

**INTERNATIONAL CIVIL AVIATION ORGANIZATION**



**REPORT OF THE SIXTH MEETING OF THE ASIA/PACIFIC AIRPORT  
COLLABORATIVE DECISION MAKING TASK FORCE (APA-CDM/TF/6)**

VIDEO TELECONFERENCE, 28 TO 30 APRIL 2021

The views expressed in this Report should be taken as those of the  
Meeting and not the Organization

Approved by the Meeting

and published by the ICAO Asia and Pacific Office, Bangkok

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## INTRODUCTION

### APA-CDM/TF/6 Meeting

1.1 The Sixth Meeting of the Asia/Pacific Airport Collaborative Decision Making Task Force (APA-CDM/TF/6) was held as a video teleconference from 28 to 30 April 2021.

### Attendance

2.1 The meeting was attended by 150 participants from 17 States/Administrations and 5 International Organizations including Australia, Cambodia, China, Hong Kong China, Fiji, India, Indonesia, Japan, Malaysia, Nepal, Pakistan, Philippines, Republic of Korea, Singapore, Thailand, United States, Viet Nam, Airport Council International (ACI), Civil Air Navigation Services Organisation (CANSO), International Air Transport Association (IATA), International Federation of Air Line Pilots' Associations (IFALPA) and ICAO.

2.2 The list of participants is provided at **Appendix A** to this report.

### Officers & Secretariat

3.1 First day meeting's session was facilitated by Mr. Shane Sumner, RO/ATM, ICAO Asia and Pacific Office. Mr. George Tak Yuen Wong, Chairperson of APA-CDM/TF, presided over the meeting from the second day. Dr. Punya Raj Shakya, Regional Officer Aerodromes and Ground Aids, ICAO Asia and Pacific Office, was the Secretariat for the meeting. The meeting was supported by Mr. Hiroyuki Takata, RO/ATM, RSO Beijing, and Ms. Mantana Dharmvanij from APAC Office.

### Opening of Meeting

#### Opening Addresses

4.1 Dr. Punya Raj Shakya, Regional Officer Aerodromes and Ground Aids, ICAO Asia and Pacific Office, welcomed the participants of the meeting.

### Documentation and Working Language

5.1 The working language of the meeting and all documentation was English. There were eight (8) Working Papers (WP) and five (5) Information Papers (IP) considered by the meeting.

5.2 A list of papers is included at **Appendix B** to this report.

### Draft Conclusions, Draft Decisions and Decisions of APA-CDM/TF – Definitions

6.1 APA-CDM/TF recorded its actions in the form of Draft Conclusions, Draft Decisions and Decisions within the following definitions:

- a) **Draft Conclusions** deal with matters that, according to APANPIRG terms of reference, require the attention of States, or action by the ICAO in accordance with established procedures;
- b) **Draft Decisions** deal with the matters of concern only to APANPIRG and its contributory bodies; and
- c) **Decisions** of APA-CDM/TF that related solely to matters dealing with the internal working arrangements of these bodies.

### List of Decisions and Draft Conclusions/Decisions

#### 7.1 List of Draft Conclusion

*Nil*

#### 7.2 List of Draft Decision and Conclusion

| Draft Conclusion APA-CDM/TF/6/1 – A-CDM FREQUENTLY ASKED QUESTIONS (FAQs)                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| What: that:<br><br>1. the Frequently Asked Questions (FAQs) on A-CDM at <b>Appendix F to the Report</b> be uploaded to the ICAO Asia/Pacific Regional Office Website for reference; and<br><br>2. the document be updated when and as required to include new FAQs and answers. | Expected impact:<br><br><input type="checkbox"/> Political / Global<br><br><input type="checkbox"/> Inter-regional<br><br><input type="checkbox"/> Economic<br><br><input type="checkbox"/> Environmental<br><br><input checked="" type="checkbox"/> Ops/Technical |
| Why: To publish on ICAO APAC eDocuments to facilitate in capturing and providing uniform answers on A-CDM as a standalone live document.                                                                                                                                        | Follow-up: <input type="checkbox"/> Required from States                                                                                                                                                                                                           |
| When: 2-Jul-21                                                                                                                                                                                                                                                                  | Status: Draft to be adopted by Subgroup                                                                                                                                                                                                                            |
| Who: <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other:                                                           |                                                                                                                                                                                                                                                                    |

| Draft Conclusion APA-CDM/TF/6/2 – Framework for Monitoring the Implementation of A-CDM                                                                                                                                                                                                                                                                 |                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| What: that the survey questionnaire at <b>Appendix G</b> and <b>Appendix H to the Report</b> be uploaded to the ICAO Asia/Pacific Regional Office website for use by States for self-assessment of their A-CDM implementation projects and to report the progress of A-CDM implementation to APAC Office in the format provided in <b>Appendix H</b> . | Expected impact:<br><br><input type="checkbox"/> Political / Global<br><br><input type="checkbox"/> Inter-regional |

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|                                                                                                                                                                                                                              |                   |                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                              |                   | <input type="checkbox"/> Economic<br><input type="checkbox"/> Environmental<br><input checked="" type="checkbox"/> Ops/Technical |
| <b>Why:</b> To monitor the progress of the A-CDM implementation by the States/Administrations and report to ICAO APAC.                                                                                                       | <b>Follow-up:</b> | <input checked="" type="checkbox"/> Required from States                                                                         |
| <b>When:</b> 2-Jul-21                                                                                                                                                                                                        | <b>Status:</b>    | Draft to be adopted by Subgroup                                                                                                  |
| <b>Who:</b> <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: |                   |                                                                                                                                  |

| Draft Conclusion APA-CDM/TF/6/3 – Amendment to APAC A-CDM Implementation Plan                                                                                                                                                                    |                                                                                                                                                                                                                                                       |                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| <b>What:</b> that, the Asia Pacific A-CDM Implementation Plan, Second Edition, 2021, at <b>Appendix I to the Report</b> be adopted, and made available on the ICAO Asia/Pacific Regional Office Website for reference by States/Administrations. | <b>Expected impact:</b><br><input type="checkbox"/> Political / Global<br><input type="checkbox"/> Inter-regional<br><input type="checkbox"/> Economic<br><input type="checkbox"/> Environmental<br><input checked="" type="checkbox"/> Ops/Technical |                                               |
| <b>Why:</b> To align the APAC A-CDM Implementation Plan with the 6th Edition of GANP and APAC Seamless ANS Plan, Version 3, 2019.                                                                                                                | <b>Follow-up:</b>                                                                                                                                                                                                                                     | <input type="checkbox"/> Required from States |
| <b>When:</b> 2-Jul-21                                                                                                                                                                                                                            | <b>Status:</b>                                                                                                                                                                                                                                        | Draft to be adopted by Subgroup               |
| <b>Who:</b> <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other:                     |                                                                                                                                                                                                                                                       |                                               |

| Draft Decision APA-CDM/TF/6/4: Dissolution of the APA-CDM/TF                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>What:</b> that:<br>a) the Airport Collaborative Decision Making Task Force (APA-CDM/TF), having completed most of the tasks assigned under its Terms of Reference, be dissolved, and any further Asia/Pacific Regional work in the A-CDM field (including Task List in <b>Appendix J to the Report</b> , be undertaken by the Air Traffic Flow Management Steering Group (ATFM/SG) or other appropriate body | <b>Expected impact:</b><br><input type="checkbox"/> Political / Global<br><input type="checkbox"/> Inter-regional |

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|                                                                                                                                                                                                                                                                                 |                                                          |                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| determined by APANPIRG; and<br><br>b) A-CDM Experts nominated by States and International Organisations are encouraged to attend the ATFM/SG Meetings.                                                                                                                          |                                                          | <input type="checkbox"/> Economic<br><br><input type="checkbox"/> Environmental<br><br><input checked="" type="checkbox"/> Ops/Technical |
| Why: To dissolve the APA-CDM/TF and merge with the ATFM/SG, subject to APANPIRG agreement, so that further coordination on matters related to A-CDM implementation and the integration and interoperability of A-CDM with ATFM and with other systems be undertaken by ATFM/SG. | Follow-up: <input type="checkbox"/> Required from States |                                                                                                                                          |
| When: 24-Nov-21                                                                                                                                                                                                                                                                 | Status: Draft to be adopted by PIRG                      |                                                                                                                                          |
| Who: <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other:                                                                      |                                                          |                                                                                                                                          |

7.3 List of Decision

*Nil*

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## REPORT ON AGENDA ITEMS

### Agenda Item 1: Adoption of Agenda

#### Adoption of Agenda (WP/01)

- 1.1 The provisional agenda (WP/01) was adopted by the meeting without amendment.

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### Agenda Item 2: Review Outcomes of Related Meetings/Seminars

#### Outcome of APANPIRG/31 (WP/02)

- 2.1 The Secretariat provided a brief summary of APANPIRG/31 Meeting, which had been held as a video teleconference from 14 to 16 December 2020, with particular highlights on the “Decision APANPIRG/31/1 (AOP/SG/4-1 & APA-CDM/TF/5-1): Proposal for Amendment of APA-CDM/TF TOR” endorsed by AOP/SG/4 and approved by APANPIRG/31. The amendment to APA-CDM/TF’s TOR approved by APANPIRG/31 was provided in **Appendix C to this Report**. The Report of APANPIRG/31 Meeting was available at: <https://www.icao.int/APAC/Meetings/Pages/2020-APANPIRG31.aspx>.

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### Agenda Item 3: State A-CDM Planning and Implementation Updates

#### Progress of A-CDM Implementation in Japan (IP/03)

- 3.1 Japan Civil Aviation Bureau (JCAB) introduced A-CDM into three major airports in Japan, including Tokyo (Haneda) Airport in 2020, Narita Airport in 2020, and New Chitose (Sapporo) Airport in accordance with Collaborative Actions for Renovation of Air Traffic Systems (CARATS) as well as the Asia Pacific Seamless ANS Plan.
- 3.2 The implementation of A-CDM to other high-density airports and the upgrading of A-CDM were under consideration among relevant stakeholders and also in the framework of CARATS.

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### Agenda Item 4: Interoperability of A-CDM with ATFM and Aircraft Operator systems

Nil.

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### Agenda Item 5: Integration of A-CDM with ATFM

#### Development of Joint Operational Procedure Guidance for the Integration of ATFM and A-CDM Operations (WP/03)

- 5.1 Hong Kong China, China, India, Republic of Korea, Thailand and CANSO presented WP/03 summarising the progress of the development of joint operational procedure guidance for the integration of Air Traffic Flow Management (ATFM) and Airport Collaborative Decision Making (A-CDM) operations as entrusted to the expert group under Task 5/2 of the APA-CDM/TF.

5.2 Those, who implemented or were implementing A-CDM and ATFM, were invited by ICAO, via the State Letter (Ref.: AN 3/3 - AP-AGA0049/20) dated 30 November 2020, to share:

- a) Details about national and/or local model/guidance for integrating ATFM and A-CDM operations; and
- b) Suggestions on generalising and enhancing the national and/or local models/procedures for cross-border application.

5.3 Responses received from Australia, Hong Kong China, India, Republic of Korea and United States were provided in **Appendix D to this Report**.

5.4 In response to ICAO's invitation, CANSO had provided an educational publication "the CANSO Guide on ATFM/A-CDM Integration" (available at <https://canso.org/publication/canso-guide-on-atfm-a-cdm-integration>).

5.5 The meeting noted that pioneering ANSPs and Aerodrome Operators (AOs) in the Asia Pacific Region generally had individual local/national models for integrating the operations of A-CDM and ATFM at various levels, including node-to-node, state-wide network, etc. However, there was not much detail on how these local/national models could be further enhanced into a regional "cross-border" integration model, although all reckon interoperable systems/operations across Flight Information Regions (FIRs) as a means to reap the expected benefits of system-wide collaborative decision making.

5.6 Exploring the survey results (paragraph 5.3 above refers) alongside the CANSO Guide in a systematic manner would make a worthwhile contribution to the development of regional integration model. Such system engineering approach should be intended to:

- a) Transform the needs of ANSPs and AOs into a balanced system solution that meets those needs;
- b) Address the complex and technological challenges of automated operations by System-Wide Information Management (SWIM) and associated information standards, including Flight Information Exchange Model (FIXM) and ICAO meteorological information exchange model (IWXXM); and
- c) Elaborate the survey results and generalize their common features to develop the joint operational procedure guidance for the integration of ATFM and A-CDM operations, e.g. covering those topics listed in **Appendix E to this Report**.

5.7 To continue the work of APA-CDM/TF with AOs as a group of key stakeholders on the integration of ATFM and A-CDM across FIRs (paragraphs 5.5 and 5.6 above refer), it was proposed that a small working group (SWG) should be established, reporting to appropriate APANPIRG Contributory Body with members from the following domains:

- a) Experts from AOs, ANSPs and civil aviation authorities (CAAs) to share knowledge and experience on A-CDM and its enabling systems;
- b) Experts from ANSPs to share knowledge and experience on ATFM and its enabling systems;
- c) International organizations such as CANSO, IATA, ICCAIA, etc. to present broad interests of various stakeholders and contribute expertise on a balanced system solution; and
- d) Experts from the SWIM TF to help the Expert Group in applying the SWIM concept and infrastructure to cross-border ATFM/A-CDM integration.

5.8 The meeting discussed on approach that had to be taken to further carry out this task by another appropriate body of APANPIRG. ICAO noted that ATFM/SG, which was anticipated to assume responsibility for A-CDM matters under APANPIRG, had a current task assigned to ATFM Information Requirement Small Working Group (ATFM/IR/SWG) to develop operational requirements for the exchange of ATFM data. The proposed activity aligned with that work.

5.9 After deliberation, the meeting agreed that this activity would be included in the task list discussed under WP/08 (**Appendix J** refers).

CANSO/ACI Workshop on ATFM/A-CDM Integration (WP/04)

5.10 CANSO presented WP/04 on a virtual workshop on ATFM and A-CDM integration they would jointly organise with ACI on 2-3 June 2021. The objectives of the workshop were to familiarise ANSPs and airports in the region with the ICAO APAC implementation framework for A-CDM and cross-border ATFM as well as the concept and benefits of ATFM/A-CDM integration. The workshop would be facilitated by subject matter experts from CANSO and ACI and supported by speakers from IATA and ICAO. As part of industry's effort to support the promotion and implementation of ATFM and A-CDM in the Asia Pacific Region, the workshop would be open to all States and non-members of CANSO and ACI. All interested in attending the workshop were strongly encouraged to register for the event at [Registration \(gotowebinar.com\)](https://gotowebinar.com).

5.11 ACI acknowledged and thanked CANSO for initiating this workshop in coordination with Singapore, Thailand, IATA and ICAO.

Integration of Airport-Collaborative Decision Making (A-CDM) with Air Traffic Flow Management (ATFM) in Singapore (IP/04)

5.12 Singapore shared its approach for local integration of A-CDM and ATFM. The approach referenced established A-CDM milestones to identify the required information exchanges between ATFM and A-CDM to further enhance operational predictability and decision-making processes for all CDM partners. The identified information exchanges were also categorized based on phase of flight and its associated operational use cases were detailed in the paper. The meeting noted the information contained in this information paper.

5.13 CANSO informed the meeting that the integration of A-CDM with ATFM in Singapore was in line with the CANSO Guide on ATFM/A-CDM Integration, facilitating the exchange of information to enhance predictability.

5.14 In response to Japan's query on the inclusion of Scheduled In-Block Time (SIBT) in the APAC FIXM Extension, the Co-chair of SWIM/TF explained that no operational use case for its inclusion had been presented to the SWIM/TF. However, the APA-CDM/TF/5 meeting had agreed to *"Task 5/3 - Identify any other data attributes which are necessary to support the A-CDM and ATFM integrated operations (from A-CDM perspective), in addition to the ones already included in the current version of the FIXM v4.1 Extension in collaboration with Experts from ATFM/SG and SWIM TF"*. The meeting was further informed that the current APAC Extension to FIXM Core Version 4.1 was in the process of being updated to FIXM Version 4.2, and this work was expected to be completed at the next meeting of the SWIM/TF in August 2021. The development of any new attributes for inclusion in the APAC Extension to FIXM Version 4.2 would need to be completed in time for the SWIM/TF meeting.

5.15 Singapore informed the meeting that they used Aviation Information Data Exchange (AIDX) for the exchange of information between ATFM and A-CDM systems, and noted that SIBT would not normally be expected to be included among the data attributes exchanged in cross-border ATFM.

5.16 In response to a query on the issue of the use of different call signs (ICAO versus IATA) by different stakeholders in the ATFM/A-CDM environments, and the potential challenge of ensuring the call sign only applied to a single flight, IATA advised the meeting to refer to *Conclusion APANPRG/31/11: Alphanumeric Call Sign Initiative*, formulated by RASMAG/25 and endorsed by the AOP/SG/4 and the ATM/SG/8.

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## **Agenda Item 6: APAC A-CDM Implementation Plan**

### A-CDM Frequently Asked Questions (FAQs) (WP/05)

6.1 To facilitate the capture of Frequently Asked Questions (FAQs) on A-CDM and to provide uniform answers, in accordance with Task 4/1 of APA-CDM/TF, CANSO and IATA developed FAQ on A-CDM as a live document, which is provided in **Appendix F to this Report**.

6.2 In view of the above, the APA-CDM/TF/6 formulated the following Draft Conclusion for consideration by AOP/SG/5 in June 2021:

| <b>Draft Conclusion APA-CDM/TF/6/1 – A-CDM FREQUENTLY ASKED QUESTIONS (FAQs)</b>                                                                                     |                                                                                                                                                                                                                  |                                                   |                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------------------------|
| What: that:                                                                                                                                                          |                                                                                                                                                                                                                  | Expected impact:                                  |                                               |
| 1. the Frequently Asked Questions (FAQs) on A-CDM at <b>Appendix F to the Report</b> be uploaded to the ICAO Asia/Pacific Regional Office Website for reference; and |                                                                                                                                                                                                                  | <input type="checkbox"/> Political / Global       |                                               |
| 2. the document be updated when and as required to include new FAQs and answers.                                                                                     |                                                                                                                                                                                                                  | <input type="checkbox"/> Inter-regional           |                                               |
|                                                                                                                                                                      |                                                                                                                                                                                                                  | <input type="checkbox"/> Economic                 |                                               |
|                                                                                                                                                                      |                                                                                                                                                                                                                  | <input type="checkbox"/> Environmental            |                                               |
|                                                                                                                                                                      |                                                                                                                                                                                                                  | <input checked="" type="checkbox"/> Ops/Technical |                                               |
| Why:                                                                                                                                                                 | To publish on ICAO APAC eDocuments to facilitate in capturing and providing uniform answers on A-CDM as a standalone live document.                                                                              | Follow-up:                                        | <input type="checkbox"/> Required from States |
| When:                                                                                                                                                                | 2-Jul-21                                                                                                                                                                                                         | Status:                                           | Draft to be adopted by Subgroup               |
| Who:                                                                                                                                                                 | <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: |                                                   |                                               |

### Questionnaire Based on ICAO Asia Pacific A-CDM Implementation Plan (WP/06)

6.3 WP/06 presented the questionnaire developed by India and CANSO as part of Monitoring Framework for monitoring the progress of achieving the performance expectations of the Asia/Pacific A-CDM Implementation Plan.

