



# Overview of MET decision-support tools in use in USA

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Engage thematic challenge 3 workshop  
SESAR JU, 13NOV18



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# Overview



- Introduction
- Aviation meteorological information provision in USA
- ITWS
- CIWS
- NextGen Weather
- Discussion points

# Introduction



- Very different situations in the USA and Europe regarding convective weather
- In Europe just started appearing
- In the US, storms with short build up and dissipation times are very common, as well as other types of thunderstorms
- Weather is the biggest cause of delays in the US
- Most of delay is due to the capacity reduction at the airport
- Slightly different organization of controlled/non-controlled airspace
- More significant impact of general aviation

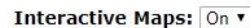
# Introduction

- Decision support tools - are the tools that help automatize, integrate and visualize information for end-users, in this case air traffic controllers



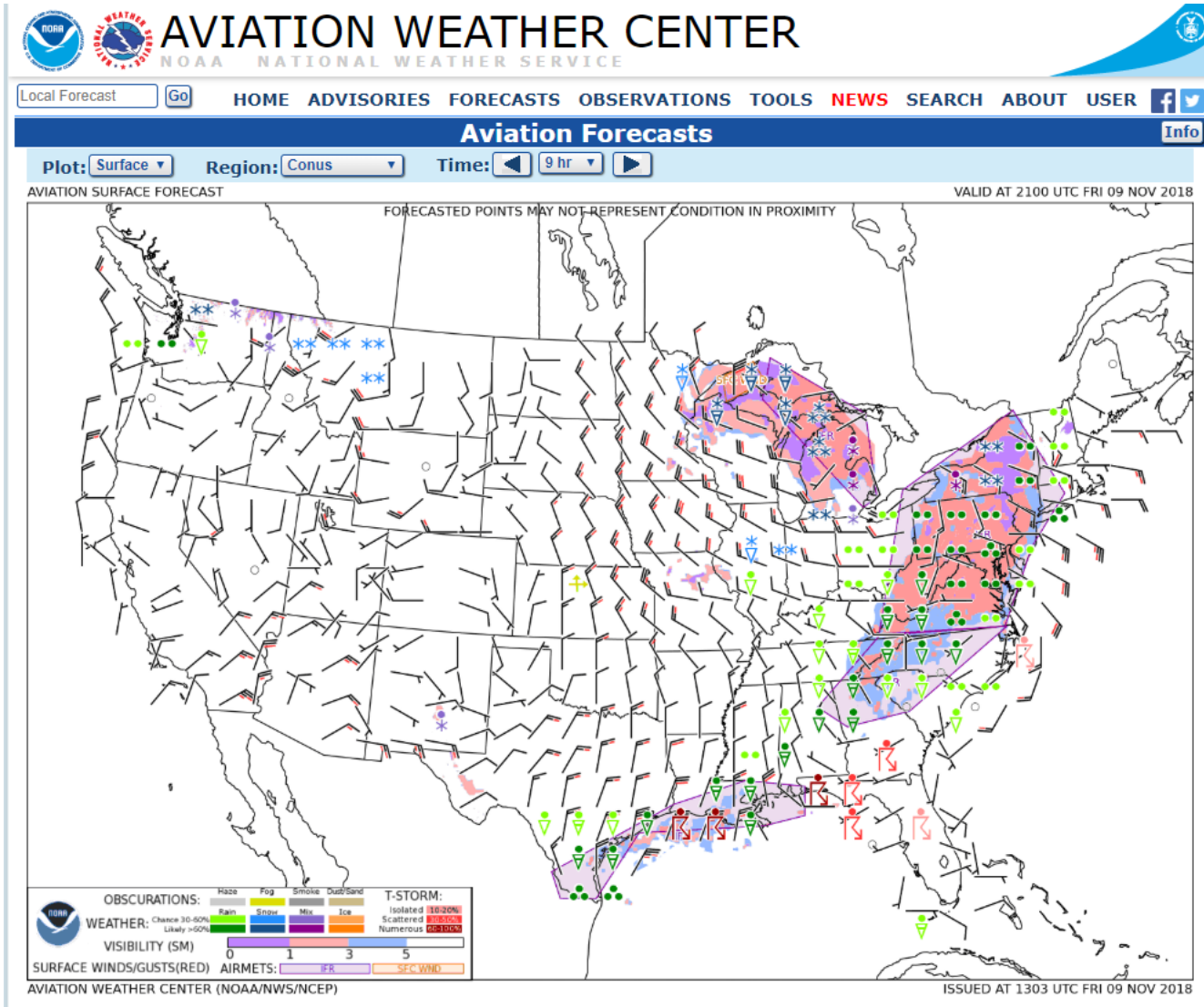
Source: Eurocontrol: Maastricht Area control room

