

Friends and Partners in Aviation Product Generation Panel

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Turbulence-Related Products

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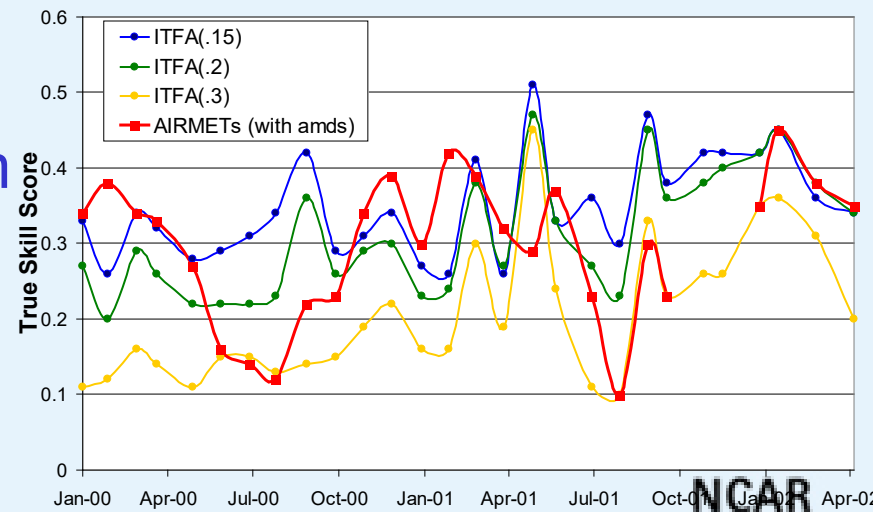
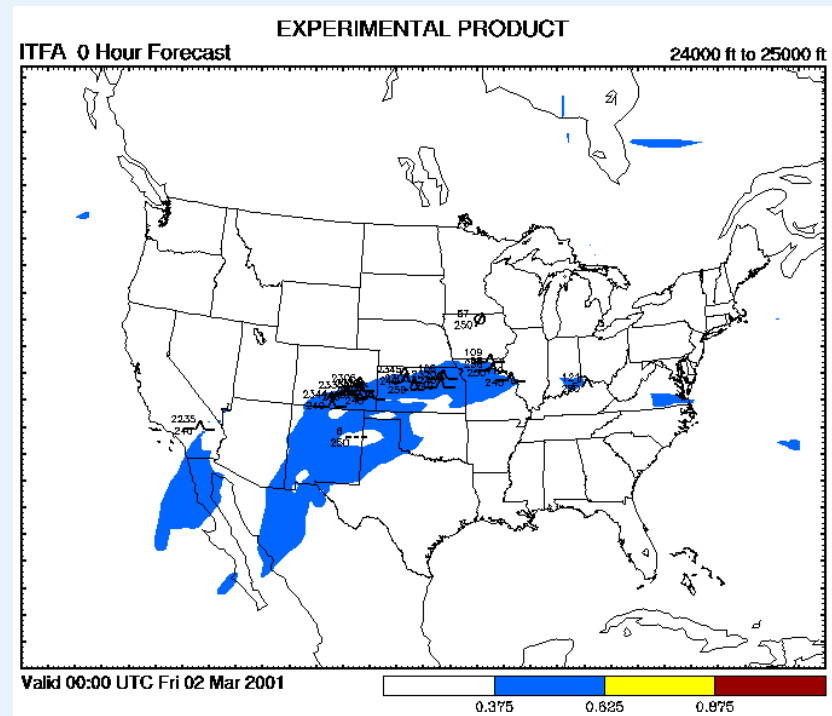
FAA AWRP sponsored turbulence research teams and products

