International Civil Aviation Organization

Third Meeting of the Asia/Pacific Air Traffic Management Automation System Task Force (APAC ATMAS TF/3)

Video Tele-Conference, 8– 10 June 2022

Agenda Item 4: ATM Automation System Implementation by States

4.1 ATMAS Implementation Status and Experience

Airways design and implementation of its new Air traffic Management System – SkyLine-X

(Presented by New Zealand)

SUMMARY

This paper presents an overview implementation history of the new Air Traffic Management System (ATMS) that Airways will be introducing into operation in 2023.The paper will also highlight lessons learnt from the 6-year project.

1. INTRODUCTION

1.1. Airways is the ANSP for New Zealand. It operates two ATMS, one Domestic (Skyline) and one Oceanic (Oceanic Control System – OCS).

1.2. In 2015, Airways created an Operational Strategy through to 2028. The Strategy's core concept was a shift from air traffic control (ATC) to air traffic management (ATM). Replacement of the current ATM systems with a system that could provide functionality to support the concept was critical

1.3. This paper will overview the system selection process, development, and the current state of implementation. Lessons learnt are also provided.

2. DISCUSSION

High level needs

2.1. The current OCS and Skyline systems have been in operation for over 20 years. Airways operates an in-house approach to system maintenance and development that has provided safe and reliable systems while supporting regulatory, technology and operational enhancements. The approach suits an ANSP of Airways size allowing iterative development that maintains up-to-date systems at reasonable cost independent of traditional system lifecycles.

2.2. With the scope of change envisaged within Global, Regional and National ATM plans and the rapid emergence of new technologies, Airways initiated a review of its overall Operational Strategy

in 2014-15. The Strategy's primary concept was a shift from ATC to ATM via core deliverables. These were:

Common processes and complementary system support tools – Sectors had retained a high degree of operational autonomy. This impacted service levels, training, and system development. Airways saw an opportunity to facilitate a 'control by exception' environment by standardising Oceanic/Enroute and Approach services and applying appropriate ATM support tools.

Enhanced contingency – With almost all surveillance services in Christchurch, any loss of the Centre would always result in a degree of service suspension. The 2012 earthquake highlighted this and maintaining the exposure was considered unacceptable. Continuous service was desired.

Enhanced resilience - Technical failures, the complexity of initiating alternatives, and the concept of continuous service drove the need for a system with automated resilience that could self-identify faults, quarantine corrupted data and logically failover.

Safety enhancements - Resulting from the core deliverables.

One Centre/Two Locations - A single ATMS distributed and operated across two Centres (Christchurch and Auckland). System capability, connectivity, the use of common ratings[1] and splitting staff between Centres, would mean each Centre providing immediate contingency and systems redundancy for the other, while giving resource flexibility between them.

2.3. Important to note is the scale of change the Strategy envisaged (See appendix A). Implementation was 3-Phased with completion expected in 2028. This approach relied on having an ATMS, including its enhanced functionality, ready by early 2020 to support operational transition to the new Centres in 2021 and subsequent Phases of implementation.

Requirements definition and system selection

2.4. Requirements definition and system selection was a 14-month process starting with a Registration Of Interest (ROI) in early 2016. The ROI described Airways current operations, Ops Strategy high-level concepts/deliverables, and a high-level program plan through to 2028.

2.5. The ROI served Airways in several ways:

- Testing the validity of the Operational Strategy with vendors
- Garnering additional information on identified/new functional needs
- Obtaining detail on a vendors approach to our program plan
- Budget formulation by requesting indicative costings

2.6. The ROI also served as initial selection mechanism to reduce the pool of eligible vendors. In this regard, the ROI was effective in saving both unsuccessful vendors and Airways considerable time and effort on the phases that followed.

2.7. Following the ROI came the RFP (Request For Proposal). An RFP team was formed which included Operational/Technical SMEs, Senior Management, Training, Business and Legal representatives. The team's composition reflected the need for the RFP to incorporate all aspects of the business. Particularly important were commercial and development factors; with the ability

[1] Common Rating – A single rating for an approach/enroute/oceanic controller that would allow them to operate at any of the applicable sectors in the system. A common rated controller could operate on multiple common Sectors in a single shift and Sectors could be transferred within or across Centres to support resourcing.

to partner with providers who could work with the allocated budget, share development, and then leverage the system for revenue generation.

