

# How the FAA Tech Center is trying to make flying in winter weather safer

JOE MARTUCCI Press Meteorologist

While the summer heat reaches its peak, the Federal Aviation Administration is keeping cool with the In-Cloud Icing and Large-drop Experiment (ICICLE), led by a meteorologist at the William J. Hughes Technical Center in Egg Harbor Township.

The ICICLE campaign will update decades-old data. The goal is to provide weather information to distinguish among different types of icing environments so aircraft personnel that have limitations know where the icing is and when it will happen. This will increase pilot and passenger safety.

“There was aircraft certified for icing conditions and that was it. It was generic. But from advances that have been done in meteorology and, unfortunately, from accidents, we know that all icing environments are not the same. ... Whenever you ask somebody what their concerns are while flying, they usually think of thunderstorms or turbulence, but when you’re in those smaller aircraft, icing environments really create a hazard.” said Danny Sims, a physical scientist in the Aviation Weather Research Program and co-lead of the ICICLE program.

Icing environments are based largely upon the size of pure, supercooled water droplets in the atmosphere. When a plane flies through an icing environment, the supercooled droplets can attach to the aircraft and quickly turn to ice.

This, in turn, reduces the aerodynamic ability of the plane, causing anywhere from a rough flight experience to even crashes. This depends on the size of the droplets.

“If you think of cloud drops, which are very small in an environment (below freezing), it can immediately freeze upon impact of the wing. In large drops, it won’t freeze immediately. It’ll hit the wing and then freeze elsewhere on the aircraft. These drops can disrupt the flow. Even though you were certified for icing, it may have been for small drops. We’re now able to break certification out into drop size,” Sims said.

Previous datasets were used in developing the certifications. However, technology has since shown meteorological improvements that prevent those flight datasets from being used in current analyses.

Stephanie DiVito, FAA research meteorologist for the Aviation Research Division, is the ICICLE and Terminal Area Icing lead, based out of the Technical Center. DiVito said that much of the old data was before the tremendous leaps made in meteorological technology.

DiVito specially mentioned dual polarization radar, which can detect aircraft icing conditions, the over-900 automated surface observation stations, most of which are located at airports, and the new GOES satellites, GOES-17 and GOES-18, which provide three times more data, four times better resolution and more than five times faster coverage than previously before.

DiVito, says the FAA’s icing research program is based out of the EHT facility and was largely why she was chosen to be the lead on this \$3 million project.

“I was the one doing a lot of the early leg work to put it all together.” DiVito said.

ICICLE involved flying through conditions prime for icing out of Chicago Rockford International Airport, about halfway between Chicago and the Illinois-Iowa border.

Between Jan. 27 and March 8, researchers, including DiVito, would hop aboard a Convair-580 twin-engine research aircraft.

Scientists spanned government agencies and even countries. Environment and Climate Change Canada and the National Research Council of Canada were onboard with American organizations to collect extensive environmental measurements using a wide variety of instrumentation.

“The aircraft was heavily instrumented, measuring things like drop size, ice accretion, concentrations of liquid and ice. We also called information on aerosols. ... We also had other instruments to give us a 3D perspective,” DiVito said.

The crew would leave as early as possible, well before sunrise, to make sure there was the potential for two flights in the same day, allowing double the data collection. DiVito said the plane ride was not for the weak stomach.

“I was a bit nervous for some turbulence depending on the icing environment that you’re in. You’re reading (for research on the plane). ... You get that carsick feeling. Thankfully, for my particular flight, it was tolerable, and I was fine,” DiVito said.

After collecting the tremendous amount of data, the next steps are to boil it down and use it to improve safety through available icing weather information.

“We have a roadway where we’re laying out enhancements for those in-flight icing conditions. We’re adding in new technology. ... But we need ICICLE data to tell us how good we are. ... Meteorologists can say it ‘works well’, but ICICLE is giving us a tremendously rich data source that will truly enhance and make our weather forecasting products better. This is world-class research. That’s something the FAA Tech Center in South Jersey can take pride in,” Sims said.