

CURRENT SITUATION

The IATA ATFM Study – Benefits of ATFM.

The IATA ATFM Study

NEW PARAGRAPHS 6.1 to 6.14 include statements of benefits of ATFM

6.1 This analysis of the current state of ATFM implementation and capability in the Asia/Pacific Region is extracted from the IATA *Asia-Pacific (APAC) Regional Air Traffic Flow Management – Phase 1 Final Report* (21 November 2014). The study was commissioned to establish a baseline view of ATFM capability and interoperability, and to develop recommendations for a cohesive and flexible approach for achieving integrated and coordinated ATFM capabilities within the Asia/Pacific Region.

The Benefits of Networked, Cross-Border ATFM

6.2 An interoperable network approach for the region will result in system-wide Demand Capacity Balancing. This approach enhances the safety and optimizes the efficiency of airports and available airspace.

6.3 As the Asia-Pacific region, the world’s largest market for air transport, continues to grow, it becomes essential to optimize the use of available capacity through ATFM. In 2013, the Asia/Southwest Pacific Region was the fastest growing region by passengers in the world (**Table X**). The region’s passenger growth was 8.5%. Individual countries with notable passenger growth include: China (11.8%), Indonesia (20.4%), and Thailand (16.4%).

6.4	Passenger Volume	Annual %
Indonesia	92,534,902	20.4
Thailand	62,831,288	16.4
China	404,174,939	11.8
Singapore	42,438,276	7.6
Malaysia	51,821,210	7.5
Japan	148,450,196	4.9
India	97,677,318	4.4
Hong Kong	44,399,060	3.9
Korea, Republic of	62,166,163	1.2
Australia	81,983,309	0.6
Asia/Southwest Pacific	1,075,572,893	8.5

Table 1: Top Asia/Pacific Passenger Countries 2013

6.5 Throughout the Asia Pacific region, individual States’ ATM and ATFM equipment, services, procedures, airspace design, communications, and resources have a wide disparity in capabilities. These limitations often result in a less efficient operational environment. Prevalent throughout the study region are excessive miles-in-trail restrictions (MITs), fuel burn, carbon dioxide (CO₂) emissions, aircraft departure holding on the ground, airborne holding, and delays.

6.6 Weather and other system constraints increase schedule buffer, delayed flights,

cancellations, and missed connections. Flight delays add costs to airlines, passengers, airport operators, and States. Aviation inefficiencies have trickle-down impacts on other sectors due to lost time and productivity. As traffic demand increases, delays will also increase if resource capacity is not increased.

6.7 An interoperable ATFM network of States will have potential benefits to airlines, passengers, airport operators, and States.

6.8 The IATA ATFM Study listed the substantial benefits of implementation of an interoperable cross-border ATFM network. Key benefits were in the domains of safety, and operating efficiency.

Safety Benefits

6.9 Standard ATM practices of separating and sequencing traffic by vectors, speed control, and airborne holding are carried out during un-metered peaks of traffic. These practices are proven safe and effective. However, during these peak periods, the workload on ATC and pilots can increase significantly, thereby reducing the margin for error. Through ATFM, a constant manageable flow of traffic is achieved, resulting in a more manageable workload and hence, a safer operation. A network approach to ATFM reduces sector/system saturation, increases efficiency and enhances safety.

6.10 Often with implementation of ATFM, States enhance their ability for severe weather detection. This earlier detection of weather is shared with airline operators and ANSPs, increasing situational awareness. In addition this is taken into account when determining capacity of resources, resulting in the correct ATFM measure being implemented, which can have a direct impact on safety.

6.11 Communication networks will improve between States with ATFM implementation so as to accommodate CDM. A resultant benefit will be reduced coordination errors, leading to enhanced safety.

Economic Benefits

6.12 Air traffic demand in Asia Pacific is expected to grow significantly in the next five to ten years. While the growth is predicted to increase by approximately 5.5% - 6% annually, such an increase in demand will eventually lead to unsustainable levels of congestion and delay within the region's airport and airspace operating environments, until capacity enhancements are operationally available. **Table X** shows the expected fuel savings benefit expected from ATFM in 2014 and 2019, based on this projected traffic growth.