- Turbulence PDT
 - Integrated Turbulence Forecasting System (ITFA) to provide nowcasts/forecasts of turbulence
 - In-situ measuring and reporting system to augment/replace turbulence PIREPs
 - Ground-based and airborne (with NASA AvSP) detection algorithms
- Oceanic Weather PDT
 - Cloud top heights
 - Convective nowcasts/forecasts
 - Oceanic ITFA
 - Improved winds
 - In-flight icing
 - Volcanic ash transport and dispersion

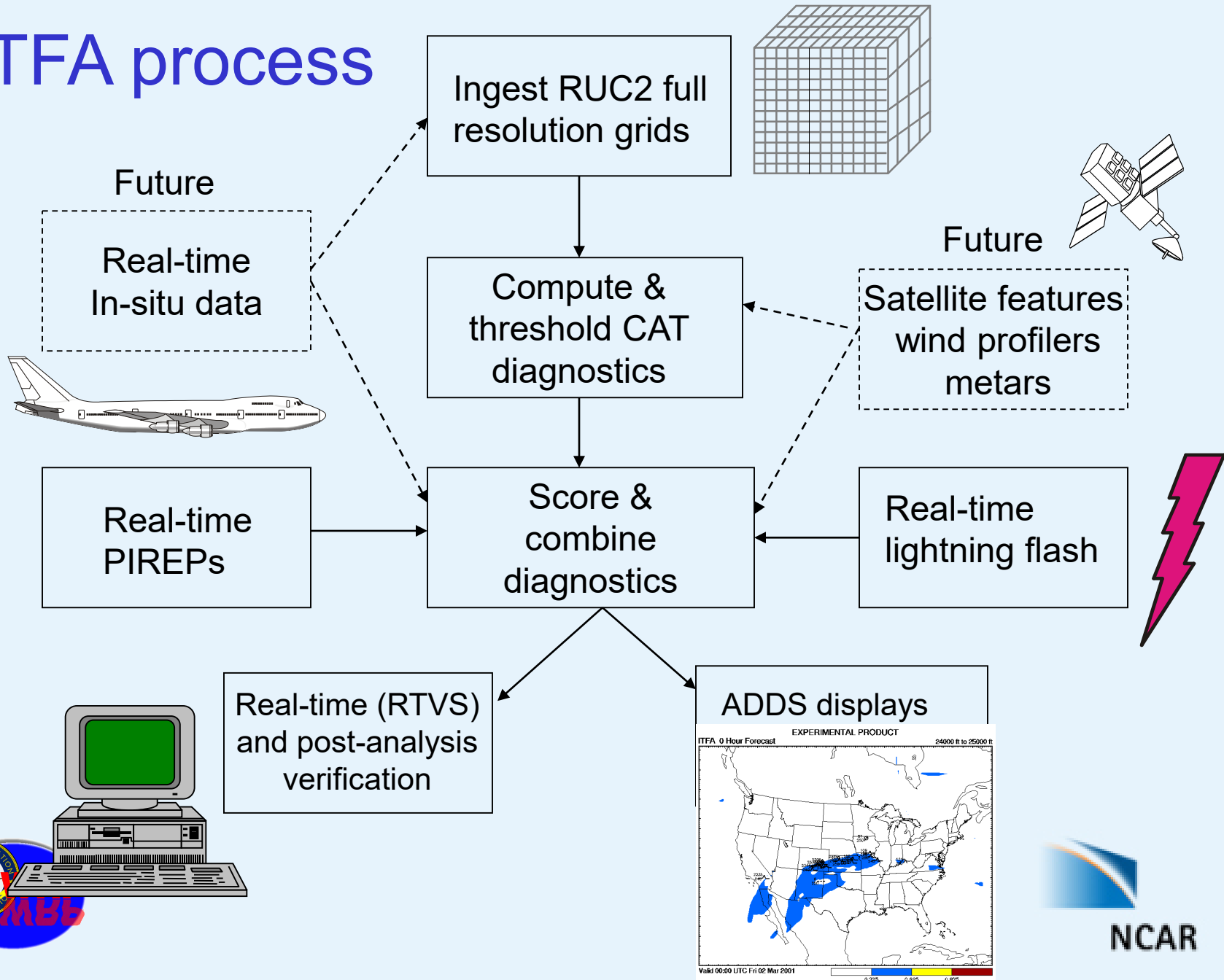


ITFA

- Upper level CAT prediction system
 - related to jet streams and upper-level fronts only
 - $\geq 20,000$ ft only
- Based on RUC2 forecasts
 - RUC2 domain only
 - 0,3,6,9,12-hr forecasts updated every 3 hrs
- Fits turbulence predictors to observations (PIREPs)
- Verification has been an integral part of the program since initial development
- Approved for “Operational” status, i.e., guidance to government and airline meteorologists

