International Civil Aviation Organization

Ninth Meeting of the ICAO Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/9)

Bangkok, Thailand, 22 – 26 April 2019

Agenda Item 4: Review of Current ATFM/CDM Operations and Problem Areas

ATFM PROGRESS - NEW ZEALAND

(Presented by New Zealand/Airways)

SUMMARY

AN update in ATFM work by Airways over the last year. Broken into tactical work focused around the new ATM system and research into future concepts with other ANSPs

1. INTRODUCTION

1.1 Airways is going through a major operational and technical restructure built around the companies 2015 Operational Strategy. Key to the strategy is the use of technology to support controller decision making and deliver safety and efficiency improvements. ATFM technology and techniques are core to such improvements.

1.2 The core ATFM technology change is the implementation of a new tactical flow management tool – Time Based Flow Management (TBFM). This tool will be the primary reference for airborne flow management. Coincidently Airways is reviewing the procedures used in the implementation of tactical flow to correct deficiencies in the current methodology.

1.3 Airways continues to work with other ANSPs to research tactical or pre-tactical ATFM techniques such as Long Range-ATFM (LR-ATFM) and the use of Ground Delay Program (GDP) schedule times to integrate to cross-border flights into domestic airborne flow sequences.

2. DISCUSSION

Tactical ATFM

2.1 Airways currently provides tactical ATFM via an Arrival Manager (AMAN) for flights arriving at Auckland (NZAA). This service has been in place for approximately 5 years.

2.2 AMAN generates Required Times of Arrival (RTA) for TMA Meter Fixes (MF) based on a schedule calculated at the threshold of the Runway in use. RTA are passed to the aircraft at approximately 40 minutes prior to the ETA and the crew manage the aircraft's compliance. Controllers monitor compliance and intercede as required. The system is linked to CAM - the domestic GDP system, so that Short Sector Flights (SSF), those that depart within the RTA passing horizon of AMAN, can be factored into the schedule.

2.3 AMAN is a proven arrival management system and is technically capable and reliable. The system provides a single and complete picture of the arrival schedule for all sectors implementing flow and improves workload planning. However, the New Zealand approach has shown up some deficiencies that can manifest in airborne tactical ATFM application, namely:

- GDP lag – Because arrival rates are set only at the current time, rapid changes associated with changes in conditions result in over/under pressure effects in the airborne flow. This is most obvious for sudden changes in condition e.g. frontal weather or fog.

- Using GDP Calculated Take Off Time (CTOT) as the basis of calculating AMAN's sequence time for SSFs. CTOT change notification practices and the degree of compliance variance (allowable and not) impacts the airborne sequence detrimentally

- Not using a frozen sequence at the RTA passing point – to accommodate variability is routing and aircraft performance. This has left AMAN 'guessing' when events change and a resulting unstable sequence

- RTA calculation aimed at a mid-descent MF and aircraft managed compliance – Airline/aircrew and aircraft flight Management Systems use various methods of achieving compliance while AMAN calculates based on one – action taken to comply from when the RTA is passed. Variation leads to sequence instability and inconsistent 'product' delivered to the TMA (particularly around uniformity of speed entering the TMA)

2.4 The Operational Strategy gave an opportunity to review tactical ATFM. The decision was made when selecting the new ATM system to obtain a new arrival management system also - TBFM. Alongside this, review of ATFM process has been ongoing. The new system/process is expected to provide several major improvements:

- Extension of automated arrival management to cover the 3 main airports of New Zealand – Auckland (NZAA), Wellington (NZWN) and Christchurch (NZCH)

- The ability to set future Arrival rates/Spacing criteria. This links the GDP based hourly arrival rate with TBFM spacing to improve syncronisation between the systems and reduce lag. The system will also consider special consideration arrivals e.g. Super Heavy and operational conditions that affect spacing e.g. low cloud and protection of the missed approach

- 'Frozen' sequence management including the application of asymmetric freezing. The sequence will be 'set' at a VSP distance and actively managed. Asymmetric freezing will allow the sequence time for one arrival flow to be set earlier (e.g. Jets) than another flow that affects it (e.g. turboprops departing from locations within or around the freeze horizon for the jet sequence)

- Separation of GDP function from airborne sequencing. Once within the managed sequence horizon, SSF departures require greater accuracy in departure time compliance than can be afforded by the GDP system. Tower controllers handling SSFs will use their Electronic Flight Strip system to automatically co-ordinate a Scheduled Departure Time (SDT) with TBFM. Compliance with this time will then be actively monitored and managed