	2014	2019
Regional ATFM	US\$250 – \$300M	US\$600M – \$800M
Domestic & Regional ATFM	US\$660 – 810M	US\$1.1B - \$1.4B

Table X: Asia Pacific Annual Fuel Savings Benefit Projection

6.13 The benefit opportunity of a network-based Asia Pacific Regional ATFM implementation strategy is particularly significant in the following airport operating environments, where international arrival traffic accounts for 35-100% of the total demand, indicating that domestic ATFM deployments are not practical for demand/capacity balancing at these airports:

- China - Shanghai Pudong International
- Indonesia - Ngurah Rai International
- Hong Kong - Hong Kong International
- Japan - Narita International
- South Korea - Incheon International
- Malaysia - Kuala Lumpur International
- Philippines - Ninoy Aquino International
- Singapore - Changi International
- Taiwan - Taiwan Taoyuan International
- Thailand - Suvarnabhumi Bangkok International
- Vietnam - Tan Son Nhat International and Nội Bài International

6.14 Within the remainder of the major Asia Pacific airport operating environments, international arrival traffic currently accounts for 20-30% of the total demand. Achieving the benefit of fuel savings in these environments would be supported by domestic ATFM deployments and enhanced through the Regional ATFM implementation strategy.

Summary of ~~Analysis~~ Asia/Pacific Region Collaborative ATFM Capability

6.15 ~~This analysis of the current state of ATFM implementation and capability in the Asia/Pacific Region is extracted from the IATA Asia Pacific (APAC) Regional Air Traffic Flow Management – Phase 1 Final Report (21 November 2014). The study was commissioned to establish a baseline view of ATFM capability and interoperability, and to develop recommendations for a cohesive and flexible approach for achieving integrated and coordinated ATFM capabilities within the Asia/Pacific Region.~~

6.16 A comprehensive survey was conducted in mid-2014 of current ATFM initiatives within the Region. **Figure X** summarizes the results:

	ATFM Structure			ATFM Demand and Capacity Balancing							Interoperability							
	Regulatory & Operational Requirements	Organizational Structure	Infrastructure	Airport Capacity Declaration	Airspace Capacity Declaration	CDM Processes - Situational Awareness	CDM Processes - Procedures and Tool	Demand and Capacity Balancing - Strategic	Demand and Capacity Balancing - Pre-tactical	Demand and Capacity Balancing - Tactical	ATFM LOAs with Adjoining ANSP	Message Exchange with Adjoining FIR	Exchange AAR/ADR with Adjoining FIR	TMI Documented in External LOA	External TMI Communication	ATFM Initiatives Planned Internally	ATFM Initiatives Planned with Adjoining FIR	
States	Australia	1	1	1	1	1	1	1	1	1	1	1	4	1	1	1	4	
	Bangladesh	1	4	4	4	4	4	4	4	4	1	4	1	4	4	4	4	4
	China	1	2	2	1	4	1	1	1	1	1	4	4	4	4	1	1	4
	Hong Kong	1	2	2	1	4	2	2	1	1	1	1	1	1	1	1	1	1
	India	1	3	3	1	1	4	4	1	4	1	4	1	4	4	4	1	4
	Indonesia	4	3	3	1	4	4	4	1	4	1	4	4	4	4	4	1	4
	Japan	1	1	1	1	4	1	1	1	1	1	1	1	4	1	1	1	4
	Malaysia	1	3	3	1	4	3	4	1	4	1	1	1	4	4	1	4	4
	Maldives	4	4	4	1	4	4	4	4	4	1	4	1	4	4	4	1	4
	New Zealand	1	2	2	1	4	1	1	1	4	1	4	1	4	4	4	1	4
	Pakistan	1	3	3	1	1	4	4	1	4	1	4	1	4	4	1	4	4
	Philippines	1	2	2	1	4	2	2	1	1	1	4	4	4	4	1	1	4
	Singapore	1	3	3	1	4	3	4	1	4	1	1	1	4	1	1	1	1
	South Korea	1	3	3	1	1	4	4	1	4	1	1	1	4	4	1	1	4
	Taiwan	1	3	2	1	4	4	4	1	1	1	4	1	4	1	4	4	4
	Thailand	1	2	2	1	1	3	3	1	1	1	4	1	1	4	1	1	1
	Vietnam	4	4	3	1	4	3	4	4	4	1	4	4	4	4	4	1	1
	More Advanced	1		Yes														
		2																
		3																
	Less Advanced	4		No														