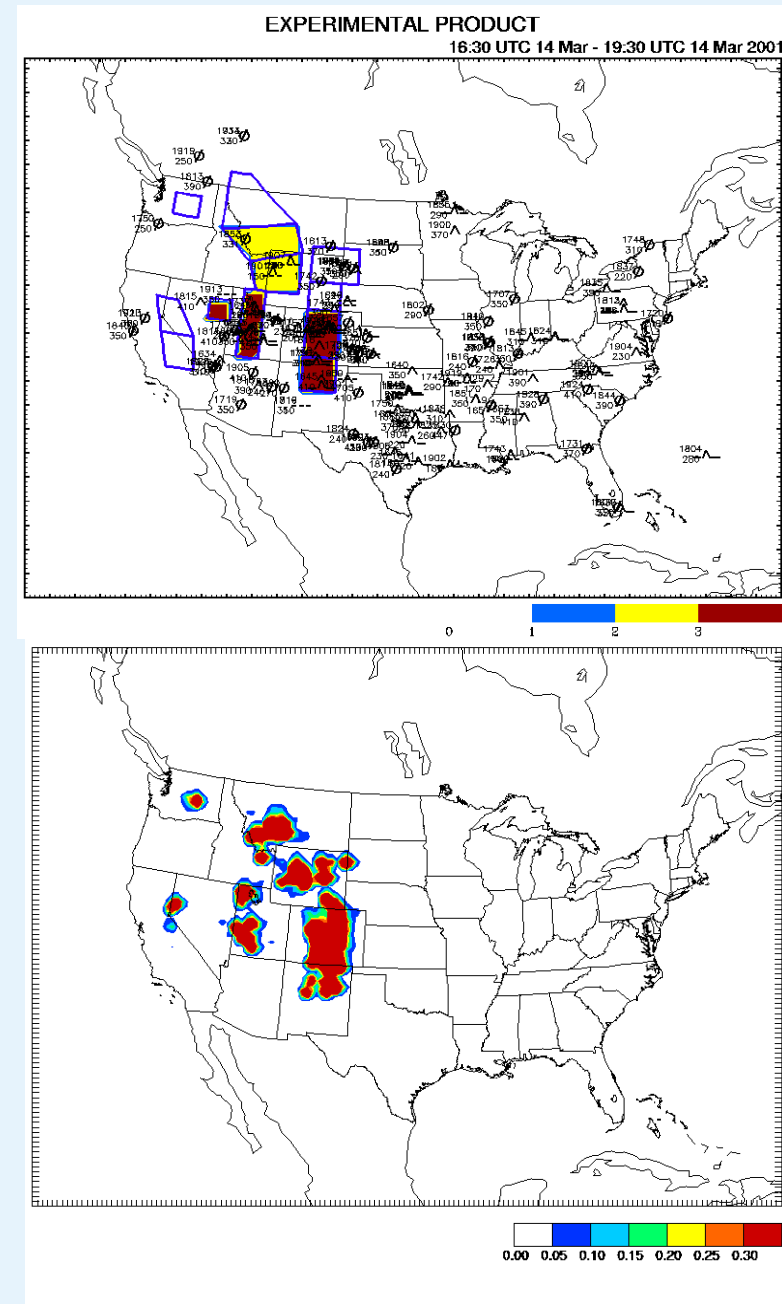


ITFA process



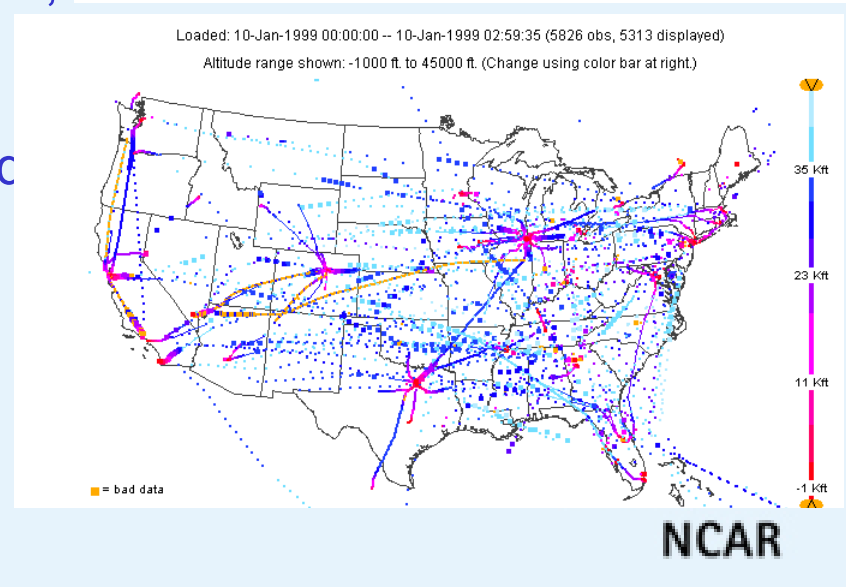
