

# NextGen Weather Systems

*Common Support Services-  
Weather (CSS-Wx) and  
NextGen Weather Processor  
(NWP)*

Presented to: FPAW

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Federal Aviation  
Administration



# Purpose

- **Provide NextGen Weather Systems status**
  - Common Support Services- Weather (CSS-Wx)
  - NextGen Weather Processor (NWP), including Aviation Weather Display (AWD)
- **Announce upcoming event**
  - FAA PMO NextGen Weather Systems User Forum in October 2016

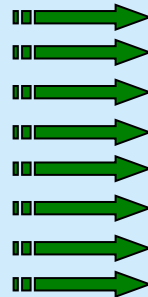
# Delivering NextGen Improvements

## Legacy System

- Radar
- Inefficient Routes
- Voice Communications
- Disparate Information
- Fragmented Weather Forecasting
- Weather Restricted Visibility
- Forensic Safety Systems
- Nationwide Focus

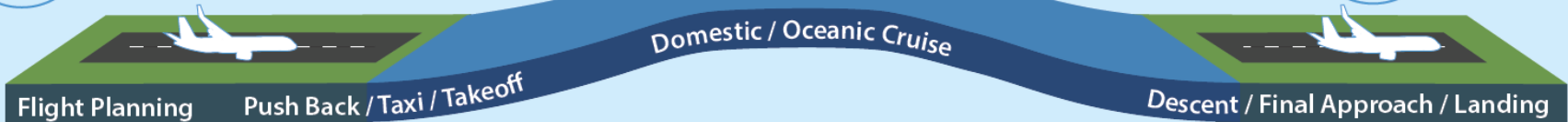
## NextGen

- Satellite
- Performance Based Navigation (fuel savings)
- Voice & Digital Communications
- Automated Decision Support Tools
- Integrated Weather Information
- Improved Access in Low Visibility
- Prognostic Safety Systems
- Focus on Congested Metroplexes



<https://www.faa.gov/nextgen/programs>

Aviation Data



Implementation

TFDM   PBN   TBFM   ASIAs   AIM   **NWP**

Transformational

ADS-B   CATM-T   SWIM   **CSS-Wx**   NVS   DataComm

Foundational

Terminal Automation Modernization and Replacement   En Route Automation Modernization   Terminal Automation Modernization and Replacement

# Key Benefits of CSS-Wx and NWP

**Reduce FAA  
Operations Costs**



***\$2.0B Cost Avoidance Over 25 Year Lifecycle Including \$350M Ops Cost Savings***  
***Eliminates Need for Legacy System Tech Refreshes***

**Modernize National  
Airspace System**



***Decommission Outdated Systems Leveraging SWIM and FTI***  
***Cloud Compatibility***  
***Global Data Standardization***

**Improve Efficiency**



***Over \$2.8B of User Benefits***  
***Reduce Flight Delays***  
***Enable Collaborative Decision-making***

**Improve Safety**



***Enhanced Weather Information***  
***Greater Access***  
***Common Situational Awareness***

# NextGen Weather Systems Scope

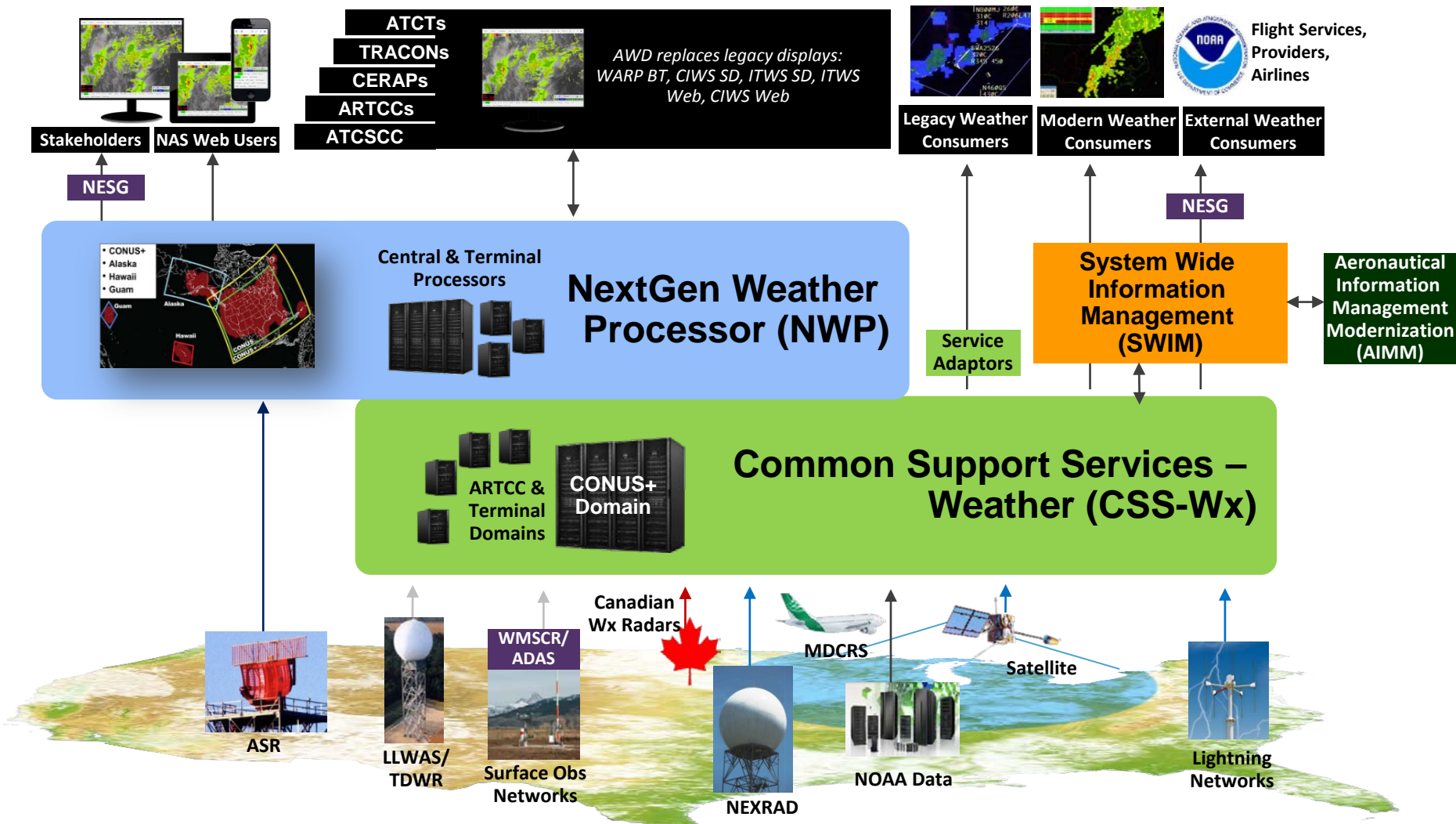
## Common Support Services – Weather (CSS-Wx)

