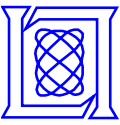# Improved Thunderstorm Observations and Forecasts

Mark E. Weber
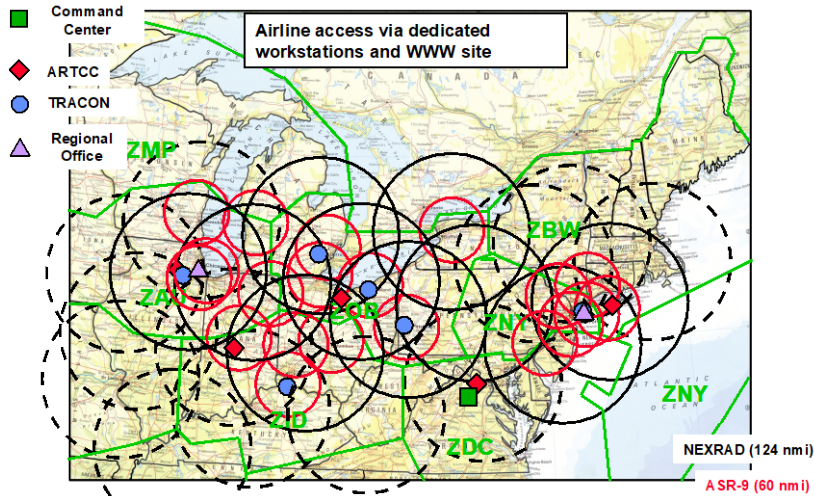
MIT Lincoln Laboratory
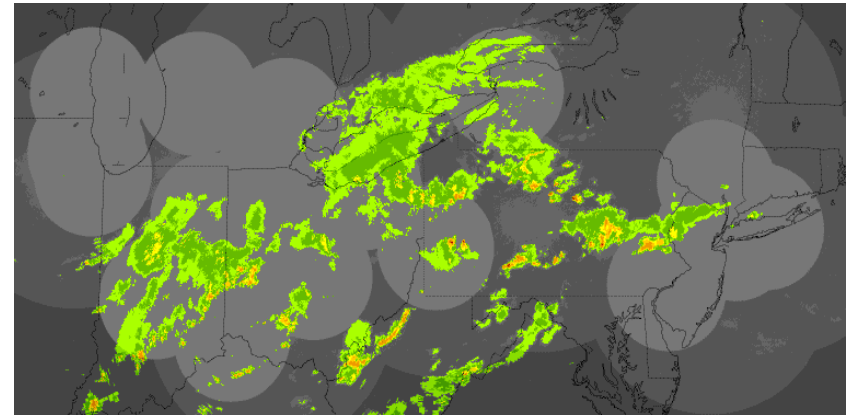
23 October 2002

Outline

- **Integrated Weather Systems**

- **Enhanced Weather Radar Surveillance**

- **Thunderstorm Forecasting Technology**

- **Departure Route Availability Tool**

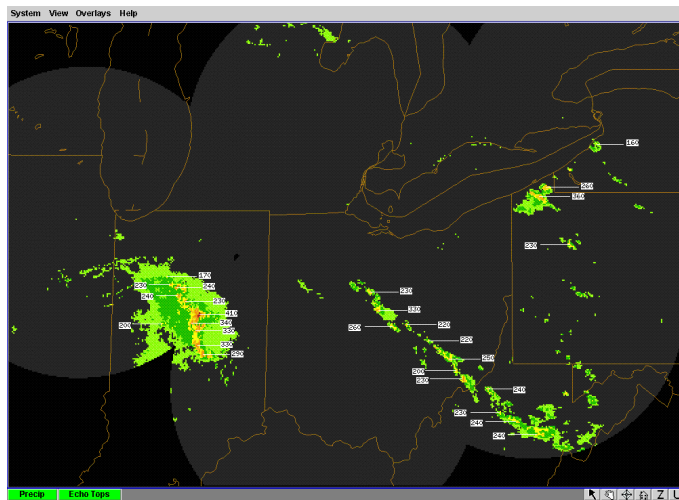# Corridor Integrated Weather System (CIWS)