6.4 As the A-CDM Implementation plan served as a roadmap for a uniform, harmonized and scalable implementation of A-CDM in APAC Region, the meeting recognised the need to measure the progress of States in achieving its performance expectations.

6.5 The Survey Questionnaire had been developed with the following objectives:

- a) Allow States to provide updated information on the implementation; and
- b) Monitor the progress of achieving the performance expectations as per Asia/Pacific A-CDM Implementation Plan.

6.6 The Survey outcomes would be used for future review the performance expectations of the A-CDM Implementation Plan as needed, in consultation with relevant APANPIRG technical groups.

6.7 The questionnaire (**Appendix G**) was categorized into the following topics:

- a) Overall A-CDM Implementation Status;
- b) Stakeholder's involvement;
- c) A-CDM Procedures & Compliance;
- d) System Functions;
- e) ATFM Integration; and
- f) Interoperability.

6.8 A Microsoft Excel spreadsheet (**Appendix H**) was also developed for States/Administrations to provide their completed survey questionnaires to ICAO APAC Regional Office.

6.9 Recognising the need to measure the progress of States/Administrations in achieving the performance expectation of the Asia/Pacific A-CDM Implementation Plan and report to ICAO APAC Office, the APA-CDM/TF/6 formulated the following Draft Conclusion for consideration by AOP/SG:

| <b>Draft Conclusion APA-CDM/TF/6/2 – Framework for Monitoring the Implementation of A-CDM</b>                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                  |                                                                                                                                                                                                                            |                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| What: that the survey questionnaire at <b>Appendix G</b> and <b>Appendix H to the Report</b> be uploaded to the ICAO Asia/Pacific Regional Office website for use by States for self-assessment of their A-CDM implementation projects and to report the progress of A-CDM implementation to APAC Office in the format provided in <b>Appendix H</b> . |                                                                                                                                                                                                                  | Expected impact:                                                                                                                                                                                                           |                                                          |
|                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                  | <input type="checkbox"/> Political / Global<br><input type="checkbox"/> Inter-regional<br><input type="checkbox"/> Economic<br><input type="checkbox"/> Environmental<br><input checked="" type="checkbox"/> Ops/Technical |                                                          |
| Why:                                                                                                                                                                                                                                                                                                                                                   | To monitor the progress of the A-CDM implementation by the States/Administrations and report to ICAO APAC.                                                                                                       | Follow-up:                                                                                                                                                                                                                 | <input checked="" type="checkbox"/> Required from States |
| When:                                                                                                                                                                                                                                                                                                                                                  | 2-Jul-21                                                                                                                                                                                                         | Status:                                                                                                                                                                                                                    | Draft to be adopted by Subgroup                          |
| Who:                                                                                                                                                                                                                                                                                                                                                   | <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: |                                                                                                                                                                                                                            |                                                          |

Amendments to APAC A-CDM Implementation Plan (WP/07)

6.10 India, Thailand and CANSO presented WP/07, proposing amendments to Asia Pacific A-CDM Implementation Plan for clarity, inclusion of some editorial modifications and changes to align with the provisions of APAC Seamless ANS Plan, Version 3.0 & 6<sup>th</sup> Edition of Global Air Navigation Plan (GANP).

6.11 After review and deliberation of proposal by the meeting and some editorial modifications, the APA-CDM/TF/6 formulated following Draft Conclusion for adoption by AOP/SG/5 in June 2021:

| <b>Draft Conclusion APA-CDM/TF/6/3 – Amendment to APAC A-CDM Implementation Plan</b>                                                                                                                                                             |                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>What:</b> that, the Asia Pacific A-CDM Implementation Plan, Second Edition, 2021, at <b>Appendix I to the Report</b> be adopted, and made available on the ICAO Asia/Pacific Regional Office Website for reference by States/Administrations. | <b>Expected impact:</b><br><br><input type="checkbox"/> Political / Global<br><br><input type="checkbox"/> Inter-regional<br><br><input type="checkbox"/> Economic<br><br><input type="checkbox"/> Environmental<br><br><input checked="" type="checkbox"/> Ops/Technical |
| <b>Why:</b> To align the APAC A-CDM Implementation Plan with the 6th Edition of GANP and APAC Seamless ANS Plan, Version 3, 2019.                                                                                                                | <b>Follow-up:</b> <input type="checkbox"/> Required from States                                                                                                                                                                                                           |
| <b>When:</b> 2-Jul-21                                                                                                                                                                                                                            | <b>Status:</b> Draft to be adopted by Subgroup                                                                                                                                                                                                                            |
| <b>Who:</b> <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other:                                |                                                                                                                                                                                                                                                                           |

6.12 The Secretariat confirmed that the full form of CRV was “Common aeronautical Virtual Private Network”; the term ATFM Unit should be used in the document as the same had been used in ICAO Doc 9971 - Manual on Collaborative Air Traffic Flow Management; and there was no need to add any explanatory notes for the “Remarks Column” of the “Table 5: Overview of the 16 A-CDM Milestones”, as it was marked either “Required” or “Optional” and no mandatory word was used. Those corrections were incorporated in the Asia Pacific A-CDM Implementation Plan, Second Edition, 2021 (**Appendix I**).

**Agenda Item 7: APA-CDM/TF Task List**

APA-CDM/TF Terms of Reference and Task List (WP/08)

7.1 The Secretariat presented the APA-CDM/TF Terms of Reference (ToR), (**Appendix C to this Report**) for review by the meeting.

7.2 The Secretariat also presented the APA-CDM/TF Task List. The meeting reviewed and updated the Task List, provided in **Appendix J to this Report**.

7.3 The meeting noted that the timeframe of the APA-CDM/TF was extended by APANPIRG/30 decision for two years, i.e. until APANPIRG/32, requiring that deliverables of APA-CDM/TF addressing the objectives of the Task Force were developed and delivered to APANPIRG/32.

7.4 The meeting also noted the remarks made at APANPIRG/30 by the Chairpersons of APANPIRG and ATM/SG that the work of the APA-CDM/TF would eventually be absorbed by ATM/SG.

7.5 The APA-CDM/TF had achieved its objectives and accomplished the work assigned in its initial TOR. Residual tasks were related to the integration of A-CDM with ATFM systems. The meeting recommended that the APA-CDM/TF be merged with the ATFM/SG, and encouraged A-CDM Experts nominated by States and International Organisations to participate in future ATFM/SG Meetings. The APA-CDM/TF/6 formulated the following Draft Decision for endorsement by AOP/SG and ATM/SG and consideration by APANPIRG/32:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Draft Decision APA-CDM/TF/6/4: Dissolution of the APA-CDM/TF</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                           |
| <p>What: that:</p> <p>a) the Airport Collaborative Decision Making Task Force (APA-CDM/TF), having completed most of the tasks assigned under its Terms of Reference, be dissolved, and any further Asia/Pacific Regional work in the A-CDM field (including Task List in <b>Appendix J to the Report</b>) be undertaken by the Air Traffic Flow Management Steering Group (ATFM/SG) or other appropriate body determined by APANPIRG; and</p> <p>b) A-CDM Experts nominated by States and International Organisations are encouraged to attend the ATFM/SG Meetings.</p> | <p>Expected impact:</p> <p><input type="checkbox"/> Political / Global</p> <p><input type="checkbox"/> Inter-regional</p> <p><input type="checkbox"/> Economic</p> <p><input type="checkbox"/> Environmental</p> <p><input checked="" type="checkbox"/> Ops/Technical</p> |
| <p>Why: To dissolve the APA-CDM/TF and merge with the ATFM/SG, subject to APANPIRG agreement, so that further coordination on matters related to A-CDM implementation and the integration and interoperability of A-CDM with ATFM and with other systems be undertaken by ATFM/SG.</p>                                                                                                                                                                                                                                                                                    | <p>Follow-up: <input type="checkbox"/> Required from States</p>                                                                                                                                                                                                           |
| <p>When: 24-Nov-21</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>Status: Draft to be adopted by PIRG</p>                                                                                                                                                                                                                                |
| <p>Who: <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other:</p>                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                           |

7.6 The APA-CDM/TF/6 Meeting further noted that the ATFM/SG/11 meeting, scheduled to be held from 12 to 16 July 2021, would consider an amendment to its TOR to incorporate A-CDM-related activities. ATFM/SG/9 meeting in 2019 had agreed to a draft amendment to the ATFM/SG TOR (**Appendix K to this Report**), in the event that APANPIRG decided to dissolve APA-CDM/TF. When agreed by ATFM/SG/11, its revised TOR would be forwarded under a Draft Decision to ATM/SG/9 and APANPIRG/32 for consideration.

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## **Agenda Item 8: Any Other Business**

### Update on SWIM Regional Coordination (IP/05)

8.1 IATA provided a summary on key SWIM activities being undertaken in Asia & Pacific Region. It was noted that a proposal for a SWIM Demonstration on the Common aeronautical Virtual Private Network (CRV) proposed by Hong Kong China in March 2020 had been postponed until further notice due to the COVID-19 situation. IATA discussed APAC FIXM 4.1 Extension, concept of SWIM Discovery Services, and a SWIM Service Category Taxonomy. It also summarized important SWIM-related updates from the Meteorological working groups held in 2020 and 2021, Seventh Meeting of Aeronautical Communications Services (ACS) Implementation Co-ordination Group of APANPIRG (ACSICG/7 – July 2020), the Fifth Meeting of the Surveillance Implementation Coordination Group (SURICG/5 – September 2020), and a virtual seminar on SWIM in January 2021 by Electronic Navigation Research Institute (ENRI) in Japan.

8.2 The ICAO APAC Regional Office was progressively uploading SWIM reference and education material to the SWIM-APAC site of the ICAO Secure Portal. The meeting was briefed on steps to gain access. The meeting was further informed that IATA offered a two-day IATA SWIM Training classroom course and had developed a two-hour online SWIM introductory course. The registration links for this course, and for two separate SWIM-awareness videos published by ICAO and IATA, were provided.

8.3 The meeting thanked IATA for sharing and supplementing useful information on behalf of SWIM TF. The meeting was also informed about a two-day ICAO SWIM workshop scheduled for 6 -7 July 2021, planned as part of the ICAO APAC Webinars in 2021. The relevant information and online registration were available at the following link:  
<https://www.icao.int/APAC/Meetings/Pages/Webinars.aspx>.

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## **Closure of Meeting**

9.1 Mr George Tak Yuen Wong, Chairperson of the APA-CDM/TF, expressed sincere thanks and appreciation to the participants from States/Administrations, International Organisations and A-CDM Expert Group for their contribution and support to APA-CDM/TF/6, as well as all other APA-CDM/TF meetings and tasks in the past.



ICAO

Sixth Meeting of the Asia/Pacific Airport Collaborative Decision  
Making Task Force (APA-CDM/TF/6)

Video Teleconference, 28 to 30 April 2021

### LIST OF PARTICIPANTS

|                                           |            |
|-------------------------------------------|------------|
| <b>TOTAL NO. OF STATES/ADMINISTRATIVE</b> | <b>17</b>  |
| <b>TOTAL NO. OF ORGANIZATION</b>          | <b>4</b>   |
| <b>TOTAL NO. OF PARTICIPANTS</b>          | <b>146</b> |
| <b>ICAO</b>                               | <b>4</b>   |
| <b>GRAND TOTAL</b>                        | <b>150</b> |

|                          |           |                          |           |
|--------------------------|-----------|--------------------------|-----------|
| <b>AUSTRALIA</b>         | <b>3</b>  | <b>PHILIPPINES</b>       | <b>7</b>  |
| <b>CAMBODIA</b>          | <b>5</b>  | <b>REPUBLIC OF KOREA</b> | <b>22</b> |
| <b>CHINA</b>             | <b>2</b>  | <b>SINGAPORE</b>         | <b>7</b>  |
| <b>- HONG KONG CHINA</b> | <b>8</b>  | <b>THAILAND</b>          | <b>14</b> |
| <b>FIJI</b>              | <b>2</b>  | <b>USA</b>               | <b>4</b>  |
| <b>INDIA</b>             | <b>8</b>  | <b>VIET NAM</b>          | <b>17</b> |
| <b>INDONESIA</b>         | <b>9</b>  | <b>ACI</b>               | <b>1</b>  |
| <b>JAPAN</b>             | <b>12</b> | <b>CANSO</b>             | <b>2</b>  |
| <b>MALAYSIA</b>          | <b>4</b>  | <b>IATA</b>              | <b>1</b>  |
| <b>NEPAL</b>             | <b>8</b>  | <b>IFALPA</b>            | <b>4</b>  |
| <b>PAKISTAN</b>          | <b>6</b>  | <b>ICAO</b>              | <b>4</b>  |

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ICAO

Sixth Meeting of the Asia/Pacific Airport Collaborative  
Decision Making Task Force (APA-CDM/TF/6)

Video Teleconference, 28 to 30 April 2021

### LIST OF WORKING AND INFORMATION PAPERS

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| WP/02                      | 2           | Outcomes of APANPIRG/31 & AOP/SG/4 Meetings                                                          | Secretariat                                            |
| WP/03                      | 5           | Development of Joint Operational Procedure Guidance for the Integration of ATFM and A-CDM Operations | Hong Kong China, China, India, ROK, Thailand and CANSO |
| WP/04<br><b>Revision 1</b> | 5           | CANSO/ACI Workshop on ATFM/A-CDM Integration                                                         | CANSO and ACI                                          |
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| WP/06                      | 6           | Questionnaire Based on ICAO Asia Pacific A-CDM Implementation Plan                                   | India and CANSO                                        |
| WP/07                      | 6           | Amendments to APAC A-CDM Implementation Plan                                                         | India, Thailand and CANSO                              |
| WP/08                      | 7           | APA-CDM/TF Terms of Reference and Task List                                                          | Secretariat                                            |

| Paper No.                  | Agenda Item | Title                                                                                                             | Presented by                                |
|----------------------------|-------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| <b>INFORMATION PAPERS</b>  |             |                                                                                                                   |                                             |
| IP/01                      | -           | List of Papers                                                                                                    | Secretariat                                 |
| IP/02                      | -           | List of Experts on Airport Collaborative Decision Making (A-CDM)                                                  | Secretariat                                 |
| IP/03<br><b>Revision 1</b> | 3           | Progress of A-CDM Implementation in Japan                                                                         | Japan                                       |
| IP/04                      | 5           | Integration of Airport-Collaborative Decision Making (A-CDM) with Air Traffic Flow Management (ATFM) in Singapore | Singapore                                   |
| IP/05                      | 8           | Update on SWIM Regional Coordination                                                                              | IATA on behalf of ICAO APAC SWIM Task Force |

**Asia/Pacific Airport Collaborative Decision-Making Task Force (APA-CDM/TF)**

**TERMS OF REFERENCE**

(As amended by **Decision APANPIRG/31/1**)

The scope and objective of the APA-CDM/TF is to assist States in implementation of A-CDM at international aerodromes by fostering harmonized A-CDM implementations and promoting best practices to achieve performance expectations as per Asia/Pacific A-CDM Implementation Plan.

To achieve the above objective, the Task Force shall:

- 1) Monitor and assist States in implementation of A-CDM at international aerodromes to foster harmonized implementations as per Asia/Pacific A-CDM Implementation Plan;
- 2) Encourage States to share their experiences and best practices in implementing A-CDM through Workshop /Seminar;
- 3) Monitor the progress of achieving the performance expectations as per Asia/Pacific A-CDM Implementation Plan and review them as needed;
- 4) Foster the interoperability of A-CDM with ATFM and Aircraft Operator systems; and
- 5) Establish and continue close working arrangements with other relevant ICAO Regional groups such as the Air Traffic Flow Management Steering Group (ATFM/SG), System-Wide Information Management Task Force (SWIM/TF) and other groups working on related issues.

**Composition:** The APA-CDM Task Force will be a multidisciplinary group composed of subject matter experts in aircraft operations, air traffic management, aerodrome operations and systems engineering, supplemented with other members as and when required.

**Working Methods:** The Task Force will hold at least one three-day face-to-face meeting each year.

**Time Lines:** Deliverables addressing the objective of the Task Force are required to be developed and delivered to APANPIRG/32.

## Case Study: Planned A-CDM and ATFM Integration for Australia

*Case Study supplied by Airservices*

### 1.1 Australian Operating Environment

The Australian ATM Network comprises of a single state with operations managed by Airservices Australia. The airspace assigned by ICAO to Australia covers 11% of the earth's surface, divided into two Flight Information Regions (FIRs) controlled from two major centres as shown in Figure 1. The Melbourne FIR (YMMM) covers the southern part of the Australian continent and large parts of the Indian and South Pacific Oceans, the Brisbane FIR (YBBB) covers the northern part of the Australian continent and half of the Tasman Sea (with the other half administered by New Zealand).

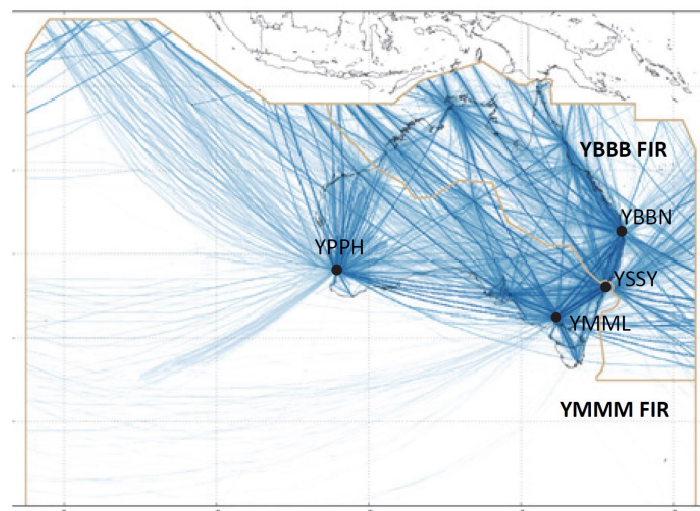


Figure 1: Australian Flight Densities, FIRs & Top Airports.

Due to vast travel distances and population concentration to only a few metropolitan areas, air transportation is the major form of inter-city travel in Australia, with approximately 1.4 million flights and 156 million passengers per year. While these numbers are a lot lower compared to the US and Europe, relative to Australia's smaller population, it represents an air transportation system roughly twice the size per capita.

Despite its large airspace, the Australian ATM Network has a unique characteristic in that a relatively high proportion of air traffic occurs between just three major airports within a relatively short flying time: Sydney (YSSY), Melbourne (YMML) and Brisbane (YBBN), often referred to as "The Triangle". Approximately 30% of the flights from these three airports departs towards the other two. These three city pairs are in the top 15 busiest city pairs in the world (by aircraft movement), with a flight taking off between Sydney and Melbourne (and vice versa) approximately every 10 minutes during peak hours.

Due to runway configurations and constraints on airport layout, Melbourne and Sydney airports in particular can experience large fluctuations in declared capacity. Even in visual conditions, wind can have a significant impact on capacity dropping the maximum arrival rates from 50 and 40 for dual runway operations, to 23 and 22 for single runway operations at Sydney and Melbourne respectively, essentially halving the available capacity.

