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New Meteorological Services Supporting Air Traffic Management

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The new Meteorological Services in the Terminal Area (MSTA) initiative, which is being undertaken by the WMO in close collaboration with ICAO, will provide meteorological services to support Air Traffic Management (ATM) for wider terminal areas, especially those at busy airports, which are currently not covered by the standard meteorological services stipulated by ICAO.

As C.M. Shun and Sandy M.K. Song of the Hong Kong Observatory, Hong Kong, China, report, ICAO and the WMO are continuing to coordinate further MSTA developments in advance of a projected 2014 endorsement for this promising enhancement to current MET/ATM capabilities.



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The international air navigation system is presently undergoing a paradigm shift: one that is moving it away from past Air Traffic Control (ATC) environments to the more integrated and collaborative Air Traffic Management (ATM) systems now needed to meet aviation's needs in the 21st century.

These requirements have stemmed from the more or less continuous growth in aviation and the ever present risk that the capacity of Regional air navigation systems may soon be exceeded by operator demand. This issue is presently of particular importance in the European (EUR) and in North American (NAT) Regions, but it has also become an increasingly urgent priority in the Asia/Pacific (APAC) Region, where the number of intra-APAC air travellers has recently surpassed associated domestic passenger totals from the North American market, making today's Asia-Pacific the world's largest aviation market.

The goal of the changes now under development is to ensure that ICAO's vision of a safe, secure, efficient and environmentally sustainable air transport system will continue to be available to all aviation stakeholders at the global, Regional and national levels. The implementation of a new ATM system that will make maximum use of the enhanced capabilities provided by advances in science and technology, as well as allowing for the effective sharing of available information on the basis of Collaborative Decision Making (CDM), is a mandatory component on the path to this objective. The Next Generation Air Transportation System (NextGen) and Single European Sky ATM Research (SESAR) initiatives are the corresponding programmes now ongoing in the USA and Europe to help effectively address this challenge.

It is under this evolving environment that the concept of Meteorological Services in the Terminal Area (MSTA)¹ was conceived of by the Commission for Aeronautical Meteorology (CAeM) of the World Meteorological Organization (WMO) in its 13th Session in 2006. In recent years, with increasing air traffic leading to issues of airport and route capacity limits, as well as the advancement of meteorological sciences such as numerical weather prediction and 'nowcasting' techniques, different meteorological products tailored for supporting Air Traffic Management (ATM) have been developed.

These developments have occurred in parallel across various Regions in order to address the gap between the data products stipulated in ICAO's existing standards and guidance and the newer and evolving 21st century ATM user needs for meteorological information. Currently, ICAO Annex 3 stipulates meteorological data products such as the Aerodrome Forecast (TAF), Trend-type Landing Forecast (TREND) and Aerodrome Warnings, which are presented to the users in highly-condensed codes in textual format.

The coded aspect of this weather data was a necessity in the mid-20th century, primarily to overcome the severe bandwidth

limitations in legacy telecom systems. It has since become a severe constraint for meteorologists as they seek to convey the specific details of available weather information to modern aircraft operators.

A case in point is how convective weather, which impacts busy approach areas, flight routes, corner posts and fixes over the wider terminal area², is already causing significant impacts to ATM operations and capacity. Currently this cannot be addressed by the regulated products which only provide generic weather information for the aerodrome—i.e. within approximately eight kilometres of its centre. Other products under development, in trial, or already in operational use at some airports in the APAC Region, include wind forecasts over approaches, crosswind probability forecasts for runways, strike probability for tropical cyclones, etc.

In more advanced applications of these weather products, specific information of the weather impact on air traffic capacity is also generated and provided to ATM and airline users. One such example is the Air Traffic Meteorology Center (ATMetC) of Japan.

To address these new and evolving ATM user needs and to avoid the costly parallel development of similar weather products of varying and confusing data formats, an expert team has been set up by the WMO in order to work closely with ICAO to develop a proper MSTA proposal. This proposal would be based on commonalities in similar products developed thus far and would also recognize current technical capabilities and limitations.

It is envisaged that this new MSTA data product would provide forecasts of weather elements critical to aviation in the wider terminal area, along with longer lead times and much finer resolution in space (both the horizontal and vertical domains) and time (especially in the first couple of hours of the forecast) compared to currently available aviation MET products. While MSTA is intended primarily for busier airports and terminal areas, it is also envisaged as a significant enhancement to aviation safety in general.

