

South Africa's Air Traffic and Navigation Services (ATNS) has recently completed the operational validation and commissioned a collaborative solution from Thales and Metron to manage system-wide capacity in South Africa. As a country poised for growth amidst the increase of tourism and sporting events for the area, South Africa made extensive preparations to allow for the increased volume of air traffic to the region, including massive upgrades to transport and accommodation infrastructure.

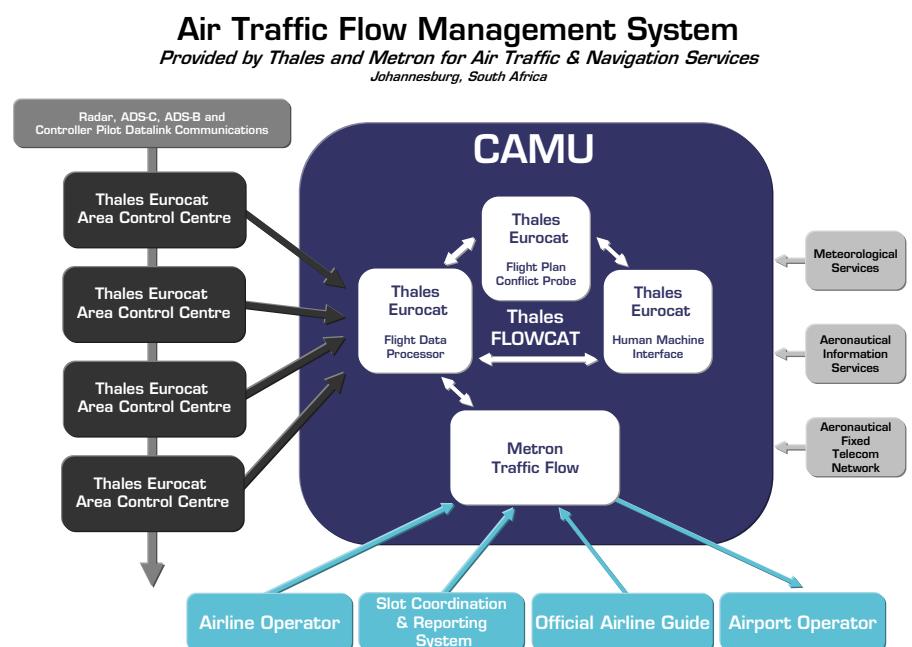
# ATFM: ATNS South Africa goes with the flow

Over the last decade, tourism and travel in South Africa has steadily increased by approximately 7% per year. With the increase in aircraft, passengers and total air traffic movements, South Africa needed to manage airspace more efficiently while enhancing safety. When South Africa was awarded the opportunity to host the 2010 Football World Cup, airspace optimisation and management became an even larger challenge. The average number of daily aircraft populating the airspace (around 2,000) is projected to double at peak periods during this global tourism event. South Africa anticipates an influx of over 400,000 visitors during this time.

Taking these factors into consideration, South Africa's Air Traffic and Navigation Services (ATNS) identified the need for growth and put a plan in place to upgrade their existing air traffic management system. ATNS looked for proven Air Traffic Flow Management (ATFM) solutions that would equip their Central Airspace Management Unit (CAMU) with technology that would balance capacity and demand dynamically, while providing a Collaborative Decision Making (CDM) capability. This would allow airlines to utilize available capacity most effectively to the maximum benefit of their business, operations and passengers.

## **A collaborative solution**

After evaluating existing air traffic flow management options, ATNS decided to customize a system that was specific



to the South African environment and in March 2007, selected Thales, with the support of Metron, to develop a complex new central system. The system deployed for ATNS is designed to use Thales tools to address the tactical environment, by tracking capacity and demand, while incorporating Metron equipment to assess and address pre-tactical conditions that will allow CAMU to maximize the use of available capacity when airspace conflicts arise.

The system is unique in that it is the first time that an ATFM system of this kind will be fully integrated into an advanced ATM system enabling auto-

mated strategic, pre-tactical and tactical ATFM to be cohesively facilitated.

## **Tactical flow management**

Thales's solution for ATNS is designed to enhance its air traffic control system to facilitate strategic, tactical flow management while also managing the flexible use of airspace and successful implementation of pre-tactical slot allocations. Thales's ATFM solution, FLOWCAT, is an innovative, new generation system which optimises the use of available airspace and airport resources by balancing load and capacity in order to reduce delays, alleviate congestion and

# ATNS SOUTH AFRICA: AIR TRAFFIC FLOW MANAGEMENT

The screenshot shows a web-based interface for air traffic flow management. On the left, there's a sidebar with 'Reports Links' and various navigation options like 'Performance', 'Flight Status Page', 'Console That Flies', 'Compliance', 'CISI Business PILOT', 'Pop Up', 'Time Out Timer', 'Duplicates & Flights', 'Unassigned Flights', 'Events', and 'Logout Flight'. The main area has tabs for 'CAMU Web Substitution Page', 'FACT slot list', and 'Suspended Flights'. It displays two tables: one for 'FACT slot list' with columns like Site, ACID, Map, Type, ACDEP, ACDES, AC REQ, AC\_TYPE, ETD, ETA, CBT, MET, ELTOT, ELLTOT, and ELLMET, and another for 'Suspended Flights List' with similar columns. Both tables have rows of flight information.