Demand and capacity challenges in the Australian ATM Network therefore generally originate from capacity reductions at one or more of three major airports, which quickly propagate to the other two and affect the flow of traffic in and out of *The Triangle*.

Australia will therefore be implementing A-CDM at Sydney (YSSY), Melbourne (YMML), Brisbane (YBBN) and Perth (YPPH) as a Partnership between Airservices (ANSP), Australia's four major domestic airline groups and the respective four airport corporations, with the ANSP (Airservices) as the lead organisation. The aim of the partnership is to reduce cost and complexity of the A-CDM implementation by ensuring a single technology solution and consistent A-CDM procedures across the country. Further, as a partnership, buy-in to the A-CDM concept by the main stakeholders is ensured from the very start, and implementation across multiple airports raises the benefits of A-CDM from an individual airport level to an ATM Network perspective.

### 1.2 Current Collaborative Decision Making Processes

Australia has a mature implementation of Collaborative Decision Making (CDM) between ATC and the major domestic airlines to mitigate the impact of disruptions across the Australian ATM Network through the use of Air Traffic Flow Management (ATFM) – in particular Ground Delay Programs (GDPs) – managed by the Network Coordination Centre (NCC) in Canberra.

Planning for the ATFM measure – specifically the GDP – occurs the day prior to operations to provide airlines early notice of any constraints that may be present for the day of operations through the publication of the ATFM Daily Plan (ADP).

To support the ATFM planning process to start the day prior, the Australian ATFM systems works off schedules in first instance, which get updated by flight plans once filed on the day of operations. The planning follows a 3-step process:

1. As the first step in this planning process, airlines upload their confirmed flight schedules to ATFM system the day prior to operations to inform of the demand for the following day.
2. In the second step, the NCC establishes available capacity through a collaborative process with major domestic airlines and the Australian Bureau of Meteorology, in a process referred to as Meteorological Collaborative Decision Making (MET-CDM). The major aim of the MET-CDM process is to assess any weather risks that may affect capacity of the ATM Network and mitigate operational impact.
3. In the third step, if deemed required, the NCC publishes a GDP – with CTOTs assigned to flights based on the uploaded confirmed schedule – to balance the demand with the available capacity, as established in the first two steps.

By publishing the GDP the day prior, airlines have the opportunity to optimise their fleet operations and inform passengers of changed departure times the night before they travel.

### 1.3 Benefits of A-CDM at Network level

Australia's ATFM system tracks active, flight-planned and scheduled flights, but flights are considered independent (i.e. no "tail tracking" between the different GDPs). A single aircraft is likely to operate many sectors (legs) between Australia's four major airports a day, and therefore requiring multiple slots across the different GDPs. A delay on any of these sectors quickly propagates and

requires new slots to be negotiated for downstream sectors. The propagation of these sector delays are inherently difficult to estimate beyond the current airborne flight, partly due to limited (data) visibility on airport operations and low predictability of taxi-out and take-off time for the subsequent sector as schematically shown in Figure 2.

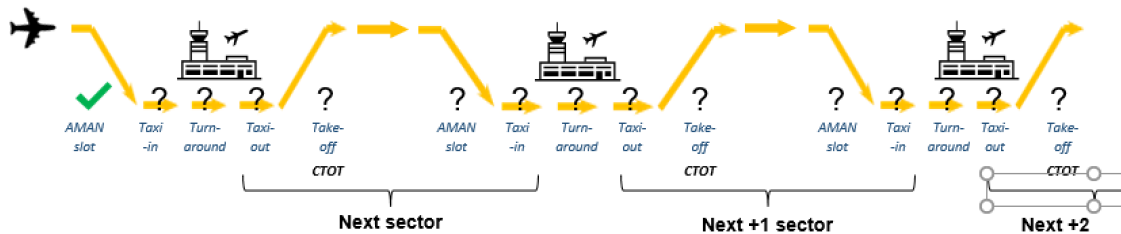


Figure 2: Uncertainty in sector delay propagation.

The benefits of A-CDM at individual airport level are well understood and demonstrated at various locations around the world. By implementation at Australia's four major airports, Airservices is further aiming for benefits at a Network level through integrating A-CDM with the centralised ATFM system in order to 'link' individual GDPs at the respective airports, and to improve the ability to predict sector delay propagation.

To realise maximum benefits of A-CDM within the context of the entire ATM Network, the integration of A-CDM and ATFM in Australia has been considered both from a technical and CDM process perspective.

#### 1.4 Principles for A-CDM and ATFM Integration

The implementation of A-CDM needs to complement the existing CDM processes, and prevent significant complexity from requiring aircraft operators to comply with departure constraints provided by an A-CDM implementation at the departure airport (through assigning a Target Start-up Approval Time (TSAT)), with arrival constraints for ATFM at the destination airport (through a Calculated Take-off Time (CTOT)) (Figure 3).

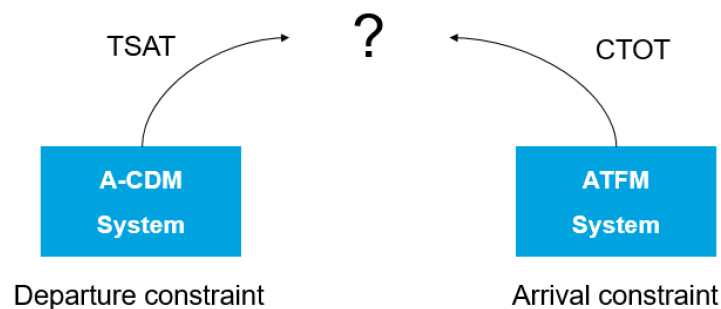


Figure 3: Potential for conflicting constraints.

The Australian A-CDM and ATFM integration is guided by the following main principles:

1. Arrival ATFM slot is nominally of higher priority than position in A-CDM Pre-Departure Sequence (PDS).

2. PDS at the departure port is a dynamic sequence (order) rather than fixed slot allocation (times).
3. A change in ATFM arrival slot at the arrival port (CLDT/CTOT) automatically results in a nominally compliant position in the PDS at the departure port (TTOT/TSAT)

Principle 1 states that within the overall ATM Network, nominally, arrival constraints are of higher importance than departure constraints, i.e. nominally delays should be incurred on the ground rather than in the air. Practically, this means that within the A-CDM PDS, priority is assigned to flights with a CTOT assigning a TSAT that ensures an ATFM-compliant departure (refer to 1.6 on PDS equity).

Principle 2 states that the PDS is more tactical tool than an ATFM slot manager; the PDS needs to respond to operator changes in Target Off Block Time (TOBT) close to departure. Rather than assigning *fixed time slots* (like an ATFM slot manager), focus should therefore be on delivering the right pushback *sequence*.

Principle 3 states that ATFM slot changes performed by CDM stakeholders are automatically send to the PDS and actioned; i.e. a change of CLDT/CTOT in ATFM system results in automatic re-assignment of TSAT aiming for ATFM compliance. On the other hand, a (significant) change to TOBT (and potentially TSAT) in the A-CDM system does not result in an automatic ATFM slot re-assignment. The A-CDM system will show an alert that based on the TOBT update by the operator, a new TSAT was assigned that will result in departure time non-compliant with the assigned ATFM slot. Manual action is required in line with pre-existing CDM processes where an operator is required to apply for a new ATFM slot, if the original slot cannot be operated to.

### 1.5 Collaborative Management of Flight Updates

Collaborative Management of Flight Updates is one of the EUROCONTROL A-CDM Concept Elements, and it is implemented within the Australian context as follows.

Anticipated airport configurations (and departure rates) will be pre-set in the four A-CDM implementations the day prior as part of the development of the overall plan for the Network (same configurations that are used to plan for any possible GDPs). Schedule information and any ATFM constraints (CTOTs) for the day of operations will be send from the ATFM system to the four A-CDM implementations as soon as available. This combination of anticipated airport configurations, schedules and ATFM constraints allows for pre-processing of TOBTs (as driven by schedule) and TSATs (driven by departure demand vs capacity and CTOTs).

On the day of operations, real-time arrival time updates are being send from the ATFM system to the A-CDM implementations to provide an accurate estimate of arrival time at the destination airport, taking into account operator supplied schedule, ATFM slots, and tactical in-flight updates.

In the Australian implementation, TOBTs for subsequent sectors will be automatically updated whenever a local A-CDM implementation determines that based on an updated arrival time of the inbound flight and minimum turn-around time, the original schedule of the outbound flight (next sector) cannot be met. This automatic update of the TOBT ceases whenever an airline performs a manual TOBT update, or when the aircraft has arrived at the destination airport (whichever occurs first). The philosophy behind this implementation choice is that prior to arrival of the inbound flight, the variables that impact TOBT of the outbound flight are within the ANSP domain (e.g. enroute and arrival delays) and not directly transparent to the aircraft operator; while when the aircraft has

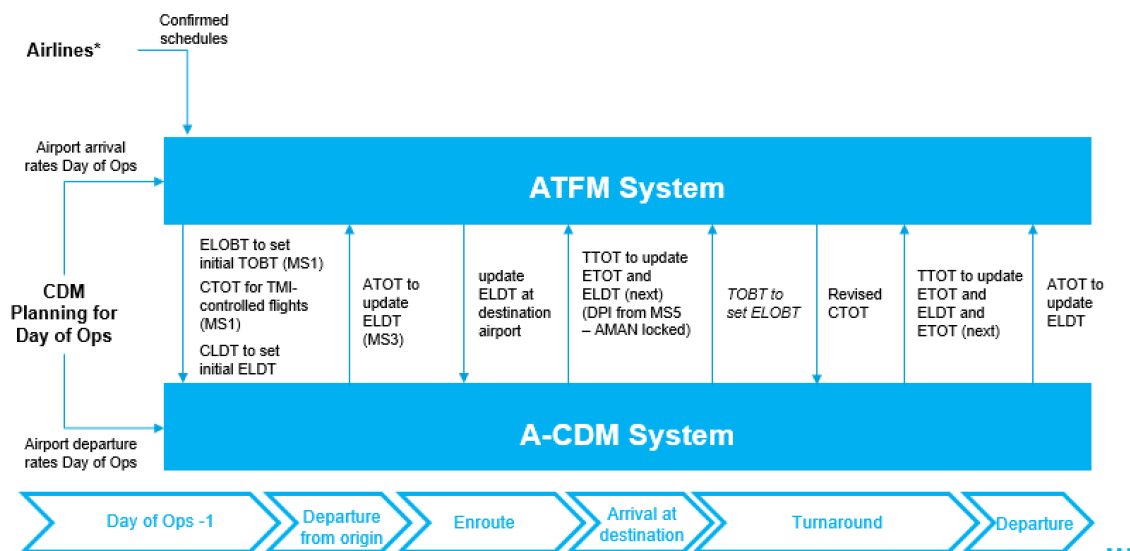
arrived at the gate, the variables that subsequently impact TOBT are within the aircraft operator domain (e.g. late passengers etc.), and thus the aircraft operator becomes responsible for keeping the TOBT updated.

From A-CDM Milestone 5 ‘Final Approach’ (referred to as ‘Sequenced in AMAN’ in Australian implementation), Departure Planning Information (DPI) is being send from the local A-CDM implementation to the centralised ATFM system. From this Milestone, the flight is locked in the arrival sequence for landing, ensuring an accurate Estimated Landing Time (ELDT), Estimated In-Blocks Time (EIBT) for the inbound flight and therefore TOBT and TTOT for the outbound flight (next sector).

DPI messaging in the Australian context is the sending of updated estimated Target Take-Off Times (TTOTs) and TOBTs from the A-CDM PDS to the centralised ATFM system:

- TTOTs send by the A-CDM system update the departure time estimate in the ATFM system to update the demand prediction across the network for both airport and airspace resources.
- TOBTs send by the A-CDM system can set Earliest Off-Block Times (ELOBT) in the ATFM system to ensure that upon a GDP activation or revision, flights will not get assigned an unachievable ATFM slot.

A schematic overview of the Collaborative Management of Flight Updates in the Australian A-CDM-ATFM context is shown in Figure 4.



\* Integration of Airline system with ATFM and A-CDM system during Day of Ops not displayed

Figure 4: Collaborative Management of Flight Updates in the Australian A-CDM-ATFM context.

The combination of departure (DPI) and arrival time updates allow to estimate the propagation of network delay. E.g. a flight on arrival into Melbourne triggers a DPI for its next sector to Sydney. The ATFM system subsequently updates the departure time to Sydney, as well as the arrival time in Sydney. This updated arrival time in the ATFM system for Sydney is send to the Sydney A-CDM implementation and triggers an automatic (preliminary) TOBT update for the following sector to Brisbane.

### 1.6 Equity in A-CDM Pre-Departure Sequence

As previously stated, a relative high proportion of departures from especially Sydney (YSSY), Melbourne (YMLL), Brisbane (YBBN) depart to the other two. This means that when GDPs are active at any of these ports, the PDS at the departure port may have a high proportion of flights with a CTOT that will be automatically prioritised (to ensure ATFM compliance). As a result, during times of high departure demand (or times of low departure capacity), inequitable TSAT delay distribution may occur where flights without a CTOT receive more delay.

To ensure delay distribution within the PDS is as equitable as possible, the PDS uses the CTOT compliance window (when required) to ensure that flights departing within vicinity of one another, are allocated balanced TSAT delays.

Further, as part of the Network CDM concept (see 1.8), CTOT compliance from a certain departure airport may be suspended if it has been determined that departure capacity at that airport is the limiting factor on of the ATM Network. For example, if strong crosswinds at Sydney (YSSY) dictate the use of a single runway only (less than 50% of normal capacity), Sydney (YSSY) capacity becomes the limiting factor of the ATM Network; CTOT compliance for flights departing Sydney (YSSY) may subsequently be suspended to ensure the PDS can deliver the most optimal pushback sequence given the limited available capacity.

### 1.7 ATFM Compliance Management

Upon implementation of A-CDM at an airport, the local tower ATC will be no longer presented with COBT/CTOT information. Instead, Tower ATC will be shown TOBT/TSAT on their strips and will manage TOBT & TSAT compliance (-5/+5 mins).

ATFM compliance will be embedded in the TSAT assigned by A-CDM. The A-CDM system will not allow a TSAT that results in a TTOT < CTOT - 5 mins. Early non-compliance with ATFM is therefore prevented through the TSAT allocation logic, and TSAT compliance management.

Preventing late non-compliance with ATFM will become the responsibility of the aircraft operator. Up to pushback, the aircraft operator will be required to perform an ATFM slot change when a TOBT updates results in a TSAT and TTOT update outside of the ATFM compliance window (aircraft operator will receive warning from A-CDM system). After pushback, compliance is no longer measured and referred to as 'departure accuracy' as the aircraft operator is no longer solely responsible for achieving the CTOT. The only exception is during a ground stop enforced by ATC.

Placing the responsibility of ATFM compliance (i.e. preventing late non-compliance) with the aircraft operator has been possible due to a mature CDM environment and a mature relationship between ANSP and aircraft operators where all parties understand that a predictable network is a responsibility by all stakeholders. This is further enabled through transparent post-operational reporting available to all CDM stakeholders, driving a culture of accountability by all.

### 1.8 Network Collaborative Decision Making

The proposed integration of the multiple A-CDM systems with the centralised ATFM system provides improved predictability 'beyond the airport turnaround' into the next sector (see figure 5). Aircraft operators benefit from predictability for the next two or more sectors of an airframe as it performs multiple back-and-forth sectors on the East Coast per day. While the accuracy on an individual flight level reduces beyond the next sector, it is anticipated to remain sufficient on *flow* level. This allows

for an earlier warning of network delay propagation, allowing timely action to be coordinated with the CDM stakeholders.

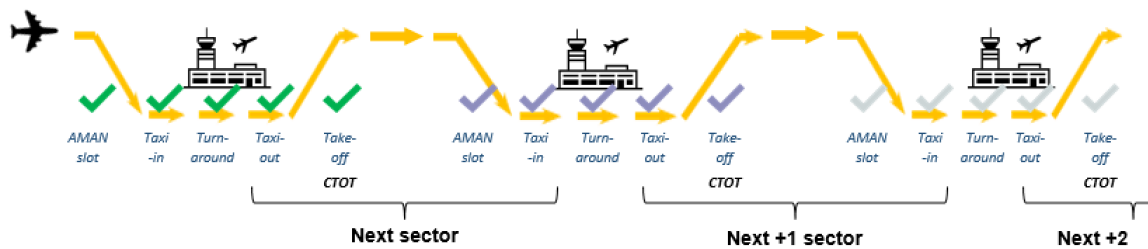


Figure 5: Improved predictability of sector delay propagation.

Current CDM is predominately focussed at managing arrival demand through adjusting airport arrival acceptance rates and associated GDP revisions. The impact of departure demand is often not adequately considered. For example, when recovering from adverse events, often large departure delays occur as arrival demand has been prioritised. Departure delays subsequently impact on the arrival flows at the destination airport. In some cases, the tactical arrival rate is lowered in order to clear (some of the) departure queue, which increases airborne delays. The impact of an adverse event at one airport, may therefore ripple unpredictably throughout the network and lengthen the time it takes for all stakeholders to recover.

A-CDM provides improved visibility of real-time arrival and departure demand throughout the network. Collaborative decision making will be able to include considerations of arrival and departure balancing, to ensure a smoother recovery from an adverse event, and mitigate the impact on the remainder of the network.

Integrating A-CDM into network management provides common and real-time situational awareness of local/network pain points, allowing to make collaborative decisions in the context of stakeholder priorities, to enact the right controls to unlock latent airspace, runway and gate capacity, thereby improving customer experience: Network-CDM (Figure 6).

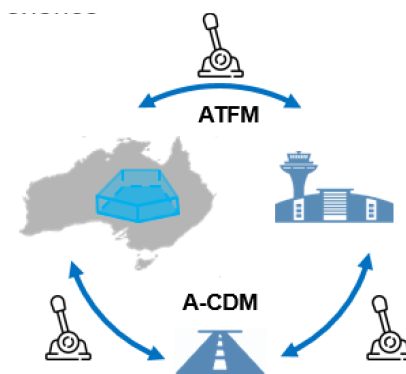


Figure 6: Network CDM: unlocking latent airspace, runway and gate capacity.

### 1.9 Lessons Learned

*Lesson 1 – Change Management: don't underestimate the difficulty of explaining the interaction between ATFM and A-CDM*

Despite the mature CDM environment in Australia and the mature relationship between the ANSP, airlines and airports, it took considerable effort to explain to operational SMEs across the different organisations how ATFM and A-CDM would work together. The establishment of the core Integration Principles presented earlier significantly assisted to convince key stakeholders that no such situation would occur where an aircraft operator would be confronted by conflicting ATFM and A-CDM constraints.

