Goal: Develop a capability for icing diagnosis and forecasting in the terminal area, with an emphasis on FZDZ and FZRA identification

- Diagnosis updates every 5-15 mins
- Forecasts 0-12 hours
- High resolution grid spacing
  - ~1 nmi horizontal; <500 ft vertical

Discriminate between small drops, FZDZ, and FZRA

- 14 CFR Part 25 Appendix C vs Appendix O subsets

Developed version 1
Demonstration Plan: Overview

**Part A:** Data collection and Capability Demo
- Winter 2021-2022
- Data collection while running real-time v1 TAIWIN capability at select airports
  - Aircraft: NRC Convair-580
  - Ground-based: Instrumentation at 5 airports in U.S. Northeast

**Part B:** User Demo and Evaluation

**Part C:** Performance Evaluation
TAIWIN Team – Flight Demo

- Federal Aviation Administration (FAA)
  - Program Lead: Stephanie DiVito
  - Lead; Ops Director

- National Center for Atmospheric Research (NCAR)
  - POC: Scott Landolt
  - Ops Director; Forecasters; Ground Support (sensors, capability)

- Leading Edge Atmospherics (LEA)
  - POC: Ben Bernstein
  - Ops Director; Forecaster
Sampling Environments

- Deep FZRA layers
- Shallow FZRA layers
- FZDZ reaching the ground
- FZDZ aloft only
- Small drop icing
- Clear air and glaciated conditions adjacent to icing
- Transitions
Part A: Objectives

• Monitor and evaluate TAIWIN capability in real-time
  - Output for select terminal areas: FZRA, FZDZ, small-drop, low chance, none
    ▪ Diagnosis and forecasts; categorizations; operational use and applicability; comparison to other icing products

• Evaluate and assess:
  - Surface observations
    ▪ Surface vs aloft conditions; spatial/temporal variability of icing; value of “raw” backscatter ceilometer data
  - Satellite
    ▪ Phase discrimination; drop-size discrimination
    ▪ Feature-tracking
  - Radar
    ▪ Phase discrimination; drop-size discrimination; effects of radar blocking, poor sampling, etc.
    ▪ Feature-tracking
  - NWP models
    ▪ Microphysics of HRRR (and RRFS, if available); time-lagged ensemble (TLE) approach to forecasting; partial cloudiness schemes
Data Collection and Capability Demo
Ground-based Sensors

Ground-based Instrumentation: 5 airports

- Disdrometer (e.g. particle size)
- Luftt (state parameters)
- Present Weather Sensor (e.g. precip type and intensity)
- Precipitation Gauge w/ Shield (e.g. liquid water equivalent)
- Icing Sensor (ice accretion)
- Micro Rain Radar (x2) - KBTV & KSYR -
- Ceilometer (x1) - KSYR -
- Also 1 fog sensor @ KSYR
KBTV Sensor Suite
Flight Sampling

• Collect data in terminal areas
  - Emphasis on missed approaches

• Surface to 15,000 feet
  - Current max altitude of TAIWIN definition of terminal areas is 12,000 ft

• Legs will often be flown at a single altitude
  - Often near cloud top.
  - Most interested in altitudes below 15,000 ft AGL
  - Cloud top will be upper limit for most flights (often below 15,000 ft)
  - Alternative altitudes may be chosen, such as at low altitude in FZDZ or FZRA
  - Terrain may require adjustments, especially around Burlington

• Example KBTV flight pattern on next slide
Blue (and/or Red) Strategy
Cover parts of 4+ TAs
- BTV (NW,S), PBG (C,S), MPV (W), RUT (NW)
- Also LKP, MLVL, LEB and some smaller ones
- Traffic is more to S; A little tricky w/ATC
Try for one altitude on legs, as terrain/ATC permit
- Porpoise unlikely because of multiple M.A.s
- ~155-170 nm (0.8-1 hr – straight lines, no MAs)
- Could repeat track to S of BTV
- Could do multiple circuits, diff. circuits
- Adding MAs adds time
- 110 nm (40 min) ferry YOW-PBG
Timeline

Data Collection
- Aircraft: January 24 – February 20, 2022
  - NRC Convair-580
  - 5-6 flights
    - Emphasis on KSYR
    - 1-2 flights at KBTV
- Ground instruments: December 2021 – March 2022

Dry-Runs
- Thu 16 Dec (time TBD)
  - Non-flight day
- Mid-Jan
  - Flight day
  - Non-flight day
Questions?

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