Figure X: 2014 Asia/Pacific ATFM Survey – Summary of Results

6.17 It was observed that:

1. All respondent States recognized the requirement for ATFM;
2. Few States had well-established ATFM organizational structures;
3. There was a diverse range of ATFM capability infrastructure; only three States had mature ATFM systems, while others had little or no infrastructure;
4. CDM between States was minimal. While there was a common desire for better CDM, there was no standard for the region;
5. Airport capacities were declared for most major airports in the region, but only five States are declaring capacities for airspace.
6. Very few States were performing Demand Capacity Balancing (DCB) in the strategic phase of ATFM beyond allocating Airport Slots via the IATA World Scheduling Guidelines (WSG).
7. Only the limited number of States with mature ATFM systems were able to carry out DCB in the pre-tactical phase.
8. States without mature ATFM systems that were encountering DCB issues did not have any facility to monitor demand against capacity.
9. All of the States were performing DCB in the tactical phase, but only five States had the ability to issue ATFM Measures using allocated slot times to smooth traffic into airports.
10. There was no substantive interoperability between the States. There was very little formal ATFM procedure agreement between States.
11. The most prominent Regional development for cross-border ATFM implementation was the Singapore-initiated Regional ATFM Concept of Operations. Four States participated in the development of the concept with relevant stakeholder participation. The resultant Operational trial of the *Distributed Multi-Nodal Regional ATFM* concept was being planned, with Singapore, Malaysia, Hong Kong, China, Vietnam, Indonesia, Australia, and Thailand participating.

Survey Scope

6.18 The survey was distributed to 22 States, of which 17 responded (**Table 2**).

6.19 Most of the responses were comprehensively completed. The States that have more mature ATFM capabilities were able to respond in a higher level of detail. Generally, the responses directly answered the survey with the possibility of limited misunderstanding. Any misunderstanding does not appear to have impacted the results of the study.

	State	Survey Sent	Response Received
1	Australia	Yes	Yes
2	Bangladesh	Yes	Yes
3	China	Yes	Yes
4	Hong Kong, China	Yes	Yes
5	India	Yes	Yes
6	Indonesia	Yes	Yes
7	Japan	Yes	Yes
8	Republic of Korea	Yes	Yes
9	Malaysia	Yes	Yes
10	Maldives	Yes	Yes
11	New Zealand	Yes	Yes
12	Philippines	Yes	Yes
13	Singapore	Yes	Yes
14	Taiwan	Yes	Yes
15	Thailand	Yes	Yes
16	Vietnam	Yes	Yes
17	Pakistan	Yes	Yes
18	Lao PDR	Yes	No
19	Nepal	Yes	No
20	Cambodia	Yes	No
21	Sri Lanka	Yes	No
22	Unites States Of America	Yes	No(Not relevant)
23	Papua New Guinea	No	No
24	Myanmar	No	No
25	Fiji FIR	No	No
	Organizations		
1	IATA	Yes	Yes
2	EU (AATIP)	Yes	Yes
3	ICAO	Yes	Yes
5	CANSO	Yes	Yes

Table 2: State Responses to Survey

6.20 All States were requested to supply supporting documentation; Australia, Singapore, Philippines, and India did so.

Regulatory Requirements

6.21 Thirteen States had regulatory requirements for ATFM in their FIR. Vietnam, Indonesia, and Malaysia, while having no regulatory requirement, had plans to implement ATFM.

Annex 11 to the Convention on Civil Aviation States: Air traffic flow management (ATFM) shall be implemented for airspace where air traffic demand at times exceeds, or is expected to exceed, the declared capacity of the air traffic control services concerned.