*Lesson 2 – Identify the strengths of your local CDM implementation and leverage those to reduce complexity*

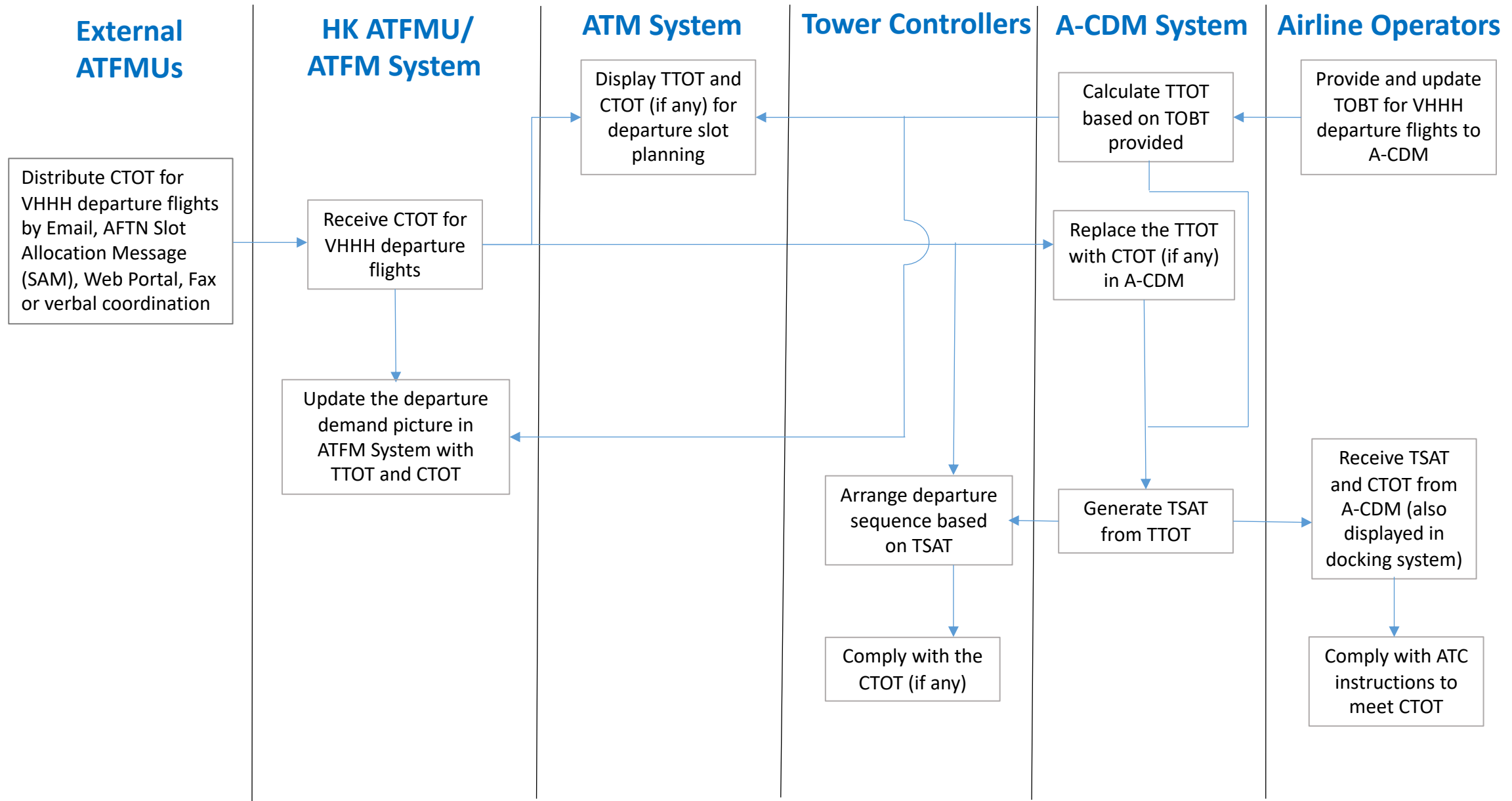
Within the Australian context, the ANSP and airlines were able to agree on a shared responsibility on ATFM compliance management. This significantly reduced the integration complexity by simplifying the changes to ATC tower technology. It is noted that each operational environment is different due to different traffic patterns, different airlines, and different cultures. What works for one environment does not necessarily work for another environment; but the key lesson is to leverage local strengths to keep things as simple as possible!

1.10 Contact

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# Hong Kong, China Model for Integrating ATFM and A-CDM Operations



## **ACDM C-ATFM INTEGRATION IN INDIA**

### **INTRODUCTION**

Air traffic in India continues to grow rapidly and this trend is likely to continue to expand into the future. Increased traffic is expected at many of the existing airports. This increase in demand requires a corresponding effort to utilize systems capacity efficiently. This will require Air Traffic Flow Management (ATFM) capabilities for effective Demand and Capacity Balancing (DCB). The ATFM tools will enable improved management of demand and capacity and will help system stakeholders to deal with the increased complexity of the nation's air routes.

Airport CDM (A-CDM) aims at improving the overall efficiency of airport operations by optimising the use of resources and improving the predictability of events of operation. Increased predictability can be of significant benefit for all major airport and ATFM operations; it raises both productivity and cost-efficiency and also eco-friendly.

The scope of A-CDM is Airport specific whereas ATFM caters to wide airspace comprising several Airports. In India, CATFM at New Delhi serves the nation's airspace. Integration of A-CDM and ATFM will benefit both the system by exchanging relevant, timely and reliable data. Collaborative Flight Update, an important concept element of A-CDM will require integration of A-CDM and ATFM.

The Central Air Traffic Flow Management is responsible for ensuring the balance between the capabilities of providing Air Traffic Control Services and the demand for air movements in the Indian airspace. Acts strategically in the planning phase of scheduled flights and tactically during the daily operation, minimizing impacts from fluctuating the balance between capacity and demand in order to ensure the safety of operations, regularity and punctuality of flights. The system to be implemented at the Center is specifically designed to increase the efficiency of ATFM measures by applying separations in flight, ground delays and rerouting path. The situational awareness being generated by the system, allows all users to participate collaboratively to determine flow management measures to be adopted.

### **BENEFIT**

Integration between A-CDM and ATFM will benefit both systems. A-CDM will be generating TSAT taking into account any ATFM measure from ATFM. Similarly, timely and reliable data from ACDM systems will benefit the ATFM system to generate more accurate ATFM measures and to deal with Demand and Capacity Balancing.

### **FUNCTIONS**

The C-ATFM System's main functions are:

- Receive and process flight information associated with the operation of flights scenery as well as the state of operability of ATS units, technical resources, infrastructure and meteorological phenomena that affect the national air navigation;
- Allow the definition of strategic actions, pre-tactical and tactical, in order to optimize the use of airspace with existing resources and meeting the demands of the sectors involved.
- Follows the best practices and recommendations for Human Machine Interfaces for the sector, such as FAA - Human Factors Design Standard (HFDS), ensuring adequate consideration to the science of human factors.

- Greater interoperability and global harmonization of systems from the use of international standards to exchange messages.
- Decision support functionality via graphics and easy interoperability components, with information to be shared collaboratively among the system's users.
- The system process the flight plans data received by the AFTN network or through files of Repetitive Flight Plans (RPL).
- Processes the correlation (association) between the flights plans data and flights tracks generated by the surveillance system.
- Performs the exchange of messages with ATS Control Centers (ACC / APP) responsible for Air Traffic Services (ATS) in the Flight Information Regions (FIR), which ensure the balance between capacity and demand of users of these airspaces.

The C-ATFM System implements the appropriate interfaces to/from the external systems or external database to enable accurate traffic demand and capacity modeling and projections.

External Systems C-ATFM System relates to the following external systems for exchange automatically data with them:

- Foreign ATFM/ATC Systems: to implement data exchange with foreign ATFM/ATC Systems.
- MET System: provides weather information in the area of interest in text format, binary or image.
- AIS System: this interface allows you to receive data published by NOTAM.
- ATC Systems: provides information in real-time to generate a national mosaic through the data generated by the surveillance system (radar, ADS-B, ADS-C and MLAT). Also enables the exchange of data from the flight plan for the generation of the national air situation.
- AOCC (Airport Operations Center): provides airport status, aircraft parking stands and off-block time.
- Airline Operations: this interface allows the forwarding of flight plans (FPL) and related messages (CHG, CNL and DLA).
- Military Operations: establishes connectivity between the C-ATFM and military installations to receive flight plans directly from the user for flights that will cross in civil airspace.
- Airport CDM: provides Target Off-Block Time (TOBT) where the aircraft will be ready to begin operations at the aerodrome.

#### **A-CDM INTERFACE DESCRIPTION**

For tactical planning of air operations at an airport is necessary that the information about the events of execution is updated dynamically for all involved sectors. In this sense the C-ATFM should receive information about these events in order to enable the planning of the implementation with the greatest accuracy possible. The interface with the A-CDM will allow such information to be used in real-time by users of the C-ATFM System. The interface allows the C-ATFM to receive Departure Planning Information Message (DPI) forwarded by the A-CDM system, including Target Off-Block Time (TOBT). To send departure information, the A-CDM system should use a DPI message formatted in ADEXP (as described below) and the route then automatically via Web Service whenever updated information is available. The interface also enables transmitting DPI Message from C-ATFM to A-CDM (AOBD System) to send information, including ETA, CTA and CTOT.

## **CONFIGURATION**

The A-CDM Client program is configured to send automatically following DPI messages to ATFM Server:

- a) Modification of the aircraft type
- b) Modification of the aircraft registration
- c) Modification on estimated TOBT of more than 5 minutes.
- d) Modification on estimated TSAT of more than 5 minutes.
- e) Modification on estimated TTOT of more than 5 minutes.
- f) Update of actual AOBT
- g) Update of actual ATOT
- h) Update of actual ALDT
- i) Update of actual AIBT

ATFM client program is configured to send automatically following DPI messages to A-CDM Server:

- a) Route point update in more than 3 minutes: ELDT.
- b) Application of ATFM measure: CTOT.

**Departure Planning Information (DPI) Message** This message is used by the A-CDM system to provide the C-ATFM updated planning departure information. The message should be sent by A-CDM in the events of:

- modification on take-off or off-block time of more than 5 minutes.
- modification of the aircraft type and/or aircraft registration. This message is also used by the C-

ATFM to provide the A-CDM with updated information about the flights. The message should be sent by C-ATFM in the events of:

- modification on Estimated Time of Arrival (ETA) more than 3 minutes.
- application of ATFM program for Calculated Time of Arrival (CTA) and Calculated Take-Off Time (CTOT).

The message DPI should be sent in ADEXP format, according to the following syntax: `DPI_MESSAGE := "-TITLE DPI"+ orgnid + arcid + adep + ades + eobd + eobt + (aibt) + (tobt) + (tsat) + (ttot) + (atot) + (aobd) + (aobt) + (aldt) + (arctyp) + (reg) + (eta) + (cta) + (ctot) + timestamp`

The DPI message will have your data formatted in accordance with the standard ADEXP, as specified below:

| Primary Field | Description                                                                                                                                                                                         | Classification |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| -TITLE        | Message title. In this case, should be "DPI"                                                                                                                                                        | M              |
| -ORGNID       | The designator of an addressee having originated a message                                                                                                                                          | O              |
| -ARCID        | Aircraft Identification. May be the registration marking of the aircraft, or the ICAO designator of the aircraft operator followed by the flight identifier.                                        | M              |
| -ADEP         | ICAO location indicator of the aerodrome of departure or the indication 'AFIL' meaning an airfiled flight plan or 'ZZZZ' when no ICAO location indicator is assigned to the aerodrome of departure. | M              |
| -ADES         | The ICAO location indicator of the aerodrome of destination or 'ZZZZ' when no ICAO location indicator is assigned to the aerodrome of destination.                                                  | M              |
| -EOBD         | Estimated Off-Block Date.                                                                                                                                                                           | M              |
| -EOBT         | Estimated Off-Block Time.                                                                                                                                                                           | M              |
| -AIBT         | Actual In-Block Time. This information is sent from A-CDM to C-ATFM.                                                                                                                                | O              |
| -TOBT         | Target off-block time. The message should contain this field and/or TSAT. This information is sent from A-CDM to C-ATFM.                                                                            | O              |
| -TSAT         | Target startup approval time. The message should contain this field and/or TOBT. This information is sent from A-CDM to C-ATFM.                                                                     | O              |
| -TTOT         | Target take-off time. This information is sent from A-CDM to C-ATFM.                                                                                                                                | O              |
| -ATOT         | Actual Take-Off Time. This information is sent from A-CDM to C-ATFM.                                                                                                                                | O              |

|            |                                                                                                            |   |
|------------|------------------------------------------------------------------------------------------------------------|---|
| -AOBD      | Actual Off_Block Date. This information is sent from A-CDM to C-ATFM.                                      | O |
| -AOBT      | Actual Off_Block Time. This information is sent from A-CDM to C-ATFM.                                      | O |
| -ALDT      | Actual Landing Time. This information is sent from A-CDM to C-ATFM.                                        | O |
| -ARCTYP    | Type of aircraft (ICAO identification of the type) or ZZZZ. This information is sent from A-CDM to C-ATFM. | O |
| -REG       | Registration markings, as ICAO field 18 REG/. This information is sent from A-CDM to C-ATFM.               | O |
| -ELDT      | Estimated landing time. This information is sent from C-ATFM to A-CDM.                                     | O |
| -CLDT      | Calculated Landing Time. This information is sent from C-ATFM to A-CDM.                                    | O |
| -CTOT      | Calculated Take-Off Time. This information is sent from C-ATFM to A-CDM.                                   | O |
| -TIMESTAMP | The time at which an event occurred.                                                                       | M |

Classification:

M – Mandatory

O – Optional

EXAMPLE:

-TITLE DPI  
 -ORGNID VIDPACDM  
 -ARCID ETH3739  
 -ADEP VIDP  
 -ADES HAAB  
 -EOBD 141217

- EOBT 1030
- AIBT 1700
- TOBT 1035
- TSAT 1035
- TTOT 1036
- ATOT 1039
- AOBD 141217
- AOBT 1040
- ALDT 1645
- ARCTYP B773
- REG ETAPS

- TITLE DPI
- ORGNID VIDPACDM
- ARCID ETH3739
- ADEP VIDP
- ADES HAAB
- EOBD 141217
- EOBT 1030
- ETA 1230

- TITLE DPI
- ORGNID VIDPACDM
- ARCID ETH3739
- ADEP VIDP
- ADES HAAB
- EOBD 141217
- EOBT 1030
- CTA 1240
- CTOT 1045
- TIMESTAMP 141217104100

The C-ATFM will be prepared to receive DPI message in two formats:

<message>

- TITLE DPI
- ORGNID VIDPACDM
- ARCID ETH3739
- ADEP VIDP
- ADES HAAB
- EOBD 141217

-EOBT 1030  
 -AIBT 1700  
 -TOBT 1035  
 -TSAT 1035  
 -TTOT 1036  
 -ATOT 1039  
 -AOBD 141217  
 -AOBT 1040  
 -ALDT 1645  
 -ARCTYP B773  
 -REG ETAPS  
 -TIMESTAMP 141217104100  
 </message>

#### DPI response

C-ATFM system shall produce DPI responses simply composed by a text message with a statement regarding the DPI request message processing. The system shall issue the following messages:

1. "SUCCESS – Flight Plan <ARCID> successfully update."

This message shall be issued once C-ATFM receives, interprets the DPI message request correctly, and successfully associates this message to an existing flight plan within System's database.

2. "SUCCESS – Message received successfully."

This message shall be issued once C-ATFM receives, interprets the DPI message request correctly, and however, cannot associate this message to an existing flight plan within System's database.

3. "ERROR – the following message is undefined and is going to be discarded:  
<MESSAGE>"

This message shall be issued once C-ATFM receives, and however, is not capable to identify of what kind of message type is this DPI request about.

4. "ERROR – The message was not correctly processed due to the following error message(s): <MESSAGES>"

This message shall be issued once C-ATFM receives, and however, is not capable to correctly interpret the DPI message request. This incapability will be related to either:

- 1) the absence of one of all the required fields for the message; or 2) due to syntactical malformation of one or more fields used within the message.

### **IMPLEMENTATION**

Integration of A-CDM and ATFM systems have been carried out in a phased manner.

As of date, the AAI ACDM Team has completed Integration of seven Indian Airports.

- 1] Kolkata Airport;
- 2] Mumbai Airport;
- 3] Chennai Airport;
- 4] Trivandrum Airport;
- 5] Ahmedabad Airport;
- 6] Guwahati Airport;
- 7] Jaipur Airport;

Delhi International Airports Limited has completed the integration of Delhi Airport.

### **ABBREVIATIONS**

| Abbreviation | Description                                  |
|--------------|----------------------------------------------|
| AAI          | Airports Authority of India                  |
| ACC          | Area Control Center                          |
| A-CDM        | Airport CDM                                  |
| ADS-B        | Automatic Dependent Surveillance-Broadcast   |
| ADS-C        | Automatic Dependent Surveillance – Contract  |
| AFTN         | Aeronautical Fixed Telecommunication Network |
| AIBT         | Actual In-Block Time                         |
| AIS          | Aeronautical Information Service             |
| ALDT         | Actual Landing Time                          |
| ANS          | Air Navigation Service                       |
| AOBD         | Actual Off_Block Date                        |
| AOBT         | Actual Off_Block Time                        |
| APP          | Approach Control                             |

|        |                                     |
|--------|-------------------------------------|
| ATC    | Air Traffic Control                 |
| ATFM   | Air Traffic Flow Management         |
| ATOT   | Actual Take Off Time                |
| ATS    | Air Traffic System                  |
| C-ATFM | Central Air Traffic Flow Management |
| CDM    | Collaborative Decision Making       |
| CTA    | Calculated Time of Arrival          |
| CTOT   | Calculated Take-Off Time            |
| EOBD   | Estimated Off-Block Date            |
| EOBT   | Estimated Off-Block Time            |
| ETA    | Estimated time of arrival           |
| FAA    | Federal Aviation Administration     |
| FIR    | Flight Information Region           |
| FPL    | Flight Plan                         |
| HFDS   | Human Factors Design Standard       |
| MET    | Meteorology                         |
| MLAT   | Multilateration                     |
| NOTAM  | Notice to Airmen                    |
| RPL    | Repetitive Flight Plan              |
| SICD   | System Interface Control Document   |
| TMU    | Traffic Management Unit             |
| TOBT   | Target off-block time               |
| TSAT   | Target startup approval time        |
| TTOT   | Target take-off time                |

## DEVELOPING A JOINT OPERATIONAL PROCEDURE GUIDANCE FOR THE INTEGRATION OF ATFM AND A-CDM OPERATIONS

### Status

1.1 To handle the ever-increasing volume of air traffic safely and efficiently within limited airspace, ROK has introduced and operated the A-CDM and ATFM systems. A-CDM was first introduced at Incheon International Airport in December 2017. At the establishing stage, the focus was on establishing and operating a system in which 38 basic milestone information, such as TOBT and TSAT, could be shared among airport operators, airlines, ground handling companies and controllers (Stage 1). Currently, it is in the process of establishing an integrated A-CDM system (Step 2) that can link with the DMAN (Departure Manager) and expand to de/anti-icing flights, and plans to make an advancement (Step 3) that aims to full automation of A-CDM. With the introduction of A-CDM, Incheon International Airport experienced a 6.6% reduction in ground movement time, 9% reduction in fuel volume and 8.7% reduction in carbon emissions per aircraft in 2018. In addition, from 2018 to 2020, flight punctuality improved by about 19.5%<sup>1</sup> and the delay rate decreased by about 3.9%<sup>2</sup>. Based on these achievements, the plan has been established to build A-CDMs for 3 busy airports - Gimpo, Gimhae, and Jeju airports. Those airports are expected to complete pilot operations in 2020 and actually operate the A-CDM in 2021.