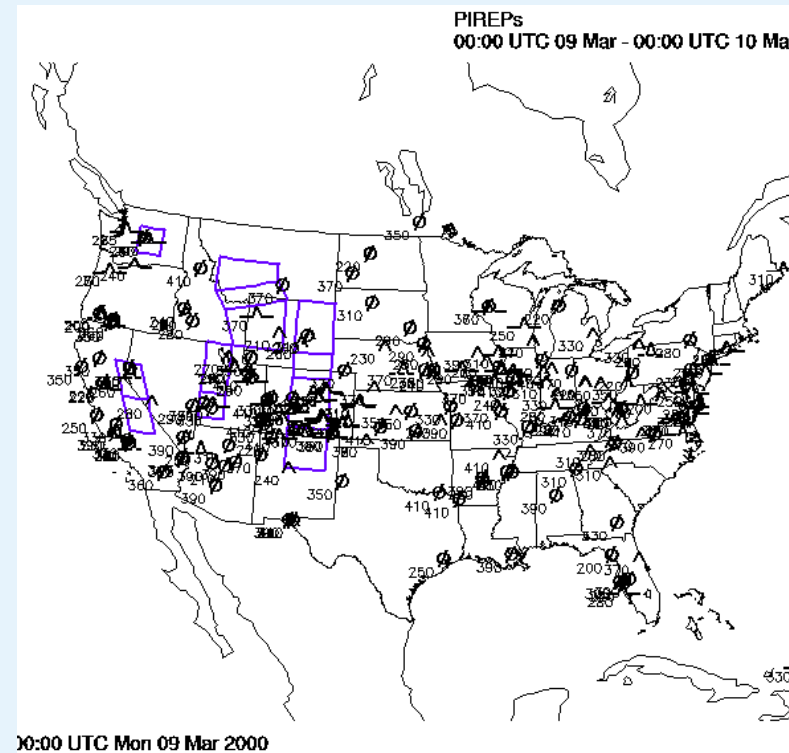
ITFA - Future Enhancements