2.8. Core to the RFP was assessment. Starting with response documentation, assessment was supplemented by demonstrations in New Zealand that allowed vendors to demonstrate system function and assessors to confirm requirements more accurately. Subsequent team moderation of assessments facilitated syncronised scoring or the need for clarification. At the conclusion of assessment, the top two vendors were advised they would continue to the final assessment phase.

2.9. Final assessment included site visits to vendors and the ANSPs that used their systems. Vendor site visits included further system familiarisation, understanding development process and review of the program plan, partnership concepts, and budget. ANSP visits included seeing systems in operation – including future concepts and assessment of vendor support.

2.10. Concurrent with the RFP, Airways assessed enhancing its existing ATMS in-house. Assessment concluded this would be both too costly and too long, so the option was not pursued.

2.11. At the conclusion of the RFP phase in March 2017, Leidos SkyLine-X ATMS was selected

Development

2.12. Initial effort focused on identifying work packages and their allocation between Airways and Leidos. Specifically:

- Baseline code and enhancement integration including TBFM, MTCD and CPDLC
- ATFM – TBFM/TSAS application and integration into existing ATFM function
- HMI development – To support stripless operations and new functional tools
- Dynamic sectorisation – Essential for sharing Sectors between Centres, this included transfers of control and handover process
- OCS integration – A considerable task given the distinct applications and systems support

2.13. Concurrently, ATS Operations commenced investigation work on Common TMA/Common En-route concepts that were core to the One Centre Two Locations concept – particularly:

- Standardisation of HMI
- Use of TBFM/TSAS and MTCD
- Stripless operations
- Dynamic Sectorisation across Centres

2.14. As work progressed, the complexities inherent in such significant changes became apparent and pressure began to mount on the planned go-live timeframes. A review of the project deliverables and timeframes was initiated in 2019. With a desire to keep operational go-live as close to 2021 as possible, the review included Operational Strategy deliverables. The results of this extensive review were about to come into effect when the program was further impacted by the beginning of the COVID-19 pandemic in 2020.

2.15. Airways initial response to the pandemic was to prioritise the assurance of services. All program work was initially suspended and then reviewed and categorised to either continue, delay, or discontinue the work. The ATM program was continued, given the level of investment and the need to support the operational developement once the pandemic subsided.

2.16. The pandemic and its financial impact brought into stark reality the challenges the program now faced. To fit with constrained budgets, interruption due lockdowns and the existing program

issues, significant effort was invested in prioritising and re-sizing Phase 1 deliverables (See appendix A).

2.17. Along with the re-sizing, a revised roadmap for development was devised:
- Phase 1 – Go Live – New Centres with new ATMS and VCS but existing operations
- Phase 2 – Deferred functionality for enhanced domestic services and new technologies
- Phase 3 – Deferred Oceanic/Domestic integration and remaining deferred new technologies

2.18. Post-go-live, each deferred function will be subject to a cost/benefit analysis to confirm need and development sizing to ensure greater effectiveness for scheduling, budgeting and operational syncronisation. Critical to ATMS developement, the ATM project team has produced Concept of Operations (Con Ops) documents for each major piece of new ATM functionality.

Implementation

2.19. Post review Phase 1 go-live was late 2022 but, due continued COVID impact, this slid a further 6 months to the end of 1st quarter of 2023. Go-live will be a single step transfer of domestic operations from the current facilities/ATMS to the new system and conducted at night during low traffic.

2.20. Primary tasks for Project and Operational teams through to Transition are:
- Adaptation/build testing (including Regression ID and solutioning)
- Training development/delivery
- Procedure development
- Contingency configuration/procedures
- Transition planning
- Safety case and QA compliance monitoring

3. Lessons Learnt

3.1. Every ATM program is unique in what it is trying to achieve and for environment its being applied. For the New Zealand program here are some key learnings:

Validation

3.2. Operational Strategies are high-level concepts documents designed to give direction but, by themselves, lack detail to support concept validation or requirements writing. Airways realised that lack of detail at program inception contributed to some of the program issues prior to COVID. In re-setting the program in 2020 Airways has defined Con Ops for each major concept to facilitate validation and act as the connection between Strategy and implementation.