The new MSTA will be produced in a digital, gridded format, initially being available as a web-based colour graphic with alerting criteria. It will provide common situational awareness for data sharing by different user groups in support of CDM, and could be supplemented by textual descriptions as appropriate and simplified/condensed to facilitate uplinks to aircraft cockpits.

At this early stage in its development, the MSTA product will focus on forecasts

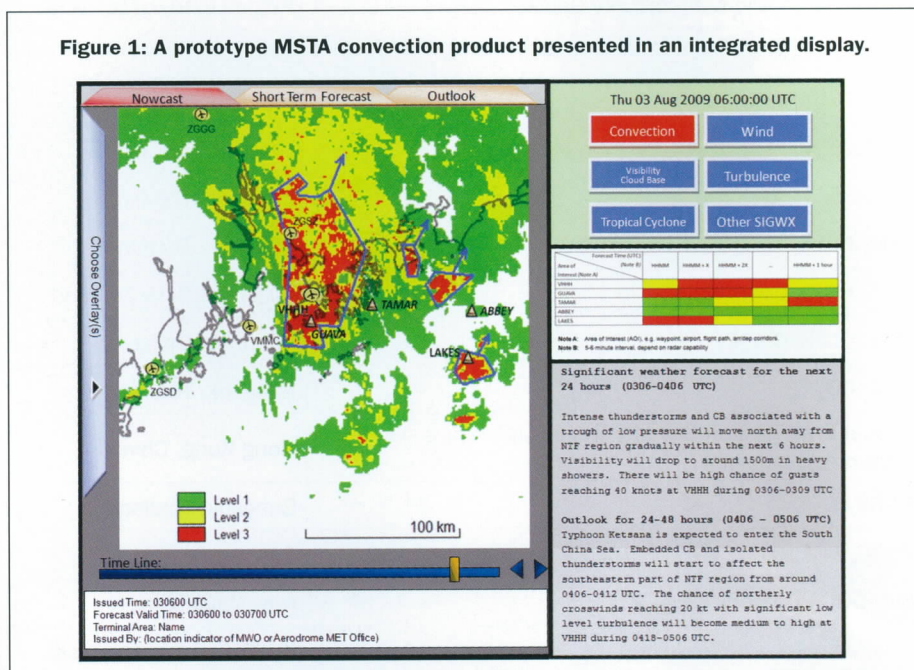
of convection, winds, low ceiling/visibility and winter weather. In addition, probability attributes of the various weather elements will be included as possible inputs for user decision-support systems. A number of core experts from various Regions are working together on MSTA development, including several from the APAC Region (Australia, Hong Kong/China and Japan).

Prototypes of convection (see Figure 1, below) and wind products have already been developed and were presented to the 14th Session of the CAeM held in Hong Kong, China in February 2010.

To facilitate further development of MSTA prototypes and input from the aviation community, a web site (<http://www.msta.weather.gov.hk/>) is currently being hosted by the Hong Kong Observatory with access available to WMO members and aviation users. In addition to the WMO expert team, a new Task Force on MSTA User Needs was also set up by the CAeM to strengthen engagement with aviation user communities, focusing on user needs and gathering feedback on the MSTA concept.

On the ICAO side, the Aerodrome Meteorological Observation and Forecast Study Group (AMOFSG) has established an ad hoc group to work closely with the WMO Task Force to coordinate inputs from the requirements perspective. Its work programme also includes consultations with the ICAO Air Traffic Management Requirements and Performance Panel (ATMRPP).

The objective of these efforts is to develop a detailed MSTA proposal, supported by ICAO and the aviation user communities, ready for endorsement by the next Conjoint ICAO MET/AIM Divisional Meeting/WMO CAeM Session (currently scheduled for 2014) and reflected in ICAO Annex 3. ■



¹The term 'New Terminal Forecast (NTF)' was initially used when the MSTA concept was first developed. It was subsequently renamed as Meteorological Services in the Terminal Area (MSTA). This was done to avoid possible misinterpretation that the new services were intended to replace the conventional 'Aerodrome Forecast (TAF)'.

²The terminal area is the portion of the airspace within the proximity of a controlled aerodrome, within which arriving and departing aircraft are managed to provide separation, assurance, appropriate arrival spacing, appropriate departure spacing and final approach sequencing.