



FAA International Activities

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In-Flight Icing Users Technical Interchange Meeting (TIM)
25-26 February 2015



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Outline

- ICAO/WMO Meteorological (MET) Divisional Meeting (MET/D)
- Global MET in support of global Air Traffic Management (ATM)
- Reorganization at ICAO
- MET Integration
- World Area Forecast System (WAFS)
 - ✦ WAFS Icing Forecasts

MET/D July 2014 Montreal

- Attended by 308 participants from 95 United Nation States and 7 international organizations
- Divisional meetings are held decadal
 - ✦ Establishes the direction for MET for the next 10-15 years
- Focus was to support MET services in the ICAO Aviation System Block Upgrades (ASBU) as adopted by the 12th Air Navigation Conference (ANC)
 - ✦ MET as enabler for ATM services and Trajectory-Based Operations (TBO)
 - ✦ MET must be consistent, coherent, and fit-for-purpose



12th ANC and MET/D

- 12th ANC directed ICAO to develop a roadmap for MET Services
- Roadmaps and ConOps
 - ✦ World Area Forecast System
 - ✦ International Airways Volcano Watch
 - ✦ Space Weather Information Services
 - ✦ Radioactive Material Information Services
 - ✦ Advisory Services for Hazardous MET Conditions (i.e. regionalized SIGMETs)
 - ✦ MET Information Integration for Trajectory Based Operations



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Next**GEN**

MET/D Significant Recommendations

- WAFS to become global ATM and TBO database
- Advancement of the International Airways **Volcano** Watch to new capabilities
- Development of provisions for **Space Weather** forecasts
- Develop capability to provide release of **radioactive** material forecasts (e.g., radioactive cloud SIGMET)
- Implementation of a **regional advisory** system (SIGMETs)
- Development of provisions for aeronautical MET services in the context of **CDM** and common situational awareness
- Ensure that all MET services are integrated into the System-Wide Information Management (**SWIM**) environment
- Restructure Annex 3 and develop a new PANS-MET





Future global ATM services and TBO

- ICAO's "One Sky" concept
 - ✦ NextGen, SESAR, CARATS, etc.
 - ✦ Global Air Navigation Plan (GANP)/ASBU
 - MET is just one of many components
 - ✦ Shift from "products" to "data" (e.g. gridded data, metadata) for ATM and TBO

Reorganization at ICAO

- MET Section dissolved
- MET Panel established
 - ✦ Terms of Reference
 - Determine operational requirements for MET service for global ATM system
 - Develop/maintain ICAO provisions for MET service
 - Develop/maintain MET integration roadmaps
- Work program to be defined by Air Navigation Commission via Job Cards

Future MET Services

- Development of future MET services will be managed by the new MET Panel
- MET Panel will give direction to various Expert Teams who carry out tasks from MET/D
 - ✦ Expert Teams to report to Panel
 - Expert Teams to use Roadmaps and ConOps to guide future work
- Key is for all future work to be aligned with the future SWIM concept environment

MET Integration

- Challenge: Raw MET data is rarely in a format that users need to make a decision
- Objectives:
 - ✦ Translate MET data to be ingested into decision support tools in support of strategic or tactical solutions
 - ✦ Translate MET data to identify constraints or impacts
- There are different levels of integration
 - ✦ ICAO recognizes that States are responsible for determining what fits their operational needs

Levels of ATM-Weather Integration

Source: The MITRE Corporation

- Level \emptyset – No integration

"I gotta' do it all in my head..."

- Level 1 – "Weather on the glass"

"It's easier to figure out the impact..."

- Level 2 – Constraint

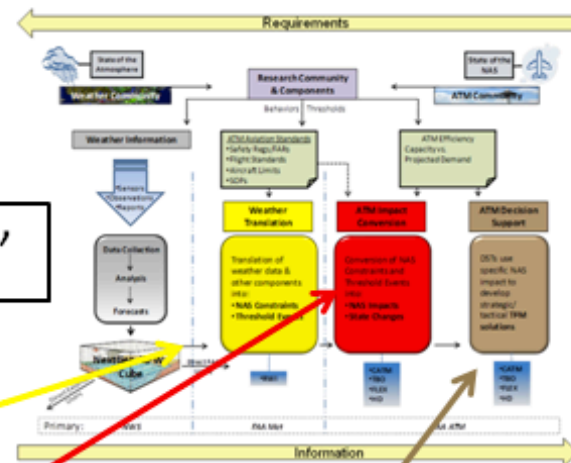
Translation to NAS Constraint or Threshold Event