- Provides a single source for FAA weather information and establishes enterprise level common support services using SWIM
- Focuses on weather information management, publishing to support users, and providing new interface standards and formats
  - Consistent with global standards (e.g., WXXM)
  - Provides geospatial data access services (WFS, WCS, WMS, WMTS)
- Enables decommissioning of legacy weather dissemination systems (e.g., WARP WINS, FBWTG, CDDS)

## NextGen Weather Processor (NWP)

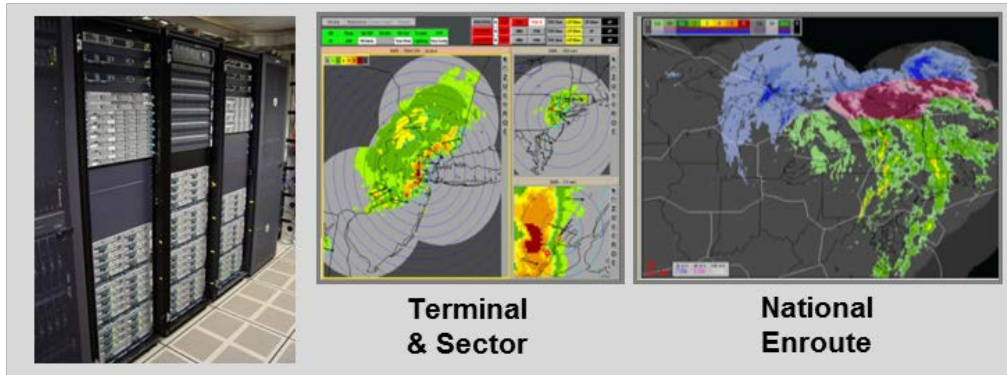
- Produces advanced aviation specific weather products
  - 0 to 8 hour aviation weather products
  - Real-time weather radar information (e.g., ERAM)
  - Convective Weather Avoidance Fields
  - Wind Shear alerts
- Translates weather information into weather avoidance areas for integration into decision support tools (e.g., TFMS, TBFM)
- Provides Aviation Weather Display (AWD) of NextGen weather information for ATC users
- Enables decommissioning of legacy weather processor systems (e.g., WARP, ITWS, CIWS)

# NextGen Wx Systems Architecture

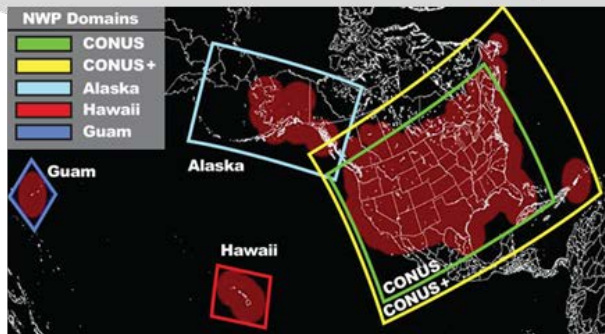




# Safety Improvements



NextGen Weather Processor (NWP)



- New architecture makes terminal safety products available domain-wide
- New processing enables rapid convective growth detection
- New products provide low-cost options for expanding terminal weather coverage

