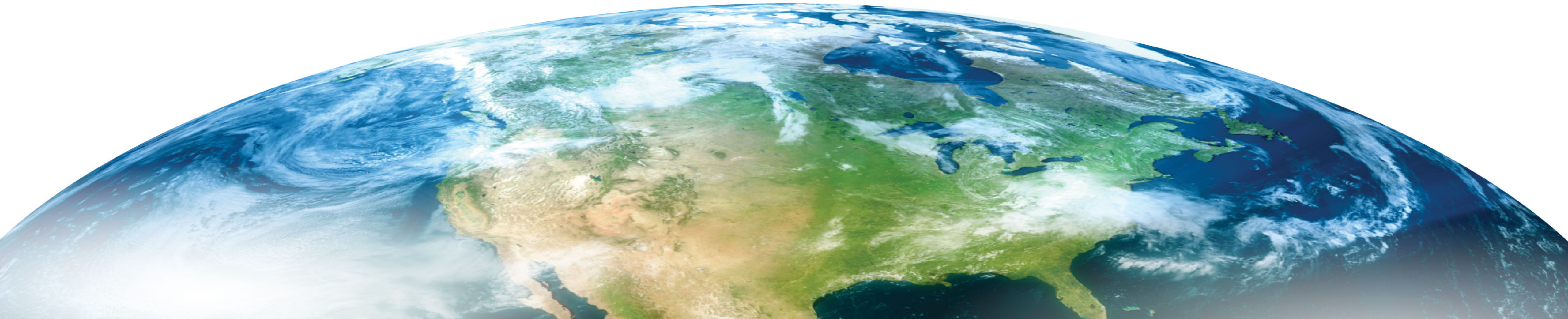
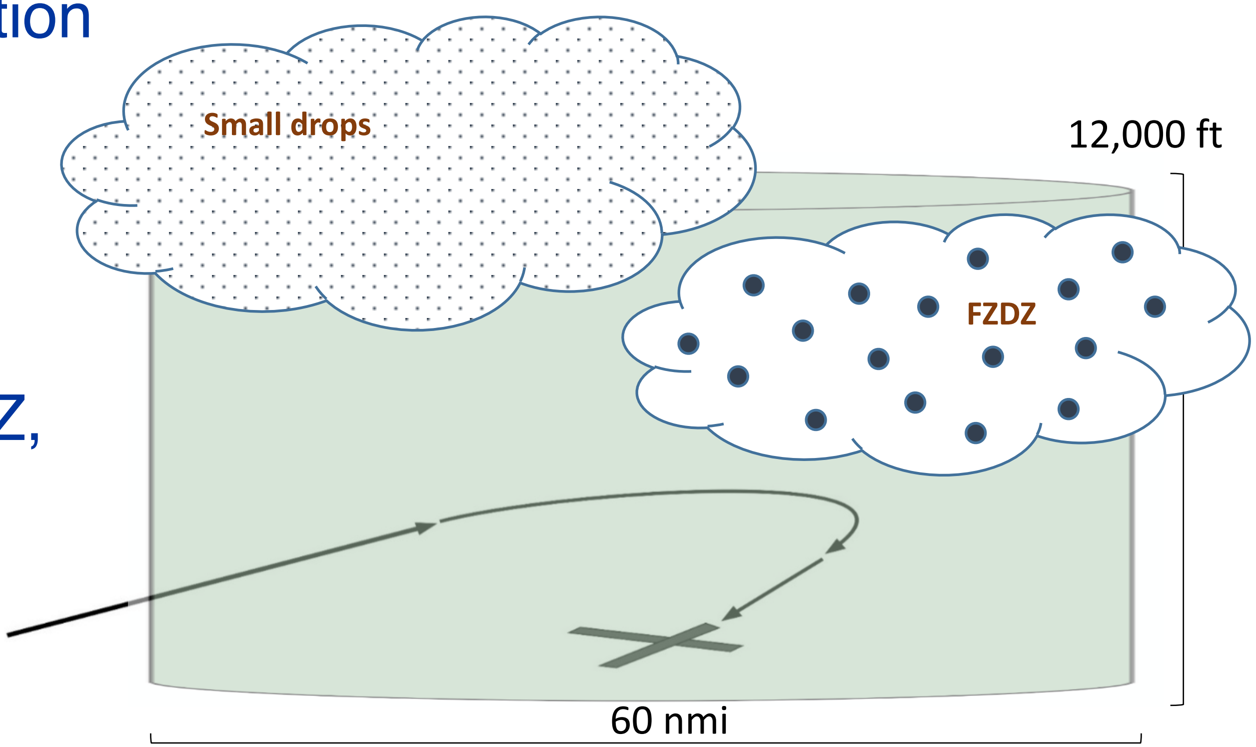
# TAIWIN Project Overview

