

# Test & Simulation Methods to Evaluate Ice Contamination Effects on Flight Dynamics

*Cessna Aircraft Company*



## TECHNOLOGY

An engineering process was developed to produce flight simulation models that incorporate the effects of various ice accretions on a business jet aircraft. The process included full-scale wing component testing to sub-scale, complete airplane model with ice shapes to develop databases of forces and moments to develop the flight simulation models. The models were incorporated into the NASA Ice Contamination Effects Flight Training Device (ICEFTD), where test pilots could evaluate the simulation model accuracy and fidelity.

## COMMERCIAL APPLICATION

Understanding the effect icing has on an aircraft is critically important to airplane manufacturers so that ice protection and stall protection systems can be properly designed and implemented to avoid loss of control. Icing effects flight simulation modeling provides a way for manufacturers to that understanding prior to potentially risky flight tests. The process developed by the test team is of great interest to airplane manufacturers and industry.

## NASA APPLICATIONS

NASA's Aviation Safety Program is developing technologies that monitor the health of the aircraft and have control capabilities to gracefully recover from loss of control. The technology developed here provides a good example for developing integrated resilient aircraft control for the icing hazard.



*Ice Contamination Effects Flight Training Device*

## SOCIAL / ECONOMIC BENEFIT

- ◆ The flight simulation models represent the aerodynamics of ice contamination and allows engineers and test pilots to identify potentially hazardous scenarios through simulation rather than through risky and expensive flight tests.
- ◆ Through more accurate simulations, airplane manufacturers and test pilots will develop a better understanding of the potential problems icing can cause, thus improving flight safety.

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