Sensor Network

Precipitation Mosaic
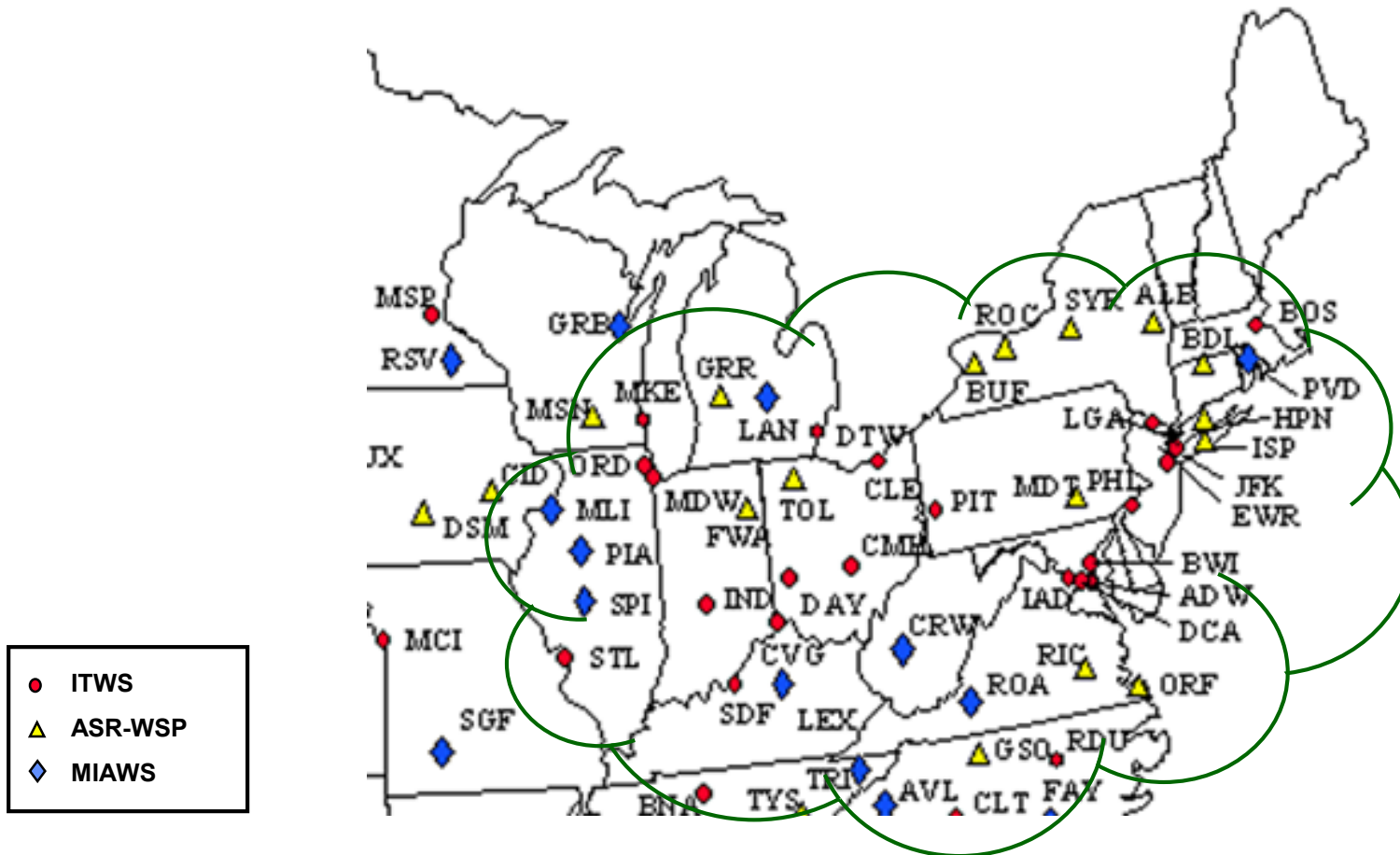

High Resolution Echo Tops
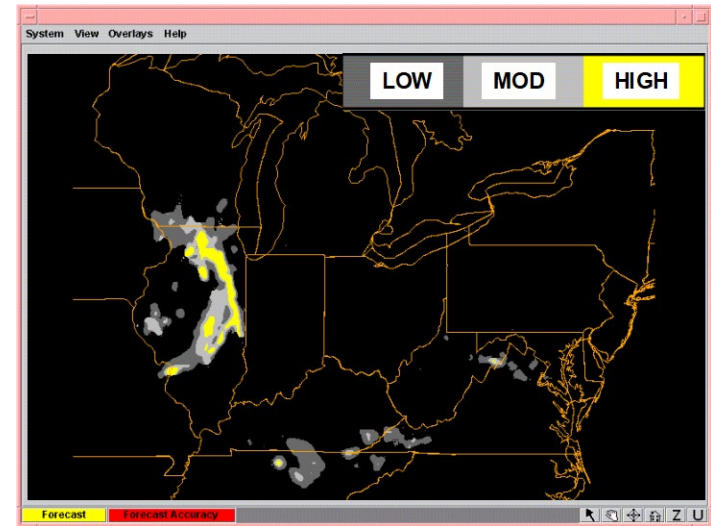
Tactical (0-2 hour) Forecast

Terminal Weather Systems within CIWS Coverage Area

Legend:
- ● ITWS
- ▲ ASR-WSP
- ◆ MIAWS

Why Improve TDWR and NEXRAD?