December 13, 2021



# Terminal Area Icing Weather Information for NextGen (TAIWIN)

- Goal: Develop a capability for icing diagnosis and forecasting in the <u>terminal area</u>, 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

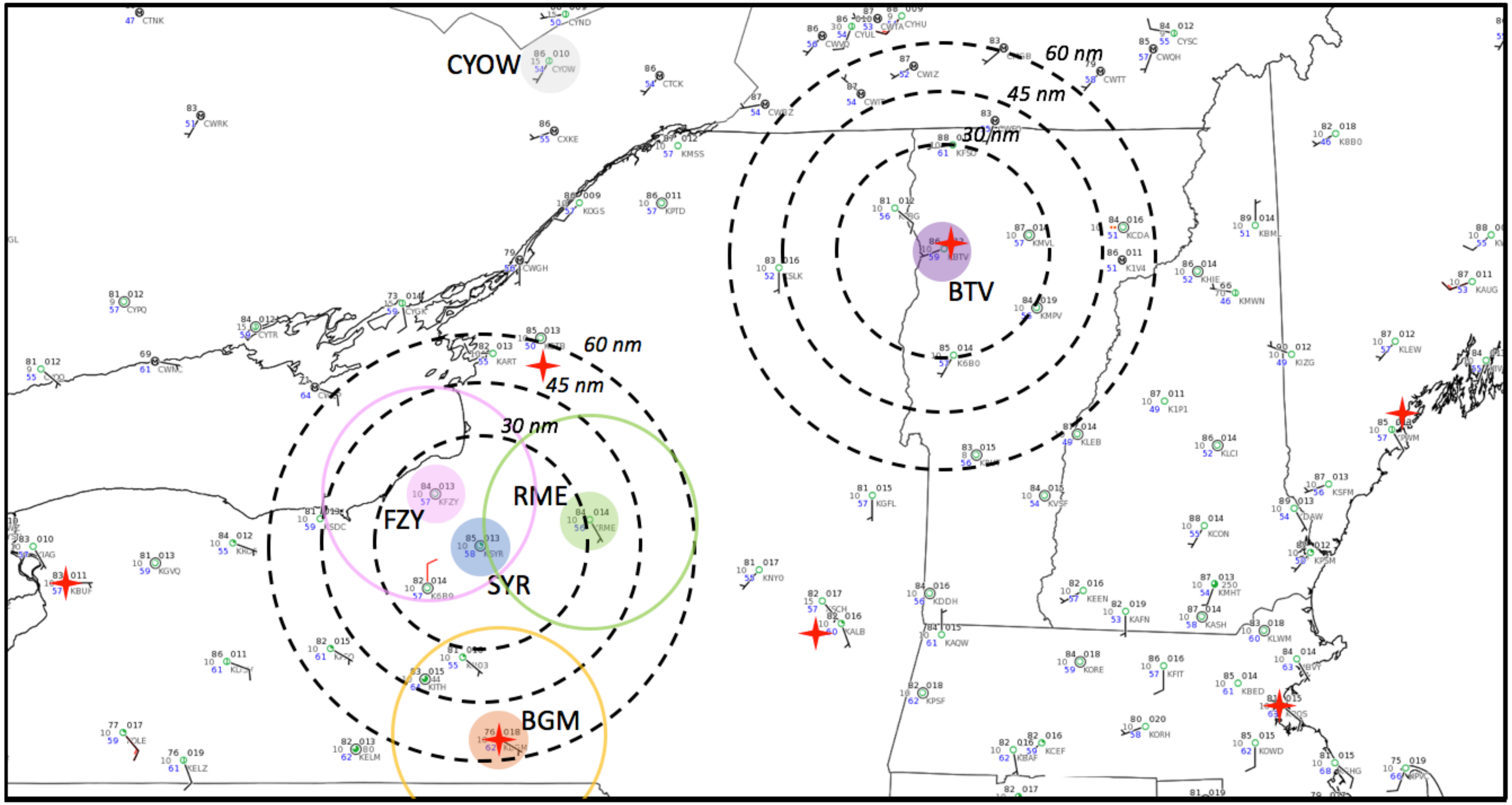
- Clear air and glaciated conditions adjacent to icing