# Aviation meteorological information provision in USA

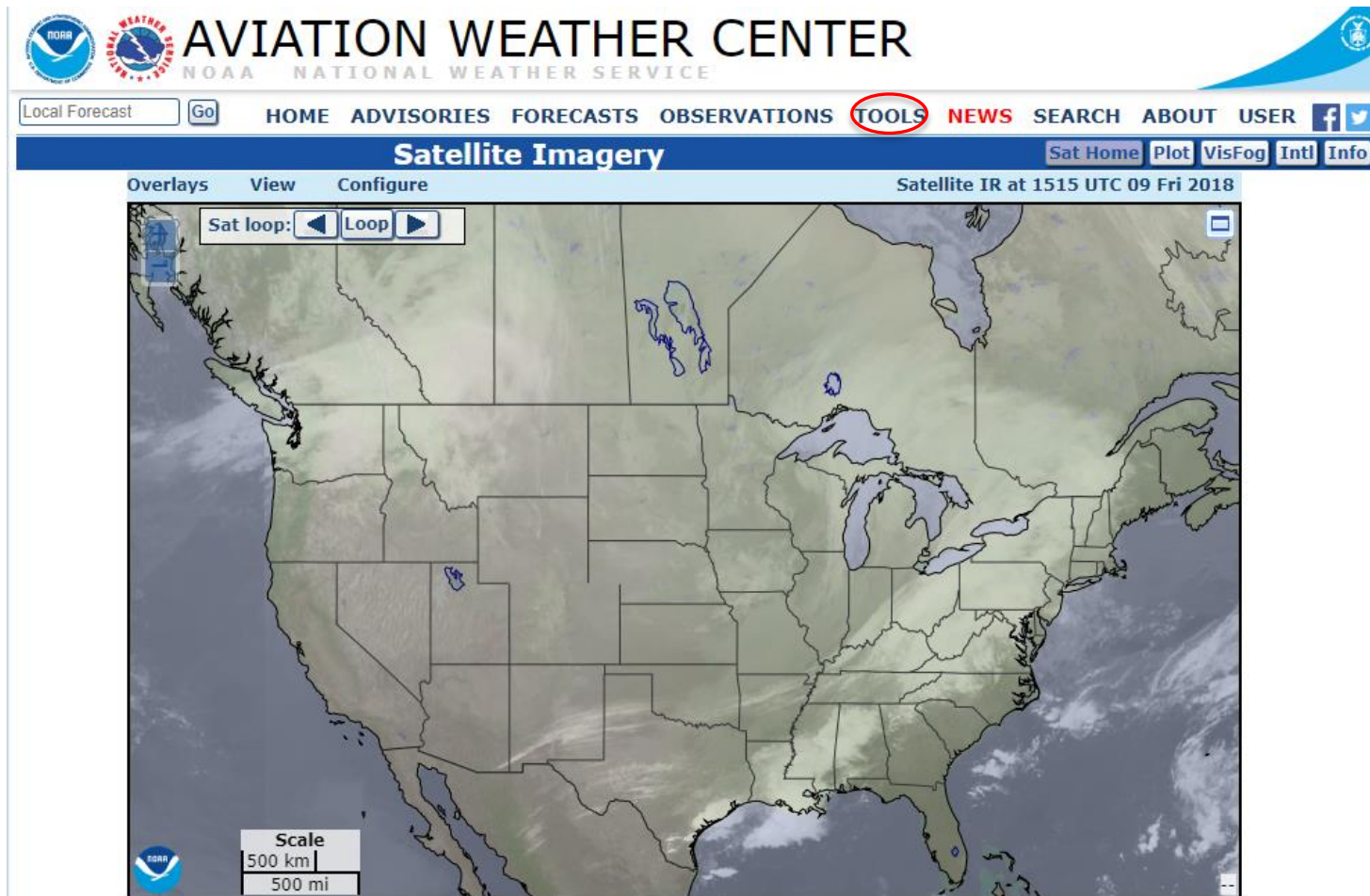


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# Aviation meteorological information provision in USA



# Aviation meteorological information provision in USA



# Integrated Terminal Weather System (ITWS)

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- Provides automated weather information for use by air traffic controllers, supervisors, pilots, and airline dispatch
- Initial algorithms developed by MIT Lincon Labs then the production transferred to Raytheon Company