Lessons learnt:
- Investigation of concept functionality/application must be thorough enough for validation
- Concepts have wide impact so validators must be from across the business and be those impacted by *and* that impact resulting design, developement and implementation
- Concepts of Operation should be created for any major new piece of functionality, particularly if supporting a coincidental Operational Strategy. Con Ops allows robust validation, facilitate detailed requirements discovery and support effective implementation
- Use ROI/Vendor/ANSP visits to further validate concepts and achievability. Vendors and ANSPs are good sources of experience for what went right and wrong

- Effort spent ‘up front’ on activities as described above should lead to effective RFP and program execution

Recognition of scope

3.3. The time spent re-assessing deliverables with greater consideration of priority and delivery capacity in 2019 and 2020 and was effective in setting a more dependable delivery schedule.

Lessons learnt:

- No amount of time spent before program execution assessing deliverable scope and achievability is wasted. For an ATM program, this should be a separate phase at the completion of the Strategy/Con Ops validation, so the right level of detail is available to support time and resource estimations and identify risks
- Recognise what are ‘foundation deliverables’. Foundation deliverables will be the deliverables that all other concept deliverables are dependent on and do not change even if schedules and budgets do.

Unforecast change

3.4. Despite all the effort in project reset, the arrival and impact of COVID could not be forecast. Fortunately, both Airways and key vendors already had infrastructure in place to support remote working and ongoing systems development. On-going review of workstreams as the pandemic progressed led to further priority and schedule review.

Lessons learnt:

- Despite best plans - expect unforecast change. The average ATM program runs for at least 5 years – there will always be something significant that impacts delivery
- Significant events tend to have roll-on effects – expect iterations
- Design nimble monitoring and review processes that allow quick response and revision due to significant change
- Create work environments that can accommodate impacts and ensure vendors have the same capability

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate

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Appendix A

Operational Strategy 2015 Deliverables for Phase 1	Revised Deliverables for Phase 1 post 2020 re-set
Operations	Operations
• Common TMA	• Existing operational configuration
• Surveillance Services split across 2 Centres	• Enhanced contingency to support operational configuration
• Relocation of staff across 2 surveillance locations	• Minimalisation of strip-based functionality
• Enhanced contingency capability	
• Stripless operations	
Facilities	Facilities
• 2 new Centres with replication of all ATS operational positions at each	• 2 new Centres with replication of all ATS operational positions at each
• Each Centre as contingency for the other	• Network connectivity to support 1 Centre/2 Locations concept
• Network connectivity to support 1 Centre/2 Locations concept	• 2 new Local contingency locations for each Centre providing continuation of service
ATM	ATM
• Dynamic sectorisation (for 2 Centre operations and contingency)	• Dynamic sectorisation – to support new contingency
• Advanced HMI designed to support progression from ATC to ATM management	• Advanced HMI designed to support progression from ATC to ATM management
• MTCD	• Enhanced trajectory
• New and extended ATFM capability	• Enhanced EFS functionality to existing Tower users
• TMA sequencing tools	• Automated Flight following (for SAR)
• Enhanced Conformance monitoring	• Enhanced surveillance inputs and degradation function
• Trajectory enhancement to support MTCD, ATFM and conformance functionality	• Failover functionality – 'Poison Pill' capturing and processor failure impact
• Enhanced Electronic Flight Strip (EFS) functionality including nationwide roll-out	• Trajectory enhancement to support MTCD and TBFM
• Domestic CPDLC	
• Integration of OCS into a single ATM platform	
• Automated Flight following (for SAR)	
• Enhanced surveillance inputs and degradation function	
• Failover functionality – 'Poison Pill' capturing and processor failure impact	
VCS	VCS
• New primary and standby systems	• New primary and standby systems
• Linking of VCS role allocation with ATM dynamic sectorisation	• Linking of VCS role allocation with ATM dynamic sectorisation
New Technologies	
• A-SMGCS – enhancement of existing capability	
• Remote Towers	
	Deferred to Phase 2/3
	• Surveillance Services split across 2 Centres
	• Relocation of staff across 2 surveillance locations
	• Common TMA
	• Combined Enroute/Oceanic control service
	• Fully Stripless operations
	• MTCD
	• Enhanced and extended ATFM capability (TBFM)
	• TMA sequencing support tools (TSAS)
	• Domestic CPDLC
	• Integration of Oceanic Control into a single ATM platform
	• Enhance EFS rollout to all towers
	• Enhance Conformance monitoring
	• A-SMGCS – enhancement of existing capability
	• Remote Towers