Convective Growth Hazard

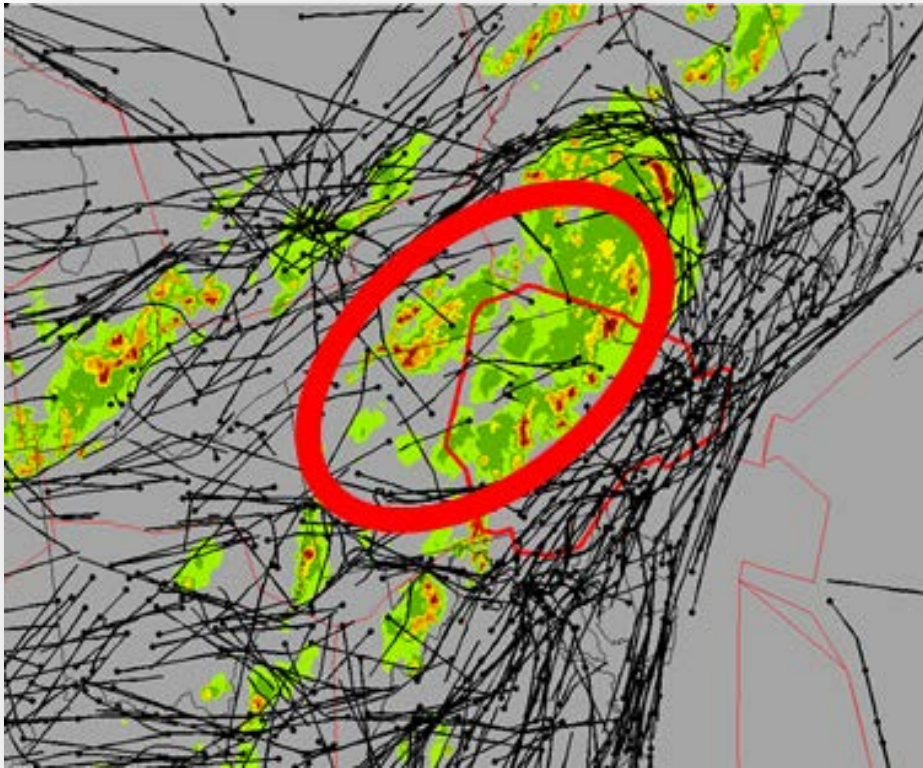


TRACON Expansion



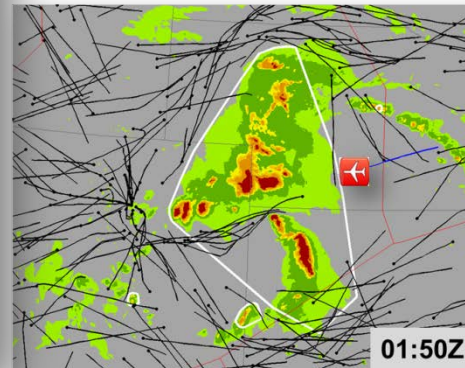
# Efficiency Improvements

## Decision Support for Strategic Traffic Flow Management

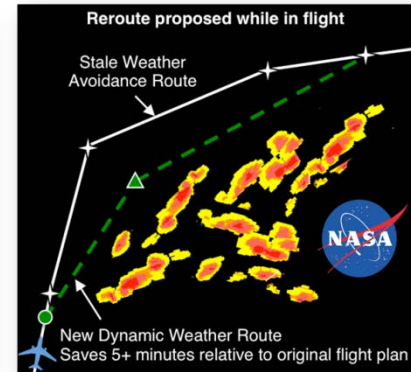


- Operational implementation of 0-8 hour “radar-forward” predictions
- Translation of weather products into pilot avoidance metrics
- Enables decision support tool development with tailored access via SWIM