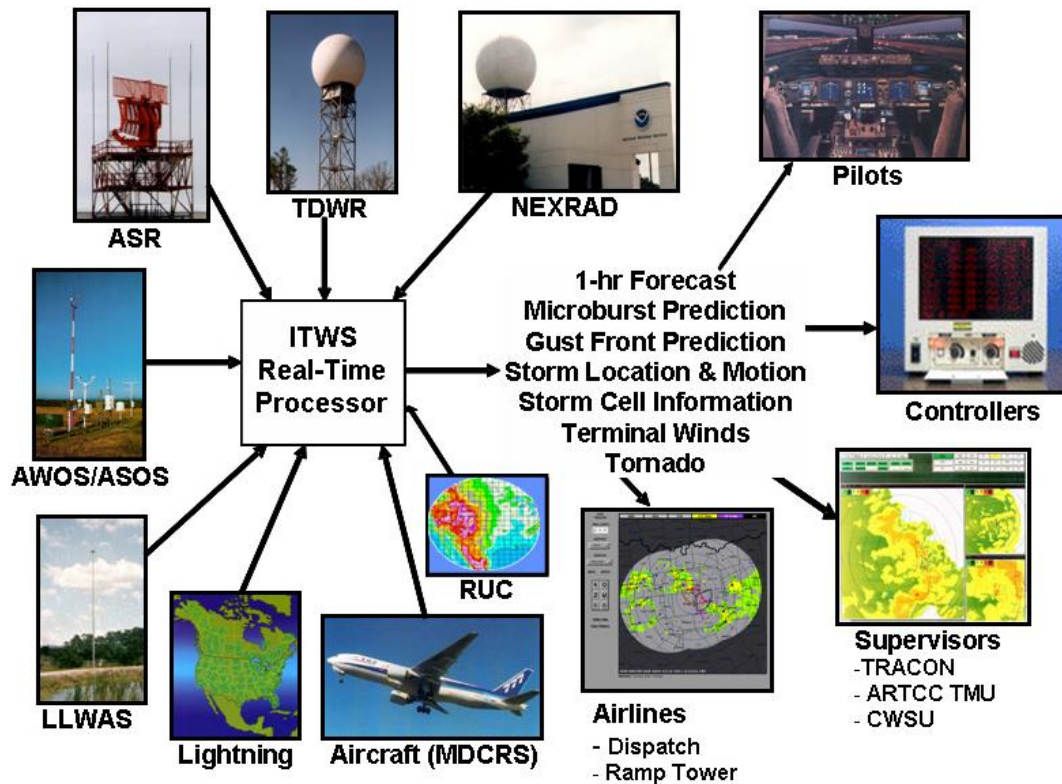


Figure 1 : ITWS block diagram.

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Source: MIT Lincoln Labs

- ITWS systems are installed at the 32 major airports in the US
- All the others have the weather radar – shows precipitation
- Sometimes pilots have better information as they might be able to see what is going on
- Controllers welcome sharing of such information