- Other sources of turbulence
 - Mountain wave turbulence algorithms in place and being tested
 - Convectively-induced turbulence
- Lower levels
 - Mid-levels (10-20,000 ft)
 - Upper levels (>20,000 ft)
- Beginning to use in-situ turbulence data to eventually replace PIREPs
- Forecast probabilities of smooth, MOG, severe

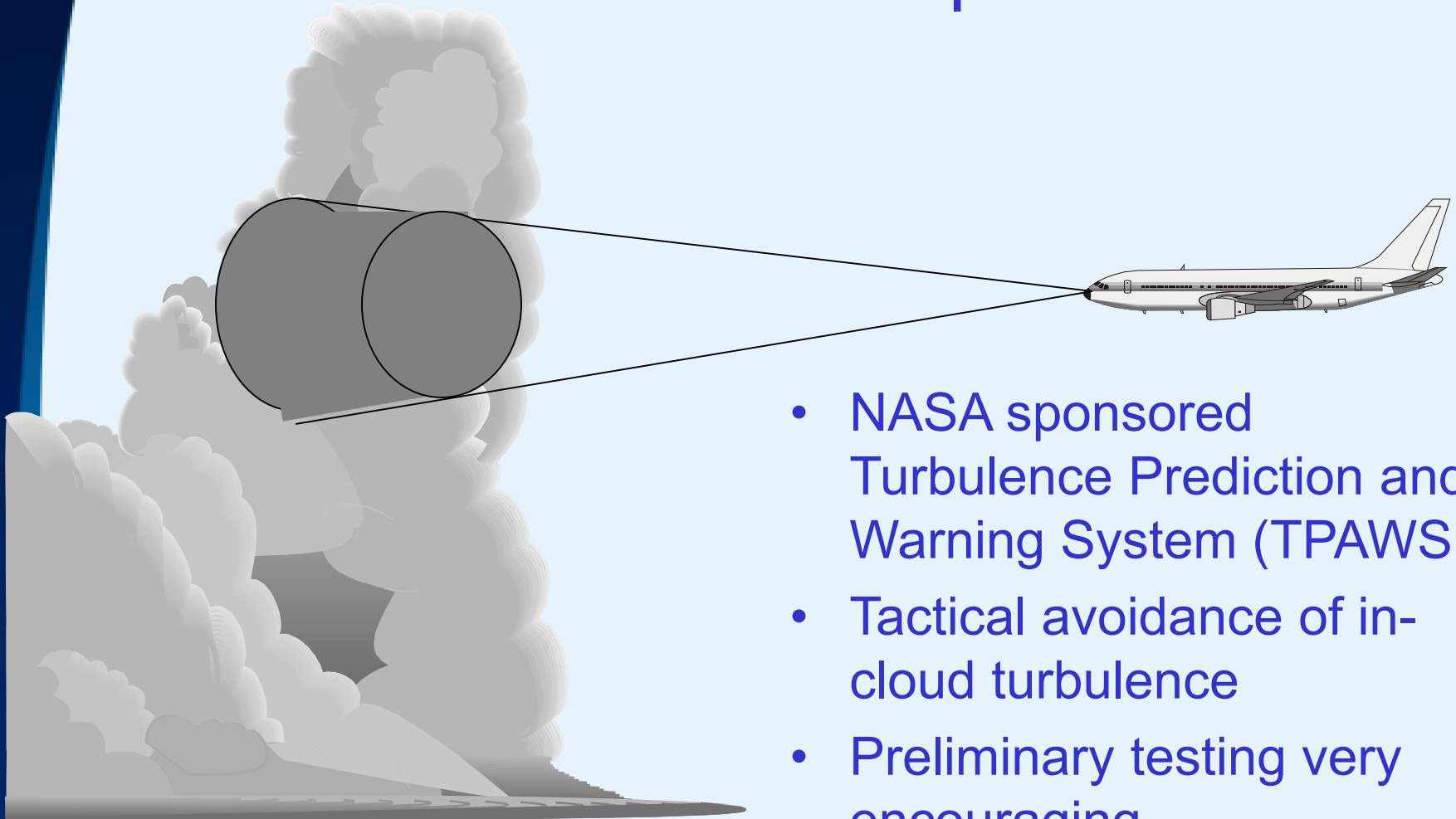


In-situ measurement and reporting system

- Provides objective, precise atmospheric turbulence measures
- Features
 - Automatically measures turbulence (peak and average)
 - Automatically downlinks
