



<p>Report on MET in support of ATM - ad hoc WG from AMOFSG</p> <p>Presented to: ASIA/PAC MET/ATM Seminar By: Steven Albersheim, FAA Date: January 24-26, 2011</p>	 <p>Federal Aviation Administration</p> 
--	--

Goal

- Provide guidance to AMOFSG and the Secretary on the operational requirements for the provision of meteorological information services (MET), based on the concept provided by the ICAO Air Traffic Management Requirements Performance Panel (ATMRPP) to improve the efficiency of traffic flow with Performance-Based Navigation

Tasks Assigned to Ad Hoc WG

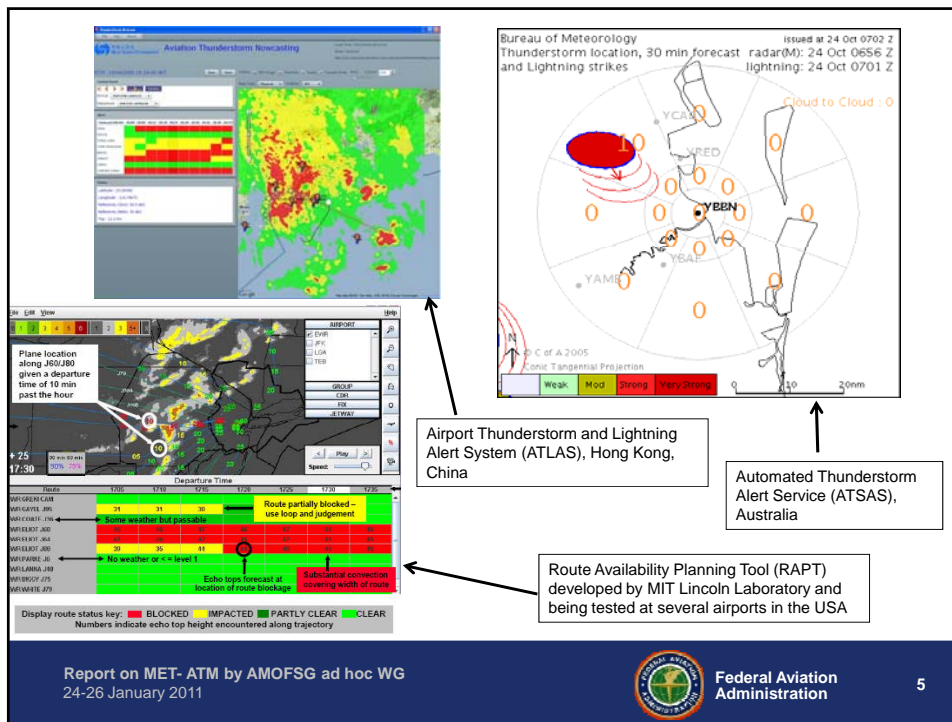
- Develop an outline for the meteorological services required to support the ICAO concept of performance-based flight operations reflecting the needs of aircraft operators and Air Traffic Management (ATM);
- Identify an initial set of performance metrics for the meteorological elements that are required for performance-based flight operations;
- Develop an initial set of Meteorological Information Services, based on performance-based flight operations principles, with a focus on high density Terminal Maneuvering Areas (TMA's) and Airports.



Tasks

- Develop recommendation for the level of supplemental information required for newly developed requirements for meteorological information for performance-based flight operations; i.e. providing clear recommendations and rationale for the required provisions:
 - Standards and Recommended Practices (SARPs)
 - Procedures
 - Manuals
 - Other Guidance material





Common Characteristics

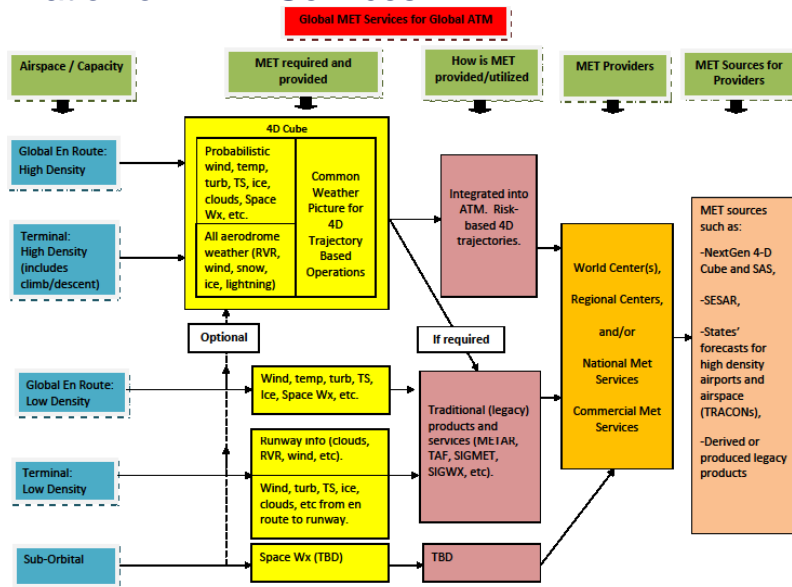
- All deal with same phenomenon but no two are alike
- All are graphical
- Most are digital, machine manipulable
- All partially or fully automated, more frequently updated, with lower latency
- Some are decision aids: most just wx depiction
- None completely integrate weather into ATM
- All exceed Annex 3 guidance

Assessment of Approach

- **SARPS**
 - Difficult to complete. Today’s MET SARPS are simple products (e.g., SIGWX charts). MET-ATM for PBN is complex and involves MET integration into ATM and Flight Planning Systems.
- **Procedures**
 - Moderate to complete and is currently underway via the PBN that is being developed but what is missing is what MET is required.
- **Manual**
 - Best course in that ICAO specialist group can provide updates to manuals in response to service needs as ATM for PBN evolves.
- **Other Guidance Material**
 - Vague and no clear direction as to what is meant by guidance and how binding the information is to ANSP and MET Providers.



