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AEROSPACE RECOMMENDED PRACTICE

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AEROSPACE - DEICING/ANTI-ICING SELF-PROPELLED VEHICLE FUNCTIONAL REQUIREMENTS

FOREWORD

This document is to be read in conjunction with ISO 6966, Aircraft - Basic Requirements for Aircraft Loading Equipment.

NOTE: Though a deicing/anti-icing vehicle is not a piece of aircraft loading equipment, the basic general requirements are identical for aircraft loading and aircraft servicing equipment, designed in the same airport ramp environment.

1. SCOPE:

This document specifies the general functional and performance requirements for a self-propelled, boom type aerial device equipped with an aircraft deicing/anti-icing fluid (ADF) spraying system. The unit shall be highly maneuverable for deicing and anti-icing all exterior surfaces of wide-body and narrow-body aircraft, e.g., B747 and DC9. The vehicle shall be suitable for day and night operations. The vehicle and all associated systems shall operate satisfactorily under the temperature conditions between -40 and 50 °C (-40 and 122 °F) and in continuous humidity of up to 100%.

It is not within the scope of this document to specify a comprehensive set of technical design criteria for aircraft deicing/anti-icing vehicles but only those relating to functional and performance requirements.

2. REFERENCES:

2.1 Applicable Documents:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other documents shall be the issue in effect on the date of the purchase order.

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

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2.1.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

ARP1247 General Requirements for Aerospace-Powered Mobile Ground Support Equipment

J1211 Environmental Practices for Electrical Equipment

AMS 1424/ISO 11075 Aircraft Deicing/Anti-Icing Fluids, Newtonian, Type I

AMS 1428/ISO 11078 Aircraft Deicing/Anti-Icing Fluids, Non-Newtonian, Type II

2.1.2 U.S. Government Publications: Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

ISO 6966 Aircraft - Basic Requirements for Aircraft Loading Equipment

2.1.3 Deutsche Lufthansa AG Publications: Available from Deutsche Lufthansa AG, Dept. HAMIF 1, P.O. Box 300, D-2000 Hamburg 63, West Germany.

AEA Material Specification. Deicing/Anti-Icing Fluid, Aircraft.

2.1.4 Air Transport Association Publications: Available from Air Transport Association, 1709 New York Avenue, N.W., Washington, DC 20006.

ATA 101 Specification for Ground Equipment Technical Data

3. GENERAL REQUIREMENTS:

3.1 Equipment:

For the purpose of this document, the vehicle shall be of a size to accommodate the fluid capacity required for standard-body and wide-body aircraft at either low frequency outstations or high frequency hubs and may be chosen by the purchaser from the following alternatives in Table 1:

TABLE 1 - Fluid Capacities

Type	Tank Capacity Range Liters	Tank Capacity Range U.S. Gallons	Minimum Basket Floor Height Meters	Minimum Basket Floor Height Feet
A size	Up to 4600	Up to 1,215	10.0	33
B size	Over 4600	Over 1,215	12.2	40'

' Except enclosed baskets

The unit shall consist of a suitable self-propelled chassis, an aerial device with personnel basket constructed and mounted in accordance with applicable national safety standards, fluid supply tank(s), a fluid pumping system, and a heater for applying heated deicing fluid to all necessary aircraft surfaces.

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3.2 Basic Performance Features:

- 3.2.1 The primary function of the vehicle shall be to apply heated deicing/anti-icing fluid and their mixtures from a variable height boom to the surfaces of stationary aircraft while traversing their perimeter. A hose stored in a compartment shall also be fitted for ground use. The vehicle shall be acceptable for use around terminal gate areas, airport service roads, and aircraft service ramps.
- 3.2.2 The personnel basket shall be capable of accommodating:
- Single operation basket - minimum 136 kg (300 lb) lift capacity.
61 cm x 61 cm x 107 cm (24 in x 24 in x 42 in) minimum dimensions (L x W x H)
 - Dual operation basket - minimum 204 kg (450 lb) lift capacity.
61 cm x 122 cm x 107 cm (24 in x 48 in x 42 in) minimum dimensions (L x W x H)
- 3.2.3 The deicing fluid system shall be capable of producing a prenozzle discharging pressure of 655 kPa (95 psi) minimum at a flow rate of at least 132 Lpm (35 gpm) from the basket nozzle with the boom fully elevated.
- 3.2.4 The deicer shall be capable of delivering fluids at a temperature of 82 °C (180 °F).
- 3.2.5 The heater system shall be capable of raising the deicing fluid from a temperature of 5 °C (41 °F) to 82 °C (180 °F) within a period of 1 h or less and delivering at a constant flow of at least 132 Lpm (35 gpm). Exceptions to this would be an external energy source providing fluid preheat or electric heating elements in the tank.
- 3.2.6 Where a separate anti-icing fluid system is provided, it shall be capable of spraying Type II anti-icing fluid at a minimum rate of 57 Lpm (15 gpm).
- 3.2.7 Power distribution shall be so arranged as to accomplish all necessary deicing activities as dictated by local regulatory agencies and/or specific airline requirement.
- 3.2.8 Noise level in the cab with all systems operating should not exceed 85 dBA and shall meet local regulatory requirements.
- 3.2.9 The vehicle shall be capable of being transported either on a trailer or driven at normal road speeds in accordance with applicable government highway regulations.
- 3.2.10 The boom must be easily secured in a rest to prevent vehicle or boom damage when transported at road speeds.

