AEROSPACE RECOMMENDED PRACTICE

ARP6852™ REV. D

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Superseding ARP6852C

Methods and Processes for Evaluation of Aerodynamic Effects of SAE-Qualified Aircraft Ground Deicing/Anti-Icing Fluids

RATIONALE

Text clarification at 4.4.3.2.1.2 to better representing industry practices.

New reference from FAA added.

Inclusion of middle speed ramp at 3.3.2, and wording harmonization with AS5900. Notes referring to development history of high-speed, low-speed, and middle-speed ramps added.

Minor editorial corrections.

Change in title of Figure A1.

FOREWORD

The qualification processes for SAE fluids are described in ARP5718 and the standards, including aerodynamic standards, with which the fluids must comply are given in AMS1424 (Type I) and AMS1428 (Types II, III, and IV). These standards require that the aerodynamic performance of all fluids be tested and qualified in accordance with AS5900. The purpose of the AAT is to ensure that new fluids have aerodynamic performance properties that are not worse than an established, accepted standard. In this way, the AAT provides a general screening of the aerodynamic effects of the fluids. Even with successful AAT qualification, however, there can be circumstances which require evaluation of the aerodynamic effect of the fluids on specific aircraft.

The intent of this SAE Aerospace Recommended Practice (ARP) is to provide guidance for the evaluation of aerodynamic effects of fluids on aircraft, if it is determined that an evaluation is required to ensure safe operation of an aircraft with fluids applied. This ARP describes previously used methods and methods under development. To evaluate fluid effects on a particular model, it should typically not be necessary to utilize more than one method described in this ARP; however, depending upon the circumstances, it may be advantageous to do so (e.g., similarity analysis combined with CFD).

The recommended practices and other information described herein are limited to the experiences of the members of the SAE G-12 ADF Aerodynamics Working Group. Thus, this ARP is not intended to be an exhaustive discussion of information from all possible sources. Should users of this ARP, or other entities with relevant experience, have additional recommendations or revision suggestions, they are encouraged to contact the SAE G-12 ADF Aerodynamics Working Group.

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1. SCOPE

This SAE Aerospace Recommended Practice (ARP) describes methods that are known to have been used by aircraft manufacturers to evaluate aircraft aerodynamic performance and handling effects following application of aircraft ground deicing/anti-icing fluids ("fluids"), as well as methods under development. Guidance and insight based upon those experiences are provided, including:

- Similarity analyses.
- Icing wind tunnel tests.
- Flight tests.
- Computational fluid dynamics and other numerical analyses.

This ARP also describes:

- The history of evaluation of the aerodynamic effects of fluids.
- The effects of fluids on aircraft aerodynamics.
- The testing for aerodynamic acceptability of fluids for SAE and regulatory qualification performed in accordance with AS5900.
- Additionally, Appendices A to E present individual aircraft manufacturers' histories and methodologies which substantially contributed to the improvement of knowledge and processes for the evaluation of fluid aerodynamic effects.

NOTE: This document is applicable for fluids that are "qualified" (i.e., have passed) to the tests and other standards prescribed in AMS1424 or AMS1428, and are properly used in accordance with AS6285.

NOTE: There are topics of potential interest not discussed in this document, such as re-hydrated gel residues (see 2.2).

CAUTION: The results and conclusions of the various test programs described herein should not be assumed to be universally applicable.

CAUTION: All methodologies presented in this ARP were created or developed considering solely glycol-based fluids.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS1424 Fluid, Aircraft Deicing/Anti-Icing, SAE Type I

AMS1424/1 Deicing/Anti-Icing Fluid, Aircraft SAE Type I Glycol (Conventional and Non-Conventional) Based

AMS1424/2 Deicing/Anti-Icing Fluid, Aircraft SAE Type I Non-Glycol Based