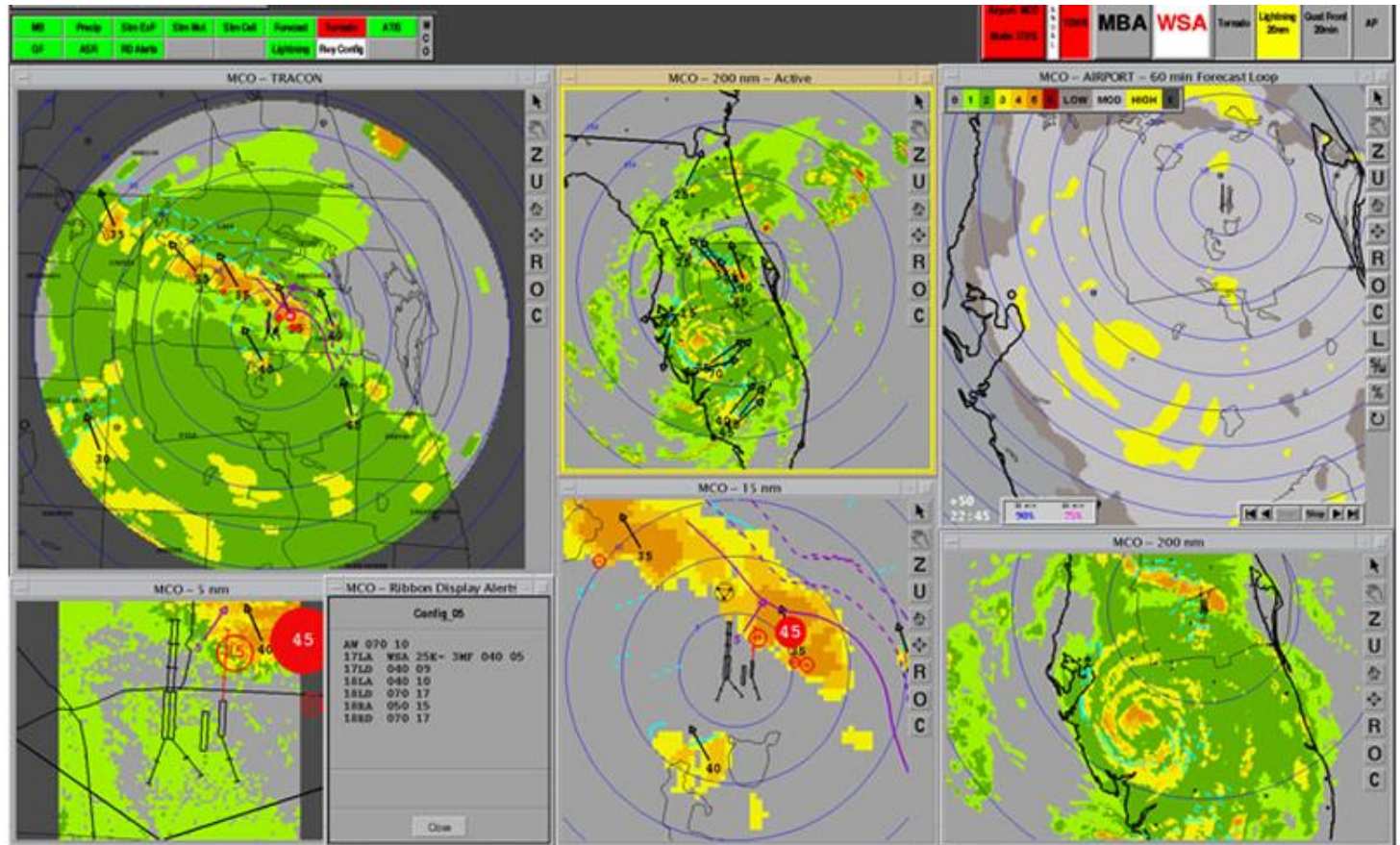


Figure 2: Display of the ITWS prototype at Orlando, FL during the approach of Hurricane Charley. The system provides multiple views of weather at difference ranges around the airport. As the outer feeder band approached the runways (lower left, center), several microburst (areas of severe wind shear) developed and were detected by Terminal Doppler Weather Radar (TDWR). The microburst detections are shown as red circles. The top right picture shows the Terminal Convective Weather Forecast, which loops to show forecasted storm patterns 1-hr in the future. The long range view is provided by a NEXRAD radar mosaic (top, center and bottom, right).