## 4D Flow Constrained Areas

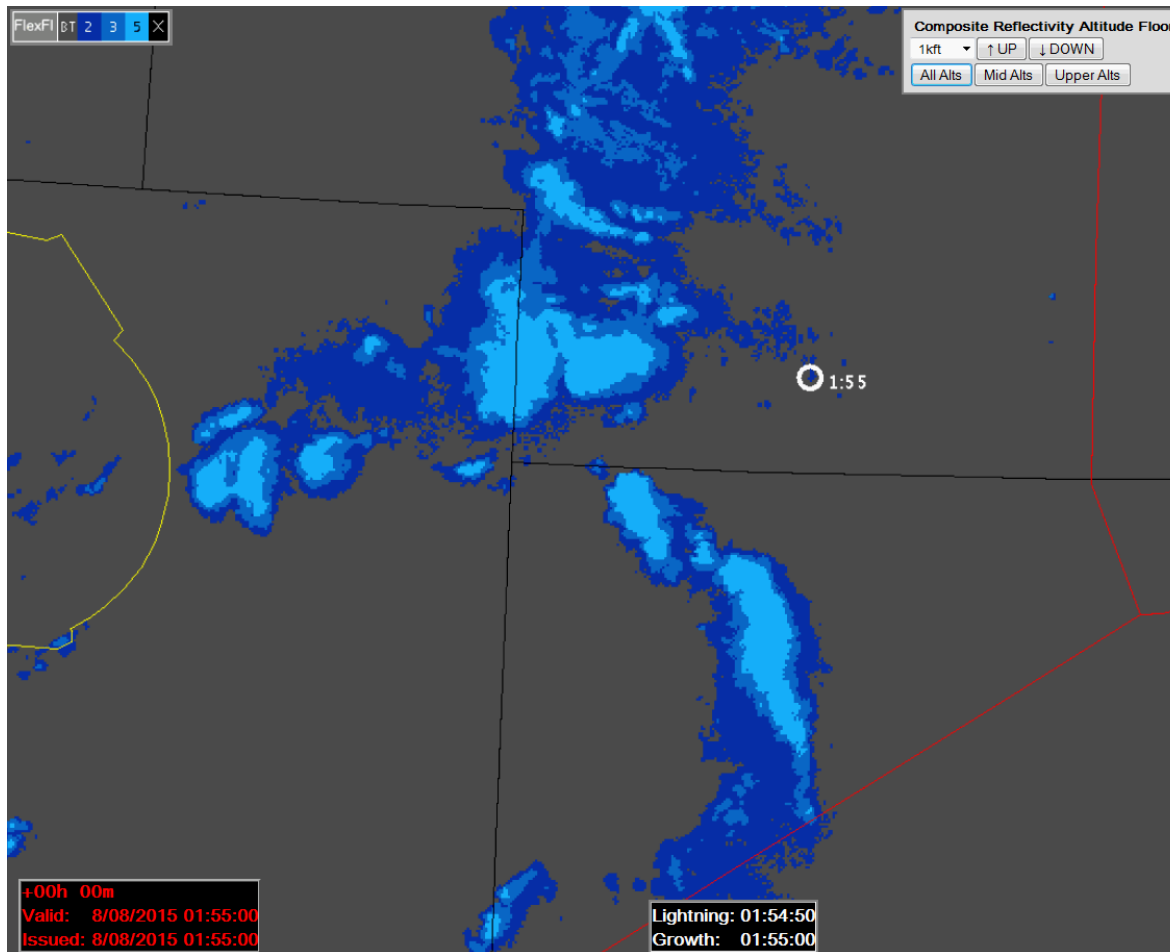


## Efficient In-flight Reroutes



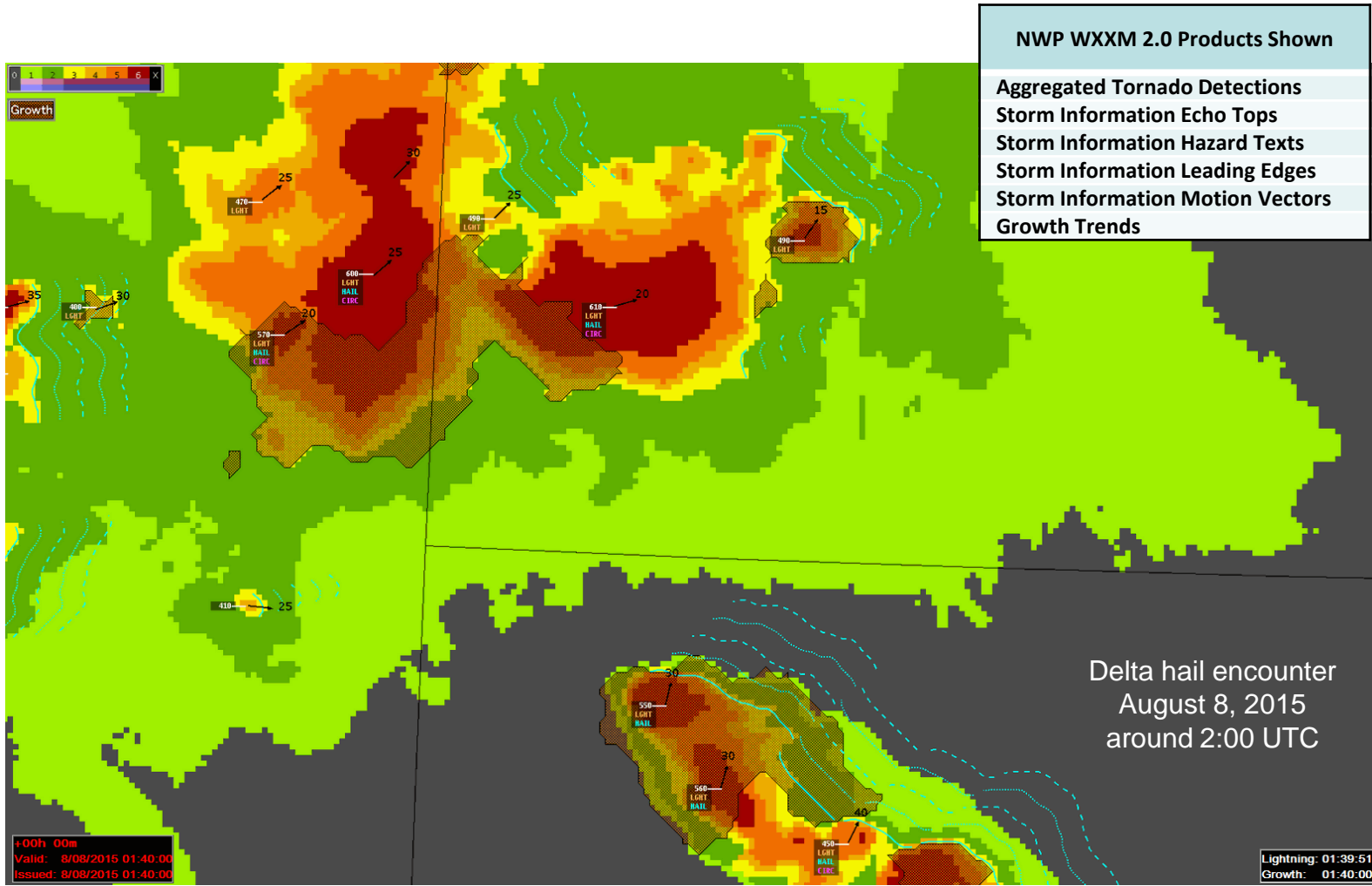


# NextGen Flexible Layer Mosaics

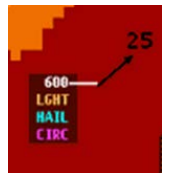


- **NWP reflectivity mosaics update every 25 sec**
  - New volumes are created with each new radar tilt
  - All tilts are time-aligned in each new volume
  - Trends are computed between 'like' volumes
  - All volume products are time-aligned in making multi-radar mosaics
- **Example shows Composite Reflectivity from “floor” to 60 Kft**
- **Layer bottom (“floor”) and layer top (“ceiling”) selectable in 1 Kft increments**
- **NextGen Weather radar mosaics contain fine-scale vertical storm structure**

