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The winds of change

The dissemination of meteorological information is being transformed by industry advances.

The weather is a fundamental part of air traffic services. It can cause delays, affect safety and drive flight optimisation decisions.

Getting crucial meteorological information to the relevant stakeholders is fulfilled by a variety of products and services. Be it routine or special reports, a thorough assessment of the weather is likely to include visibility, cloud cover, surface wind, temperature and atmospheric pressure.

Some of the information is immediately significant, such as strong gusts or a thunderstorm in the airport vicinity. The remainder, however, can become quickly out of date.

Rectifying this to allow a pilot to modify his flight path if necessary is usually down to verbal updates from air traffic control or text message weather updates, known as SIGMET or AIRMET information, via an aircraft's ACARS (Aircraft Communication and Reporting System).

Harmonised future

But it is not only the weather patterns that change. ATM is in a period of dynamic transformation with skies getting busier and technological upgrades delivering fresh possibilities.

System-wide information management (SWIM) and the ICAO Aviation System Block Upgrades (ASBU) are driving a new era

of harmonisation and will govern how weather information is reported and exchanged in the future.

SWIM will enable the global air transport system to better manage air traffic under all meteorological conditions by facilitating common situational awareness.

The extensive sharing of information across different systems will improve decision-making in flight planning and flight execution.

Recently, EUMETNET – a collaboration between European national meteorological service providers – won an award for its 4D WeatherCube, which provides detailed weather information via a SWIM-compliant portal.

Importantly, SWIM and ASBUs signal the end of proprietary codes. ICAO is already pushing forward with this concept and has amended Annex 3 (Meteorological Service for International Air Navigation) so that some meteorological messages can be transmitted digitally using the open, XML language.

It is likely that Annex 3 will continue to be updated until XML standards cover all weather reporting.

The World Meteorological Organization (WMO), another agency of the United Nations, plays a role in ICAO's deliberations. WMO provides recommendations for the aviation meteorological service and has a formal working arrangement with ICAO.

The two organisations are assisting States by providing guidance material and online training resources that will be updated as required. Work was boosted by the 2014 ICAO Meteorology Divisional Meeting, a coming together of ICAO States and WMO members typically held once every eight or twelve years.

Peter Lechner, Chief of Meteorological Services for the Civil Aviation Authority of New Zealand asserts that there is a strong mandate for the continuing development of aviation meteorological services and systems.

"States know that this work is an essential part of maintaining the integrity and confidence needed in the international civil aviation system, the safety of flight in general, and the realisation of economic benefits," he says. "With the continuing expansion of conventional aviation and the development of new aircraft systems, the nature and supply methods of meteorological information will need to rapidly adapt to a more data-centric and global approach."

Increasing predictability

Major ANSPs are involved in their own efforts to improve weather reporting. The exchange of meteorological information through SWIM using Common Support Services – Weather (CSS-Wx) is one of many elements in the US NextGen programme, for example.

The FAA has awarded two contracts to put the weather element into place. Harris has a \$48 million contract to build CSS-Wx while Raytheon was awarded a \$77 million contract to build weather processing technology and display infrastructure for use throughout US national airspace.

Michael Espinola, Managing Director, Raytheon Air Traffic Systems notes weather is the most disruptive factor with which the FAA has to contend. "Increasing the predictability window by eight hours will allow air traffic specialists to better manage flights and make the most efficient decisions to support the traveling public and business operations," he says. "Improving the quality and accuracy of aviation weather data products will significantly improve the efficiency and safety for all stakeholders within the system."

The FAA has been working closely with European partners in support of the global harmonisation of weather reporting. In late 2015, a Weather Resilience Forum was held in Brussels that brought together the various players in the European arena.

The discussion revolved around the development of a strategy that would allow the sharing of forecasts, alerts and local action plans and thereby enhance decision-making and capacity recovery. Given that 69% of airport arrival delays were attributed to bad weather in the first two months of 2015, this is timely work.

The forum was organised by EUROCONTROL's Network Manager, which aims to facilitate improved collaboration, giving ANSPs support in developing, coordinating and executing mitigation strategies, fully in line with collaborative decision-making (CDM) processes.

The shift from a reactive response to a managed one, will be supported by the Network Manager's efforts, including tools such as the Network Resilience Tool and the massive diversion tool (MASSDIV), which will assist during weather disruptions and the recovery phase.

Pilot paper

Getting the right information to pilots – in effect the end user – will obviously be central to the various weather information-related projects. Many commercial flights still lack optimised weather documentation, being confined to black and white paper documents, verbal communication and text messaging via ACARS.

The challenge will be get the authoritative stream of weather content now available thanks to vastly improved predictive models and computing power into the hands of pilots in real time in a format that is readily understood and easily transferred to trajectory calculations.

"The present method of in-flight weather-information relay does not take advantage of any graphics, nor are satellite or radar pictures transmitted to pilots," says Captain Klaus Sievers of the International Federation of Air Line Pilots' Associations (IFALPA) ATS Committee.

"Depending on arrangements between the airline and the met office, satellite pictures may be in the briefing package. Mostly, all of this is provided in printed form, for each flight, however, at some airlines, provision in electronic form is under development."

Sievers says pilots would prefer to have information appear in easy to interpret form on the screens of their electronic flight bags. The information should be displayed in a way appropriate to its content, with SIGMET-areas being shown as overlays on navigation charts, for example. "Colourful, high resolution graphics and satellite pictures are required to help with interpretation of complex meteorological situations," he adds.

As present-day weather information is highly standardised, it can be transmitted and used on a global scale. This applies to basic data, such as the temperature and winds at an airport, or at altitude. There is also a standard set of basic charts that is standardised at ICAO level.

"Weather is global and information has to be transmitted in standard form so all participants in aviation can use it," Sievers notes. "Within the framework of ICAO, standards and concepts such as SWIM are being promoted to help achieve just that."

Better quality weather information in the hands of pilots will improve air safety and efficiency by helping pilots to avoid adverse weather.

Suppliers are stepping into a perceived void. Honeywell has released a mobile app that alerts pilots to potentially severe weather. Pilots can use their tablets to get vertical views of storm clouds, for example, or clear air turbulence predictions. Wind speed and direction is also available to help pilots choose the optimum route. ➔