Organization of MET Services



Concept for MET support to Global ATM for PBN Outline

- Minimize the impact of adverse weather on the total Air Transport System.
- Ensure maximum throughput is sustained in all meteorological conditions.
- Common Weather Situational Awareness:
 - Probabilistic and Deterministic weather information,
 - Weather integration for flexible airspace management,
 - Common code form for data exchange
- Categorized by Airspace Capacity:
 - En Route – High Density,
 - Terminal Control Area (TMA) – High Density.
 - En Route – Low Density
 - TMA – Low Density.



Next Steps

- ICAO should guide development of high level performance based ATM and MET requirements for PBN
- Where appropriate, ICAO should incorporate ATM and MET requirements as enablers into Annex 3 to:
 - Achieve global harmonization for safety & efficiency
 - Enable cost recovery
- Socialize with ICAO Regions and WMO on a Manual



Summary

- Concept for MET support to Global ATM for PBN
 - Categorized by Airspace Capacity,
 - Probabilistic and Deterministic weather information,
 - Weather integration for flexible airspace management,
 - Common code form for data exchange,
 - Incorporate into a new Manual instead of major changes to Annex 3



Supplemental Slides



Outline of MET in support to Global ATM and PBN

- The following four slides presents Version 0.2 (draft) of the proposed outline



Global MET/ATM/PBN per Airspace Capacity

- **En Route - High Density**
 - MET Required and Provided:
 - Common weather picture used by ATM decision makers.
 - Flight profile to be used in the participating airspace.
 - Flight profile choices that consider high resolution 4D weather (i.e., the 4D Weather Cube):
 - Observed and probabilistic (and/or deterministic) forecasts of wind, temperature, turbulence, icing, thunderstorms, space weather hazards, volcanic ash, tropical cyclones, etc.
 - Automatic updates to flight profile for changing weather (i.e., observed and probabilistic and/or deterministic forecasts of wind, temperature, turbulence, icing, thunderstorms, space weather hazards, volcanic ash, tropical cyclones, etc).
 - How MET is provided and utilized:
 - Integrated into ATM
 - Minimize weather impact. Maximum throughput is sustained in all meteorological conditions.
 - Risk-based 4D Trajectories
 - Decision Support Tools
 - Machine-readable, network-enabled, geo- and time-referenced weather information authorized for use by ATM for decision making.
 - Options for visualized output (graphic, text) for a subset of information.



Global MET/ATM/PBN per Airspace Capacity

- Terminal Control Area (TMA) – High Density
 - MET Required and Provided:
 - Common weather picture used by ATM decision makers.
 - Flight profile to be used in the participating airspace.
 - Departure and arrival flight profile choices, including instrument approaches, that consider 4D weather:
 - Observed and probabilistic (and/or deterministic) forecasts of wind, temperature, turbulence, icing, thunderstorm, volcanic ash, sandstorms/duststorms, wake turbulence, etc., from the runway to the “top of climb”, and from the “top of decent” to the runway.
 - Observed and probabilistic (and/or deterministic) forecasts of aerodrome / runway(s) information: wind, wind shear, ceiling, visibility, RVR, temperature, dew point, liquid/freezing/frozen precipitation and accumulation, lightning, barometric pressure barometric pressure, volcanic ash, etc.
 - Automatic updates to flight profile for changing weather.
 - How MET is provided and utilized:
 - Integrated into ATM.
 - Minimize weather impact. Maximum throughput is sustained in all meteorological conditions.
 - Risk-based 4D Trajectories,
 - Network-enabled,
 - Decision Support Tools,
 - Options for visualized output (graphic, text) for a subset of information.
 - Derived output as needed
 - METAR, TAF, etc.



Global MET/ATM/PBN per Airspace Capacity

- En Route – Low Density
 - MET Required and Provided:
 - Common weather picture used by ATM decision makers. (Optional, depending on region of the world and capabilities of the providers).
 - Flight profile choices that consider
 - Observed and deterministic forecasts of wind, temperature, turbulence, icing, thunderstorms, volcanic ash, space weather hazards, volcanic ash, tropical cyclones, sandstorms/duststorms, etc.
 - Options to use 4-D Cube for probabilistic forecasts.
 - Updates
 - Options for automatic updates to flight profile for changing weather, otherwise
 - Traditional updates
 - How MET is provided and utilized:
 - Flight planning system (machine to machine)
 - Uplink/downlink to aircraft
 - Visualized output (graphic, text) where needed.



Global MET/ATM/PBN per Airspace Capacity

- **Terminal Control Area (TMA) – Low Density**
 - **MET Required and Provided**
 - Common weather picture used by ATM decision makers. (Optional, depending on region of the world and capabilities of the providers).
 - Observed and deterministic forecasts of wind, turbulence, icing, thunderstorms, volcanic ash, tropical cyclones, sandstorms/duststorms and radioactive cloud.
 - Options to use 4-D Cube for probabilistic forecasts.
 - Aerodrome / runway(s) observations and forecasts:
 - Wind, wind shear, ceiling, visibility, RVR, wake turbulence, liquid/freezing/frozen precipitation and accumulation, lightning, temperature, dew point, pressure, etc.
 - Updates
 - Options for automatic updates to flight profile for changing weather, otherwise
 - Traditional updates.
 - **How MET is provided and utilized**
 - Traditional products
 - METAR, TAF, etc.
 - Visualized output (graphic, text) where needed.

