Improvement in Pilot Training for Aircraft Icing Conditions

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I. Overview

- One of the most dangerous atmospheric hazards in aviation is aircraft icing. Icing effects can be detrimental to any aircraft’s ability to successfully remain in flight.
- The understanding of cloud physical processes and icing conditions can be gained through the analysis of aircraft measurement case studies (Sand et al., 2000).
- How can we improve pilot knowledge and response to icing conditions through use of specific meteorological forecast products, interactive training modules, and research case studies?

II. Training Modules

- The Cooperative Program for Operational Meteorology Education and Training (COMET) has produced dozens of interactive training modules related to aviation meteorology (www.meted.ucar.edu).
- Examples of the instructional graphics from an interactive module is shown in Figures 1 and 2. These training resources utilize case study research, life experience and modern forecasting technology and put them into easily understood training tools.

III. Operational Forecast Products

- Access to accurate weather information and graphical products is extremely important for pilots for weather hazard avoidance.
- Meteorological graphs and figures are not always available on a timely basis from standard pilot websites, so it is important for pilots to have training on data resources.
- Fig. 3 is an example of an operational product from the NOAA Aviation Weather office which provides pilots with the ability to view icing conditions predicted along their flight route.
- Fig. 4 depicts a time series of vertical wind profiles, cloud/precipitation features and freezing layer heights predicted by an operational forecast model for a given location.

IV. Lessons from Icing Encounters

- Icing rate is highly dependent on the in-cloud supercooled water concentration and the sizes of the droplet population.
- An instrumented aircraft (University of Wyoming King Air) was utilized for a series of research flights near Prescott and obtained measurements of cloud microphysical conditions (Wetzel et al., 2015).
- Fig. 5 presents a time series of icing detector counts and cloud liquid water content, verifying the occurrence of cloud icing as predicted in the forecast product (Fig. 4), and showing the variation between estimates from sensors which measure different droplet size ranges.

V. Summary

- This poster demonstrates training resources and applies theoretical concepts as methods to improve pilot knowledge of icing processes and the ability to diagnose icing risk.
- Professional training with MetEd and other similar training aids show us the importance of accessing flight planning tools, forecast products, radar, and satellite images prior to flight.
- Instruction on icing physical processes and statistical summaries of occurrence combined with practice in the use of meteorological forecast tools and immersion in case study scenarios, will create safer and more knowledgeable pilots.

VI. References


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