ATFM Infrastructure

6.22 ATFM infrastructure was assessed against each ANSP's human resources commitment and personnel, dedicated positions and equipment available to perform ATFM, and the existence of internal and external stakeholder ATFM Letters of Agreement (LOAs). **Figure X** illustrates the assessed ATFM infrastructure of the 17 respondents. Two States had mature ATFM structures and six States had developing ATFM structures. Six States had an Air Traffic Flow Management Unit (ATFMU). Seven States had some ATFM functionality, which was carried out from existing supervisory and/or Air Traffic Control (ATC) positions. Two States had no infrastructure. All respondents had plans to implement ATFM (**Figure X**).

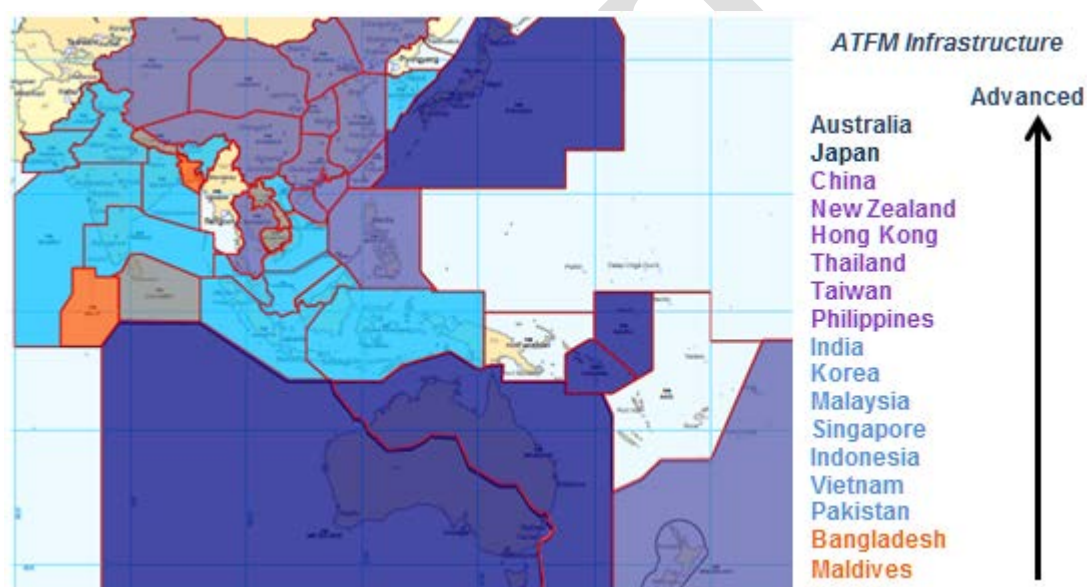


Figure X: ATFM Infrastructure

CDM Infrastructure and Processes

6.23 Several States with mature ATFM infrastructure had implemented domestic CDM, but CDM between States was minimal. Some ad-hoc CDM was taking place across FIR boundaries when resources were constrained. Cross FIR CDM between Hong Kong, Thailand, Malaysia, and Singapore was under development on a trial basis, establishing initial cross-border procedures and communication. **Figure X** illustrates CDM capability.

