**Integration of Meteorological Data in the ATM System.**

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(Concept and supporting details supplied by various ATM Community members)

**INTRODUCTION**

“The cooperation between ICAO and WMO will result in a better integration of the meteorological information into the Air Traffic Management system as a key enabler to improving aviation safety, enhancing air navigation capacity and efficiency, reducing the impact of aviation on the environment and mitigating the impact of climate change and variability on aviation.”

The purpose of this paper is to explain the advances already made in the area of collaboration and information sharing in this identified area of consideration, and to furthermore solicit increased participation in the benefits.

**GENERAL DISCUSSION**

The ATM operational concept is a vision that describes how an integrated global ATM system should operate. The concept provides States and industry with clearer objectives for the design and implementation of ATM and supporting CNS systems. The global ATM operational concept addresses what is needed to increase user flexibility and maximise operating efficiencies in order to increase system capacity and improve safety levels in the future ATM system.

The ATM community is made up of the following members:

1. Aerodrome Community;
2. Airspace Providers;
3. Airspace Users;
4. ATM Service Providers;
5. ATM Support Industry;
6. Regulatory Authorities;
7. States and
8. ICAO

There are three phases of airspace management, namely:

1. Strategic phase: airspace management taking place more than 7 days before the day of operation
2. Pre-tactical phase: airspace management taken during the 6 days before the day of operation
3. Tactical phase: airspace management taken place on the day of operation.
The responsibility for the management of air traffic flow and capacity management within South African sovereign and delegated airspace resides with the Central Airspace Management Unit (CAMU) which was established at the Johannesburg ATC Centre. The Central Airspace Management Unit officially opened in March 2001.

The unit’s responsibility includes, apart from managing the functions of the slot allocation program, the management of the flexible use of airspace (FUA), facilitating military exercises and operations, special and unusual events and any other activity which might require the use of airspace for a particular time period.

The Central Airspace Management Unit is also responsible for the re-routing of traffic, affected by adverse weather and temporary restricted or special use airspace in consultation with operators and users in a collaborative decision making (CDM) process, as well as reducing delays caused by various reasons at destination aerodromes in co-operation with the relevant ATS Units. For this to be done effectively, high-quality real time or near real time weather observations and weather forecast need to be provided by the South African Weather Service (SAWS).

The South African Weather Service (SAWS) became a public entity on 15 July 2001. It is an authoritative voice for weather and climate forecasting in South Africa and as a member of the World Meteorological Organization (WMO) it complies with international meteorological standards.

As an Aviation Meteorological Authority, SAWS is designated by the State to provide weather services to the aviation industry, marine and a range of other identified clients and to fulfil a range of international obligations of the government. It provides two distinct services, namely public good services that are funded by government, and paid-for commercial services.

ACSA introduced an Airport Management Centre (AMC) to monitor and improve the different passenger, baggage and aircraft processes across the airport. The ACSA Airport Management Centres (AMC) are unique multi-stakeholder collaborative platforms focused on the airport end to end value chain. Here the airport community strives to improve punctuality, drive process quality and instil a culture of continuous improvement for the objective of delivering a world-class customer service experience through airport operational excellence.

Currently O.R. Tambo International Airport, King Shaka International Airport and Cape Town International Airport have dedicated AMCs. The provision of meteorological data contributes to the proactive management of operations as well as design and implementation of robust procedures aimed at improving safety, recovering performance and reducing delays across our airport network.

Often the impact of weather phenomena on the ATM system is not taken into consideration at an appropriate level. This leads to delays and extra fuel burn by aircraft which could have been avoided.

Two major weather system dominates over South Africa in a year. In summer, the interior of South Africa is dominated by tropical weather systems characterized by severe thunderstorms. In winter, the mid-latitude weather system dominates over the southern parts of South Africa bringing rain and strong winds. The effect of mid-latitude weather systems can also be felt in winter over the high-veld (inland plateau) where cold temperatures in the morning often result
in prolonged periods of reduced visibility due to fog. It is believed that this weather phenomena could result in a reduction of up to 50% of airspace capacity.

Daily Airspace Plans (DAPs) and Daily Airspace Forecasts (DAFs) are distributed by CAMU to the other affected ATM community members, primarily Aerodrome and Air Operators, informing them of capacity and demand, particularly at the three coordinated airports, namely O.R. Tambo International Airport, King Shaka International Airport (KSIA) and Cape Town International Airport.

The DAP and DAF, one of CAMUs management tools, also informs the industry of constraints that are being experienced at these airports, as well as possible weather phenomenon that could be expected for the duration of the day.

The reliability of the DAP and DAF allows the aviation industry to effectively plan and mitigate any constraints that are being experienced or that are foreseen to occur, in the air or on the ground. The major benefit to the aviation industry is that delays can often be put into effect while the aircraft is on the ground instead of being airborne and burning extra fuel due to possible holding and/or diversions.

**How is Meteorological Data integrated into the ATM system on a pre-tactical level?**

The Daily Airspace Forecast is distributed a day in advance to affected ATM community members, primarily Aerodrome and Air Operators. Typically, it is distributed before 18:00Z. Along with CNS constraints and Airport demand overview, Meteorological forecasts (Thunderstorm Probability, Terminal Aerodrome Forecast and Qualitative Overview) are also published in the DAF.
How is Meteorological Data integrated into the ATM system on a tactical level?

On the day of operation, the Daily Airspace Plan is distributed to the affected ATM community. The DAP is distributed before 06:00Z. Along with CNS constraints and Airport demand overview, the following Meteorological forecasts are published in the DAP:

1. Thunderstorm Probability (see fig.2);
2. Significant weather below F180 (see fig.2);
3. Significant weather above F180 (see fig.2);
4. Terminal Aerodrome Forecast (see fig.3);
5. Advisories and warnings (see fig.3) and
6. A qualitative over for the day (see fig.4).
Figure 2: Thunderstorm probability, Significant weather below and above F180 as depicted in the DAP for 17/10/2017
Should there be a significant change in weather conditions at an aerodrome, a SPECI is distributed by CAMU to the affected ATM Community. The ATM community is also informed of any Traffic Movement Initiative (TMI) that will be implemented and the resultant reduction in capacity of the aerodrome.

Currently CAMU makes use of a system called TITAN for thunderstorm activity predictions. TITAN was designed to identify and track thunderstorms, as measured by digital weather radar. TITAN data is delivered to the AMT from the SAWS Meteorological Office. The thunderstorm predictions are the depicted on the Air Situation Display (see fig.6).

The Air Traffic Flow Specialists (ATFS), who sits at CAMU, uses the data to determine what TMI needs to be implement and also the duration of the TMI. The reliability of the data being provided and the predictions of the TITAN system allows the ATFS to implement a TMI that will ensure that demand and capacity are balanced.
It is a requirement that the CAMU Operational personnel are qualified in interpreting and integrating the information into the best route and airspace structure at the time.

CAMU and SAWS are ensuring that all weather predictions and actual events are accurately integrated into the pre, and tactical phases of the ATM System in a timely manner thereby ensuring that the aviation industry can effectively plan for their immediate and indeed, daily operations. It is intended that all historical records will be used to inform the design and development of the strategic slot allocations.

**CONCLUSION**

Previously a silo environment existed where each and every support service provider individually made their information available. This came with its cost in time and energy. Today it is intended that the system wide information sharing and availability as and when required provided into the ATM System and used by all needing community members. The name of the game is collaboration to ensure we can meet the expectations of the users as so well-articulated in the ICAO ATM Operational Document and mentioned in the introduction of this paper.

References:

1. ICAO DOC 9854
2. www.waethersa.co.za