First Echo

Gust Front

First Echo

First Echo

Gust Front

Thunderstorm Forecasting
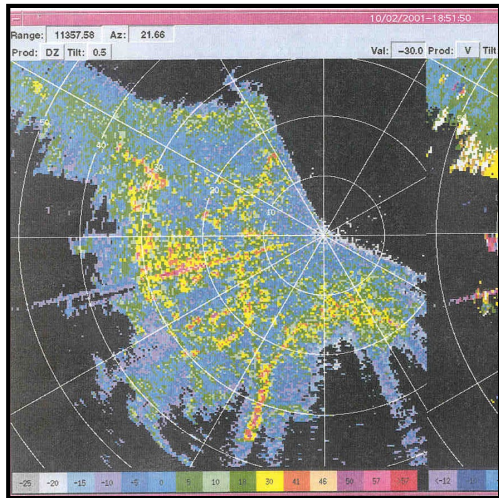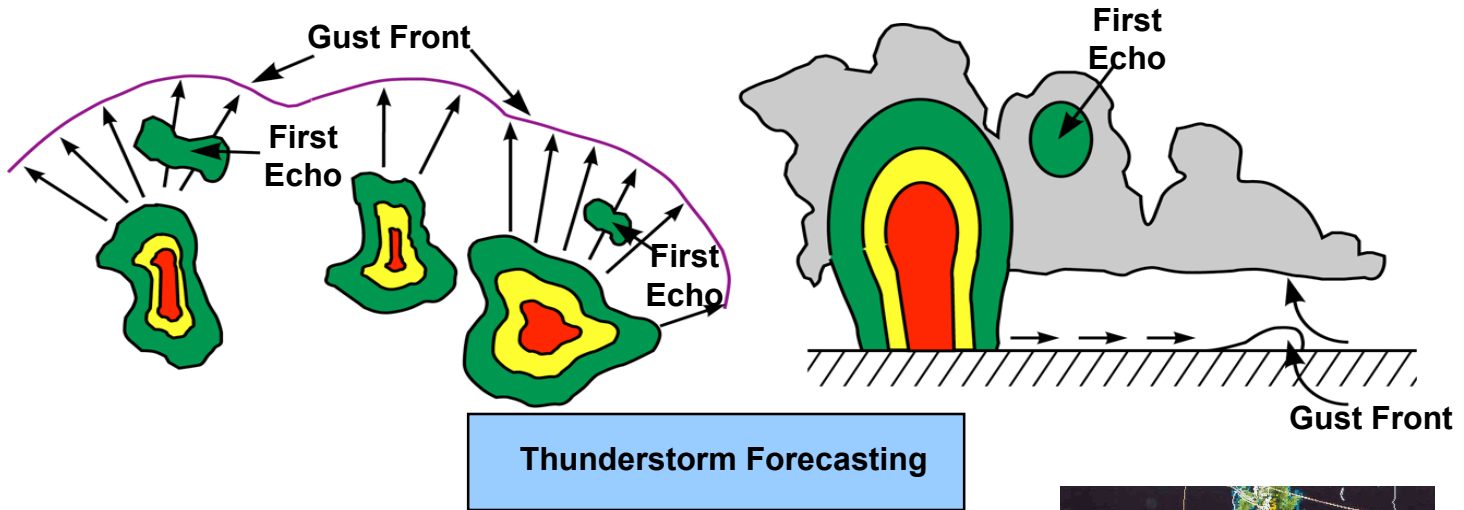
Improved Wind Shear Detection at Challenging Sites (LAS)
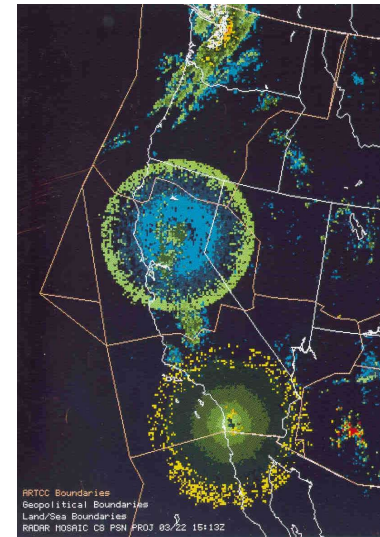
Improved NEXRAD products for DSR

