FPAW – Segment 4
Data Centric Weather

Presented to: Friends and Partners of Aviation Weather (FPAW)
Presented by: Alfred Moosakhanian, FAA
Date: October 31, 2012
Data Centric Wx: Global Embrace

• WMO and ICAO are jointly moving forward to enable data centric weather exchange

• In aviation, we are moving from text and product centric weather for:
  – Observations
  – Forecasts
  – Accessing (Dissemination) and
  – Integration into Decision Support
WXXM Evolution

- WXXM is key to data centric concepts and applications & NextGen/SESAR support
  - FAA and NWS are leading the evolution in partnership with EUROCONTROL
  - The World Meteorological Organization (WMO) establishes the basis for global MET/Wx information exchange
  - ICAO establishes the basis for Meteorological Service for International Air Navigation (ICAO Annex 3)
  - Open Geospatial Consortium (OGC) provides the forum for establishing open standards for exchanges of geospatial referenced information
Open standards for weather information exchange ensure harmonization and ease of future enhancement and implementation.
ICAO/WXXM Model Relationship

WXXM

NWP non-gridded Products

- Non-gridded Forecasts
- Observations
- Convective Wx info
- Other ...

Wind & temp data

ICAO Model (Annex 3)
- METAR/SPECI
- TAF
- SIGMET
- Other

Other …
Harmonization: Converging Activities

Harmonized Aviation Weather Data Models

- FAA/EuroControl WXXM
- FAA/EuroControl AIXM / FIXM
- ICAO Annex 3
- WMO METCE
## ICAO Implementation – Annex 3

<table>
<thead>
<tr>
<th>MET/Wx Info</th>
<th>2013</th>
<th>2016</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>METAR/SPECI</td>
<td>States <em>in a position may structure</em> per ICAO Model / WXXM <em>and exchange</em> using XML/GML</td>
<td>States <em>should structure</em> per ICAO Model / WXXM <em>and exchange</em> using XML/GML</td>
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<td>TAF</td>
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<tr>
<td>SIGMET</td>
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<tr>
<td>All Other MET/Wx Info</td>
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FAA Common Support Services for Weather (CSS-Wx) & NextGen Weather Processor (NWP)

Presented to: Friends and Partners of Aviation Weather (FPAW)
Presented by: Alfred Moosakhanian, FAA
Date: October 31, 2012
Background

- FAA weather information today is limited by:
  - Weather products only provide limited coverage area and update rate
  - Traffic managers and users must mentally interpret weather conditions, future traffic, and airspace information and their potential impact on decisions
  - Unique data types, fixed graphic or text products formats
  - Customized information sharing protocols
  - Fixed time and space resolution
  - Weather forecasts not integrated into Decision Support Tools (DSTs)
Legacy Weather Systems Transformation

• NextGen weather programs:
  – Reduce legacy system complexity
  – Enable reuse, scalability, and agility
  – Fulfill varying needs of different systems/users
  – Transform legacy silos to SOA services
  – Improve services interoperability using SWIM
CSS-Wx Scope

• Common Support Services for Weather (CSS-Wx) is a FAA NextGen Transformational Program

• CSS-Wx will be part of a National Airspace System (NAS) Common Support Services capability for deployment in 2016

• CSS-Wx will be the single provider of aviation weather information for FAA users
  – Consolidate legacy weather provider systems
  – Filter weather information to support specific users needs
  – Standardize weather information into common formats
  – Enable integration of weather information into air traffic decision support tools
CSS-Wx Functionalities

- CSS-Wx will publish advanced aviation specific information from NextGen Weather Processor, NOAA 4-D Wx Data Cube and other sources to consumers via System Wide Information Management (SWIM)

- Provide weather information via web services such as:
  - Web Coverage Service (WCS) for gridded data
  - Web Feature Service (WFS) for non-gridded data
  - Web Map Service (WMS) for imagery