# NextGen Storm Information



Safety Benefits of NextGen Weather



Storm Info Hazard Text



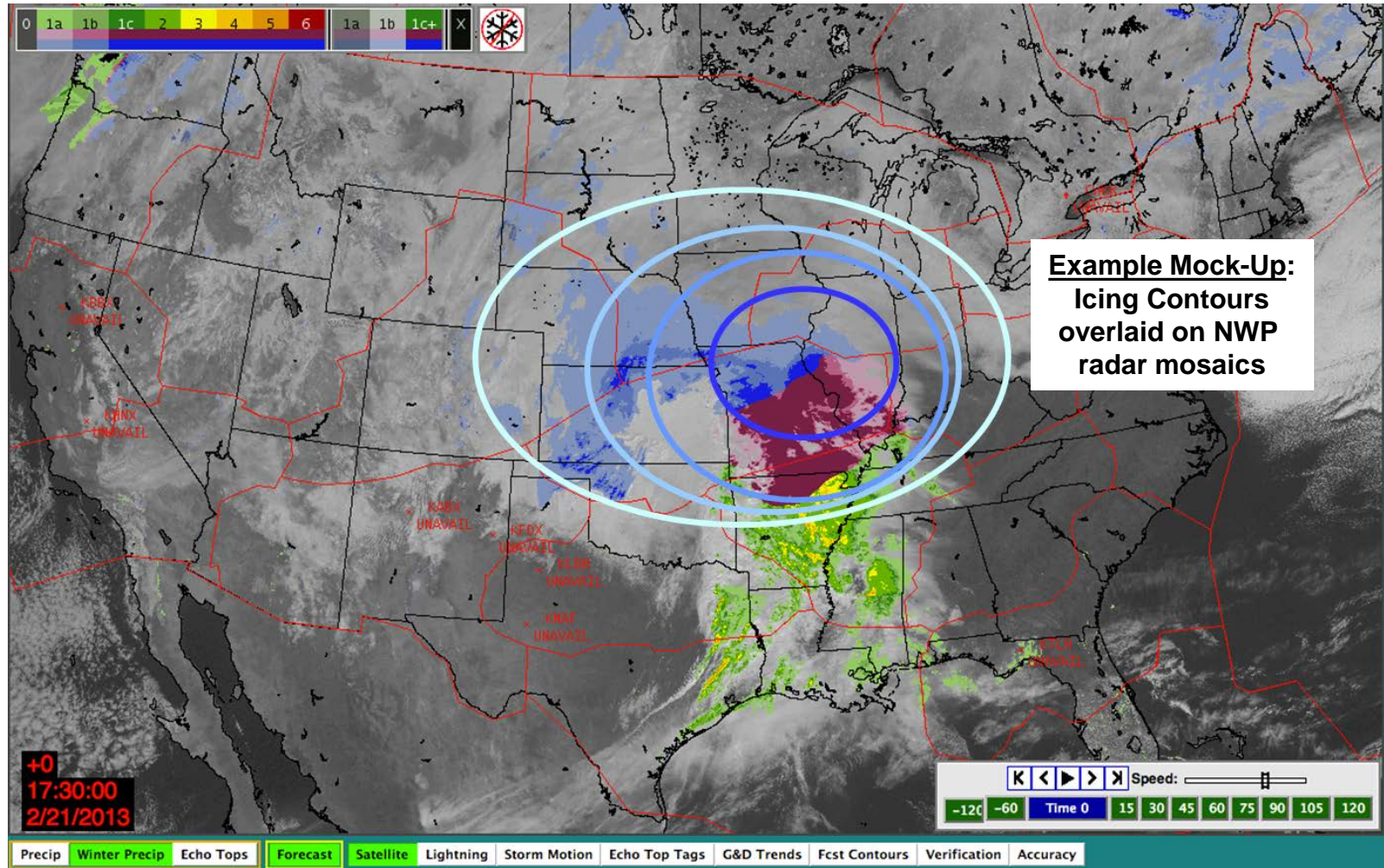
