The Federal Aviation Administration (FAA) Aviation Weather Research Program (AWRP) conducts applied weather research to enhance the safety and efficiency of the National Airspace System. The goal of the research is to transition new or improved weather capabilities into evolving air traffic management decision support tools and/or incorporation by the National Weather Service (NWS) to improve delivery of FAA-required services and enhance aviation safety and efficiency.

In-Flight Icing (IFI) continues to be a safety issue for aviation as it can distort the flow of air over the wing and adversely affect handling qualities. An airplane may stall at much higher speeds and lower angles of attack than normal. It can roll or pitch uncontrollably, and recovery may be impossible.

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In addition, regulatory and policy changes have resulted in a shift in IFI research strategy. Traditional IFI forecasts focused on the potential and intensity of icing ranging from trace, light, moderate, to severe. FAA policy changes in Title 14, Code of Federal Regulations Part 25 [Airworthiness Standards: Transport Category Aircraft], Appendix C and Appendix 0 have been created to improve the safety in in-flight icing and super-cooled large drop (SLD) conditions.

The NWP model output will transition to the High Resolution Rapid Refresh (HRRR) model that has a horizontal grid spacing of 3 kilometers with 50 vertical levels. The initial operational version of IPA is expected in 2021.

The WPRP will also be modified to incorporate Next Generation Weather Radar (NEXRAD) dual-polarization data from the Multi-Radar Multi-Sensor (MRMS) national mosaic. Research will also be conducted into the ability to diagnose icing conditions based on Appendix C and O drop size.

Weather in Alaska presents a special challenge for icing detection and forecasting due to terrain and polar orbiting weather satellites. The IFI research is focused on enhancing automated diagnostic and forecast capabilities used by pilots, dispatchers, and meteorologists to make timely decisions on icing threat areas, optimum routings, and areas to avoid in compliance to updated regulations and policy changes. The IFI program is focused on improving CIP and FIP by incorporating enhancements in NWP, weather satellites, and weather radar, and developing enhancements for Appendix C and O guidance.

The newest generation of Geostationary Operational Environmental Satellites (GOES) provides an opportunity to enhance real-time detection of aircraft icing hazards. CIP will also be modified to incorporate Next Generation Weather Radar (NEXRAD) dual-polarization data from the Multi-Radar Multi-Sensor (MRMS) national mosaic. Research will also be conducted into the ability to diagnose icing conditions based on Appendix C and O drop size.

CIP and FIP enhancements (Version 2.x) are targeted for initial NWS operational implementation in 2023. However, the capabilities of providing drop size information are dependent upon a full and complete analysis of the ICICLE field campaign data which provides valuable in-cloud measurements of in-flight icing parameters. Future versions will add other refinements for improved accuracy and applicability to emerging aviation users.

Current icing severity CIP on left and possible new icing category product (Appendix C and O) on the right.