Operational Weather Radar Network Improvements

- **TDWR Processor Upgrade**

  Enhance supportability

  Improve data quality

  - **Suppress range folded weather**
  - **Reduce velocity aliasing**
  - **Improve clutter suppression**

  Increase instrumented range

  Enhance base data accessibility

  - **External users port**
  - **Base data compression**

- **FAA – Developed NEXRAD Algorithm Enhancements**

  AP Edited Precipitation Reflectivity

  High Resolution VIL

  "Bulls Eye" and "Strobe" Removal

  Enhanced Echo Tops

  Gust Front Detection

MIT Lincoln Laboratory

Tactical (0-2) Hour Thunderstorm Forecasts

Sensors

NEXRAD

(TDWR)

GOES-8

Data

Forecast & Verification

Precip

Boundary Layer Forcing

Thermo-dynamic Variables

Feature Extraction → Forecast Generation

Other Data

Numerical Weather Prediction Model (20-40 km grids)

99	00	01	02	03
Storm Envelope Tracker	Use of VIL	Satellite Data Processor	Storm Classification & Multi-scale Tracking	Storm Trends & Initiation
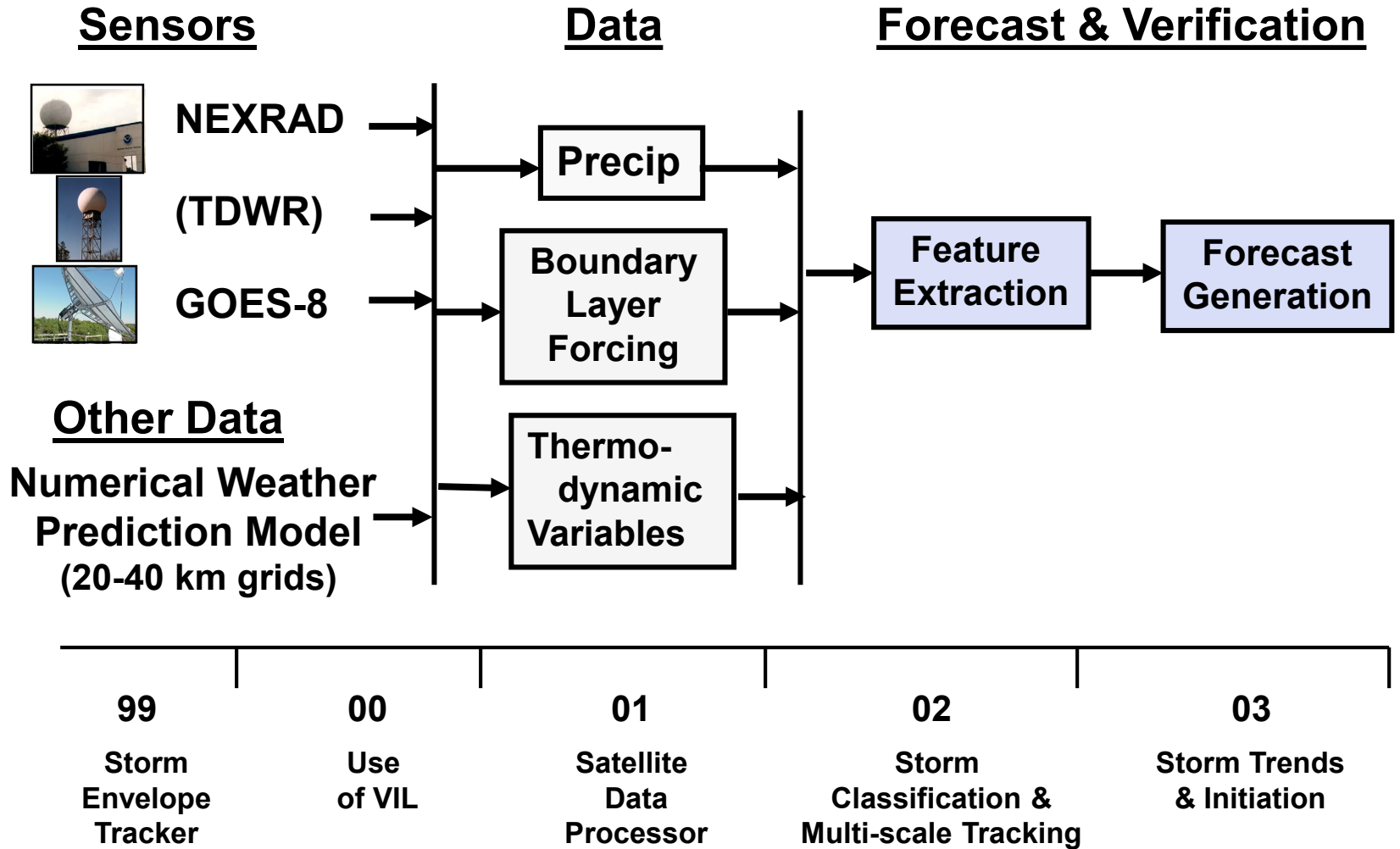
Weather Forecast Driven Decision Support Tools