- Transitions

# Part A: Objectives

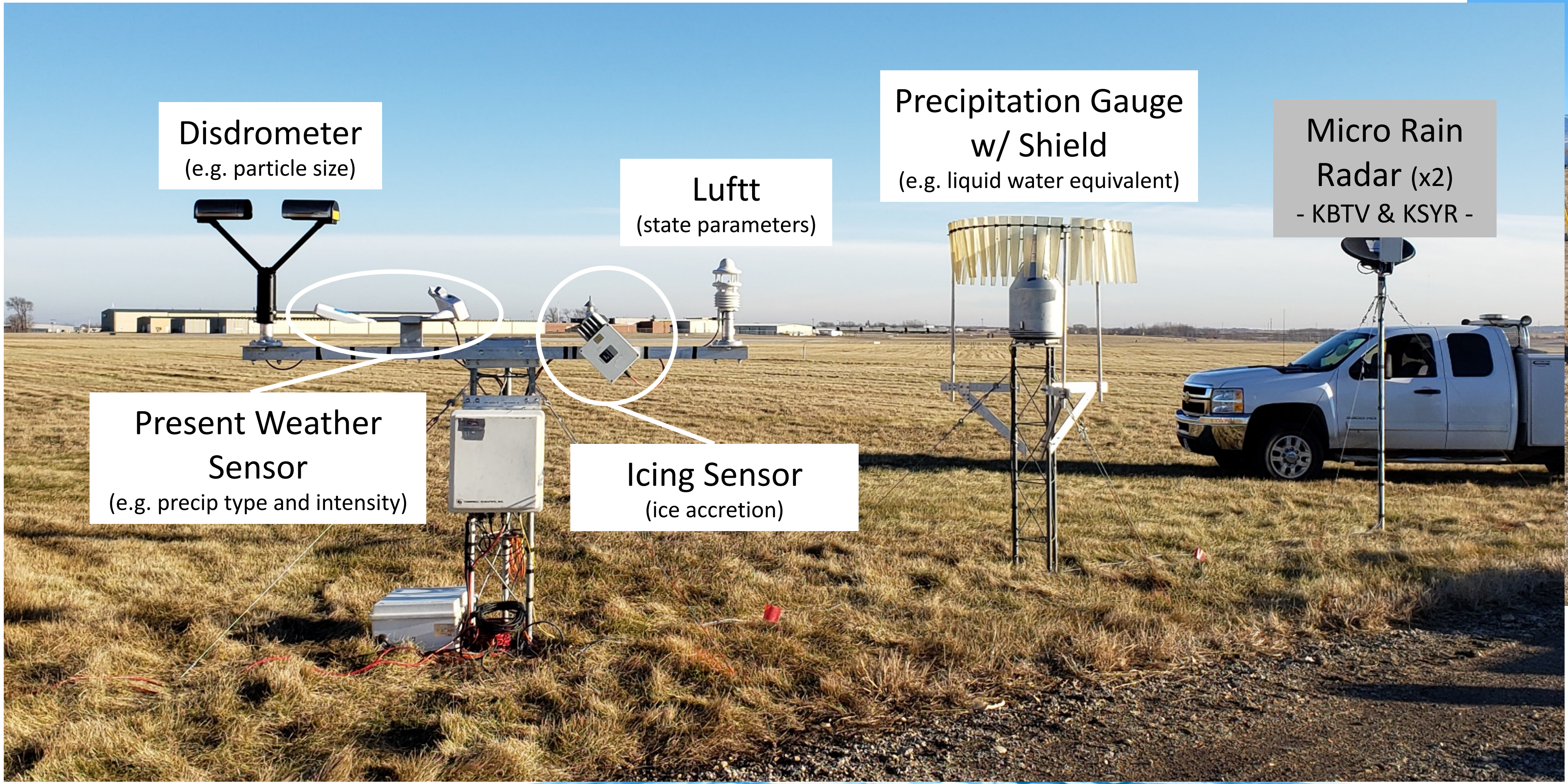
- Monitor and evaluate TAIWIN capability in real-time
  - Output for select terminal areas: FZRA, FZDZ, small-drop, low chance, none
    - Diagnosis and forecasts; categorizations; operational use and applicability; comparison to other icing products
- Evaluate and assess:
  - Surface observations
 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

