

Piloted Flight Simulator Developed for Icing Effects Training



Pilot performing an approach to landing using the Ice Contamination Effects Flight Training Device, with instructor observing pilot reactions.

Long description of figure. The instructor uses a laptop computer to set up the training session and communicates to the pilot through headsets as an air traffic controller for scenario-based lessons.

In an effort to expand pilot training methods to avoid icing-related accidents, the NASA Glenn Research Center and Bihrl Applied Research Inc. have developed the Ice Contamination Effects Flight Training Device (ICEFTD). ICEFTD simulates the flight characteristics of the NASA Twin Otter Icing Research Aircraft in a no-ice baseline and in two ice configurations simulating ice-protection-system failures. Key features of the training device are the force feedback in the yoke, the instrument panel and out-the-window graphics, the instructor's workstation, and the portability of the unit.

A training curriculum has been developed to familiarize training pilots with the basic flight characteristics of the Twin Otter in no-ice and fully iced configurations so that pilots can compare and contrast the changes in stall and handling characteristics. In addition, a scenario-based lesson is used to demonstrate icing effects during the approach-to-landing segment of a flight. This device will be used in pilot workshops to demonstrate cues for recognizing iced-airplane handling qualities and the recovery techniques, should a handling anomaly occur.

The ICEFTD demonstrator is the result of 5 years of research and development that (1) explored iced aerodynamic scaling to develop representative aerodynamics at low

Reynolds numbers through a series of wind tunnel tests on several scale models of a tailplane airfoil, (2) developed icing-effects flight-simulation models by conducting wind tunnel tests on a 6.5 percent-scale complete aircraft model, and (3) verified flight-simulation modeling through flight tests of the NASA Twin Otter with simulated ice shapes installed on the wing and tail surfaces. The test techniques and engineering methodology explored in this effort are beneficial to many segments of the aviation industry, from airplane manufacturers to airline operations to pilots who may encounter hazardous icing.

Find out more about this research at <http://icebox-esn.grc.nasa.gov/>

Glenn contacts: Thomas P. Ratvasky, 216-433-3905, Thomas.P.Ratvasky@nasa.gov; and Thomas H. Bond, 216-433-3900, Thomas.H.Bond@nasa.gov

Author: Thomas P. Ratvasky

Headquarters program office: Aeronautics Research

Programs/Projects: AvSSP, System Wide Accident Prevention Project