Transport Canada / Transports Canada

PUBLICATION DATA FORM

1. Transport Canada Publication No.	2. Project No.	3. Recipient's Catalogue No.
TP 14376E		

4. Title and Subtitle	5. Publication Date
Endurance Time Testing in Snow: Comparison of Indoor and Outdoor Data for 2003-04	November 2004
	6. Performing Organization Document No.: CM1892.001

7. Author(s)	8. Transport Canada File No.
Nicoara Moc and Stephanie Bendickson	

9. Performing Organization Name and Address	10. PWGSC File No.
APS Aviation Inc. 634 St. Jacques, 4th Floor, Montreal, Quebec H3C 1C7 Canada	11. PWGSC or Transport Canada Contract No.

12. Sponsoring Agency Name and Address	13. Type of Publication and Period Covered
Transportation Development Centre (TDC) 800 René Lévesque Blvd. West, Suite 600 Montreal, Quebec H3B 1X9 Canada	Draft
	14. Project Officer: Barry Myers

15. Supplementary Notes (Funding programs, titles of related publications, etc.)

Several research reports for testing of de/anti-icing technologies were produced for previous winters on behalf of Transport Canada. These are available from the Transportation Development Centre (TDC). Nine reports (including this one) were produced as part of this winter's research program. Their subject matter is outlined in the preface.

16. Abstract

Under contract to the Transportation Development Centre (TDC) of Transport Canada (TC), APS Aviation Inc. (APS) undertook a research program to compare endurance times of de/anti-icing fluids under natural snow conditions with those under artificial snow conditions. These tests are required to evaluate the artificial snowmaking system that was developed by the National Centre for Atmospheric Research (NCAR) for conducting future endurance time tests. The snowmakers have been tested over several years, with various improvements made to the system in an attempt to correlate with the current outdoor test methodology.

In support of the objectives of the work statement, APS carried out fluid endurance time tests under artificial snow conditions, and compared outdoor endurance times with those obtained indoors using the modified NCAR snowmaking machine. The snowmaking system used during 2003-04 maintained the plate temperature below the ambient temperature, at a constant value calculated according to a formula agreed upon by all testing agents.

Based upon specific criteria, APS developed a proposed matrix of tests that was also provided to Anti-Icing Materials International Laboratory (AMIL) and NCAR, and they independently conducted indoor tests using the same outdoor data. Seventy-nine valid tests were performed by APS using the NCAR snowmaking machine with Type II, III and IV fluids.

The analysis of the data collected shows that the correlation between natural and artificial snow endurance times has improved significantly over the years. The Type II/IV propylene-based fluids, showed a fairly good correlation in endurance times between the indoor and outdoor tests. In the case of the only ethylene-based fluid tested, Dow Ultra+, the endurance times for indoor tests were found to be, for the most part, higher than those of the outdoor tests. This fluid also exhibited large variations in endurance time between the three participating laboratories. The test plate set temperatures used during 2003-04 were found to be satisfactory for producing a good correlation between indoor and outdoor tests for the Type II/IV propylene-based fluids.

Even though there is some scatter in the data, it is recommended to move forward and use the modified NCAR snowmaking machine to produce endurance times for new propylene-based Type II/IV fluids. It is recommended that, at the present time, Type IV ethylene-based fluids be tested under natural snow conditions. Also, it is recommended a HOT Workgroup meeting be held to review the test procedure containing requirements and parameters for conducting fluid endurance testing under artificial snow conditions. Upon receiving the approval, the indoor procedure should be included in the Aerospace Recommended Practice (ARP) 5485.

As suggested at the SAE G-12 workgroup meeting in Montreal in September 2003, APS also carried out endurance time tests at -25ºC using certified Type II and IV fluids. Based on the finding of these tests, it was recommended that artificial snowmaker values be used to determine holdover times in the -14ºC to -25ºC snow cell in fluid-specific Type II and Type IV holdover time guidelines once the simulated snow methods have been approved for use in ARP 5485. In the interim, new holdover times were developed for the propylene-based Type II and IV fluids based on the endurance time test values measured at -25°C.

DRAFT

17. Key Words	18. Distribution Statement
Simulated snow, snowmaking machine, deicing, anti-icing, endurance times, holdover times, artificial snow, precipitation rate	Limited number of copies available from the Transportation Development Centre

19. Security Classification (of this publication)	20. Security Classification (of this page)	21. Declassification (date)	22. No. of Pages	23. Price
Unclassified	Unclassified	—	xx, 68 app.	—

CDT/TDC 79-005
Rev. 96

Canada