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4. DESIGN AND OVERALL DIMENSIONS:

On an adequate chassis, the deicing vehicle shall provide the following:

- 4.1 An enclosed, heated cab for the vehicle driver and a passenger. The cab shall be fitted with windshield wipers and a defroster/heater system as well as a window in the top of the cab equipped with wiper(s).
- 4.2 The vehicle driver shall have the maximum unobstructed view of the operator and basket. In the case of single-person operation, a single driver/operator should have the maximum possible view of the vehicle when the basket is elevated for safe-driving during deicing operations.
- 4.3 Maximum width and height in folded position shall be in accordance with local regulatory agencies.
- 4.4 Tow hooks shall be installed on the chassis structure (at least two at front and one at rear).
- 4.5 Storage batteries shall be of the heavy duty type. Vehicle electrical system shall be based on DC 12V or DC 24V power with negative ground.
- 4.6 Alternators shall be capable of supplying 100% of the maximum vehicle electrical steady load plus at least 1 amp (to recharge the battery after starting) at engine idle revolutions per minute.
- 4.7 The aerial device and its installation on the vehicle must conform to applicable national and/or local regulatory safety and stability regulations.
- 4.8 The personnel basket shall have a self-adjusting mechanism to maintain a vertical operating attitude for all boom positions.
- 4.9 The personnel basket shall provide for safe and easy entry and exit. It must be equipped with safety harnesses or belts for each operator.
- 4.10 The aerial device and its attachment to the chassis shall be such that periodic structural inspection can readily be carried out without major disassembly.
- 4.11 The personnel basket shall be designed to position the operator to apply deicing/anti-icing fluid effectively to the upper areas of the aircraft control surfaces, wings, empennage, and fuselage. Operating positioning speed shall be in accordance with local safety regulations.
- 4.12 Stability and safety shall be paramount in the boom and basket design.
- 4.13 An emergency system shall be provided which will enable the aerial device and loaded basket to be maneuvered and lowered in the event of system malfunction/engine shut-down.
- 4.14 A two-way, headset communications system shall be installed between the basket and the driver's cab.

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- 4.15 The tank fluid pumping and heating system shall be designed for use with and fully compatible with either:
- a. SAE/ISO Type I deicing fluids only.
(Type I deicer)
 - b. SAE/ISO Type I deicing fluids and SAE/ISO Type II anti-icing fluids.
(Type I deicer/Type II anti-icer)
 - c. SAE/ISO Type II deicing/anti-icing fluids for one step de/anti-icing.
(Type II deicer)
 - d. SAE/ISO Type II deicing fluids for deicing and SAE/ISO Type II fluids for anti-icing.
(Type II deicer/anti-icer)

NOTE: All Type II systems should also be suitable for Type I mixtures and pure water for testing.

Special consideration should be given to Type II heating, pumping, and spraying components to avoid degradation of these fluids. Specifically, all materials in contact with the fluid should be noncorroding. Relief valves in the fluid circuit as a continuous flow path should not be used. Metallic platings should be carefully chosen to be compatible with Type II fluids (zinc and cadmium should be avoided). Pumps should be positive displacement and proven suitable for Type II fluids under pressure on a deicing vehicle, such as diaphragm pumps. Fluid circuits should have an unrestricted path back to the fluid tank or pumps should be activated only on demand (when the nozzle is open).

Type II heating circuits should avoid intermittent temperatures above 95 °C (203 °F) and constant temperatures above 85 °C (185 °F).

- 4.16 Fluid tank(s) shall be made of noncorroding material and adequately baffled to prevent undue fluid motion and starving of the fluid pump during maneuvering. Suitable vents, overflows, manual fills and liquid level gauges, drains and manhole or equivalent with cover shall be provided on the tank. Provisions should be made to allow for a bottom fill option on all tanks.
- 4.17 System design shall permit easy, nonhazardous access to all components for servicing or replacement. Fluid flow parts shall be equipped with shutoff valves to provide fluid tank isolation and major component replacement.
- 4.18 With deicing fluid the spray pattern shall vary from a fan-shaped spray to a solid stream as selected by the operator. The operator shall have on/off control of the fluid flow. There should be an option for a turret mounted nozzle in the basket for deicing.
- 4.19 The fluid heater shall be equipped with appropriate safety devices to prevent the occurrence of conditions which might damage the equipment or create an unsafe condition.
- 4.20 All steps and platforms shall have a nonskid, self-draining surface.