**CAMU Web Subs:** Traffic Flow Web CDM substitutions page showing a slot swap between flights. With the web-based interface, airlines can optimize their use of available capacity and all airport stakeholders have up-to-the-second shared situational awareness and scheduling.

## FLOWCAT: TRACKING CAPACITY AND DEMAND

FLOWCAT Capabilities include:

### Capacity load balancing

Working with the ATC system to monitor the airspace, the FLOWCAT system is designed to provide an alert when its "comprehensive traffic load prediction" detects an imbalance between demand and capacity in any airspace, sectors or consolidated control positions. The alert triggers resectorisation and helps optimally balance the controller's workload.

The system is also able to predict and smooth temporary imbalances in controllers' traffic related workload by using sophisticated charts and multi-flight 'what if' modelling to test complex scenarios. This modelling allows controllers to simulate flight rerouting and changes to airspaces sectorisation plans, strategically, pre-tactical or tactically before providing a recommendation or taking action.

### Weather avoidance

When severe weather occurs, FLOWCAT is able to interface with external systems for the reception and display of real-time and predicted thunderstorm data and imagery. Flow-constrained areas like thunderstorms are automatically tracked by the system and continually updated as the thunderstorm activity progresses.

The system also allows controllers to manually control the system to create flow constrained areas, such as simulated thunderstorms or congestion. Controllers can then use this information to try multiple reroute scenarios to determine the safest, most economical or most environmentally friendly solution to avoid the conflict.

### Flexible airspace management

Strategic airspace modelling is also enabled by FLOWCAT, allowing controllers to use simulated traffic to model the effects of long-term changes to airspace structure (routes, sectors, etc.) This strategic modelling tool can also be used to enhance Civil-Military coordination concepts by testing and requesting the online reservation or release of airspace both pre-tactically and tactically at short notice to match fluctuating peak demand.

### Additional ATFM capabilities

FLOWCAT allows controllers to view the real world route and the proposed "what if" route of an aircraft simultaneously, as well as examine time estimates for alternate routes to determine the least cost deviation for airline operators. The system also has the capability to store ATFCM solutions of interest to a playbook for later online recall and reuse or for detailed offline analysis and procedure formulation (such as constructing a database of weather deviation routes).

For South Africa's CAMU, the FLOWCAT system provides a seamless interface to Metron's solution for the optimisation of airport arrival and departure slots for flights, considering factors such as enroute delays, adverse weather, dynamic runway capacities and runway closures. The Thales FLOWCAT solution also integrates Metron's collaborative decision making tools, ATC systems and airline/airport operators, providing ATNS with the ability to integrate all airspace & airport users in the ATFM process.

streamline the workload of air traffic controllers. The FLOWCAT solution provided for ATNS uses Thales's EUROCAT air traffic control (ATC) system to track the capacity and demand on the airspace and incorporates Metron's slot-allocation and collaborative decision making capabilities to improve safety and enable economic and environmental benefits for the South African airspace.

The FLOWCAT system works by fusing the data from several ATC systems into a consolidated national or sub-regional view of current traffic, airspace utilization, forecast traffic and route planning to a consolidated traffic picture. This consolidated traffic picture is complemented by weather information and airspace and airport restriction data that allows operators to assess possible congestion or disruptive events affecting the network and establish appropriate flow management measures to alleviate problems.

### Pre-tactical flow management

CAMU distinguishes clearly between Air Traffic Control (ATC) and Air Traffic Flow Management (ATFM). Quite separate from ATC, where safe air navigation and traffic separation are the primary objectives, the objectives of ATNS's ATFM system is to provide services that are focused on cooperative planning and delay minimization.

According to ATNS, the operational benefits of ATFM systems are to provide airspace users and air traffic controllers with enhanced services:

- The centralized management and allocation of available capacity.
- Forward notice of abnormal capacity situations (e.g. extreme weather conditions).
- Tools to implement delay programs that limit cost implications to airspace users due to abnormal capacity situations.
- Relieve air traffic controllers from a significant part of the work load and subsequently reduce stress levels during control operations.
- Provide to Aircraft Operators timely and accurate information on any event affecting the flow of air traffic and capacity of the airspace, and to propose effective solutions to minimize delays or to re-route traffic.
- Improve capacity, sector productivity and support costs.
- Improve information distribution and co-ordination with the ATC system and other users, improving 'system wide' decision making.
- Expedite airport arrival, departure, taxiway and aircraft turnaround processes.
- Integrate all airspace users in ATM processes.

- Optimise flight profiles and routes during adverse weather conditions affecting airspace operations.