1.2 Since 2018, ATFM system has been in full operation and the Air Traffic Control Center located in Daegu, Air Traffic Management Office, has been conducting comprehensive flow management for Incheon FIR for 24 hours, 365 days. When hazardous weather or unusual events expected, the Air Traffic Control Center analyzes the impact on air traffic, possible changes of abnormal situation, and the magnitude of delay. Based on the analysis results, the

<sup>1</sup> (flight punctuality) If the station has been off-blocked within 15 minutes of the flight planning time

<sup>2</sup> (flight delay) standard take-off and landing time + 30 minutes or more for domestic flights and  
+ 1 hour of more for international flights

ATCC performs CDM with stakeholders such as civil and military controllers, airlines, airport operators, and meteorological officers. Through CDM, ROK can share information and determine the optimal response. For the measures of ATFM, it includes COBT/CTOT issue, distance/time separation, altitude limit, and rerouting. In 2019, CTOT issuance reduced the delay by approximately 148,538 hours, saving about 876,374 tonnes of fuel and approximately 2,769,342 tonnes of CO<sub>2</sub> on the A330-300 basis. However, the domestic airspace is heavily influenced by restriction on flow management of neighboring China and Japan and the rigid operation system due to the dualization of civil and military forces and the blocked north directions. To overcome these limitations, ROK has continued efforts to improve flow management such as the establishment of international cooperation system and the development of Korean ATFM.

1.3 Both of A-CDM and ATFM systems are one of cooperative decision support tool, which suggest the need for integration of the two systems. A more accurate CTOT can be calculated when milestone information related to ground movement from A-CDM is provided to ATFM, and flow management measures issued by ATFM can be applied in a timely and appropriate manner when supported by real-time information sharing systems such as A-CDM are supported.

### **Status of Interoperation Model between A-CDM and ATFM**

2.1 For Incheon International Airport, key aircraft time information (TOBT, TTOT, TSAT, AOBT, AIBT, etc.) produced by A-CDM is send to ATFM systems. For Incheon International Airport, key aircraft time information (TOBT, TTOT, TSAT, AOBT, AIBT, etc.) produced by A-CDM is delivered to ATFM systems. For ATCC in Daegu, CTOT containing ATFM measures are issued and shared with stakeholders to recalculate TSAT and TTOT

2.2 When the ATFM system generates CTOT, the Incheon International Airport operator shares the CTOT with the airline, the ground handling company and other stakeholders through the A-CDM operating system (including mobile). Incheon Control Tower determines TTOT in consideration of the CTOT and the operation situation shared, and manually provides TTOT to airlines and others if necessary. Since TTOT are re-established based on TSAT, airlines and ground handling companies are using CTOT, modified TTOT, and final TSAT for aircraft operations, while airport operators are utilizing them for the assignment and operation of the attached apron.

2.3 During the first phase of the A-CDM operation, Incheon airport faced difficulties in calculating TTOT/TSAT for de/anti-icing aircraft and calculating TTOT/TSAT that reflects external constraints in real time. A-CDM operation excluded de/anti-icing procedure in its milestone. The A-CDM operation excluded de/anti-icing procedure when generating milestone, which made it difficult to calculate the exact TSAT for aircraft requesting de/anti-icing. In addition, the updated TTOT/TAST with CTOT could not reflect external constraints (such as route restriction and air traffic flow management) in real time. To solve

these problems, the need was raised for the establishment of A-CDM de/anti-icing procedures and the introduction of DMAN that supports the reflection of various external constraints in real time and issuance of accurate TSAT.

2.4 To this end, Incheon airport is pushing for the upgrading of A-CDM (2nd stage) with the goal of the end of 2021. The goal of 2nd stage is to optimize the departing order of aircraft through DMAN and improve the TSAT accuracy. By introducing DMAN to the A-CDM, A-CDM can generate variable taxi time (VTT) considering runway operations, aircraft class and ground congestion, etc. It is also able to comprehensively reflect external constraints of route and ATFM to aircraft departure management and TTOT calculation.

2.5 Upon receipt of a coordinated landing time (CLDT) to be developed by the ATCC in the future, the A-CDM system can produce more accurate EIBT and TOBT. More sophisticated time information management would help improving the efficiency of airport operations and aircraft operational timeliness.

2.6 The A-CDM, which will be applied to Gimpo, Gimhae and Jeju International Airport, has a similar system. All A-CDM information and apron change information produced is delivered to the ATFM system. CTOT information from ATFM is utilized to calculate the TTOT/TSAT. From 2021, TTOT and TSAT reflecting CTOT will be provided to controllers and airlines using flow management messages. This A-CDM system is a single system linked to the ATFM system, therefore it is easy to apply A-CDM to other international airports in ROK.

### Disturbance for Integrating ATFM and A-CDM

3.1 However, the ROK currently has several limitations to be considered as having a complete integration between the two systems. As mentioned before, ATFM transmits the COBT, CTOT to A-CDM, which updates the TTOT of A-CDM and recalculates the TSAT, TTOT to meet it. As for ATFM, the milestone information of A-CDM are collected but not reflected in the actual CTOT calculation, and ATFM workers are performing their work by referring to this. Unlike systems in other countries, the ATFM system in ROK calculates COBT and CTOT based on the EOBT or SOBT of first entered flight plan and those calculated time cannot be updated through time information such as TOBT and AOBT collected in real time. This can be attributed to the lack of a priority conceptualization of how to utilize the collected time information between the two systems since they were built simultaneously and individually. To overcome these limitations and ensure full interconnection between the two systems, automatic reflection of time information between the two systems is required based on the accumulated A-CDM and ATFM operational experience, resulting in real-time milestone renewal.

3.2 Another problem is about the collection of information. The TOBT, one of the key milestones in A-CDM, is information produced by an airline or a ground handling company

that can be collected only when the agency's cooperation is guaranteed. However, current aviation laws in ROK are lack of the basis for the collection of information for A-CDM or ATFM about related agencies, which cause difficulties for the operators of A-CDM (Incheon International Airport Corp. and Korea Airports Corporation). Prior to the integration of A-CDM and ATFM, legal grounds for the collection and utilization of information are need to be assured.

3.3 Finally, the operation of the consultative group is limited. Currently, the ROK has the consultative body for collaborative decision-making in which related stakeholders exchange opinions and participate in decision-making. However, the current CDM is focused on tactical flow management, making it difficult to decide on what needs to be discussed from a macro perspective, such as integrating A-CDM-ATFM. To ensure smooth integration between the Korean ATFMS and the advanced decision support tools (DMAN, etc.) to be developed in the future, it is necessary to redefine the role of the consultative group. It plans to expand the scope of attendance presently limited to flow managers and control room workers to include higher decision makers, and to reorganize and operate existing CDM consultative bodies to ensure CDM at the strategic stage through discussion with related agencies.

3.4 Therefore, the ROK government is planning research and development to upgrade ATFM and prepare integrated operational procedures ('21~'25), and plans to amend legislation to prepare the basis for data collection ('21). Finally, the ways of integrating A-CDM-ATFM would be discussed from a macro perspective by expanding the scope of participation of the CDM consultative group and activating their roles.

#### Suggestion on enhancing the national models for cross-border application.

4.1 Considering the current status of A-CDM-ATFM linkages in ROK, the case of Hong Kong and India reported in the 5th APAC ACDM T/F, and the CANSO guide on ATFM/A-CDM integration, the core of the integrated operation between the two systems is the establishment of information sharing system. When ATFM provides flow control measures (COBT, CTOT, etc.) and expected operation-time information (ELDT, etc.), and A-CDM shares real-time airport departure situations (off-block, start-up, take-off time, etc.) with ATFM, more accurate traffic awareness and prediction can be possible. However, all of this information sharing cannot be done at once, and as mentioned in the CASNO guide, it requires a scalable and step-by-step level of information sharing, which is likely to be feasible through platform deployment, such as data centers and ATFM portal sites.

Information sharing level (Note: CANSO Guide)

- a) ATFM → A-CDM: Information on ATFM slot information
- b) ATFM → A-CDM: Flight updates information
- c) A-CDM → ATFM: Departure information

Using the platform, more efficient information sharing can be ensured by collecting comprehensive data including domestic and international flight plans, airline operating schedules, information produced by A-CDM and ATFM, etc. and by establishing a unified system to manage the quality of the data.

4.2 In addition to the establishment of an information sharing system, studies on detailed logic should be conducted to reflect shared information in each system. For A-CDM, it is necessary to determine which milestones should be updated based on ATFM measures and thus set the timing for the collection of ATFM information. ATFM should be able to prioritize information that can increase the effectiveness of the CTOT among real-time A-CDM milestone, which requires an operational procedure or algorithm to update the CTOT in real time.

4.3 In conclusion, the A-CDM-ATFM integration system needs to be established by taking into account the international cooperative characteristics of the Asia-Pacific region. ROK-China-Japan and Southeast Asia have individual ATFM systems, from which regional ATFM cooperation was formed. Integrated A-CDM and ATFM systems are not limited to a single country and are intended for internationally harmonized air traffic management. Multilateral, collaborative and universal nature system should be established, not just for ROK. Therefore, efforts for implementation from the ICAO Asia-Pacific region and countries are need to establish a phased integration system in consideration of traffic volume between countries and regions, such as support for establishing individual consultative bodies.

U.S. Department of Transportation  
Federal Aviation Administration

Office of International Aviation  
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**DATE:** December 23, 2020

**TO:** Mr. Arun Mishra  
ICAO Regional Director  
Asia and Pacific Region, Bangkok

**FROM:** Ms. Ashlei Nadler  
Principal Staff Officer  
Interagency Group on International Aviation

**PAGES:** 2

Dear Mr. Mishra:

This is in response to ICAO Bangkok letter AN 3/3 - AP-AGA0049/20 dated November 30, 2020, requesting input to the development of joint operational procedure guidance for the integration of ATFM and A-CDM operations.

The United States provides the following information:

**i. Details about national and/or local model/guidance for integrating ATFM and ACDM operations:**

Currently, the surface movement and locations of aircraft are still largely known only to the controllers who are using out the window (OTW) views, surface surveillance, or verbal reports to follow aircraft surface progression. The lack of shared situational awareness between or among air traffic control facilities, ramp towers, flight operators, and airport operators leads to excessive fuel consumption in taxiing, increased environmental impacts, sub-optimal integration of traffic into overhead flows, difficulty in meeting Traffic Flow Management System (TFMS) and Time Based Flow Management (TBFM) traffic flow restrictions, and overall system optimization. Terminal Flight Data Manager (TFDM) is the FAA system for managing surface operations and is expected to be implemented over the next several years. As different entities in the National Airspace System (NAS) start communicating data with the tower, TFDM will consolidate such data and provide services including electronic flight data with

surveillance integration, integrated traffic flow management, and a series of surface management tools. TFDM will provide the consolidated data back to all the associated entities and stakeholders involved with surface operations at the local airport. TFMS, TBFM and TFDM will be integrated to share data across all platforms and increase efficiencies at all levels of the operation.

ii. **Suggestions on generalising and enhancing the national and/or local models/procedures for cross-border application.**

The goal is global harmonization and inter-operability which facilitates interoperability across international Airport CDM programs and the FAA's Surface CDM concept. Near-term objectives are to continuously monitor capacity and demand, proactively manage departure queues and improve the management of arrival traffic flows. Mid-term and later objectives include interoperability/global harmonization with the European Airport CDM Programme, ICAO ASBU initiatives, and other international CDM programs.

Best regards,

A handwritten signature in black ink, appearing to read "Ashli Nadler", with a stylized flourish at the end.

## **BASIS FOR DEVELOPMENT OF JOINT OPERATIONAL PROCEDURE GUIDANCE FOR THE INTEGRATION OF ATFM AND A-CDM OPERATIONS**

### **A. Details about national and/or local model/guidance for integrating ATFM and A-CDM operations**

- A1. Concept of operations (CONOPS) describing the characteristics of the integrated ATFM/A-CDM model from the viewpoint of efficiency and effectiveness of overall workflow
- A2. Details of the operational workflow of integrated ATFM/A-CDM
- A3. The implementation model for computerising the integration of ATFM and A-CDM
- A4. Data items exchanged between the ATFM and A-CDM systems
- A5. Use of data items for updating flight information, including flight plan and current flight trajectory
- A6. Interaction and influence of flight update and departure Information on ATFM measures and A-CDM milestones
- A7. The methods for engaging stakeholders in the integrated processes of ATFM and A-CDM
- A8. The integration planning and execution of the integrated processes
- A9. The methods for verifying the information quality and validation the operational workflow
- A10. The key performance indicators for measuring the successful integrated system

### **B. Suggestions on generalising and enhancing the national and/or local models/procedures for cross-border application**

- B1. Concept of operations (CONOPS) describing the characteristics of the cross-border model for integrated ATFM/A-CDM from the viewpoint of efficiency and effectiveness of cross-border workflow
- B2. Operational workflow suggested for cross-border application
- B3. Considerations and constraints for generalising the national/local ATFM and A-CDM operational workflow
- B4. Data items suggested for cross-border application
- B5. Support tools suggested for integrated cross-border ATFM/A-CDM application
- B6. Key performance indicators for cross-border application
- B7. Timeframe suggested for planning and execution of cross-border integration
- B8. Verification and validation methods suggested for cross-border integration
- B9. Methods suggested for engaging cross-border stakeholders

# A-CDM Frequently Asked Questions (FAQs)

Edition 01

Date: 30 April 2021

## Edition History

| Edition No. | Edition date  | Author     | Reason |
|-------------|---------------|------------|--------|
| 01          | 30 April 2021 | APA-CDM/TF | -      |
|             |               |            |        |
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## Introduction

For any organization(s) that are planning and executing an A-CDM implementation many questions will arise. These can range from very high-level questions like *“who shall lead the project”, “what are benefits of A-CDM for me”* to details on *“how to update the TOBT when a flight is delayed”* etc.

Many of the questions that will arise can be “answered” in various A-CDM guidance materials and plans, e.g. ICAO Doc 9971 [1] and the Asia Pacific Airport Collaborative Decision Making (A-CDM) Implementation Plan [2] as well as documents from EUROCONTROL[3], CANSO [4], and IATA [5]. In addition, the ICAO Asia and Pacific Office, Bangkok has made available specific A-CDM Procedure materials provided by States via this link <https://www.icao.int/APAC/Pages/eDocs.aspx> that also may facilitate answers.

Nevertheless, it has been evidenced that many questions from organizations and stakeholders are yet frequently asked. To help with capturing these questions and provide uniform answers the Asia Pacific A-CDM Task Force meeting No. 4 agreed to *“Develop frequently asked questions as live document”*. This document presents a compilation of Frequently Asked Questions (FAQs) on A-CDM.

The intention is to make this as a “living” document” as such it shall be updated based on new FAQ inputs from A-CDM implementers and stakeholders. In order to facilitate this, questions can be sent to the ICAO Asia and Pacific Office, Bangkok e-mail address [apac@icao.int](mailto:apac@icao.int).

## Structure of the FAQ

In the following sections, the FAQs are structured by a specific topic they are “most” applicable to. Therefore, based on the FAQs currently presented in the document, the following structure is applied:

- **Implementation Related FAQs** – these are questions and answers that relate to the planning and execution of an A-CDM implementation
- **Procedural Related FAQs** – these are questions and answers that relate to the procedural character.
- **Technical Related FAQs** – these are questions and answers that relate to the technical aspects of the solution and various systems that enables an A-CDM implementation.

## Implementation Related FAQs

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Q01:</b> | Is A-CDM necessary at a small single-runway airport? What size of an airport would render A-CDM necessary?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>A01:</b> | <p>There are different size-based models that provide guidance as to when an airport should <i>explore the needs</i> for A-CDM process. In Asia-Pacific, the regional <i>Seamless ANS Plan (v3.0, 2019)</i> recommends that all international aerodromes consider implementing A-CDM with integration to ATFM.</p> <p>It is important to note, however, that A-CDM is a process designed to address inefficiencies and sub-optimized operations at the airport. Thus, a needs analysis that looks beyond just the level of traffic demand should be carried out to determine the needs for A-CDM. Common problems A-CDM is designed to alleviate include, inter alia, turnaround inefficiencies, punctuality problems, lack of information transparency, congestions and inefficiencies in the movement areas (taxiways, runways), and lack of good coordination among airport stakeholders. Even if an airport is small, if these problems exist, a level of A-CDM process may be useful.</p> |
| <b>Q02:</b> | Is it fair to say that information sharing will benefit any reasonably busy airport, while the full A-CDM process including TOBT/TSAT enforcement will only benefit extremely busy airport?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>A02:</b> | <p>Information sharing among stakeholders will most probably benefit <i>any</i> airport, not just busy ones. The open sharing of information across stakeholders will create common situational awareness and enables smooth inter-unit collaboration, thereby improving operations at the airport.</p> <p>However, <b>Information Sharing in itself is not A-CDM</b> which is important to remember. Implementation of TOBT and TSAT, related procedures, and various levels of system support is equal to A-CDM, which will require specific information sharing to take place. I.e. implementation of TOBT and TSAT (best-planned best-served principles) will drive the need for information sharing in an A-CDM context. The information sharing needs are very specific and serves very specific purposes.</p>                                                                                                                                                                           |
| <b>Q03:</b> | In engaging stakeholders for A-CDM implementation, how can we balance between problems to be solved with wishes of the stakeholders?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>A03:</b> | <p>The focus on “why A-CDM” in the initial stakeholder engagement is closely linked to looking at the wishes of A-CDM stakeholders. By getting all stakeholders to the same table and discuss their needs, A-CDM <i>strategic objectives</i> can be established. The strategic objectives should provide concrete and measurable goals in the A-CDM implementation process, e.g. “to reduce average taxi-out time by 3 minutes within 2023”, and should be based on the most pressing challenges agreed upon by stakeholders involved in the process.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                      |

**Q04:** Who should take the lead in A-CDM implementation, Airport Operator or ANSP?

**A04:** Most A-CDM implementation projects to date have been led by airport operators, and with active support by all A-CDM stakeholders. However there is not a single model that definitively says which entity should be the lead in the implementation process as it very much depends on the local environment and arrangements. There are cases where the airport operator and the ANSP *together* lead the implementation; such as the case in Singapore with the A-CDM project being a joint one between Changi Airport Group (CAG) and Civil Aviation Authority of Singapore (CAAS).

Regardless of which entity takes the initial lead, it is important that the airport operator(s), the ANSP, the airline operators and ground handlers are deeply involved in the implementation process early on. A-CDM implementation is not simply a system installation project, but requires changes (sometimes significant) to operational procedures to be performed by operational personnel.

**Q05:** Is it necessary to concurrently implement ATFM operations and system for A-CDM process to be successful?

**A05:** ***A-CDM and ATFM are independent processes, and do not need to be concurrently implemented*** for them to be successful. Inherently, they are designed to tackle different issues. A-CDM, on the one hand, is designed to address inefficiencies and sub optimized operations at the airport. ATFM, on the other hand, is designed to ensure a proper balance of demand and an optimized use of available capacities in the airport and airspace.