- Ceasing the use of aircraft/crew managed TMA boundary focused RTAs compliance. Instead controller managed compliance will be used with the assistance of TBFM generated delay/speed advisories displayed on the ATM system datablock. In the future, Aircraft/Air Crew managed RTA compliance will be considered for MF beyond the TMA boundary (i.e. cruise segments) using applications such as extended metering or Long Range-ATFM (as discussed below) due to the more uniform application of compliance in this environment

- On-Screen representation of TBFM's sequence within the TMA via the presentation of Terminal Sequencing And Spacing (TSAS) position indicators to assist with sequence order and determination of threshold spacing

2.5 Integration and technical proving of TBFM/SkyLine-X ATM system and CAM (GDP) is taking place now with a proposed system implementation timeframe of post-July 2020.

Research

2.6 Airways continues to research ATFM concepts; though at a reduced rate given the priority of the ATM project. Research is broken into 2 main areas:

- Long Range ATFM (LR-ATFM)
- Cross-Tasman flow

LR-ATFM

2.7 LR-ATFM continues on from the work done last year with CAAS and NATS and the initial trial conducted in the New Zealand Oceanic and Singapore FIRs around cruise focused delay capacity/RTO achievement (See ATFMSG/8 New Delhi − IP/06).

2.8 The three ANSPs are continuing research into the concept. CAAS and NATS are working on trials into Changi and Heathrow through 2019. Airways will provide support in analysing and formalizing trial data and is proposing to coordinate potential participation by the NZ national carrier in the Heathrow trial and collection of resulting aircrew/aircraft focused metrics.

Cross-Tasman flow

2.9 Cross-Tasman flow is a concept originating from discussions with Air Services Australia (AsA) to consider flights between the two countries and how to more effectively include them in each country's tactical ATFM process.

2.10 Both ANSPs identified international traffic as an increasing percentage of total traffic but one that is currently not included in GDP constraint calculations. The exclusion also results in the application of any delay for internationals at a relatively late part of the flight profile (approx. 40 min before ETA) – leaving the preceding part of the flight profile as a missed opportunity for constrain management.

2.11 The Tasman Sea, with a crossing time of between 2.5 and 4 hours, has increasing traffic between the main city-pairs but is currently constrained by limited surveillance and communication (VHF). These limitations impede application of surveillance based automated flow e.g. AMAN/TBFM. Alternatives methods are thus being considered focused primarily on using and appropriate GDP or scheduling system compliance time and calculating it to an accuracy that makes it useable for a later surveillance-based flow.

2.12 Initially CTOT was considered as a focus point for compliance time but was deferred given the potential for other operational factors inhibiting a flight's ability to comply (e.g. ADEP domestic departure congestion) or a flight's compliance action adversely impacting ADEP operations (e.g. gate or hardstand occupancy while absorbing delay). Instead CTA at ADES or CTO at a TMA MF are being considered. Arrival timeframe focus gives several advantages:

- Mitigation of departure point factors that could affect compliance and facilitating airline focused performance constraints e.g. On Time Departure Performance

- Gives crew flexibility in method and time for compliance action e.g. on ground or airborne techniques

- Can be factored into airline On Time Arrival Performance needs

- Enables adjustment of time/flow measures as the tactical situation evolves

2.13 New Zealand's application of the concept envisages using our GDP system's future arrival rate capability to factor schedule and weather conditions into a managed arrival schedule of international traffic (CTA based), around which domestic traffic can be scheduled. Key flight events will be feed through our ATM system to update flight trajectories and resulting Estimated Elapsed Time (EET). The EET will then be applied to the GDP function to update the CTA. Either datalink or re-transmission via the airline AOC would be used to pass on the CTA for crew actioning. Ideally this would be done before departure to allow crew determination of the best method of compliance.

2.14 Flight events being considered for updating and achieving the most reliable and accurate CTA or CTO are:

- Target Off Blocks Time (TOBT) – Nominally via ACDM Flight Update Message (FUM)

- Target Start and Taxi time (TSAT) – Nominally via ACDM Flight Update Message (FUM)

- Actual Start and Taxi (ASAT) – Nominally via ACDM Flight Update Message (FUM)

- Scheduled Time of Departure (STD) – via ATM

- Departure Message (DEP) – via AFTN/AMHS

- FIR Boundary time – via ATM

2.15 The concept is still just that and requires further work around items such as:

- SID/STAR adaptation for trajectory accuracy

- ADEP specific taxi time factoring

- Identification of method for flight event extraction and transmission to adjacent system

- Identification of degree of compliance and reasons for non-compliance is also required so subsequent tactical constrain (TMA speed/vectors/holding) is fairly and accurately applied. This would also need to consider the unique operational constraints that affect international flights such as divert planning and fuel load

2.16 Both ANSPs have busy ATM system agendas so work is progressing as time allows. Confirming message sets and methods of communication are the current items of discussion. Testing of some of these message sets and integration of them into respective systems are the planned next steps.

