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Aerospace Literature: Deicing

The abstracts that follow appear as a supplement to this issue's special section on deicing. Paper copies and microfiche of the original documents cited are available from AIAA Library, Technical Information Division, American Institute of Aeronautics and Astronautics, Inc., 555 W. 57th St., New York, NY 10019; (212) 247-6500. Use the "A" number to identify selected material.

A92-51947 Effect of a deicing device on the induced drag of a lifting airfoil (Vliv poruchy odmrazovaciho zarizeni na indukovany odpor nosne plochy). Z. SKODA, *Zpravodaj VZLU,* Czechoslovakia (ISSN 0044-5355), 1992 . 2 Refs.

In the reliability analysis of an aircraft deicing system, it is essential that consideration be given to the possible consequences of the partial failure of the deicing system on aircraft maneuverability and controllablity. Here, a method for evaluating the effect of deicing failures on the induced drag is presented.

A92-45600 Microbiological spoilage of aviation turbine fuel. II—Evaluation of a suitable biocide. H. M. DAYAL, K. C. TEWARI, and G. P. TANDON, *Defence Science Journal* (ISSN 0011-748X), Vol. 42, No. 1, Jan. 1992, pp. 47–52. 19 Refs.

Addition of ethylene glycol monoethyl ether, an anti-icing fuel additive, supports microbial growth when added to aviation turbine fuel in low dosages. However, increase in its concentration to certain limits effectively prevents bioactivity in the fuel. The optimum dosage of this biocide for prevention of bioactivity in aviation turbine fuel has been studied by the specific qualitative performance tests after 18 months storage of the inhibited fuel under accelerated conditions of temperature and humidity.

A92-45426 On the possibility of freezing and sticking phenomena in a transport during the ground taxiing and takeoff run and on the preventions of the hazard. K. TAKSAWA and M. SAKA, SAE Paper 912042, International Pacific Air and Space Technology Conference and Aircraft Symposium, 29th, Gifu, Japan, Oct. 7–11, 1991, Proceedings (A92-45376 19-01). Society of Automotive Engineers, Inc., Warrendale, PA, 1991, pp. 569–580.

In the present analytical study of slush-sticking and freezing phenomena associated with the tail surfaces of a commuter airliner during ground operations, a simple model describing outflows of heat from slush to the surrounding airflow, involving both conduction and evaporation, has given attention to meteorological and operational conditions' effects on the heat-transfer rate. Also noted is the effect of the spraying of aircraft deicing fluid, as reflected by a survey of pilots' experiences.

A92-40545 EIPOS for ice-formation control on aircraft in flight—An alternative technique. I. A. LEVIN, Institution of Mechanical Engineers, Proceedings, Part G - *Journal of Aerospace Engineering* (ISSN 0954-4100), Vol. 205, No. G2, 1991, pp. 81–88. 11 Refs.

This paper traces the history of ice-formation control on aircraft in flight and the efforts made to provide an alternative to the uneconomic heating techniques. The EIPOS was developed in the USSR and uses dynamic wave pulses generated directly in the structure by an external electrodynamic field to break up the ice. The method has proved so successful that it is now finding applications in other fields.

A92-40009 Concorde flight testing—Powerplant and performance flying. E. B. TRUBSHAW, SAE Paper 912192, SAE, Aerospace Technology Conference and Exposition, Long Beach, CA, Sept. 23–26, 1991. 15 p.

Concorde, the first major civil airliner project conducted on a collaborative basis, employed two assembly lines and two flight-test centers; the flight test program allocated the main tasks to each of the initial developmental aircraft. Attention is presently given to milestones and lessons associated with the powerplant test and performance flight test programs, encompassing the air-intake control system, engine inlet surges, aircraft response to atmospheric disturbances, deicing trials, and performance monitoring during takeooff, cruise, and landing.

A92-38375 Flying on thin ice. S. ELLIOT and G. WARWICK, *Flight International* (ISSN 0015-3710), Vol. 141, No. 4316, April 29, 1992, pp. 38–40.

A review is presented of several recent aircraft accidents showing that present airliner antiicing measures are inadequate. Attention is given to these inadequacies and what is being done to correct them.

A92-26359 Aircraft icing (Le givrage des aeronefs). D. GUFFOND, L'Aeronautique et l'Astronautique, No. 148–149, 1991, pp. 51–54; see also ONERA, TP no. 1991-202, 1991, 5 p. In French.

A review of aircraft icing presented. Systems developed to remove ice deposits or avoid structural ice formations are described. Techniques of modelizing, icing tunnel tests, and flight tests are discussed. Attention is given to computing models utilized to determine ice shapes and to predict the efficiency of antiicing or deicing systems.