However; ***once implemented, both A-CDM and ATFM should be integrated*** through mutual data exchange between the systems. By mutually exchange information across the systems, high level of flight information accuracy can be ensured, which will enable a high level of operational efficiency both at the airport and at the airport/airspace/network levels depending on how ATFM is implemented.

**Q06:** What tools are commonly used for education of front-line operators?

**A06:** Training should be carried at 2 levels; one to provide high-level conceptual understanding of A-CDM, and the other to provide in-depth knowledge on operational procedures and support system functionalities.

1. High-level training courses on A-CDM are offered by many training institutions, international organizations and vendors. ICAO Regional Offices, IATA, and CANSO have sponsored region-specific workshops in various locations over the years. Check with training institutions and regional offices of ICAO / IATA / CANSO to find out about training courses in your areas.
2. In-depth operational training should be conducted by each organization after the procedures have been developed. ATFM and A-CDM system providers can support this by providing the training on both system functionalities and its application in the ATFM / A-CDM procedures. How this is done in practical terms needs to be addressed in procurement agreement with ANSPs and airport operators.

## Procedural Related FAQs

**Q07:** When a flight departs from or going to A-CDM airports, the flight time may be adjusted while airborne due to various reasons. How will the change in flight time be handled?

**A07:** One of the data elements to be exchanged in the A-CDM process is the *Estimated Landing Time (ELDT)*. The ELDT can be updated several times during a flight's lifecycle, with revised estimations based on the flight plan, Actual Take-Off Time (ATOT) from the outstation, and en-route progress from surveillance system or airline's information. Updated ELDT may then trigger an update to *Estimated In-Block Time (EIBT)*, which in turn may be ground for an update to *Target Off-Block Time (TOBT)* and *Target Start-up Approval Time (TSAT)* of the next outbound flight.

Having the behaviors of the flight while airborne trigger information updates to be shared with all the airport stakeholders is at the core of A-CDM process. With common updates shared, airport operations can be adjusted in preparation for the flight accordingly.

**Q08:** How to enhance stakeholders' trust in the time elements provided such as TOBT?

**A08:** TOBT, along with TSAT, are two cornerstone data elements in the A-CDM process and should therefore be properly implemented.

If there is an apparent lack of trust in the TOBT, its root cause must be investigated. Reliabilities in TOBT and TSAT should be analyzed as part of the implementation process, and stakeholder engagement to explain the importance and proper handling of TOBT/TSAT – among other data elements – should be carried out comprehensively. Time should be allowed and support provided for all relevant personnel to familiarize themselves with these A-CDM elements in their operations.

**Q09:** Is TOBT allowed to be earlier than EOBT?

**A09:** Yes but this has to be carefully discussed and agreed as part of the A-CDM procedural development.

Preferably and for regional and global harmonization, TOBT updates which are more than 10min before EOBT shall be ignored or rejected (by users and the CDM system).

A TOBT should not be more than 10min before the EOBT and the corresponding TSAT should not be earlier than the TOBT. Start-up can be requested up to 5 min earlier than the TSAT, which results in the flight departing a total of 15 min before the flight plan EOBT.

**Q10:** When is TSAT made available to the pilot?

**A10:** If the pilot has not received TSAT earlier by other means, it is recommended that it be made available from ATC at the latest at TOBT - 5 min

In order to initiate the start-up procedure, the pilot should be informed about the TSAT with sufficient notice. By doing so, the pilot would be aware of any start-up delay and take action as required.

**Q11:** When does the ATC issue the start-up clearance?

**A11:** Start-up clearance should be given by ATC in accordance with TSAT.

By ATC closely respecting the pre-departure sequence, the pilot knows he/she can rely on the TSAT being accurate. Also, it results in better predictability for the network

**Q12:** What happens when the pilot does not call ready or for start-up when he/she should?

**A12:** This item records the CDM process in case the flight fails to comply with the target ready and start-up time.

The TOBT and TSAT should be respected. When a TOBT / TSAT proves to be unrealistic the pilot will not be able to call for start-up. The target times should reflect the actual estimated ready times.

In case the TOBT / TSAT has not been met, the flight may be removed from the pre-departure sequence (TSAT removed) and the TOBT may be deleted or declared invalid.

If a new TOBT is provided, the flight will be re-sequenced and the stakeholders are informed about the new TSAT and TTOT.

**Q13:** What happens if the aircraft isn't off-blocks following ASAT

**A13:** A monitoring mechanism of the actual pushback event should be in place in a full A-CDM implementation.

In case the aircraft is not off-blocks by ASAT+5 min, the flight should be excluded from the pre-departure sequence until a new reliable TOBT is provided, resulting in a new TSAT.

However it should be mandatory for an A-CDM airport to protect any flight held at gate by ATC after ASAT (e.g. due to ramp congestion etc.)

Monitoring pushback/taxi clearance compliance enforces execution of the gate, taxiway and runway occupancy according to the planned sequence.

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Q14:</b> | Procedures published in the AIP?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>A14:</b> | <p>It is important that the procedures for the provision of TOBT / TSAT / TTOT in the CDM implementation are formally agreed and covered by official documents. The National AIP is one such document.</p> <p>The AIP provides a recognized AIS channel, in which published procedures are readily available to all interested parties.</p>                                                                                                                                                                                                                                                                                       |
| <b>Q15:</b> | Can A-CDM procedures to be applied in case of adverse conditions?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>A15:</b> | <p>In simple terms the answer is “yes” and in general the approach should be that procedures for handling adverse conditions should be integrated with A-CDM processes.</p> <p>In an ideal scenario the an adverse condition should not lead to reduced use or even a temporary interruption of A-CDM processes, where A-CDM should in fact provide the backbone for operations on the basis of accurate status information for each aircraft.</p> <p>However, applying A-CDM procedures with procedures developed to handle adverse conditions will require thorough analysis on how they inter-relate and provide benefits.</p> |

## Technical Related FAQs

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Q16:</b> | What is the most accurate source of at-gate milestones e.g. AIBT, AOBT?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>A16:</b> | When available, automated Visual Docking and Guidance System (VDGS) that collects at-gate data (e.g. AIBT, AOBT) should be the most accurate source of information. However, if such a system is absent, there are other means of obtaining at-gate information ranging from surface surveillance system (A-SMGCS based on cooperative surveillance info from MLAT or ADS-B) to manual input by official observers or data operators. The accuracy levels of these alternative solutions will depend on their implementations and technical requirements & capabilities. |
| <b>Q17:</b> | Use of docking guidance system or other display                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>A17:</b> | If a DGS or other display is available and it is configurable, then the TOBT and TSAT values should be displayed on such system. The time format (UTC, local times) should also be displayed                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Q18:</b> | Alert to TWR/Apron ctrl at start-up clearance issue if TTOT outside Slot Tolerance Window                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>A18:</b> | For regulated flights, the A-CDM / TWR system should alert TWR/Apron Control at start-up clearance and pushback clearance in case the TTOT would be outside the STW.                                                                                                                                                                                                                                                                                                                                                                                                     |

This function would assist the TWR controller in his/her mission to ensure adherence to the STW.

**Q19:** Is the provision of TSATs exclusive to the pre-departure sequencer / A-CDM system or can the TWR provide TSAT values manually, when needed?

**A19:** If the TWR cannot comply with the TSAT, due to unforeseen local conditions or failure of the pre-departure sequencer to issue realistic TSATs, the system should support the provision of a manual TSAT by TWR

**Q20:** Auto generation of TOBT in the CDM platform?

**A20:** It is recommended that the A-CDM Stakeholders are provided a TOBT value that is based upon the ELDT of the inbound flight. For the purpose of this description, a distinction is made between **proposed\_TOBT**, **auto\_TOBT** and **TOBT**.

Before the inbound flight is airborne:

- **A default proposed\_TOBT = SOBT** is advised only until the flight plan has been filed. **After flight plan filing, the default for proposed\_TOBT should be EOBT.**

After the inbound flight is airborne:

- When the inbound flight is airborne, **the proposed\_TOBT value should be automatically calculated based on the ELDT ( $TOBT = ELDT + EXIT + Turnaround\ Time$ )** in order to account for any inbound delay. The dynamic recalculation of the proposed\_TOBT as soon as the parameter values change (e.g. ELDT, EXIT, Turnaround Time) is desired.
- Furthermore, the proposed\_TOBT should be based upon the ELDT as follows:
  - If  $ELDT + EXIT + Turnaround\ Time < EOBT + OBT\_upd\_param$  then proposed\_TOBT should be set to EOBT as the earliest value.
  - In case  $ELDT + EXIT + Turnaround\ Time > EOBT + OBT\_upd\_param$  then proposed\_TOBT should be set to  $ELDT + EXIT + Turnaround\ Time$ .

It will be a local decision if the proposed\_TOBT is automatically copied to the TOBT field (auto\_TOBT) or if an action is required from the "TOBT responsible person".

**Note:** OBT\_upd\_param is recommended to be set to 15min.

Automatically calculating the TOBT based on the ELDT makes the stakeholders (e.g. Ground Handler and Stand & Gate Management) aware of the earliest possible off-block time. Should the inbound flight be delayed, the Ground Handler would know from the EIBT when it can expect the flight and can thereafter update the TOBT taking into account the estimated turnaround time. An automatic TOBT will reduce the workload for the entity responsible for the management of TOBTs. The early availability of such a TOBT is also an advantage for the local TSAT calculation.

**Q21:** What is the minimum support infrastructure/systems needed for the initial implementation of A-CDM?

**A21:** This question is almost impossible to answer when not knowing more precisely what is required to be "A-CDM compliant" in the APAC region. If you look what is required in Europe versus what is required in APAC the answer will be different. Same applies for the US.

However, at the core of A-CDM it will require you to establish the use of Target Off Block Times (TOBTs) and Target Start-up Approval Times (TSATs) and procedures around how this shall work. A solution or solutions with specific features will also be needed to support the procedures as well as information inputs. This is done in Europe as well as in APAC. The US model does almost the same but due to division of responsibility between ramp and air traffic control it is slightly adapted. To elaborate on this further here is more details related to the TOBTs and TSATs:

The TOBT:

- **Automatic/Proposed TOBT:** To be able to establish the TOBT well in advance of the actual departure (e.g. 3 hours prior EOBT) of an aircraft one will need a system that can calculate this based on information updates that are triggered at certain milestones (this related to milestones 1, and 3-6 in the Milestone Approach). To drive automatic updates of the Proposed TOBT one will need information updates related to the Estimated Landing Time (ELDT) at various stage of the arriving flight. The ELDTs are typically derived from an ATFM system, ATM automation system and AMAN system depending on which phase of the flight the arrival aircraft is. This information can also come from the aircraft operators' system who also, sometimes, has ELDT information about the arrival flights. Once landed accurate Actual Landing and In-block Times can be obtained from e.g. an A-SMGCS or Aircraft Communications Addressing and Reporting System (ACARS) (ON and IN messages). Important to point out is also that if automatic calculations of proposed TOBT are done one need to have the Estimated Taxi-in times established as part of the A-CDM solution/system.
- **No Automatic/Proposed TOBT:** If the TOBT only needs to be established once the actual (physical) aircraft is at the gate there is no real need for a system to automatically calculate TOBTs as this can be put in manually into a system by either the Airline or designated Ground Handler. The drawback of this is that one loses certain level of early predictability, as there is no information about the arrival flight. For example, if the arrival flight is 30 minutes late this will not be reflected in the EIBT, TOBT, TSAT and TTOT.

**So, in short related to the TOBT:** the earlier one starts the predictions and calculations of TOBTs the more information inputs are needed (from various external systems) that then need to be processed by the A-CDM solution. With automated calculations of TOBT the requirement for Estimated Taxi In-times are also necessary or it will not work.

The TSAT:

- To be able to establish the TSAT (and Target Take-Off Times (TTOTs)) one will, with most certainty, need a function to facilitate these calculations. This function is usually referred to as a Pre-Departure Sequencer (PDS) or a Departure Manager (DMAN) that can vary in how advanced it is in terms of how the TSAT and TTOT are calculated based on various parameters. Important to note is that the PDS or DMAN function can be an integral part of the A-CDM solution/system or a standalone system that exchanges the key information with an A-CDM system. Both set-ups works and are implemented around the globe. One key-decision to make as part of the definition phase is how this "A-CDM

architecture” will look like and determine who has the responsibility to define and develop or procure the system or systems.

The following list provides some of the inputs that are used to be able to calculate TSATs and TTOTs:

| Parameter/information Inputs                                                        | Required or Optional |
|-------------------------------------------------------------------------------------|----------------------|
| <b>TOBT</b>                                                                         | Required             |
| <b>Estimated Taxi Out Times (EXOT)</b>                                              | Required             |
| <b>Runway configurations</b>                                                        | Required             |
| <b>Departure Rates</b>                                                              | Required             |
| <b>ATFM CTOT</b>                                                                    | Optional             |
| <b>Aircraft type/Wake turbulence category</b>                                       | Optional             |
| <b>Arrival flights (taking ELDT/ALDT into account)</b>                              | Optional             |
| <b>Airborne restrictions (closed fixes, minutes or miles in trail restrictions)</b> | Optional             |
| <b>Runway closures and other closures (e.g. taxi ways etc.)</b>                     | Optional             |
| <b>Standard Instrument Departures (SIDs)</b>                                        | Optional             |
| <b>Routing from A-SMGCS</b>                                                         | Optional             |

NOTE – the basic principle is that the more parameters and information inputs that are taken into account the more advanced the PDS/DMAN will have to be, but with that more accurate TSATs and TTOTs will be calculated, which should result in better pre- and departure sequencing. How advanced the PDS or DMAN has to be must be assessed based on the airport traffic density, taxi patterns, congestion, traffic operations, mix and flow, etc.

## References

| Ref No | Document Name & Edition                                                                         |
|--------|-------------------------------------------------------------------------------------------------|
| 1      | Manual on Collaborative Air Traffic Flow Management (Doc 9971), Third Edition, 2018             |
| 2      | Asia Pacific Airport Collaborative Decision Making (A-CDM) Implementation Plan, Edition 1, 2019 |
| 3      | EUROCONTROL A-CDM Implementation Manual, Version 5, March 2017                                  |
| 4      | Airport Collaborative Decision-Making: Optimisation through Collaboration, CANSO                |
| 5      | IATA Recommendations for A-CDM Implementation                                                   |

**FRAMEWORK FOR MONITORING A-CDM IMPLEMENTATION**  
**[NAME OF STATE/ADMINISTRATION]**

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**QUESTIONNAIRE BASED ON**  
**ICAO ASIA PACIFIC AIRPORT COLLABORATIVE DECISION MAKING (A-CDM)**  
**IMPLEMENTATION PLAN (First Edition 2019)**

Overall A-CDM Implementation Status of  
[Airport Name]

1. What is the phase of A-CDM Implementation at your Airport? *(Select one)*

- |                                   |                          |
|-----------------------------------|--------------------------|
| [A] Not yet started               | <input type="checkbox"/> |
| [B] Initiation Phase              | <input type="checkbox"/> |
| [C] Implementation Phase          | <input type="checkbox"/> |
| [D] Trial Phase                   | <input type="checkbox"/> |
| [E] Operations & Monitoring Phase | <input type="checkbox"/> |

*Please add free text / comments, if needed:*

2. Is the A-CDM implementation enforcing operation with TOBT and TSAT?

- |               |                          |
|---------------|--------------------------|
| [A] Yes       | <input type="checkbox"/> |
| [B] No        | <input type="checkbox"/> |
| [C] Only TOBT | <input type="checkbox"/> |
| [D] Only TSAT | <input type="checkbox"/> |

*Please add free text / comments, if needed:*

**FRAMEWORK FOR MONITORING A-CDM IMPLEMENTATION**  
**[NAME OF STATE/ADMINISTRATION]**

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3. Which of the following A-CDM enabling elements are being implemented to support A-CDM operations?

- |                                                                |                          |
|----------------------------------------------------------------|--------------------------|
| [A] Information sharing                                        | <input type="checkbox"/> |
| [B] Milestone Management                                       | <input type="checkbox"/> |
| [C] Variable Taxi Times                                        | <input type="checkbox"/> |
| [D] Pre-Departure Sequencing                                   | <input type="checkbox"/> |
| [E] A-CDM in adverse conditions                                | <input type="checkbox"/> |
| [F] Integration with Air Traffic Flow Management (ATFM) system | <input type="checkbox"/> |

*Please add free text / comments, if needed:*

**Stakeholders' Involvement**

4. Which stakeholders are involved in the A-CDM project and process?

- |                                     |                          |
|-------------------------------------|--------------------------|
| [A] Airport operator                | <input type="checkbox"/> |
| [B] Airline operators               | <input type="checkbox"/> |
| [C] Ground handlers                 | <input type="checkbox"/> |
| [D] Air Navigation Service Provider | <input type="checkbox"/> |
| [E] Network Operations/ATFM unit    | <input type="checkbox"/> |
| [F] Other (Provide details)         | <input type="checkbox"/> |

*Please add free text / comments, if needed:*

5. Which stakeholders are having access to A-CDM Information?

- |                                     |                          |
|-------------------------------------|--------------------------|
| [A] Airport operator                | <input type="checkbox"/> |
| [B] Airline operators               | <input type="checkbox"/> |
| [C] Ground handlers                 | <input type="checkbox"/> |
| [D] Air Navigation Service Provider | <input type="checkbox"/> |
| [E] Network Operations/ATFM unit    | <input type="checkbox"/> |
| [F] Other (Provide details)         | <input type="checkbox"/> |

**FRAMEWORK FOR MONITORING A-CDM IMPLEMENTATION**  
**[NAME OF STATE/ADMINISTRATION]**

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*Please add free text / comments, if needed:*

**A-CDM Procedures & Compliance**

6. Do you have procedures in place for A-CDM operations at your airport?

- [A] Yes, procedures are in place for all stakeholders ☐
- [B] We are in the process of formulating procedures ☐
- [C] Not yet started formation of the procedures ☐
- [D] We have some other plans. Please provide brief: ☐

*Please add free text / comments, if needed:*

7. Are roles & responsibilities for each stakeholder clearly defined in the local A-CDM procedures?  
(Select one)

- [A] Yes ☐
- [B] No ☐

*Please add free text / comments, if needed:*

8. Which of the below mentioned Key Performance Indicators (KPI) w.r.t. TOBT are monitored?

- [A] TOBT input participation rate ☐
- [B] TOBT Accuracy ☐
- [C] KPI related to TOBT are not being monitored ☐

*Please add free text / comments, if needed:*

**FRAMEWORK FOR MONITORING A-CDM IMPLEMENTATION**  
**[NAME OF STATE/ADMINISTRATION]**

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9. Is TSAT Compliance monitored? (Select one)

- [A] Yes ☐
- [B] No ☐
- [C] Sometimes. (Provide brief) ☐

*Please add free text / comments, if needed:*

10. Is ATC using TSAT for approving startup to aircraft? (Select one)

- [A] Yes ☐
- [B] No ☐
- [C] Sometimes. (Provide brief) ☐

*Please add free text / comments, if needed:*

11. Does local policy require the aircraft to report/be ready for start-up/pushback within certain minutes prior to or after the confirmed TOBT, irrespective of TSAT? (Select one)

- [A] Yes ☐
- [B] No ☐

*If "Yes" please fill in how many minutes:*

12. Does local policy mandate the Pilots to request start/pushback clearance within certain minutes prior to or after TSAT? (Select one)

- [A] Yes ☐
- [B] No ☐

*If "Yes" please fill in how many minutes:*

**FRAMEWORK FOR MONITORING A-CDM IMPLEMENTATION**  
**[NAME OF STATE/ADMINISTRATION]**

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13. Does local policy require the departure clearance to be requested within certain minutes prior to or after TOBT/TSAT? (Select one)

- [A] Yes ☐
- [B] No ☐

*If "Yes" please fill in how many minutes:*

14. What are the A-CDM performance indicators commonly agreed upon amongst stakeholders for A-CDM performance monitoring?