Tornado Icon



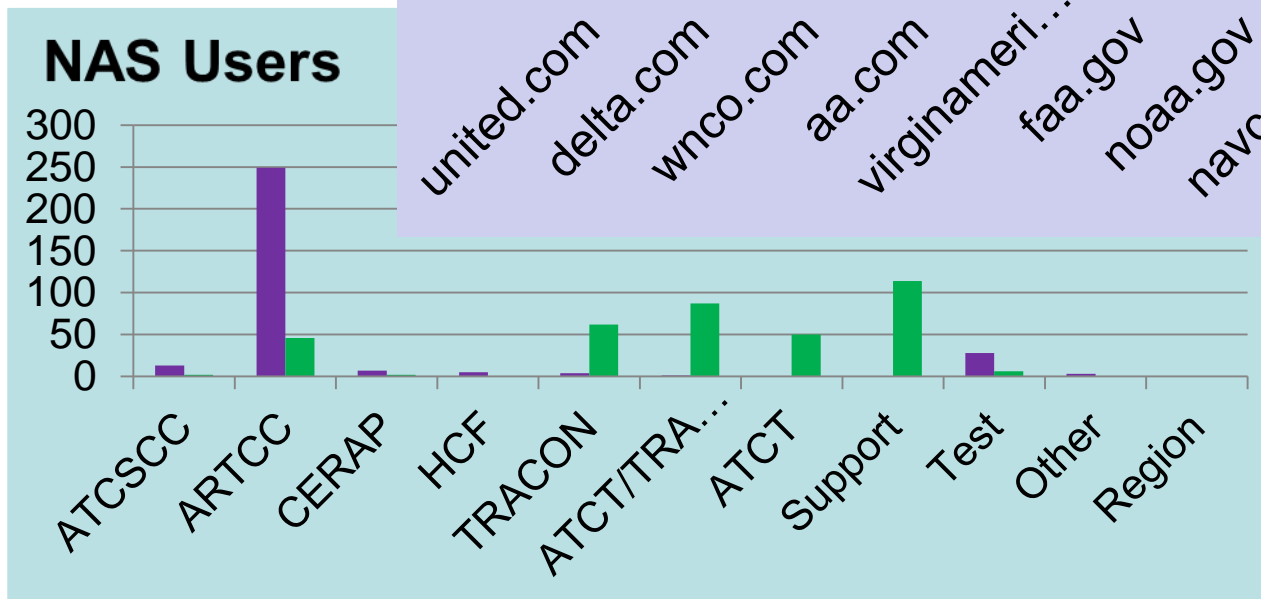
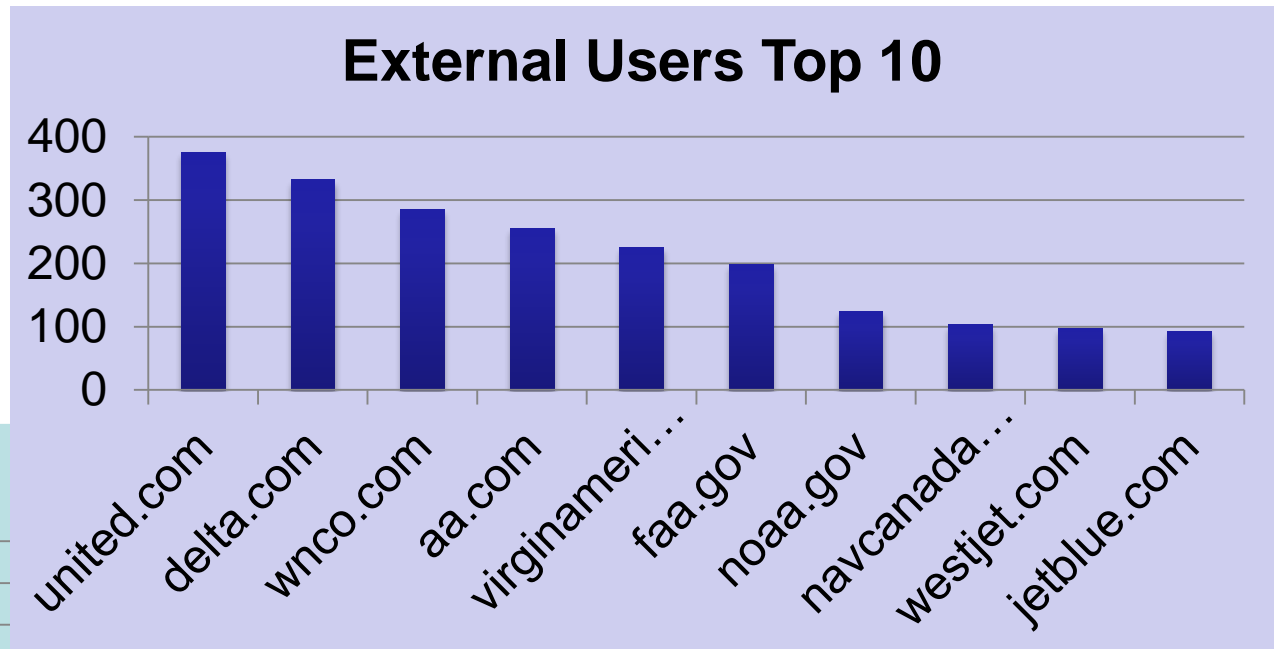
Growth Trends 25 sec update