 - Aircraft independent (edr)
 - Adopted as ICAO standard
 - Software modification to ACMS,
 - no hardware or certification requirements
 - Graphical displays at UAL and FSL websites
- Uses
 - Augments PIREPs to provide real-time turbulence maps
 - Provide Input to ITFA
 - Input to NWP models



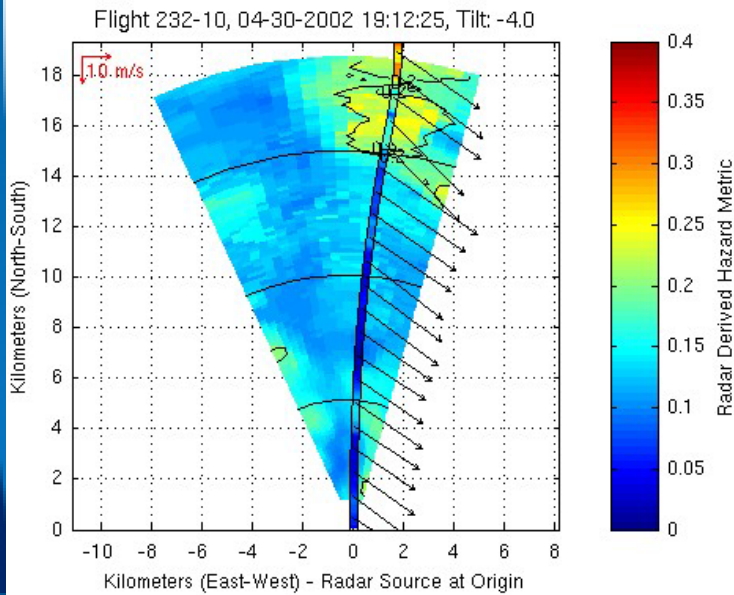
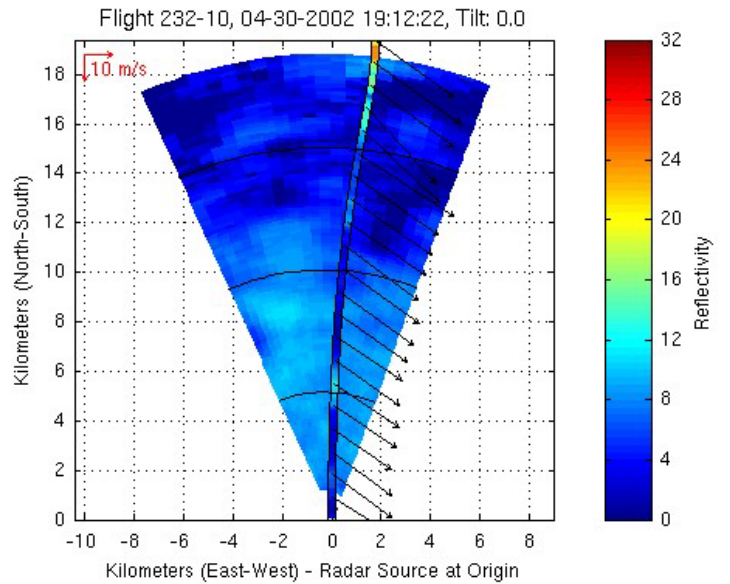
Airborne detection product



- NASA sponsored Turbulence Prediction and Warning System (TPAWS)
- Tactical avoidance of in-cloud turbulence
- Preliminary testing very encouraging