- Standardize Weather information into the Open Geospatial Consortium (OGC) formats with the exception of radar data
  - Network Common Data Form, version 4 (netCDF-4)
  - Weather Information Exchange Model (WXXM)
  - JPEG, PNG or GIF
NWP Scope

• NWP establishes a common weather processing platform to
  – Consolidate weather product generation by legacy weather processor systems
  – Produce advanced aviation specific weather, including translation of weather information into weather constraint areas

• To be implemented over multiple work packages (WPs) with WP1 Initial Operating Capability (IOC) in 2016
NWP

- CIWS
- ITWS
- WARP

• Legacy Systems
• Rising operations and maintenance costs

NextGen Weather Processor (NWP)

• Subsume legacy systems
• Host new capabilities
• 2016 – 2035*
Weather CONOPS (2016)

- NWP
- CSS-Wx
- NEXRAD, TDWR, ASR
- ADAS, RASP, WMSCR
- ERAM, ATOP, DOTS+, FDP2K, MEARTS, NIDS
- ASOS, AWOS, AWSS
- Canadian Radar
- NOAA Data Sources (4D Wx Data Cube)
- External Users
- NESG
- NESG
- SWIM
- Weather Displays
- FTI
- NAS Ops IP Network
- TFDM, TFMS, TBFM…
Weather Programs in NAS EA SV-4 View

<table>
<thead>
<tr>
<th>Aviation Weather Services</th>
<th>Interaction Services</th>
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</thead>
<tbody>
<tr>
<td>Wx Displays</td>
<td>(Display for Air Traffic users)</td>
</tr>
<tr>
<td>Wx Observations</td>
<td>Mission Services</td>
</tr>
<tr>
<td>Wx Processors</td>
<td>(Domain level processing of data)</td>
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<tr>
<td>- NWP</td>
<td></td>
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<thead>
<tr>
<th>CSS-Wx</th>
<th>Support Services</th>
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<tr>
<td>AIM</td>
<td>(Standard information models and data services)</td>
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<tr>
<th>SOA Core Services (SWIM)</th>
<th>Technical Infrastructure Services (FTI)</th>
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<tbody>
<tr>
<td>(Messaging, interfaces, security)</td>
<td>(Networking)</td>
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CSS-Wx & NWP Schedule & Milestones

- Initial Investment Decision: (CY12 - 4Q)
- SIR Release: (CY13 - 1Q)
- Final Investment Decision: (CY13 - 4Q)
- Contract Award: (CY14 - 1Q)
- Initial Operating Capability: (CY16)

CSS-Wx has also released 4 RFIs

*CY = Calendar Year
*Q = Quarter
* The dates above are tentative and subject to change
Summary

• NWP focuses on weather processing & product generation

• CSS-Wx focuses on weather information management for FAA
  – CSS-Wx will be the single provider of aviation weather information in the NAS

• CSS-Wx uses open standards, and coordinates with international organizations in developing the standards
Backup Slides
Weather Data Products

• Weather Radars
• Weather Radar Mosaics
• Weather Forecasts
• NOAA Forecast models
• Alphanumerics such as Volcanic Ash Advisory
• Weather Observations (Surface and Airborne)
• Icing Information (Current and Forecast)
• Turbulence Information (Current and Forecast)
• Lightning
• Satellite Data
Key Products

Precipitation Mosaic

Assimilation of extended NWS forecast models with real time radar extrapolation for Precipitation

Growth and Decay Trends (shown on Satellite Mosaic)

Assimilation of extended NWS forecast models with real time radar extrapolation for Winter Precipitation

Echo Tops Mosaic

Assimilation of extended NWS forecast models with real time radar extrapolation for Echo Tops
Weather Avoidance Fields

Precipitation

Echo Tops

Weather Avoidance Field (WAF)

Pilot Deviation Prob

10 20 30 40 50 60 70 80 90 100

Estimated Airspace Availability

Weather

FCAA05

FCAA08

Federal Aviation Administration

CSS-Wx Briefing to FPAW
October 31, 2012