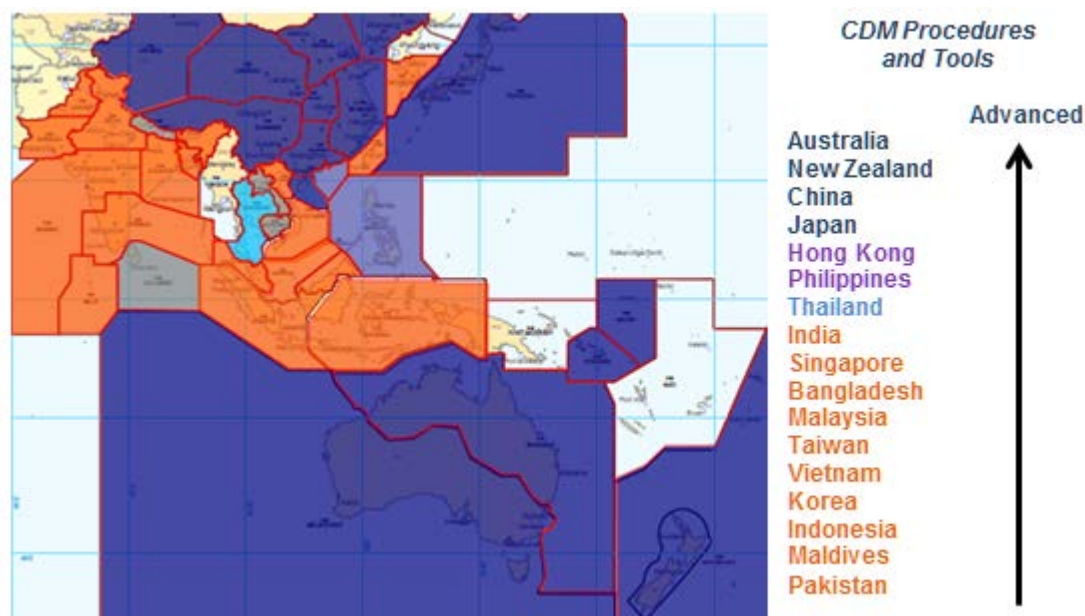


Figure X: CDM Processes – CDM Procedures and Tools

ATFM Training

6.24 Some training was taking place in States; mostly in-house, but with some States having sent staff to EUROCONTROL and the USA for training. There was an initiative between the EU AATIP and Thailand to develop criteria for ATFM personnel and an ATFM training syllabus.

6.25 The experience of the survey consultant was that many States in the region needed assistance in general ATFM education and training in all levels of their organizations, and that airline operators in the region had limited knowledge and training in ATFM and CDM.

Airspace and Airport Capacity Declaration

6.26 Defining airport and airspace capacity is fundamental to a domestic ATFM system, and to an interoperable cross-border network. Accurate airport and airspace capacity declarations provide targets for the development of collaborative planning.

6.27 Capacity had been declared for most of the large airports in the region, as they were *slot controlled* airports. Five States had declared capacities for airspace. Airspace capacity (terminal and en-route airspace) declaration needed to be promoted. Many States did not have the ability or knowledge of how to determine airspace capacities.

Strategic Demand and Capacity Balancing (DCB)

6.28 Thirteen States were allocating airport slots to balance demand against capacity in the strategic time frame. Three States included military operations in strategic planning. Apart from these, little strategic ATFM was being undertaken domestically and no formal cross-border strategic ATFM was in place.

Pre-tactical DCB

6.29 Seven States are performing some pre-tactical ATFM (see Figure 7). Lack of decision support tools was hampering States from carrying out pre-tactical ATFM. States needed to understand the importance of Pre-tactical ATFM and establish procedures and decision support capabilities to enable it to take place. Very little cross-FIR pre-tactical ATFM was taking place.

6.30 **Figure X** shows the respondent States performing pre-tactical ATFM.