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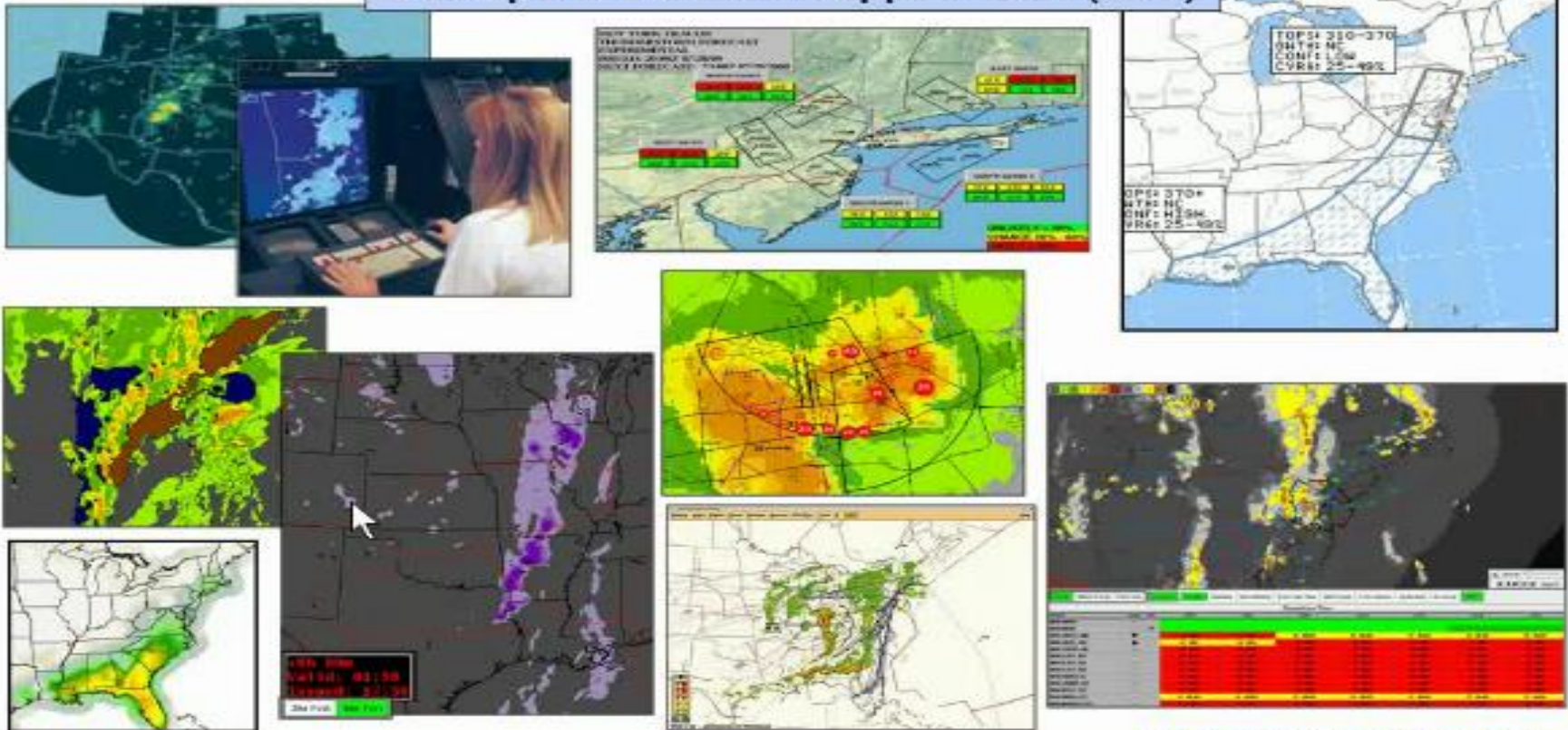
Source: MIT Lincoln Labs

# Corridor Integrated Weather System (CIWS)



## Convective Weather Decision Support for Air Traffic Management (ATM)

### A Sample of Decision-Support Tools (DST)



MIT Lincoln Laboratory

AMS-2011 Training-3  
Robinson 01/24/2011

\*from presentation by [Michael Robinson](#)