- |                                                                |                          |
|----------------------------------------------------------------|--------------------------|
| [A] Turnaround compliance                                      | <input type="checkbox"/> |
| [B] In-Block Time accuracy                                     | <input type="checkbox"/> |
| [C] Off-Block Time accuracy                                    | <input type="checkbox"/> |
| [D] Average taxi out time                                      | <input type="checkbox"/> |
| [E] Gate/Bay/Stand occupancy time                              | <input type="checkbox"/> |
| [F] Gate/Bay/Stand allocation and passenger gate freezing time | <input type="checkbox"/> |
| [G] Gate/Bay/Stand allocation accuracy                         | <input type="checkbox"/> |
| [H] Number of bay conflicts per day                            | <input type="checkbox"/> |
| [I] Slot adherence                                             | <input type="checkbox"/> |
| [J] Emission from aircraft, on ground                          | <input type="checkbox"/> |
| [K] Number of aircraft queueing in high demand periods         | <input type="checkbox"/> |
| [L] Number of aircraft compliant with ATFM slot (CTOT)         | <input type="checkbox"/> |
| [M] Other (Provide details)                                    | <input type="checkbox"/> |

*Please add free text / comments, if needed:*

**System Functions**

15. How is the TOBT input for the A-CDM system is updated:

- |                                                        |                          |
|--------------------------------------------------------|--------------------------|
| [A] Manually by Aircraft Operator / GHA                | <input type="checkbox"/> |
| [B] Automatically by system, considering ELDT and MTTT | <input type="checkbox"/> |
| [C] By a mix of both the above                         | <input type="checkbox"/> |
| [D] By some other way. Please provide brief.           | <input type="checkbox"/> |

**FRAMEWORK FOR MONITORING A-CDM IMPLEMENTATION**  
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*Please add free text / comments, if needed:*

16. How is VTT (Variable Taxi Time) considered in the System?

- [A] Fixed Taxi Times between runways and bays ☐
- [B] Dynamic Taxi Times by considering live ground movements, changes at airfield and/or traffic flows. ☐
- [C] Both the above ☐
- [D] Not available ☐

*Please add free text / comments, if needed:*

17. Does the A-CDM implementation include a predeparture sequencing (PDS)?

- [A] Yes ☐
- [B] No ☐
- [C] PDS will be implemented at a later stage ☐

*Please add free text / comments, if needed:*

18. How is the PDS implemented as part of the overall A-CDM solution? (Select one)

- [A] PDS feature is in-built in A-CDM system ☐
- [B] PDS is generated by an external system ☐

*Please add free text / comments, if needed:*

**FRAMEWORK FOR MONITORING A-CDM IMPLEMENTATION**  
**[NAME OF STATE/ADMINISTRATION]**

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19. Which of the following **required** milestones captured/calculated in the A-CDM System?

- |                               |                          |
|-------------------------------|--------------------------|
| [A] ATC Flight Plan Activated | <input type="checkbox"/> |
| [B] Aircraft Landed           | <input type="checkbox"/> |
| [C] Aircraft is in-block      | <input type="checkbox"/> |
| [D] TOBT Updated              | <input type="checkbox"/> |
| [E] TSAT Issued               | <input type="checkbox"/> |
| [F] Aircraft is off-block     | <input type="checkbox"/> |
| [G] Take-off time             | <input type="checkbox"/> |

*Please add free text / comments, if needed:*

20. Which of the following **optional** milestones captured/calculated in the A-CDM System?

- |                              |                          |
|------------------------------|--------------------------|
| [A] CTOT Allocation          | <input type="checkbox"/> |
| [B] Take-off from Outstation | <input type="checkbox"/> |
| [C] FIR Entry                | <input type="checkbox"/> |
| [D] Final Approach           | <input type="checkbox"/> |
| [E] Ground Handling Starts   | <input type="checkbox"/> |
| [F] Boarding Starts          | <input type="checkbox"/> |
| [G] Aircraft Ready           | <input type="checkbox"/> |
| [H] Start Up Requested       | <input type="checkbox"/> |
| [I] Start Up Approved        | <input type="checkbox"/> |

*Please add free text / comments, if needed:*

21. How are TOBT and TSAT shared with Flight Crew?

- |                                                               |                          |
|---------------------------------------------------------------|--------------------------|
| [A] VDGS / A-VDGS / Airside Display Board                     | <input type="checkbox"/> |
| [B] Web interface / Mobile application                        | <input type="checkbox"/> |
| [C] Ground personnel communicate TOBT and TSAT to flight crew | <input type="checkbox"/> |
| [D] ATC communicates the TSAT                                 | <input type="checkbox"/> |
| [E] Other means. Provide details.                             | <input type="checkbox"/> |

**FRAMEWORK FOR MONITORING A-CDM IMPLEMENTATION**  
**[NAME OF STATE/ADMINISTRATION]**

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*Please add free text / comments, if needed:*

**ATFM Integration**

22. Is there a plan to integrate Local A-CDM with ATFM? (Select one)

- |     |                                          |                          |
|-----|------------------------------------------|--------------------------|
| [A] | Yes                                      | <input type="checkbox"/> |
| [B] | No                                       | <input type="checkbox"/> |
| [C] | To be decided                            | <input type="checkbox"/> |
| [D] | Not applicable (ATFM is not operational) | <input type="checkbox"/> |

*Please add free text / comments, if needed:*

23. Does your A-CDM system exchange information with the ATFM system? (Select one)

- |     |                |                          |
|-----|----------------|--------------------------|
| [A] | Yes            | <input type="checkbox"/> |
| [B] | No             | <input type="checkbox"/> |
| [C] | Under planning | <input type="checkbox"/> |

*Please add free text / comments, if needed:*

24. Is the A-CDM system integrated with ATFM system for data exchange? (Select one)

- |     |                          |                          |
|-----|--------------------------|--------------------------|
| [A] | Yes                      | <input type="checkbox"/> |
| [B] | No                       | <input type="checkbox"/> |
| [C] | Will be integrated later | <input type="checkbox"/> |

*Please add free text / comments, if needed:*

**FRAMEWORK FOR MONITORING A-CDM IMPLEMENTATION**  
**[NAME OF STATE/ADMINISTRATION]**

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25. Is CTOT considered in the calculation of TSAT? (Select one)

- [A] Yes ☐
- [B] No ☐
- [C] Will be implemented at a later date ☐

*Please add free text / comments, if needed:*

**Interoperability**

26. Is reference model like FIXM been adopted in Data Exchange? (Select one)

- [A] Yes ☐
- [B] No ☐
- [C] Planned for later ☐

*Please add free text / comments, if needed:*

ICAO APAC A-CDM QUESTIONNAIRE

STATE / ADMINISTRATION:

| # | NAME OF THE AIRPORT                                                                              | Airport 3 | Airport 2 | Airport 1 |
|---|--------------------------------------------------------------------------------------------------|-----------|-----------|-----------|
| 1 | What is the phase of A-CDM Implementation at your Airport?                                       | SELECT    | SELECT    | SELECT    |
|   | Please add free text / comments, if needed:                                                      |           |           |           |
|   |                                                                                                  |           |           |           |
| 2 | Is the A-CDM implementation enforcing operation with TOBT and TSAT?                              | SELECT    | SELECT    | SELECT    |
|   | Please add free text / comments, if needed:                                                      |           |           |           |
|   |                                                                                                  |           |           |           |
| 3 | Which of the following A-CDM enabling elements are being implemented to support A-CDM operations |           |           |           |
|   | Information Sharing                                                                              | Yes/No    | Yes/No    | Yes/No    |
|   | Milestone Management                                                                             | Yes/No    | Yes/No    | Yes/No    |
|   | Variable Taxi times                                                                              | Yes/No    | Yes/No    | Yes/No    |
|   | Pre-Departure Sequencing                                                                         | Yes/No    | Yes/No    | Yes/No    |
|   | A-CDM in Adverse Conditions                                                                      | Yes/No    | Yes/No    | Yes/No    |
|   | Integration with Air Traffic Flow Management System                                              | Yes/No    | Yes/No    | Yes/No    |
|   | Please add free text / comments, if needed:                                                      |           |           |           |
|   |                                                                                                  |           |           |           |
|   | Stakeholders' Involvement                                                                        |           |           |           |
|   |                                                                                                  |           |           |           |
| 4 | Which stakeholders are involved in the A-CDM project and process?                                |           |           |           |
|   | Airport operator                                                                                 | Yes/No    | Yes/No    | Yes/No    |
|   | Airline operators                                                                                | Yes/No    | Yes/No    | Yes/No    |
|   | Ground handlers                                                                                  | Yes/No    | Yes/No    | Yes/No    |
|   | Air Navigation Service Provider                                                                  | Yes/No    | Yes/No    | Yes/No    |
|   | Network Operations/ATFM unit                                                                     | Yes/No    | Yes/No    | Yes/No    |
|   | Other (Provide details)                                                                          | Yes/No    | Yes/No    | Yes/No    |
|   | Please add free text / comments, if needed:                                                      |           |           |           |
|   |                                                                                                  |           |           |           |
| 5 | Which stakeholders are having access to A-CDM Information?                                       |           |           |           |
|   | Airport operator                                                                                 | Yes/No    | Yes/No    | Yes/No    |
|   | Airline operators                                                                                | Yes/No    | Yes/No    | Yes/No    |
|   | Ground handlers                                                                                  | Yes/No    | Yes/No    | Yes/No    |
|   | Air Navigation Service Provider                                                                  | Yes/No    | Yes/No    | Yes/No    |
|   | Network Operations/ATFM unit                                                                     | Yes/No    | Yes/No    | Yes/No    |
|   | Other (Provide details)                                                                          | Yes/No    | Yes/No    | Yes/No    |

|    |                                                                                                                                                                     |        |        |        |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|--------|
|    | Please add free text / comments, if needed:                                                                                                                         |        |        |        |
|    |                                                                                                                                                                     |        |        |        |
|    | A-CDM Procedures & Compliance                                                                                                                                       |        |        |        |
|    |                                                                                                                                                                     |        |        |        |
| 6  | Do you have procedures in place for A-CDM operations at your airport?                                                                                               | SELECT | SELECT | SELECT |
|    | Please add free text / comments, if needed:                                                                                                                         |        |        |        |
|    |                                                                                                                                                                     |        |        |        |
| 7  | Are roles & responsibilities for each stakeholder clearly defined in the local A-CDM procedures?                                                                    | Yes/No | Yes/No | Yes/No |
|    | Please add free text / comments, if needed:                                                                                                                         |        |        |        |
|    |                                                                                                                                                                     |        |        |        |
| 8  | Which of the below mentioned Key Performance Indicators (KPI) w.r.t. TOBT are monitored?                                                                            |        |        |        |
|    | TOBT input participation rate                                                                                                                                       | Yes/No | Yes/No | Yes/No |
|    | TOBT Accuracy                                                                                                                                                       | Yes/No | Yes/No | Yes/No |
|    | KPI related to TOBT are not being monitored                                                                                                                         | Yes/No | Yes/No | Yes/No |
|    | Please add free text / comments, if needed:                                                                                                                         |        |        |        |
|    |                                                                                                                                                                     |        |        |        |
| 9  | Is TSAT Compliance monitored?                                                                                                                                       | SELECT | SELECT | SELECT |
|    | Please add free text / comments, if needed:                                                                                                                         |        |        |        |
|    |                                                                                                                                                                     |        |        |        |
| 10 | Is ATC using TSAT for approving startup to aircraft?                                                                                                                | SELECT | SELECT | SELECT |
|    | Please add free text / comments, if needed:                                                                                                                         |        |        |        |
|    |                                                                                                                                                                     |        |        |        |
| 11 | Does local policy require the aircraft to report/be ready for start-up/push-back within certain minutes prior to or after the confirmed TOBT, irrespective of TSAT? | Yes/No | Yes/No | Yes/No |
|    | Please add free text / comments, if needed:                                                                                                                         |        |        |        |
|    |                                                                                                                                                                     |        |        |        |
| 12 | Does local policy mandate the Pilots to request start/pushback clearance within certain minutes prior to or after TSAT?                                             | Yes/No | Yes/No | Yes/No |
|    | Please add free text / comments, if needed:                                                                                                                         |        |        |        |
|    |                                                                                                                                                                     |        |        |        |
| 13 | Does local policy require the departure clearance to be requested within certain minutes prior to or after TOBT/TSAT?                                               | Yes/No | Yes/No | Yes/No |
|    | Please add free text / comments, if needed:                                                                                                                         |        |        |        |
|    |                                                                                                                                                                     |        |        |        |
| 14 | What are the A-CDM performance indicators commonly agreed upon amongst stakeholders for A-CDM performance monitoring?                                               |        |        |        |
|    | Turnaround compliance                                                                                                                                               | Yes/No | Yes/No | Yes/No |

|  |                                                            |        |        |        |
|--|------------------------------------------------------------|--------|--------|--------|
|  | In-Block Time accuracy                                     | Yes/No | Yes/No | Yes/No |
|  | Off-Block Time accuracy                                    | Yes/No | Yes/No | Yes/No |
|  | Average taxi out time                                      | Yes/No | Yes/No | Yes/No |
|  | Gate/Bay/Stand occupancy time                              | Yes/No | Yes/No | Yes/No |
|  | Gate/Bay/Stand allocation and passenger gate freezing time | Yes/No | Yes/No | Yes/No |
|  | Gate/Bay/Stand allocation accuracy                         | Yes/No | Yes/No | Yes/No |
|  | Number of bay conflicts per day                            | Yes/No | Yes/No | Yes/No |
|  | Slot adherence                                             | Yes/No | Yes/No | Yes/No |
|  | Emission from aircraft, on ground                          | Yes/No | Yes/No | Yes/No |
|  | Number of aircraft queueing in high demand periods         | Yes/No | Yes/No | Yes/No |
|  | Number of aircraft compliant with ATFM slot (CTOT)         | Yes/No | Yes/No | Yes/No |
|  | Other (Provide details)                                    | Yes/No | Yes/No | Yes/No |
|  | <i>Please add free text / comments, if needed:</i>         |        |        |        |

|  |                  |
|--|------------------|
|  | System Functions |
|--|------------------|

|    |                                                        |        |        |        |
|----|--------------------------------------------------------|--------|--------|--------|
| 15 | How is the TOBT input for the A-CDM system is updated? | SELECT | SELECT | SELECT |
|    | <i>Please add free text / comments, if needed:</i>     |        |        |        |

|    |                                                           |        |        |        |
|----|-----------------------------------------------------------|--------|--------|--------|
| 16 | How is VTT (Variable Taxi Time) considered in the System? | SELECT | SELECT | SELECT |
|    | <i>Please add free text / comments, if needed:</i>        |        |        |        |

|    |                                                                        |        |        |        |
|----|------------------------------------------------------------------------|--------|--------|--------|
| 17 | Does the A-CDM implementation include a predeparture sequencing (PDS)? | SELECT | SELECT | SELECT |
|    | <i>Please add free text / comments, if needed:</i>                     |        |        |        |

|    |                                                                   |        |        |        |
|----|-------------------------------------------------------------------|--------|--------|--------|
| 18 | How is the PDS implemented as part of the overall A-CDM solution? | SELECT | SELECT | SELECT |
|    | <i>Please add free text / comments, if needed:</i>                |        |        |        |

|    |                                                                                            |        |        |        |
|----|--------------------------------------------------------------------------------------------|--------|--------|--------|
| 19 | Which of the following <u>required</u> milestones captured/calculated in the A-CDM System? |        |        |        |
|    | ATC Flight Plan Activated                                                                  | Yes/No | Yes/No | Yes/No |
|    | Aircraft Landed                                                                            | Yes/No | Yes/No | Yes/No |
|    | Aircraft is in-block                                                                       | Yes/No | Yes/No | Yes/No |
|    | TOBT Updated                                                                               | Yes/No | Yes/No | Yes/No |
|    | TSAT Issued                                                                                | Yes/No | Yes/No | Yes/No |
|    | Aircraft is off-block                                                                      | Yes/No | Yes/No | Yes/No |
|    | Take-off time                                                                              | Yes/No | Yes/No | Yes/No |
|    | <i>Please add free text / comments, if needed:</i>                                         |        |        |        |

|    |                                                                                            |        |        |        |
|----|--------------------------------------------------------------------------------------------|--------|--------|--------|
| 20 | Which of the following <u>optional</u> milestones captured/calculated in the A-CDM System? |        |        |        |
|    | Turnaround compliance                                                                      | Yes/No | Yes/No | Yes/No |
|    | In-Block Time accuracy                                                                     | Yes/No | Yes/No | Yes/No |

|  |                                                            |        |        |        |
|--|------------------------------------------------------------|--------|--------|--------|
|  | Off-Block Time accuracy                                    | Yes/No | Yes/No | Yes/No |
|  | Average taxi out time                                      | Yes/No | Yes/No | Yes/No |
|  | Gate/Bay/Stand occupancy time                              | Yes/No | Yes/No | Yes/No |
|  | Gate/Bay/Stand allocation and passenger gate freezing time | Yes/No | Yes/No | Yes/No |
|  | Gate/Bay/Stand allocation accuracy                         | Yes/No | Yes/No | Yes/No |
|  | Number of bay conflicts per day                            | Yes/No | Yes/No | Yes/No |
|  | Slot adherence                                             | Yes/No | Yes/No | Yes/No |
|  | Emission from aircraft, on ground                          | Yes/No | Yes/No | Yes/No |
|  | Number of aircraft queueing in high demand periods         | Yes/No | Yes/No | Yes/No |
|  | Number of aircraft compliant with ATFM slot (CTOT)         | Yes/No | Yes/No | Yes/No |
|  | Other (Provide details)                                    | Yes/No | Yes/No | Yes/No |
|  | <i>Please add free text / comments, if needed:</i>         |        |        |        |

|    |                                                           |        |        |        |
|----|-----------------------------------------------------------|--------|--------|--------|
| 21 | How are TOBT and TSAT shared with Flight Crew?            |        |        |        |
|    | VDGS / A-VDGS / Airside Display Board                     | Yes/No | Yes/No | Yes/No |
|    | Web interface / Mobile application                        | Yes/No | Yes/No | Yes/No |
|    | Ground personnel communicate TOBT and TSAT to flight crew | Yes/No | Yes/No | Yes/No |
|    | ATC communicates the TSAT                                 | Yes/No | Yes/No | Yes/No |
|    | Other means. Provide details.                             | Yes/No | Yes/No | Yes/No |
|    | <i>Please add free text / comments, if needed:</i>        |        |        |        |

ATFM Integration

|    |                                                     |        |        |        |
|----|-----------------------------------------------------|--------|--------|--------|
| 22 | Is there a plan to integrate Local A-CDM with ATFM? | SELECT | SELECT | SELECT |
|    | <i>Please add free text / comments, if needed:</i>  |        |        |        |

|    |                                                                   |        |        |        |
|----|-------------------------------------------------------------------|--------|--------|--------|
| 23 | Does your A-CDM system exchange information with the ATFM system? | SELECT | SELECT | SELECT |
|    | <i>Please add free text / comments, if needed:</i>                |        |        |        |

|    |                                                                    |        |        |        |
|----|--------------------------------------------------------------------|--------|--------|--------|
| 24 | Is the A-CDM system integrated with ATFM system for data exchange? | SELECT | SELECT | SELECT |
|    | <i>Please add free text / comments, if needed:</i>                 |        |        |        |

|    |                                                    |        |        |        |
|----|----------------------------------------------------|--------|--------|--------|
| 25 | Is CTOT considered in the calculation of TSAT?     | SELECT | SELECT | SELECT |
|    | <i>Please add free text / comments, if needed:</i> |        |        |        |
|    |                                                    |        |        |        |
|    | Interoperability                                   |        |        |        |

|    |                                                             |        |        |        |
|----|-------------------------------------------------------------|--------|--------|--------|
| 26 | Is reference model like FIXM been adopted in Data Exchange? | SELECT | SELECT | SELECT |
|    | <i>Please add free text / comments, if needed:</i>          |        |        |        |

INTERNATIONAL CIVIL AVIATION ORGANIZATION



ASIA PACIFIC AIRPORT COLLABORATIVE DECISION MAKING (A-CDM)  
IMPLEMENTATION PLAN

Second Edition 2021

This Guidance Material is approved by the AOP/SG/3 Meeting and  
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## SCOPE OF THE PLAN

### The Need for Regional Guidance and A-CDM Implementation Plan

1.1 The phenomenal growth of air traffic for the past one and a half decades has caught the whole aviation world by surprise. Asia Pacific region has accounted for more than 30 percent of the global air transport market. Considering the fleet acquisition of aircraft operators in Asia Pacific (APAC) Region, this figure is expected to grow further.