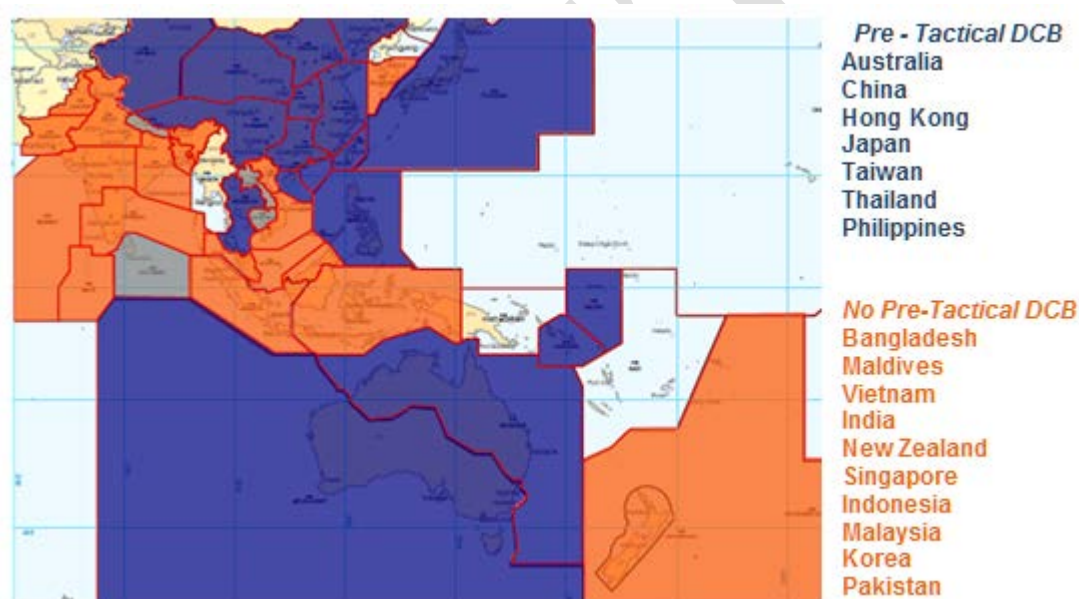


Figure X: Pre-Tactical Demand and Capacity Balancing

Tactical DCB

6.31 All respondents were performing ATFM in the tactical phase in at least a rudimentary form. However, five States were using ATC slot allocation to balance demand capacity at airports. No ANSP was using ATC slot allocation to perform DCB in terminal or en-route airspace, even though sectors of airspace were capacity constrained.

6.32 Five States had dedicated resources implementing ATFM Measures, and nine States had plans to dedicate resources to implement ATFM Measures in the future.

Interoperability

6.33 A major focus of the study was to establish the interoperability between States with regard to ATFM. The analysis revealed that, while there were initiatives in the early stages of development, there was no substantial interoperability currently taking place. However, interoperability was a key consideration of the multi-nodal ATFM concept trial.

Air Traffic Service (ATS) Message Exchange with Adjoining FIR

6.34 Detailed databases of fundamental ATS routes, route systems, navigation aids (NavAids), airports, airspace status, sectors, and arrival and departure procedures were necessary to support ATFM interoperability.

6.35 The majority of States had automated ATS message exchange capability. The survey consultant's experience suggested that those States that responded in the negative may have misunderstood the question. Current Regional ATFM initiatives required a minimum ATS message exchange capability.

Sharing Airport Acceptance Rate (AAR)/Airport Departure Rate (ADR) and Airspace Capacity

6.36 The stakeholder decision making process associated with DCB for an airport is dependent upon accurate AAR/ADRs. Advanced coordination with stakeholders and implementation of appropriate ATFM Measures based upon AAR/ADR as demand exceeds capacity results in efficient ATFM processes.

6.37 Only three Administrations (Thailand, Singapore, and Hong Kong, China) were AAR/ADR. While the majority of States did not share the AAR/ADR, there are times when an ANSP would ask an adjoining ANSP to reduce the flow of traffic as a result of the AAR being exceeded. No State was sharing airspace capacities with adjoining FIRs, and few States are declaring airspace capacity.

6.38 Operational information exchange of ATFM Measures is fundamental to ATFM. LOAs provide the ability to improve preplanning, reduce tactical coordination, and standardize actions and initiatives.

6.39 A low count of States having ATFM in LOAs with adjoining States was expected as a result of the lack of existing operational initiatives between States (**Figure X**). The States where LOAs existed had advanced ATFM systems or had a requirement to meter traffic crossing FIRs as a result of demand exceeding capacity at resources. As more cross-FIR ATFM initiatives are implemented, LOAs will need to be developed or further developed.