## **Metron Traffic Flow**

Metron Aviation's system, Metron Traffic Flow, provides tools for strategic planning, as well as pre-tactical and tactical management of traffic flows within the available capacity of the Air Traffic Management (ATM) system. The system provides CAMU with comprehensive ATFM capabilities to model and implement all traffic flow initiatives for both aerodrome/airport and airspace volumes in South Africa.

Traffic flow initiatives are used to dynamically balance air traffic demand with capacity to keep traffic flowing as smoothly and efficiently as possible. The system interfaces with ATM production systems, including Thales' airspace monitoring tool, EUROCAT and other software systems, through a scalable, event-driven data gateway.

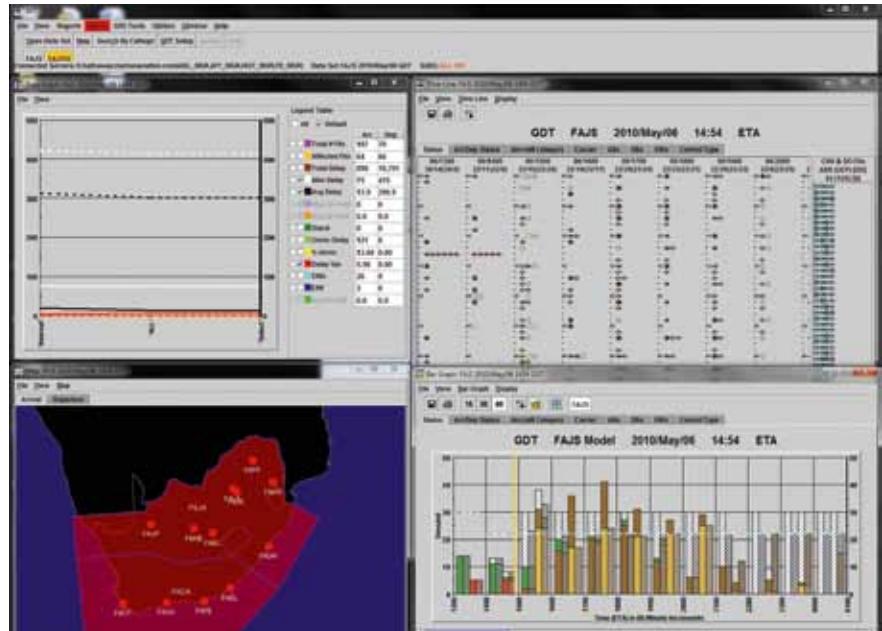
CDM features, considered to be one of the most important tools for optimizing capacity, safety and efficiency, maximizes throughput for all users and provides a basis for more predictable scheduling. The web-based CDM application gives the entire aviation community ATFM capabilities with automated support for slot allocation, based on airport arrival/departure capacity and airspace constraints, along with a multitude of optimisation functionalities. Importantly, airlines have the ability to manage flights, fly preferred trajectories and manage available capacity for the maximum benefit of their passengers and their airline operations.

"The slot management component of our system was able to help us redefine the way we do business," said Patrick Dlamini, Chief Executive Officer, ATNS.

The Metron Aviation system provides aircraft operators, ATNS personnel, CAMU traffic flow managers, ATC tower personnel and airport personnel with true shared situational awareness. By utilizing powerful analysis and reporting features, ATNS can continuously improve operational performance and strategic planning.

Additional Metron Traffic Flow features enable users to view current images of air traffic demand at selected airports and airspaces. When conditions such as weather, controller staffing, equipment outage or spikes in air traffic demand affect a resource's capacity, easy-to-understand visuals enable users to monitor the impact of those conditions.

Using Metron Traffic Flow, ANSP users can identify a capacity/demand imbalance, model the impact of alter-



**Metron Traffic Flow OR Tambo International Airport, Johannesburg (FAJS). Modelled Programme - Traffic Flow Client modelling a Traffic Management Initiative at FAJ**

native Traffic Management Initiatives (TMI), coordinate TMIs with CDM participants and determine which alternatives yield optimal solutions to address the capacity/demand imbalance. Metron Traffic Flow continually updates the predicted demand so that ANSP users can monitor the operational conditions and modify the TMI to adapt to the changing environment.

## **Working together for success**

The integrated system provide to ATNS has collaborative decision making capabilities that will allow all factors – including air traffic control, aircraft operators, military aviation and airport operators – to be considered by CAMU

before an airspace plan is finalized. The system incorporate tools from both Thales and Metron to create a cohesive solution that will optimise flight plans, taking into account weather, restrictions, ATC and airport capacities in real-time (tactical mode) but also up to seven days in advance (strategic mode).

Given the consolidated process provided by the Thales and Metron technology, South African airspace and airport facilities are better able to calculate aircraft trajectories and accommodate the aircraft operator's requirements, and are thus, better equipped to handle the volume of traffic and other circumstances surrounding the world's premier football tournament. ■



**ATNS Traffic Flow Managers utilizing Metron Traffic Flow at CAMU.**

**ATNS is responsible for Air Traffic Management in approximately 10% of the global airspace. Operating at 20 aerodromes within the country, ATNS manages about 685,000 arrival and departure movements per year.**

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