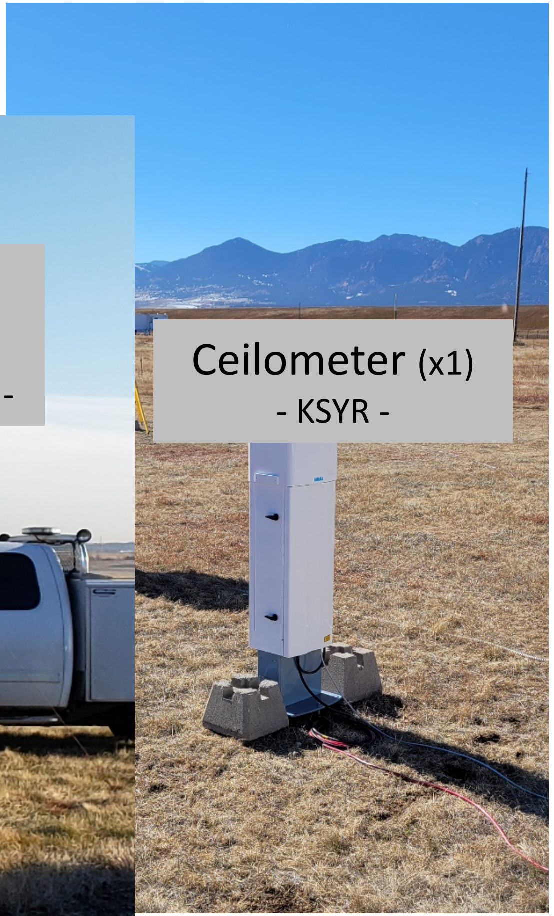
# Data Collection and Capability Demo



# Ground-based Sensors

*Ground-based Instrumentation:* 5 airports




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

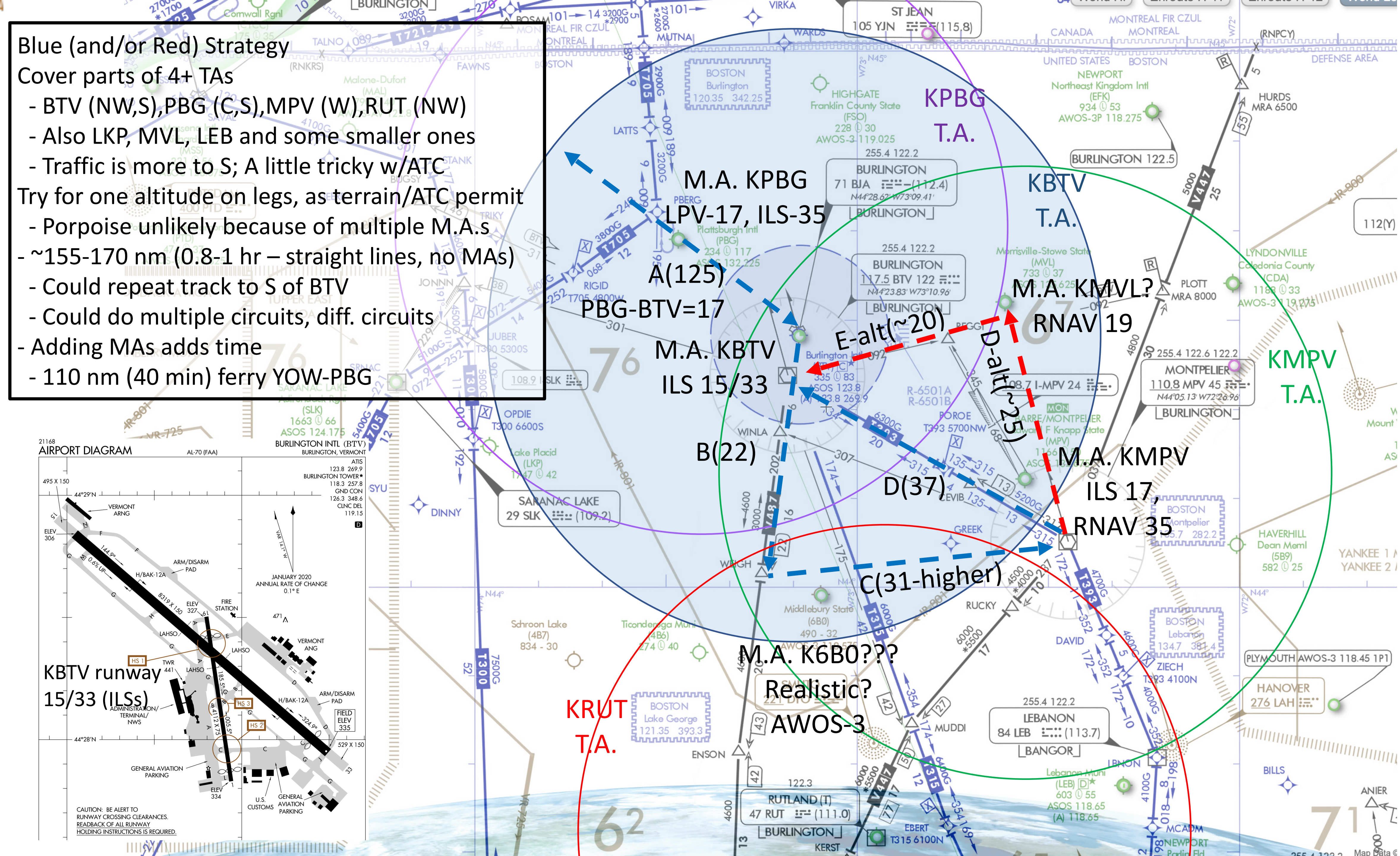
Blue (and/or Red) Strategy
Cover parts of 4+ TAs

- BTV (NW,S),PBG (C,S),MPV (W),RUT (NW)
- Also LKP, MVL, 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

<u>Data Collection</u>

- 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

<u>Dry-Runs</u>

- Thu 16 Dec *(time TBD)*
  - Non-flight day
- Mid-Jan
  - Flight day
  - Non-flight day

# Questions?

Contact info:

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- Ben Bernstein: icingweather@gmail.com