A92-17252 Engine air inlet and de-icing system — At -30 C in the icing tunnel of NRC Ottawa. T. VOGELBACHER, *Dornier Post* (ISSN 0012-5563), No. 3, 1991, pp. 68, 69.

The Canadian National Research Council's (NRC) Ottawa icing-studies wind tunnel has been used to test the engine air intake deicing system of the Do 328 aircraft. The deicing system employs neoprene rubber boots that are conformal when deflated and vaulted when inflated by pressurized air. The NRC icing wind tunnel allowed testing to be conducted with careful control of ambient temperature, pressure altitude, water droplet diameter and number, cloud size and type, aircraft flight speed, and structural surface geometry.

A92-10969 Effect of antiicer on propeller performance. A. ZHANG, *Journal of Aerospace Power* (ISSN 1000-8055),Vol. 6, Oct. 1991, pp. 349–351. In Chinese.

Comparative experiments of a propeller with and without the antiicer have been completed in a wind tunnel. The analysis of the experimental data shows that the effect of the antiicer depends on the advance ratio (J) and the blade angle. The antiicer has no effect on the performance of the propeller when the blade angle is big enough and the advance ratio is small. The efficiency of the propeller with antiicer increases when the blade angle is big enough and the J is moderate or the blade angle is smaller and the J also small. The attached antiicer reduces efficiency at the big blade angle with a large advance ratio or at a smaller angle with a moderate ratio. When the aircraft takes off, the antiicer reduces propeller efficiency by 1.5 percent, and by 3 percent when the plane cruises.

A91-52951 Aerodynamic impact of deicing/anti-icing fluids on commuter aircraft. E. LIM, N. D. ELLIS, P. J. TEELING, and S. ZHU, SAE Paper 911026, SAE, General, Corporate, and Regional Aviation Meeting and Exposition, Wichita, KS, Apr. 9–11, 1991. 14 p., 14 Refs.

A wind tunnel test simulating takeoffs of a typical commuter aircraft was conducted at NASA LeRC IRT to understand the aerodynamic impact of the ground deicing/anti-icing fluids on an aircraft. It was found that the magnitude of degradation in the maximum lift and climb gradient at climb out for the wing/flap model appears to differ for each fluid, rotation speed and time to rotation, range of temperature and fluid dilution. The effect of increasing the time to rotation constitutes the most significant finding. Tests indicated that a type II deicing/anti-icing fluid, for a rotation time of 15 seconds, had no significant clearing of the fluid from the wing/flap model, resulting in a large aerodynamic penalty which is considered unacceptable. Exposed to a 30 second rotation time, the same fluid showed a significant improvement, and even with the lower rotation speed, most of the degradation caused by the reduction of the rotation speed was gained back. This test also shows that deicing/anti-icing fluid has a more significant impact on the commuter-type of aircraft operating at a shorter time to rotation and lower rotation speed than the jet aircraft.

A91-52938 Artificial and natural icing conditions flight tests on the Piaggio P.180 Avanti aircraft. P. CINQUETTI and S. MARTINI, SAE Paper 911004, SAE, General, Corporate, and Regional Aviation Meeting and Exposition, Wichita, KS, Apr. 9–11, 1991. 12 p., 8 Refs.

An extensive development and certification test program carried out to meet the requirements for safe operations in ice conditions is described. The program encompasses preliminary evaluation in wind-tunnel tests, real flight in artificial icing conditions realized behind U.S. air tanker NKC-135, and natural ice tests performed in a wide range of atmospheric environments with a variety of average liquid water contents, cloud droplets median volume diameter and static temperature. The remarkable amount of data made it possible to accomplish power plant certification and assess all the ice protection systems with a high safety level. Some discrepances found between data in artificial and natural tests are discussed.

A90-29639 Composites don coats (for aerospace applications). G. MARSH, *Aerospace Composites and Materials* (ISSN 0954-5832), Vol. 2, Mar.–Apr. 1990, pp. 18–20, 22.

The present evaluation of the development status and range of applications for fiber-coating treatments useful in composite materials gives attention to the case of metal-coated fibers (MCFs), which have thus far aroused the greatest interest. MCFs are typically electrodeposited Ni-coated carbon fibers which retain their high tensile strength while maintaining a specific density of only slightly more than 3; Ni/C MCFs possess high electrical and thermal conductivity and corrosion resistance, rendering them useful in composites with electromagnetic screening properties. The incorporation of these fibers into composite wing structures allows them to be electrically heated for deicing