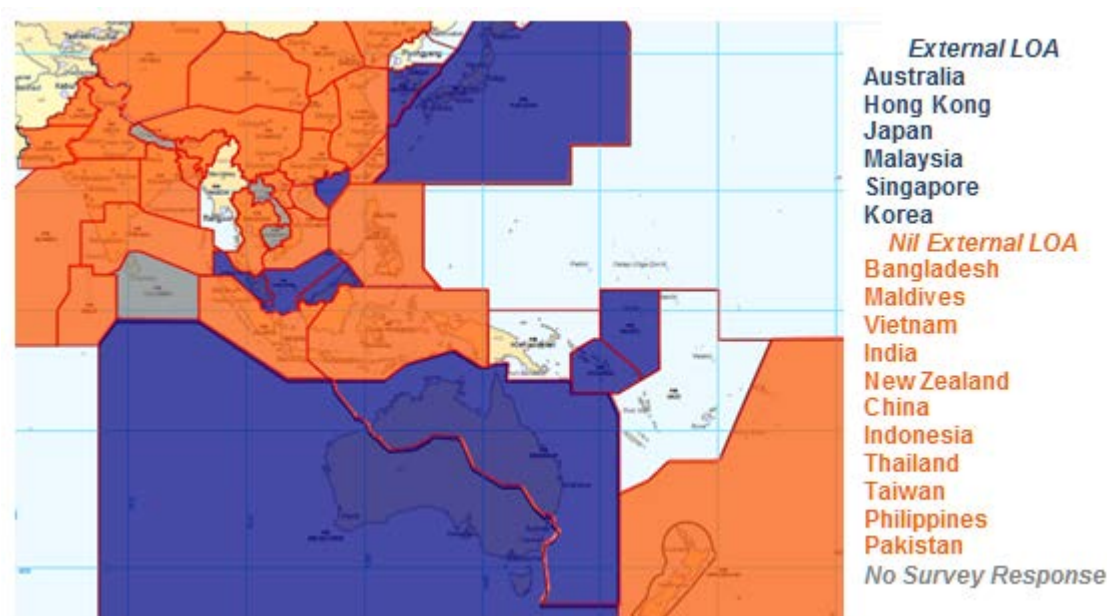


Figure X: ATFM Measures Communicated in External LOA

External ATFM Measure Communication

6.40 An interoperable network approach necessitates external ATFM Measure communication. While there were only three States with LOAs in place, there was ATFM Measure communication taking place between nine States, including two that had automated communications (China and Republic of Korea). This communication was predominantly in the tactical time frame of ATFM on an as-needed basis, and was expected to increase as initiatives were implemented. Since these communications were not supported by formalized agreements (LOAs), there was little standardization of procedures.

ATFM Initiatives Planned with Adjoining FIRs

6.41 An interoperable network will be driven by stakeholder engagement and operational needs between States. Constraint management can be best achieved through the CDM process. Formal ATFM initiatives between States are often needed because of the widespread effects on the flow of air traffic.

6.42 While States were currently implementing ATFM Measures, which occasionally required adjoining FIR participation, there was only one initiative planned to include multiple FIRs in ATFM Measures, with seven States and four international organizations participating. **Figure X** illustrates the States with external ATFM initiatives planned.