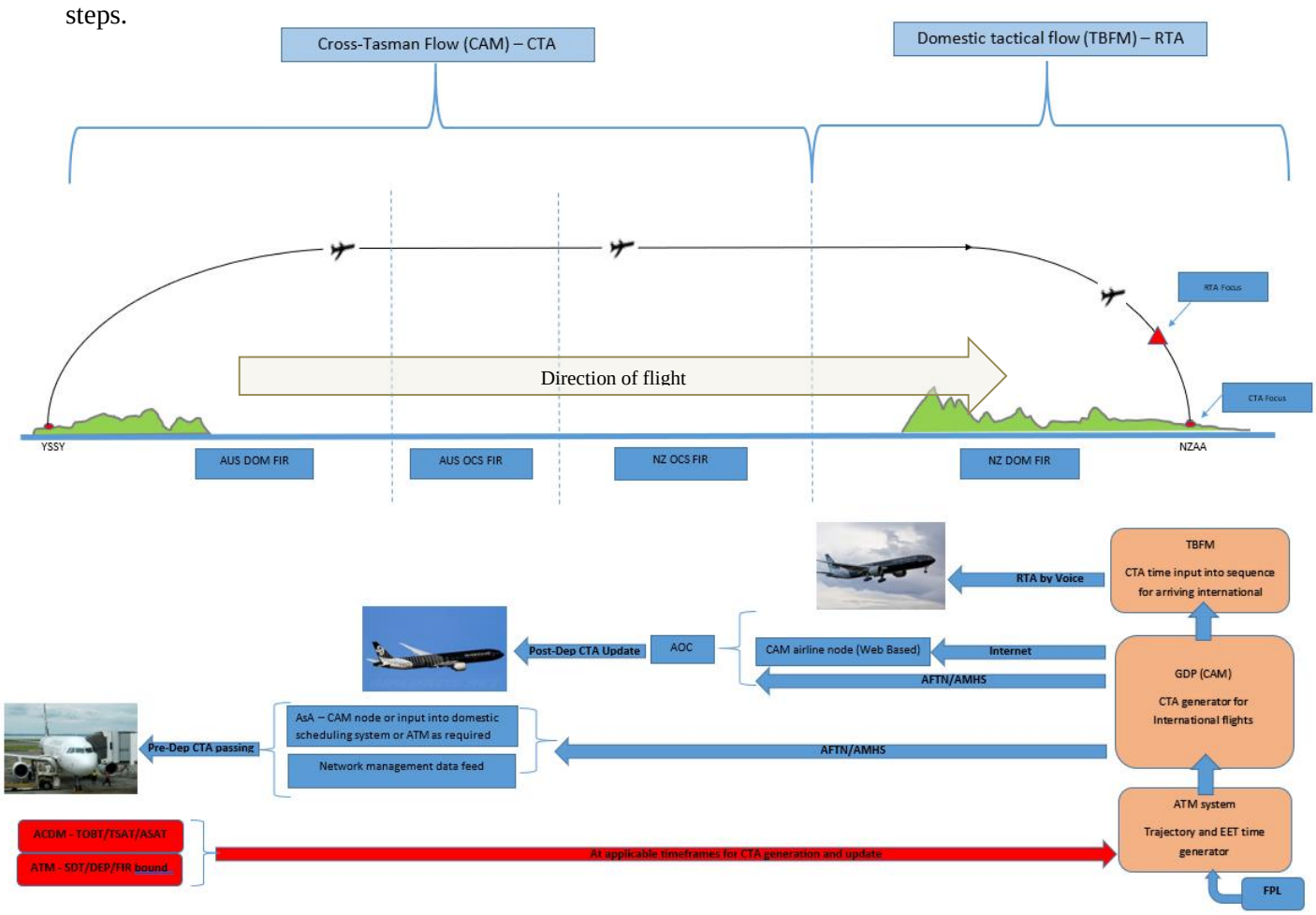

Fig 1: Cross-Tasman Flow – Australia to NZ Concept

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matters as appropriate.

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