Impact Mitigation Paradigm

Determine weather impact

↓

Determine ATC impact

↓

Develop mitigation plans

↓

Decide on mitigation plan

↓

Execute mitigation plan
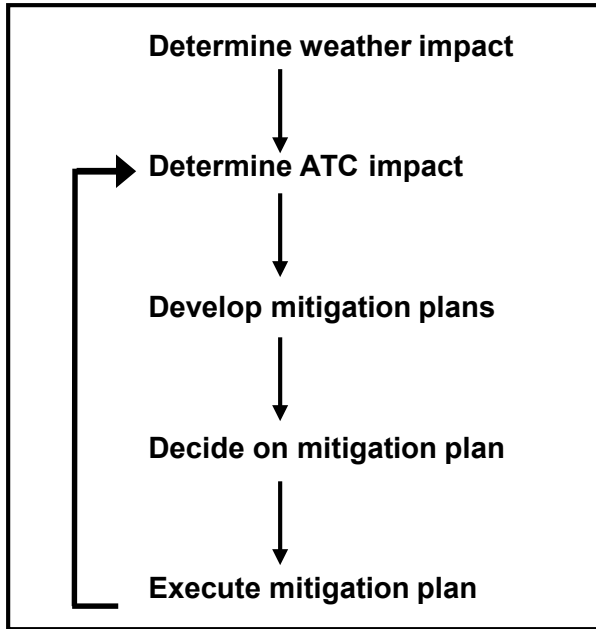
NYC Route Availability Planning Tool

Departure routes — Aircraft type — Airport selectors — Current time — Departure times

| EWR | LGA | JFK | TEB | Time: 2002 |

Jetway	Aircraft	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2100

LGA_WHITE_J209 — Jet, TurboProp, Prop
LGA_BIGGY_J75 — Jet, TurboProp, Prop
LGA_MERIT_BOS — Jet, TurboProp, Prop
LGA_PARKE_J6

Blocked departures — Impacted departures — Clear departures
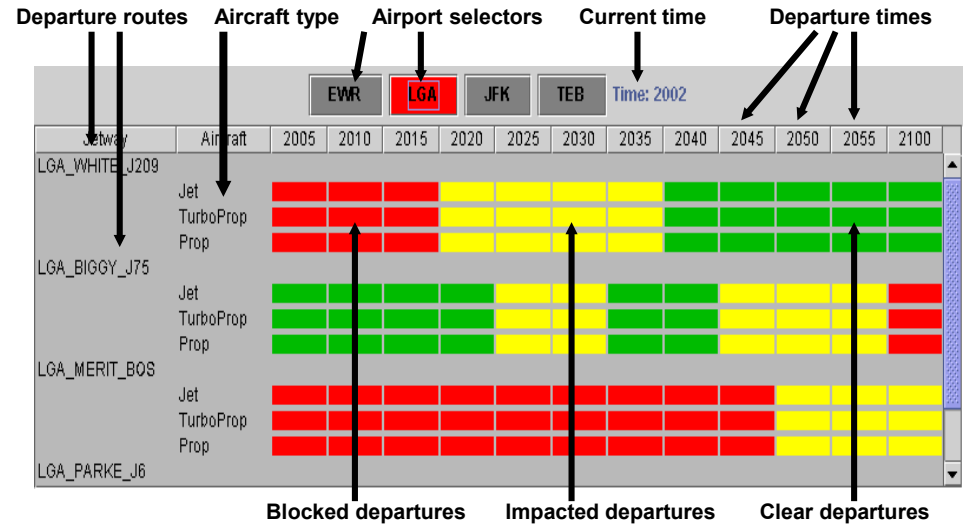
Modest Departure throughput increases provide large delay savings

Summary

- **Significant ongoing progress in providing real-time thunderstorm information to aviation community**
    - **Sensor data enhancements**
    - **Forecasting technology**
    - **Information dissemination systems**

- **Beginning development/testing of weather forecast driven DST's**