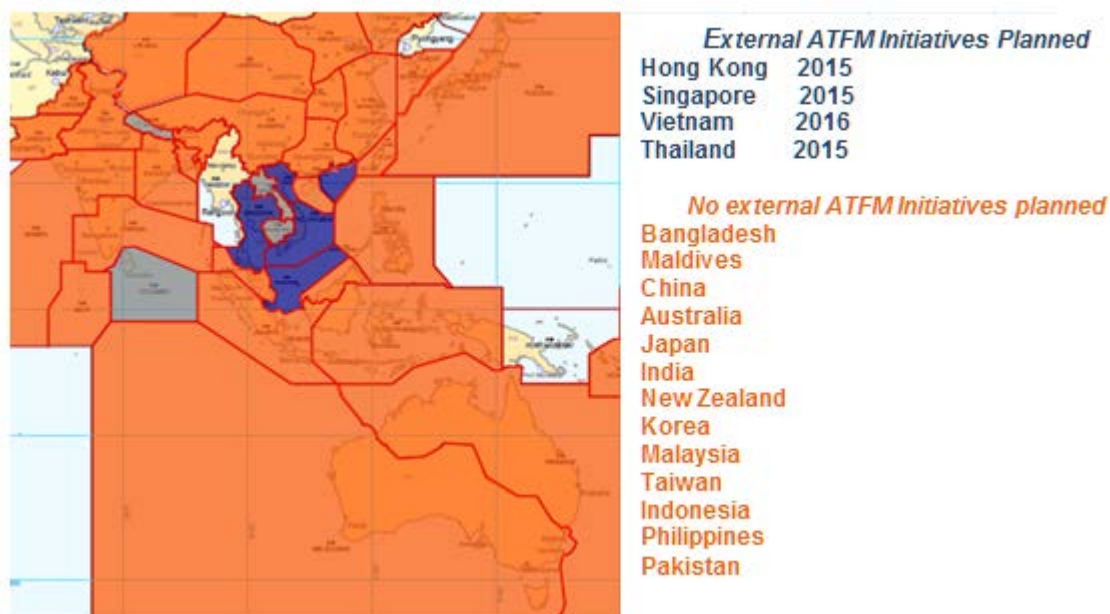


Figure X: External ATFM Initiatives Planned

ATFM Systems

6.43 All of the advanced ATFM systems implemented in the APAC region were commissioned prior to the publication of ICAO Doc 9971. The systems installed in Japan and Philippines were developed by Japan. New Zealand and China had also developed their own systems. The Australian system was similar to systems in the USA, Canada, and South Africa.

6.44 Many of the States had direct involvement in the compilation of Doc 9971 and all States are now familiar with Doc 9971. It was therefore assumed that future implementations would be in line with recommendations from that document. The Regional ATFM Concept includes participation from individuals with experience in the FAA, EUROCONTROL, South African and Australian ATFM systems.

ANSP Initiatives

6.45 Most of the States, as a result of operational, ASBU and Seamless ATM Plan requirements, had initiatives to implement ATFM in the future. All the States were at various stages of planning, procurement, or implementation. Figure X provides a timeline indicating current and planned ATFM initiatives.

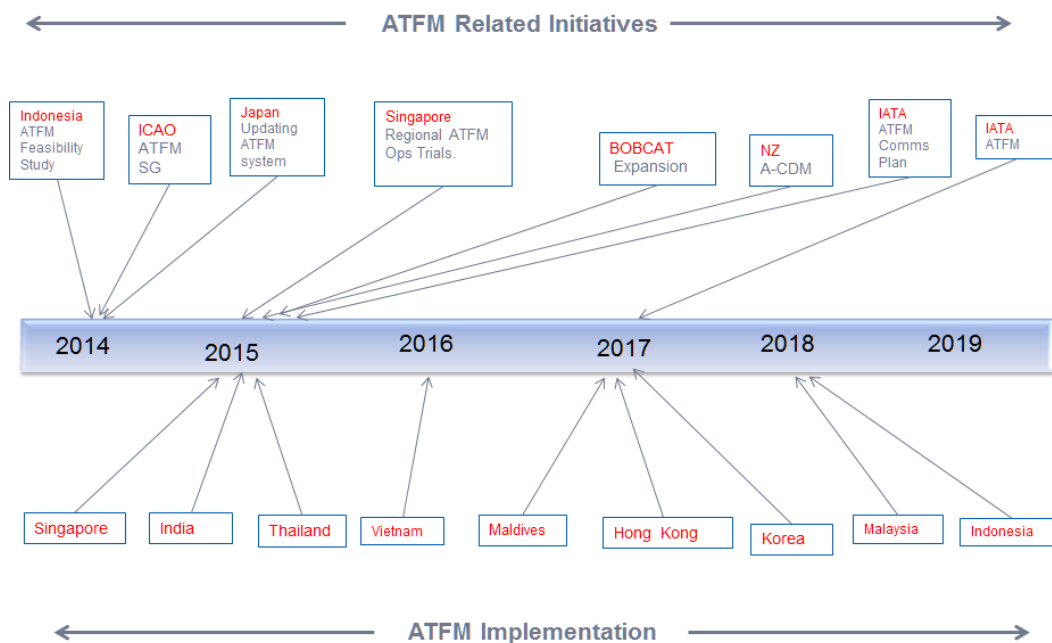


Figure X: ATFM Implementation Timeline

Opportunities for Integration

6.46 The *Distributed Multi-Nodal ATFM Concept* has been widely accepted as a potential solution for the region, and eight States had joined the plan for an operational trial of the concept starting in June 2015. The trial may be expanded to additional States as feedback is received on the viability of the concept.

6.47 Australia and New Zealand, both having mature ATFM systems, were a possibility for integration. It was understood that discussions had taken place to incorporate traffic from New Zealand into ATFM Measures in Australia. The ATFM system in Australia had the ability to include international traffic into ATFM Measures.