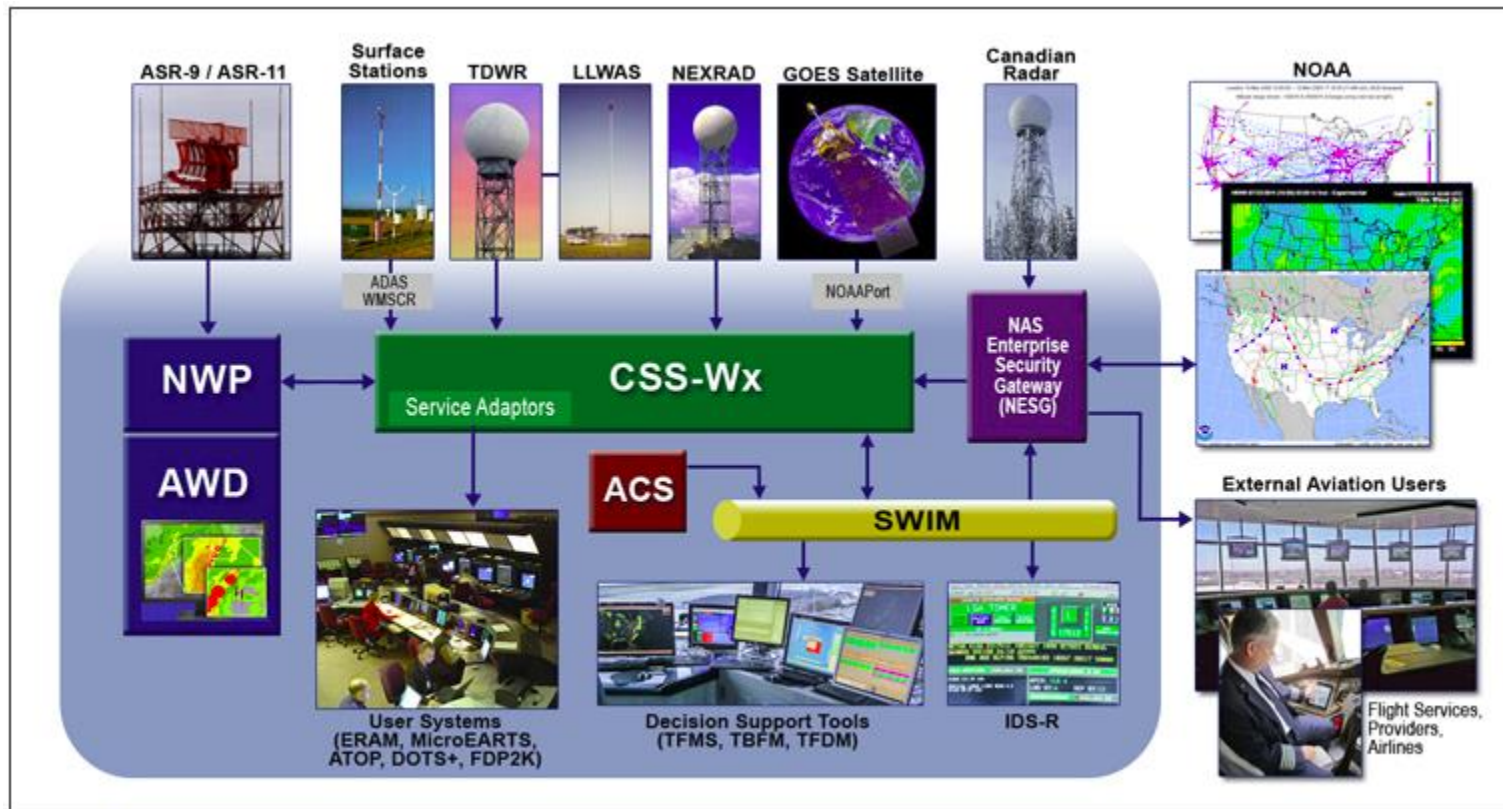
# CIWS and training



- Air traffic managers are not meteorologists
- Typically not required to use weather decision support
- Weather is a secondary, supporting information available to aid in achieving the primary objectives
- High-use periods during the storm season come and go – as the user expertise
- Weather forecast is difficult – user trust in the DST can be precarious
  
- Measure of forecast/tool performance in establishing trust needed
- Need for constant training in applied use of such DSTs