NWP Growth Trend shows danger 10 min before aircraft entered storms

# AWD Integrated Icing and Turbulence



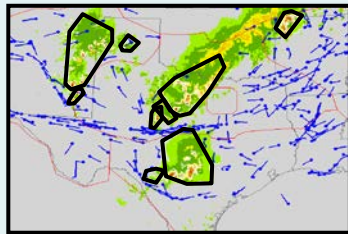
# AWD NAS and External Users



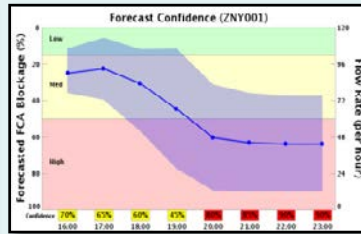
En Route Displays  
Terminal Displays



# NWP Current and Future Products



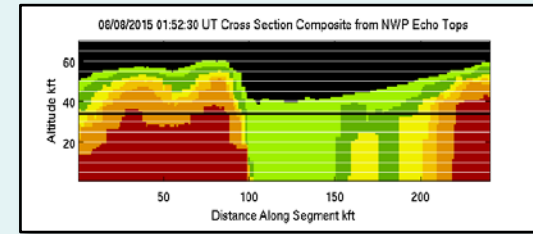
Convective Weather Avoidance Polygons



Forecast Confidence



Offshore Precipitation



4D Trajectory Weather

Per-Radar Processing

Mosaic

Analysis

0-8 hour Prediction

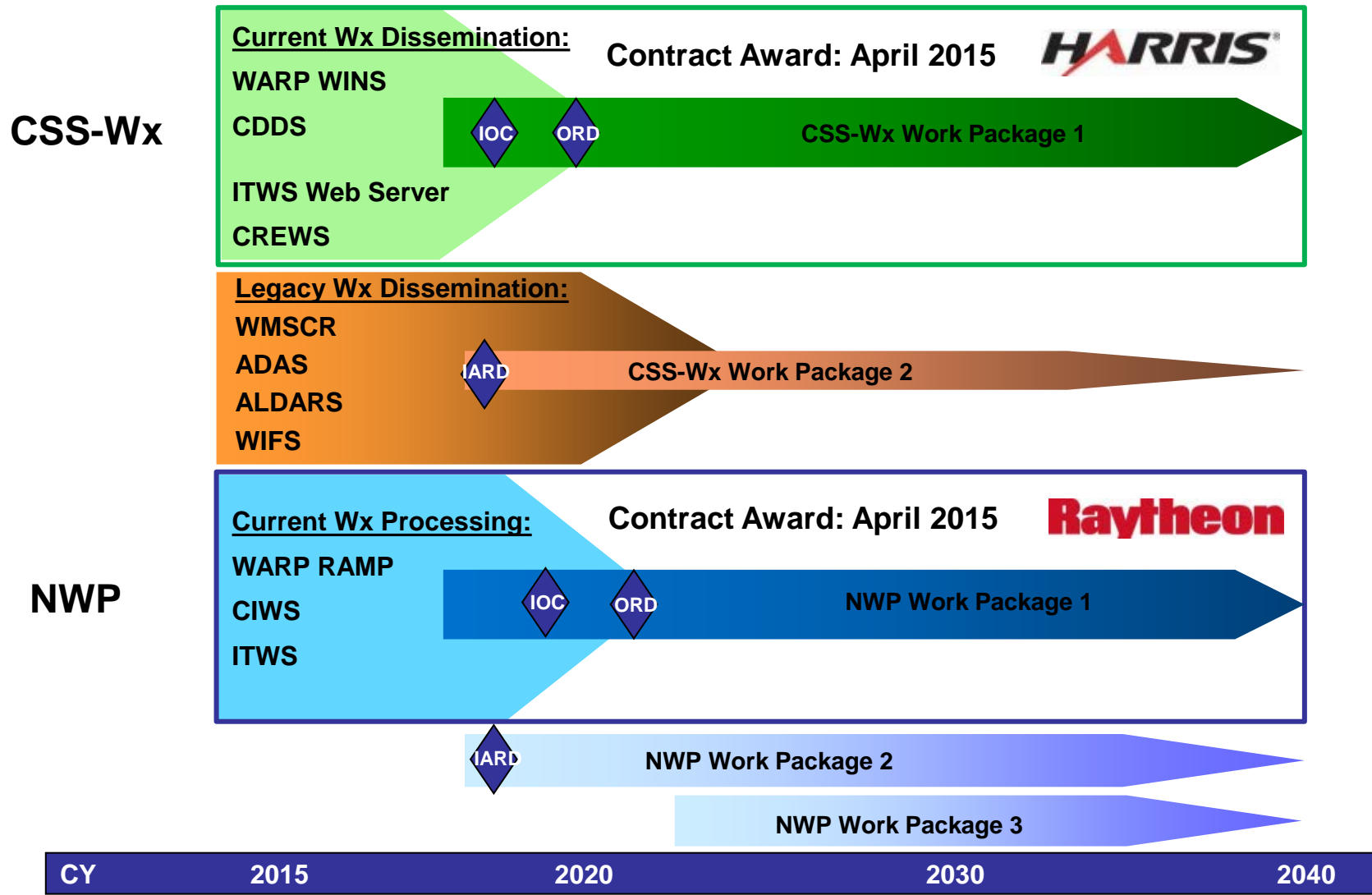
Weather Avoidance

Scoring

Post Processing

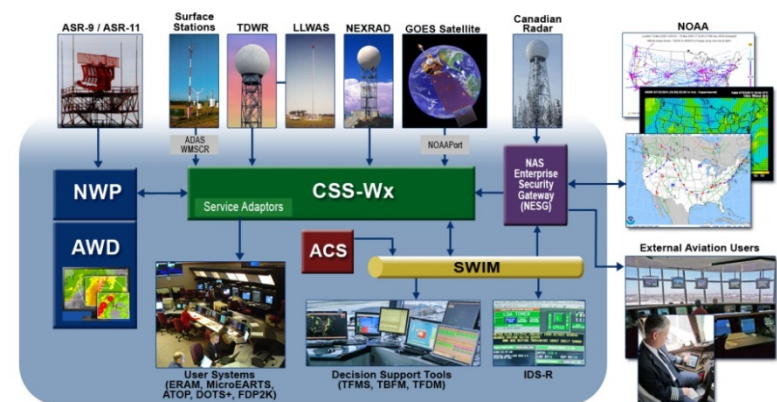
NWP Product Generation Platform

# CSS-Wx/NWP Implementation



# Upcoming User Forum

- **To be hosted by FAA AJM-333 in October 2016**
  - During ATCA conference in Washington DC
- **Internal and external weather providers and consumers are welcome to participate**
  - Contact [alfred.moosakhanian@faa.gov](mailto:alfred.moosakhanian@faa.gov)
  - Register at <http://nextgenweathersystems.com/>
- **Agenda**
  - Program schedule
  - Weather products
  - Data format and access
  - Interface and documentation



# Backup





# Key Acronyms

- ACS: Aeronautical Common Services
- ADAS: Automated Weather Observing System (AWOS) Data Acquisition System
- AIMM: Aeronautical Information Management Modernization
- ARTCC: Air Route Traffic Control Center
- ASR: Airport Surveillance Radar
- ATCSCC: Air Traffic Control System Command Center
- ATCT: Airport Traffic Control Tower
- ATOP: Advanced Technologies and Oceanic Procedures
- AWD: Aviation Weather Display
- BT: Briefing Terminal (WARP)