- Level 3 – Impact

Conversion to NAS Impact or State Change

- Level 4 – Decision Support

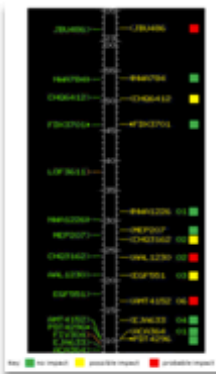
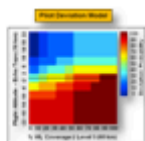
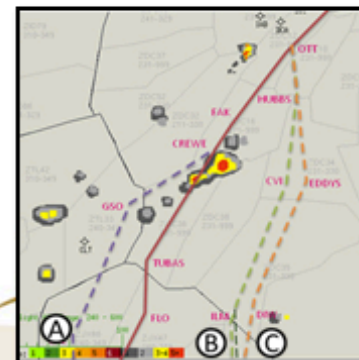
Generation of Hierarchical Solutions



Responsibility

Weather

ATM



Level of Integration- example

- Level 1: WAFS gridded forecasts consist of computer-processed meteorological data for grid points in a regular grid with a horizontal resolution of 1.25° of latitude and longitude for ingestion into flight planning systems – information on display
- Level 2: Vendors starting to learn how to take gridded data to develop constraint models in support of flight planning. Current WAFS SIGWX products are not sufficient to meet the needs of performance-based operations



WAFS

- WAFS to become global ATM and TBO database
- ICAO made WAFS 1st generation of global gridded MET hazard forecasts operational in 2013
 - ✦ Icing, turbulence, convective clouds
 - added to existing wind, temperature and humidity data sets
- WAFS Icing
 - ✦ 1st generation is in “potential”

Enhancement of WAFS

- Improved algorithms for icing and turbulence
 - ✦ “severity” forecasts to replace “potential” in gridded data
- Finer spatial and temporal resolution of all WAFS global data
- Introduce probability and ensemble forecasts
- Integrate gridded data into decision support systems for global ATM and TBO

WAFCs (World Area Forecast Centers) UK and US

- Developed Roadmap for next 15 years inline with ASBUs
- Developing science plan for global MET hazards which includes icing
- Requirements for US development comes from FAA - ANG-C6



Summary

- MET will become an enabler with future flight and ATM operations
- Global harmonization is one of FAA's top goals
- WAFS to become global ATM and TBO database



Backup Slides



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Next**GEN**

ICAO 12th Air Navigation Conference in Nov 2012

- 4th edition of Global Air Navigation Plan
 - ✦ Outlines how aviation is going to improve and provide future services
 - ✦ MET is one of the enablers
- Aviation System Block Upgrades (ASBU)
 - ✦ Agreed upon timeframe for improvement to the systems and services that support international air navigation
- Roadmaps
 - ✦ Evolution of MET services for the next 15 years
 - ✦ Example: WAFS

Through to 2018 (ASBU Block 0)

- Implement improved turbulence algorithms including the replacement of turbulence potential with turbulence severity (i.e. EDR)
- Implement improved icing algorithms including the replacement of icing potential with icing severity
- Global and regional verification of WAFS forecasts by utilizing data provided by States and user organizations

2018-2023 (ABSU Block 1)

- Implement cumulonimbus cloud *ensemble* based prediction system
- Implement turbulence type forecasts (e.g. convection, jet-stream shear, terrain) utilizing EDR
- Implement finer grid resolution for WAFS data
- Implement calibrated probabilistic forecasts for icing, turbulence and cumulonimbus cloud
- **Provide partial dataset of meteorological information for integration into flight planning, flight management and ATM decision support systems** for en-route weather
- Implement SIGWX in XML/GML format as a replacement to SIGWX in BUFR format
- Make available WAFS data via SWIM



2023-2028 (ASBU Block 2)

- Provide **increased dataset of meteorological information suitable for integration** into flight planning, flight management and ATM decision support systems for en-route weather

2028 and beyond (ASBU Block 3)

- Fully integrated *multi-member ensemble* hazard forecasts
- Implementation of the WAFS-database, populated with meteorological information from appropriate models to produce ensemble forecasts of global meteorological information
- Implementation of high spatial and temporal resolution resulting in improved representations of meteorological information
- **Provide full dataset of meteorological information covering en-route weather suitable for integration** into flight planning for en-route operations, flight management and ATM decision support systems
- Fully automated gridded and SIGWX output
- Full implementation of SWIM for access to WAFS data
- Retirement of legacy WAFS products and dissemination systems