# NextGen Weather

# NextGen weather architecture

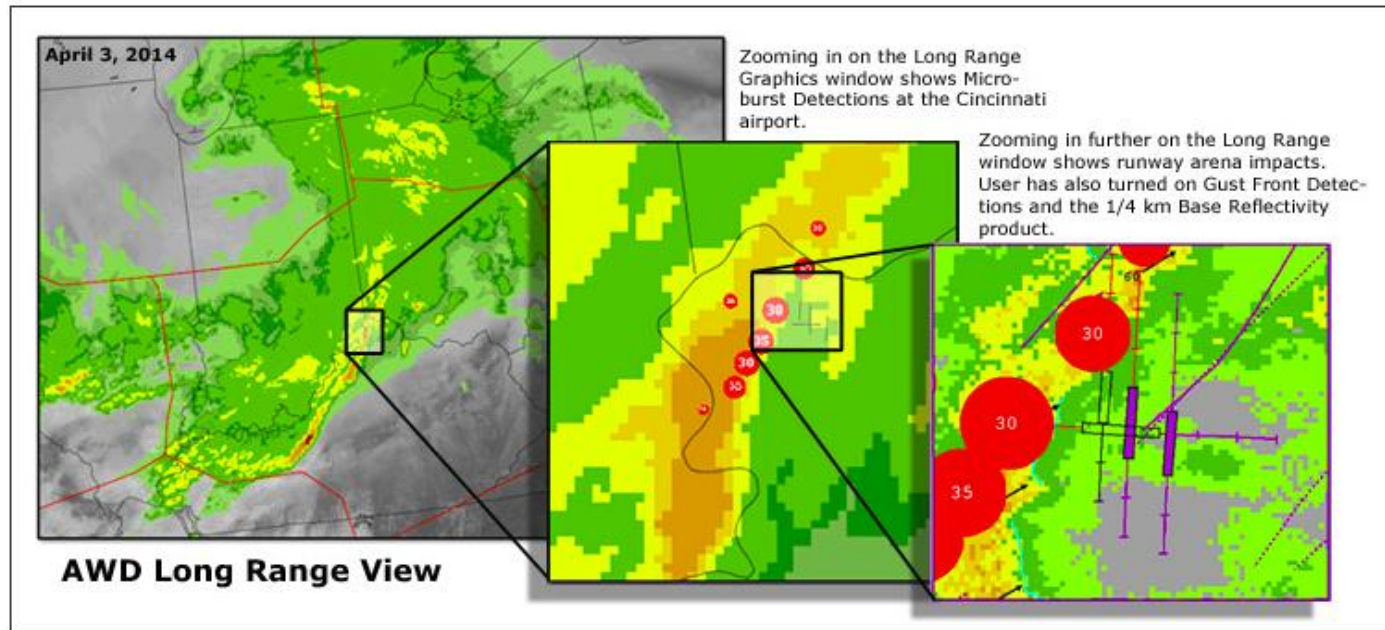


NextGen Weather Architecture diagram

Source: [FAA's NextGen](#) website

# NextGen Weather Processor (NWP)

- The NWP identifies terminal and en route safety hazards
- Provides **translated weather information** needed to predict route blockage and airspace capacity constraints up to eight hours in advance
- Aviation Weather Display (AWD) is a part of NWP – the goal is to consolidate the legacy displays – ITWS, CIWS and weather and radar processor