- CARSR: Common Air Route Surveillance Radar
- CDDS: CIWS Data Distribution Service
- CERAP: Combined Center Radar Approach Control
- CIWS: Corridor Integrated Weather System
- CREWS: CTAS Remote Weather System
- CSS-Wx: Common Support Services for Weather
- DOTS+: Dynamic Oceanic Tracking System Plus
- ERAM: En Route Automation Modernization
- FBWTG: FAA Bulk Weather Telecommunications Gateway
- FDP2K: Flight Data Processing 2000 System
- FTI: Telecommunications Infrastructure
- ITWS: Integrated Terminal Weather System
- LLWAS: Low-Level Windshear Alert System
- MDCRS: Meteorological Data Collection and Reporting System
- Micro-EARTS: Microprocessor En Route Automated Radar Tracking System
- NAS: National Airspace System
- NESG: NAS Enterprise Security Gateway
- NEXRAD: Next Generation Weather Radar (WSR-88D)
- NFU: NWS Filtering Unit
- NOAA: National Oceanic and Atmospheric Administration
- NWP: NextGen Weather Processor
- OGC: Open Geospatial Consortium
- RAMP: Radar Acquisition and Mosaic Processor
- SD: Situation Display
- STARS: Standard Terminal Automation Replacement System
- SWIM: System Wide Information Management
- TBFM: Time Based Flow Management
- TDWR: Terminal Doppler Weather Radar
- TFMS: Traffic Flow Management System
- TMAR: Terminal Automation Modernization and Replacement
- TRACON: Terminal Radar Approach Control
- WARP: Weather and Radar Processor
- WCS: Web Coverage Service
- WFS: Web Feature Service
- WINS: Weather Information Network Server
- WMS: Web Map Service
- WMSCR: Weather Message Switching Center Replacement
- WMTS: Web Map Tile Service
- WSP: Windshear Subsystem Processor
- WXXM: Weather Information Exchange Model