Detection performance



- Data from NASA B757 test flights being analyzed
- Example to left is a correct detection of moderate turbulence 1.19 min, 18 km before encounter in low reflectivity
- Overall performance to date:
 - PODyes: 81%
 - PODno: 69%

Oceanic Weather – Real-time cloud top displays

<http://www.rap.ucar.edu/projects/owpdt>

Oceanic Weather
MIT LL ARINC NRL AWC RAP
Research Applications Program

Home Project Description Development Team Documents REAL-TIME SYSTEMS

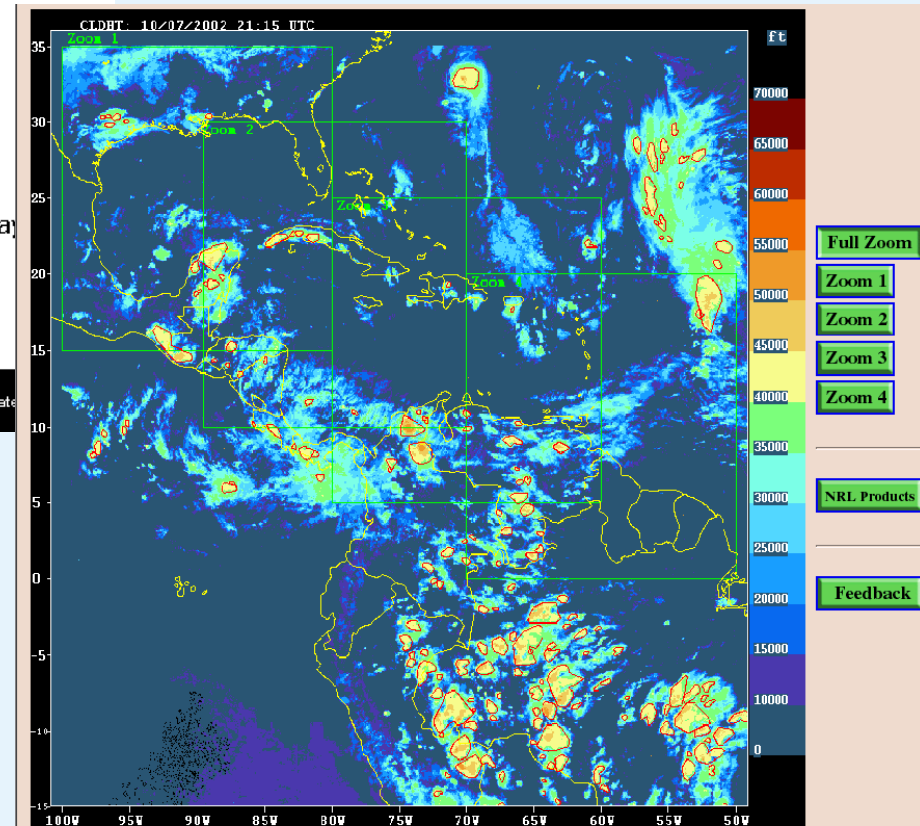
Real-Time Prototype Systems

- Pacific
 - Cloud Top Height
- North Pacific
 - Cloud Top Height
- Gulf of Mexico/South America
 - Cloud Top Height
- North Atlantic (under development)

Character-based cockpit tactical display
[Click Here](#)

Graphical cockpit tactical displays
[Click Here](#)

- Uses satellite IR images (GOES E&W, GMS) + AVN model
- Updated every 30 min



*** Caching may need to be turned off for images to update ***

Author: Gary Blackburn

Oceanic Weather Products – ITFA

- Uses AVN model
- Diagnoses and forecasts of CAT \geq 20,000 ft
- Prototype should be available semi-operationally by end of FY03
- Example: Brown's index at 32,000 ft 06 Aug 2002 18Z
 - Upper: derived from AVN
 - Lower: derived from RUC20