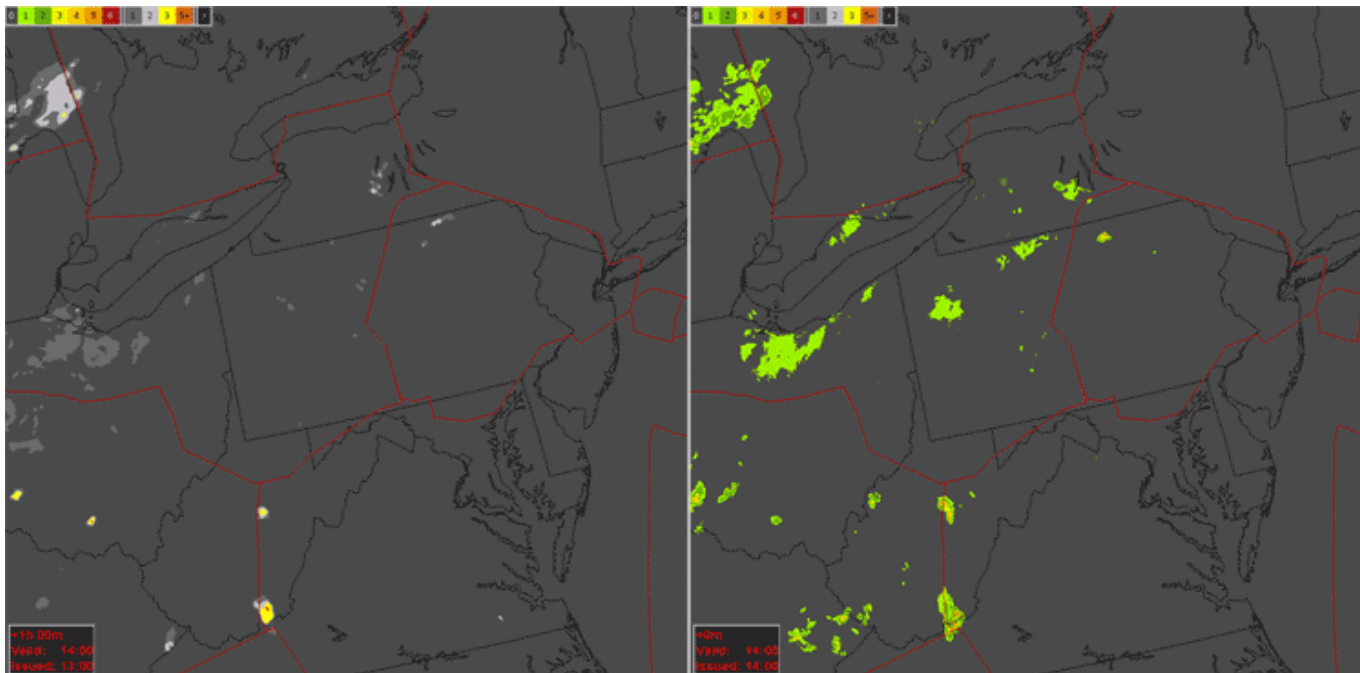


Source:  
[FAA's NextGen](http://www.faa.gov/nextgen)  
website

# NextGen's strategic flow management support



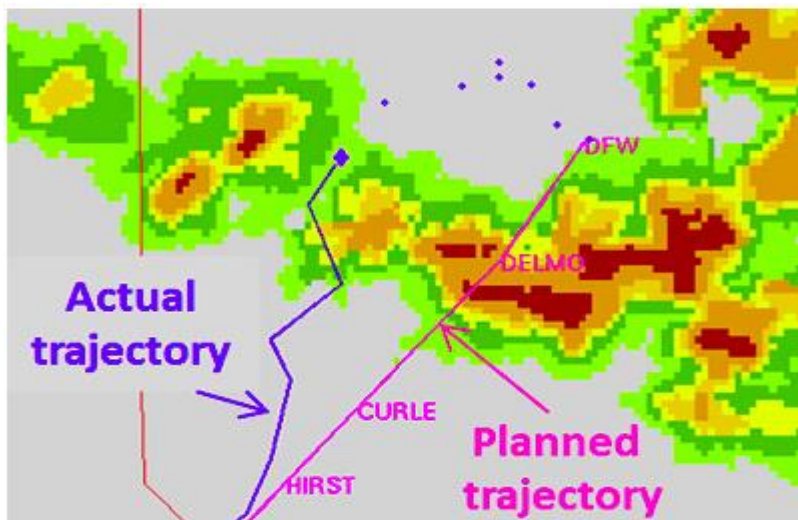
- Extending two hour predictive weather products out to eight hours
- Translating predictive products into predicted constraints on air traffic operations
- Providing measures of confidence for predicting operational weather constraints



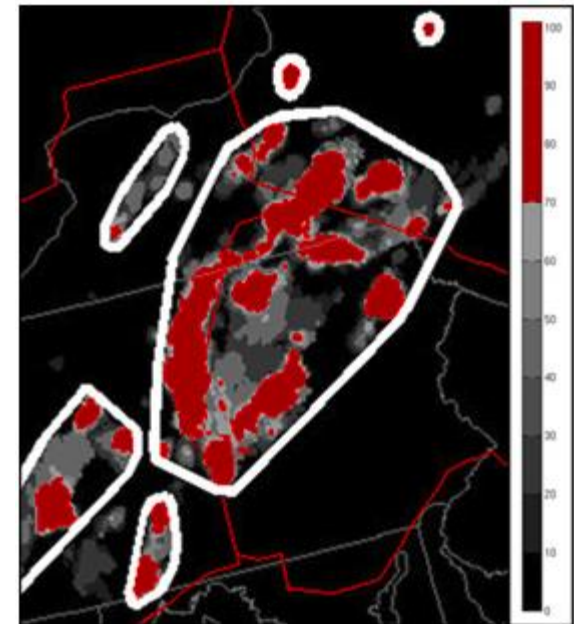
Source:  
[FAA's NextGen](#)  
website

# Predicting air traffic impact

- “Effective strategic management of traffic flows during convective weather events requires a system that can translate convective weather information into anticipated air traffic operational impact.”
- Predicting the pilots’ response to the thunderstorms:
  - Convective Weather Avoidance Model, and
  - Convective Weather Avoidance Polygons



Example of a pilot deviation to avoid weather upon arrival at DFW airport.



Example of Convective Weather Avoidance Polygons surrounding regions of high values in the Convective Weather Avoidance Field.

Source: [FAA's NextGen](https://www.faa.gov/nextgen) website

# Predicting air traffic impact



- “Effective strategic management of traffic flows during convective weather events requires a system that can translate convective weather information into anticipated air traffic operational impact.”
- Predicting the pilots’ response to the thunderstorms:
  - Convective Weather Avoidance Model, and
  - Convective Weather Avoidance Polygons
- Confidence metrics - the associated confidence in the predictions to be conveyed so strategic planners know whether it is advisable to take action or not

Source: [FAA’s NextGen](#) website

# Discussion points

- Can Europe strive for similar distribution of meteorological information:
  - One-stop shop
  - Free
- USA weather decision-support tools:
  - Do we need similar or different systems? For which reasons?
  - Are the available systems enough, or research and development is still needed?
- Can the fragmentation in MET information provision in Europe be resolved if further research is needed
- DST design in view of work change and training



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# Thank you



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