas are cleared on a lesser priority basis in accordance with operational requirements. Except for the extraordinary storm condition, the staff and equipment resources at international airports are such that a 75 foot wide centre area of the priority runway is continually cleared within 30 minutes.

Operational Requirements

(a) Priority Areas

The airside priority areas are:

(i) Priority I Area - This is the minimum area that must be cleared on a continuous basis throughout the storm to maintain the minimum airside operational capability of the airport.

This area is usually composed of the following surfaces:

(1) One runway
   - the choice of runway is dictated by the prevailing wind direction;
   - during severe storm conditions the runway shall be maintained to a minimum width of 23 metres (75 ft.);
(2) One taxiway
   - maintained to its full width;

(3) Sufficient apron area to accommodate aircraft, passenger terminal and cargo requirements which accounts for at least 20% of total area.

(4) The entrance and exit access associated with the runway, taxiway and apron areas.

(5) Access roads from firehall to all of the above areas.

(ii) Priority II Area - This is the area that will be cleared throughout the storm so that in the event of a change in the prevailing weather conditions (e.g. wind direction) the other runway can be made operational on short notice.

This area will be composed of the following surfaces:

(1) Secondary Runway;
(2) Secondary Taxiway;
(3) The entrance and exit access associated with the above runway and taxiway;
(4) Associated apron access to taxiways if different from those previously cleared under Priority I clearance operations;
(5) Area of apron required to gain access to the minimum 20% previously cleared under Priority I clearance operations.

(iii) Priority III Area - This area is composed of surfaces which are cleared after a snow storm. Such areas are as follows:

(1) Airside service roads;
(2) Runway, taxiway shoulder areas;
(3) Pre-threshold areas;
(4) Glide path sites;
(5) Remaining airside areas required to permit full operational use of the airport.

Level of Maintenance - Aircraft Manoeuvring Areas

In order to reach realistic objectives in respect to effectiveness of snow removal the following assumptions are made:

(a) Sufficient equipment to keep the airport operational during a worst possible storm condition will not be provided.
(b) Sufficient equipment will be provided to keep an airport operational during 90% of all possible storm conditions. This 90% confidence level shall be considered "normal storm conditions" (weather conditions).
(c) Determination of equipment requirements will be based upon the calculation of requirements for runways, taxiways and aprons (equipment supply).
(d) All paved runways, taxiways and aprons shall be cleared to bare pavement surface using a combination of plowing, sweeping and/or blowing (degree of cleanliness).
(e) The maximum allowable accumulation depths of snow for the different priority areas, are set as follows:

- Priority I areas - 3.3 cm (1/2 inch)
- Priority II areas - 5 cm (2 inches)
- Priority III areas - storm accumulation

Provision of Equipment for Snow Removal

A method has been developed for determining snow removal equipment requirements at Canadian airports.

It consists of using a computer program, a formula and data which describes the pertinent conditions at a given airport site.

The formula determines the number of equipment types required as follows:
applied prior to or during a freezing rain, or a lowering of temperature, shall prevent the coefficient of friction from falling below half the value of the clean dry pavement; and will render possible the removal of ice/slush contaminant by mechanical means.

### Chemicals - Groundside
Solid chemicals sodium chloride (common salt) and calcium chloride may only be used on the groundside areas of an airport such as access roads, service roads, parking lots etc. The use of sodium chloride or calcium chloride is prohibited on any airside area due to their corrosive effect on aircraft components.

### Chemicals - Airside
Solid chemical Urea may be used both as an anti-icer and a de-icer on airside areas such as runways, taxiways and aprons.

### Performance Standards for Airside Chemicals
After a chemical has been found compatible with aircraft components, pavement materials and the environment, the criteria by which a chemical is considered to be effective is as follows:

(a) for anti-icing - the ice control chemical, when applied prior to or during a freezing rain, or a lowering of temperature, shall prevent the coefficient of friction from falling below half the value of the clean dry pavement; and will render possible the removal of ice/slush contaminant by mechanical means;

(b) for de-icing - the ice control chemical application shall raise the coefficient of friction of the ice covered surface to at least half the value of the clean dry pavement within one hour of application and will render possible the removal of ice/slush contaminant by mechanical means.

### Winter Operational Reporting Program

#### General Procedures
Runway coefficient of friction is measured and reported on a routine basis using James Brake or Tapley Meter Decelerometers. At all airports having ground-to-air communication, the Airport Manager or his designated authority provide periodic voice reports on runway surface conditions to the appropriate ATC unit, or if there is no ATC unit at the airport, to the aeradio station operator, in accordance with the criteria and terminology set forth.

#### Follow-up Written Reports
Voice reports are confirmed by follow-up written reports at airports serving scheduled air carriers. Written confirmation is not to be carried out for every voice report, but only when a significant change in runway surface conditions takes place.

#### Criteria and Terminology
The following criteria and terminology is used for reporting runway surface conditions:

1. Runway Bare and Dry (give percentage);
2. Runway Bare and Wet (give percentage; also, if there are any pools of water, give location, extent, and depth; indicate "removal in progress" if applicable);
3. Runway Snow Covered (give percentage; also, give the depth, indicate drifting and depth of drifts if applicable; indicate "removal in progress" if applicable);
4. Runway has Ice Patches (give percentage; also, indicate "sanded and/or Urea-treated" if applicable; indicate "removal in progress" if applicable);
5. Runway Slush Covered (give percentage; also, give the depth; indicate "removal in progress" if applicable);

The James Brake Index (JBI) or Tapley Meter Index (TMI) is reported as an average for each runway. However, if one section of a runway has a friction value (JBI or TMI) that is 0.10 or more lower than the average for the whole runway, then that value and the affected area will be reported as well as the average value for the runway.

In addition, if one end of the runway happens to be water covered and the remainder of the runway is solid state (covered with ice or compacted snow), only the friction value (JBI or TMI) for the solid state portion should be reported. The wet condition should be reported as such together with the extent of coverage from the runway threshold.

NOTE: All condition report data refers to the entire width of the runway.