1.2 The traffic growth vis-a-vis airport infrastructure has prompted ICAO to devise various methods like promulgation of new procedures, regulations, sharing of information and collaborative approach in all fields to mitigate the issues being faced by the aviation community in this region.

1.3 All stakeholders in aviation especially aircraft operators, airport operators and air navigation service providers (ANSPs) are consistently assessing their operations to minimize their carbon footprints.

1.4 ICAO APAC Region conducted the first ever seminar in conjunction with the First Meeting of the Asia Pacific Airport Collaborative Decision Making Task Force (APA-CDM/TF) to collate, compile and analyse the issues being faced by stakeholders. During this Task Force meeting, a consensus was arrived at, to complete a survey on status of A-CDM implementation at airports by the States.

1.5 The Second APA-CDM/TF meeting analysed the survey data and it was observed that many States have not initiated the process of implementing A-CDM at many airports.

1.6 It has also been observed that wherever implementation process and / or the procedures being followed are not harmonised wherein the possibility of confusion exist among the users particularly aircraft operators, Air Traffic Control (ATC), airport operators and Ground Handling Agents (GHA).

1.7 This has necessitated ICAO APAC Office to harmonise the process of implementation, sharing of data, terminologies, data formats etc.

1.8 This document has been developed by the experts nominated by States, CANSO and IATA to foster harmonized and interoperable A-CDM implementation in the Asia Pacific Region.

1.9 The document also elucidates the performance measurement mechanism to understand the gap between the intended A-CDM implementation and results so obtained. This process will enable the planners to make necessary course correction to improve the system.

1.10 Several airports within the Asia Pacific Region have implemented A-CDM to some varying degree and more airports are in the process of planning to implement A-CDM. While there will be differences across A-CDM airports to take into account local constraints and requirements, certain key A-CDM processes e.g. terminologies, start-up procedures, can be harmonised to prevent confusion among stakeholders. States should recognise the importance of harmonisation in key A-CDM processes. This is a crucial step towards the eventual local implementation of A-CDM. Subsequently, there is a need for States to work together to ensure system interoperability between Air Traffic Flow Management (ATFM) and A-CDM implementations in the Asia Pacific Region.

1.11 A-CDM can further optimise operations at the airport by taking into consideration ATFM programmes. In a scenario where local and regional networks of A-CDM and/or ATFM units are set up and connected, key stakeholders will be able to exchange useful departure and arrival information to further improve predictability of events (as compared to standalone A-CDM or ATFM) to enhance the planning and overall situational awareness for all CDM partners. The implementation of

an integrated ATFM and A-CDM network will complement each other and together create a seamless air traffic environment. This would improve flight and ATM efficiency throughout the three phases of flight (arrival, turnaround and departure), benefiting all CDM partners.

## PLAN DEVELOPMENT AND OBJECTIVES

### Asia Pacific Seamless ANS Plan

2.1 The Asia Pacific Seamless ANS Plan includes background information and performance expectations for implementation of A-CDM in the Asia Pacific Region.

2.2 The Plan prioritizes the implementation of the Global Air Navigation Plan (GANP) Aviation System Block Upgrades (ASBUs), with ASBU modules categorized as Critical ASBU Upgrades, Recommended ASBU Upgrades or ASBU Elements that may not be Universally Implemented. The ACDM-B0/1-2 [Airport CDM Information Sharing (ACIS) - Integration with ATM Network function] and ACDM-B1/1-2 [Airport Operations Plan (AOP) - Airport Operations Centre (APOC)] ASBU modules are listed as Critical and Recommended ASBU Upgrades, respectively. ICAO GANP and APAC Seamless ANS Plan have details on ASBUs.

### APANPIRG/27 Decision on Establishment of APA-CDM Task Force

2.3 Noting the benefits that accrue by the implementation of A-CDM at high density aerodromes and the implementation challenges faced by the region, APANPIRG/27 adopted the proposal to establish an A-CDM Task Force to support and assist in the implementation of A-CDM in the APAC Region. The text of the Decision is reproduced below:

#### **Decision APANPIRG/27/2: Establishment of A-CDM Task Force**

That, an Asia/Pacific Airport Collaborative Decision Making Task Force (APA-CDM/TF) is established in accordance with the Terms of Reference (ToR) at **Appendix A to AP ANPIRG27 /WP/6**.

2.4 Following APANPIRG Decision 27/2 the ICAO APAC Office through its letter Ref.: AN 3/3 — AP107/16 (AGA) dated 20 September 2016 requested States/Administrations to nominate experts/advisors having knowledge in Airport collaborative Decision Making (A-CDM) to the APA-CDM/TF.

2.5 The second task force meeting analysed the A-CDM survey data and observed that many States have not initiated the process of implementing A-CDM at many airports. *The Decision of the Task Force/2 is as under:*

*5.21 A Regional A-CDM implementation plan would be drafted offline by the APA-CDM Expert Group, led by India supported by Singapore and CANSO and would include the development of a minimum suite of A-CDM milestones for Regional application.*

2.6 IATA also contributed in the development of this plan.

### DGCA Conference's Action Item 54/12 on Harmonization of A-CDM Practices

2.7 Noting the experience of States/Administrations gained from the implementation of A-CDM and recognizing a collaborative approach in the implementation of A-CDM would lead to the optimization of airport operations which contributes towards achieving seamless ATM in the APAC Region, the 54<sup>th</sup> Conference of the Asia/Pacific Director Generals encouraged States/ Administrations to:

- work towards harmonization of A-CDM practices in APAC Region and to participate in the ICAO Asia/Pacific A-CDM/TF; and
- implement A-CDM taking into account the cross-border ATFM operations.

## EXECUTIVE SUMMARY

### Airport - Collaborative Decision Making Task Force

3.1 In accordance with Decision APANPIRG/27/2: Establishment of A-CDM Task Force, the ICAO Asia Pacific Airport - Collaborative Decision Making Task Force (APA-CDM/TF) was formulated and the first APA-CDM/TF meeting was held in April 2017. Taking reference to survey data collected from States/Administrations in Asia Pacific Region regarding the status of A-CDM implementation and the discussion deliberated in the second APA-CDM/TF meeting for the need of harmonisation on A-CDM in Asia Pacific Region, especially for the process of implementation, data sharing, terminologies, data formats and framework of interoperability with other related systems. APA-CDM/TF Expert Group was tasked to develop this APA-CDM Implementation Plan as a reference to States/Administrations for implementation of A-CDM in Asia Pacific Region.

3.2 The APAC A-CDM Implementation Plan shares insights in the following areas for assisting States in planning and implementation of A-CDM in different stages.

### A-CDM Phases

3.3 A-CDM project activities could be grouped into the following three phases:

- Initiation;
- Implementation; and
- Operation and Monitoring.

3.4 In the Initiation Phase, it is required to define the need and complete relevant analysis in order to make a decision for the implementation of A-CDM.

3.5 In the Implementation Phase, variety among A-CDM projects in different airports is expected due to the involvement of a broad mix of stakeholders with relatively unique operational requirements. However, the following key considerations are interpreted as commonalities among A-CDM projects:

- Clear definition of roles and responsibilities among stakeholders;
- Establishment of A-CDM Project Management Team;
- Stakeholders' access to A-CDM data;
- Aim to achieve an effective and efficient turnaround process; and
- Development of continuous improvement culture.

3.6 In the Operation and Monitoring Phase, focus will remain on continuous improvement and development of the A-CDM system to optimize the utilization of airport infrastructure. It is crucial to define key performance indicator measurements related to TOBT and TSAT for evaluating effectiveness of A-CDM implementation.

### Harmonization Framework

3.7 It is understandable that each individual airport can maintain its unique requirements in implementing A-CDM. To certain extent, the need for harmonization on the following aspects is also anticipated. Relevant reference and guidance have been laid out in the APAC A-CDM Implementation Plan.

- A-CDM terminologies and definition;
- Roles and responsibilities of A-CDM stakeholders;
- Standardization of A-CDM procedures; and
- Commonality in milestone approach.

### Interoperability of A-CDM with other systems

3.8 Making reference to the ICAO Aviation System Block Upgrades (ASBU) framework, it is considered necessary to link up relevant ASBU modules and elements related to A-CDM, such as NOPS-B0, ACDM-B0, ACDM-B1, FICE-B1, the application of Common aeRonautical Virtual Private Network (CRV) and System-Wide Information Management (SWIM) for carrying regional FIXM Extension etc. There should be a project framework for integration/interoperation of A-CDM with other air traffic management (ATM) systems, especially for ATFM platform, in accordance with the ASBU roadmap. A good practice for development and implementation of interoperability among A-CDM and ATFM platforms should incorporate considerations of relevant milestones involved, open standards for sharing data with systems across border, alignment of compliance criteria in A-CDM and ATFM, and coordinated timing for data exchange matched with data availability timeline.

### Research and Future Development

3.9 A-CDM has its roots in Europe and is the foundation for Single European Sky ATM Research (SESAR) concept for the use of better data and technology to make aircraft and airport operations more efficient. However, not all regions have a centric ATM network as Europe so the processes would be different in Asia Pacific Region. As air traffic management evolves and additional concepts are being introduced by the industry, changes and adjustments to A-CDM are anticipated. To assist in making the implementation of A-CDM more successful, it is recommended that a regional ATFM environment be established e.g. via a distributed multi-nodal ATFM network, which would enable a certain degree of harmonization and provide consistency for stakeholders.

3.10 Moreover, States/Administrations should also take into consideration of performance expectation dates, which are mapped with APAC Seamless ANS Plan and Regional Framework for Collaborative ATFM expectations, provided in the APAC A-CDM Implementation Plan while planning for implementation of A-CDM at their airports.

**ABBREVIATIONS AND ACRONYMS**

|         |                                                         |
|---------|---------------------------------------------------------|
| ACARS   | Aircraft Communications Addressing and Reporting System |
| A-CDM   | Airport Collaborative Decision Making                   |
| ACGT    | Actual Commence of Ground Handling Time                 |
| ACISP   | A-CDM Information Sharing Platform                      |
| ACZT    | Actual Commencement of De-icing Time                    |
| ADIT    | Actual De-icing Time                                    |
| AEGT    | Actual End of Ground Handling Time                      |
| AEZT    | Actual End of De-icing Time                             |
| AFTN    | Aeronautical Fixed Telecommunication Network            |
| AGHT    | Actual Ground Handling Time                             |
| AIBT    | Actual In-Block Time                                    |
| AIC     | Aeronautical Information Circular                       |
| AIDX    | Aviation Information Data Exchange                      |
| AIP     | Aeronautical Information Publication                    |
| AIRM    | ATM Information Reference Model                         |
| AIXM    | Aeronautical Information Exchange Model                 |
| ALDT    | Actual Landing Time                                     |
| AMAN    | Arrival Manager                                         |
| AMHS    | ATS Messaging System                                    |
| AMQP    | Advanced Message Queuing Protocol                       |
| ANSP    | Air Navigation Service Provider                         |
| AO      | Aircraft Operator                                       |
| AOBT    | Actual Off-Block Time                                   |
| AODB    | Airport Operational Database                            |
| AOM     | Airspace Organization and Management                    |
| AOP     | Airport Operations Planning                             |
| APOC    | Airport Operations Centre                               |
| APAC    | Asia Pacific                                            |
| API     | Application Programming Interface                       |
| ARDT    | Actual Ready Time                                       |
| ARZT    | Actual Ready for De-icing Time                          |
| ASAT    | Actual Start-up Approval Time                           |
| ASBT    | Actual Start Boarding Time                              |
| ASCII   | American Standard Code for Information Interchange      |
| A-SMGCS | Advanced-Surface Movement Guidance and Control System   |
| ASRT    | Actual start-up request time                            |
| ATC     | Air Traffic Control                                     |

|        |                                                               |
|--------|---------------------------------------------------------------|
| ATCO   | Air Traffic Controller                                        |
| ATFM   | Air Traffic Flow Management                                   |
| ATFMU  | Air Traffic Flow Management Unit                              |
| ATM    | Air Traffic Management                                        |
| ATOT   | Actual Take-Off Time                                          |
| ATS    | Air Traffic Services                                          |
| ATTT   | Actual Turnaround Time                                        |
| AXIT   | Actual Taxi-In Time                                           |
| AXOT   | Actual Taxi-Out Time                                          |
| BOBCAT | Bay of Bengal Cooperative Air Traffic Flow Management System  |
| CDM    | Collaborative Decision Making                                 |
| CHG    | Modification Message                                          |
| CONOPS | Concept of Operations                                         |
| CRACP  | Cross Region ATFM Collaborative Platform                      |
| CRV    | Common aeRonautical Virtual Private Network                   |
| CRV/OG | CRV Operations Group                                          |
| CTOT   | Calculated Take Off Time                                      |
| DATM   | Digital ATM                                                   |
| DCB    | Demand and Capacity Balancing                                 |
| DCL    | Datalink Departure Clearance                                  |
| DMAN   | Departure Manager                                             |
| DLA    | Delay Message                                                 |
| ECZT   | Estimated Commencement of De-Icing Time                       |
| EDIT   | Estimated De-icing Time                                       |
| EET    | Estimated Elapsed Time                                        |
| EEZT   | Estimated End of De-Icing Time                                |
| EIBT   | Estimated In-Block Time                                       |
| ELDT   | Estimated Landing Time                                        |
| EOBT   | Estimated Off Block Time                                      |
| ERZT   | Estimated Ready for De-icing Time                             |
| ETA    | Estimated Time of Arrival                                     |
| ETOT   | Estimated Take-Off Time                                       |
| ETTT   | Estimated Turnaround Time                                     |
| EXIT   | Estimated Taxi-In Time                                        |
| EXOT   | Estimated Taxi-Out Time                                       |
| FDPS   | Flight Data Processing System                                 |
| FF-ICE | Flight and Flow Information for the Collaborative Environment |
| FIR    | Flight Information Region                                     |

|        |                                              |
|--------|----------------------------------------------|
| FIXM   | Flight Information Exchange Model            |
| GDP    | Ground Delay Program                         |
| GHA    | Ground Handling Agent                        |
| HMI    | Human Machine Interface                      |
| IATA   | International Air Transport Association      |
| ICD    | Interface Control Document                   |
| ICT    | Information and Communication Technology     |
| IP     | Internet Protocol                            |
| KPI    | Key Performance Indicator                    |
| MTF    | Major Traffic Flow                           |
| MTTT   | Minimum Turnaround Time                      |
| NARAHG | North Asia Regional ATFM Harmonization Group |
| NOPS   | Network Operations                           |
| OCC    | Operations Control Center                    |
| PDS    | Predeparture Sequencing                      |
| RMS    | Resource Management System                   |
| SESAR  | Single European Sky ATM Research             |
| SIBT   | Schedule In-Block Time                       |
| SLA    | Service Level Agreement                      |
| SMAN   | Surface Manager                              |
| SOBT   | Scheduled Off-Block Time                     |
| SQL    | Structured Query Language                    |
| STD    | Scheduled Time of Departure                  |
| SWIM   | System Wide Information Management           |
| TLDT   | Target Landing Time                          |
| TMA    | Terminal Control Area                        |
| TOBT   | Target Off-Block Time                        |
| TSAT   | Target Start-up Approval Time                |
| TLDT   | Target Landing Time                          |
| TTOT   | Target Take-Off Time                         |
| UML    | Unified Modeling Language                    |
| VDGS   | Visual Docking Guidance System               |
| VTT    | Variable taxi time                           |
| W3C    | World Wide Web Consortium                    |
| XML    | eXtensible Markup Language                   |

## OVERVIEW OF A-CDM

5.1 Airport collaborative decision-making (A-CDM) is a set of processes developed from the general philosophy of collaborative decision-making (CDM) in aviation and is applied to the operations at aerodromes.

5.2 A-CDM can optimize airport operations, by enhancing the turnaround process and improving flight predictability through real time data exchange for all A-CDM stakeholders. A-CDM also potentially helps to improve gate/aircraft stand management, reduce apron, taxiway and holding point congestion. A-CDM involves implementing a set of operational procedures supported by sharing of timely and accurate information amongst A-CDM stakeholders. Overall, A-CDM is about making more efficient use of existing capacity and resources, as well as potentially better recovery from disruptions. A-CDM can, in some cases reduce operating cost attributed to fuel burn, which contributes to environmental benefits.

5.3 Any implementation of A-CDM must be based on assessment of current operational constraints and the value an A-CDM implementation will generate to mitigate such constraints and / or improve current operations. There is a set of essential elements as well as best practices to consider when implementing A-CDM that will simplify and harmonize the implementation. However, each implementation must be based on careful engagement across all airport stakeholders, primarily the Airport Operator, Aircraft Operators, Ground Handling Agents, Air Navigation Service Provider and Air Traffic Flow Management Unit (if any).

5.4 Prior to A-CDM, the stakeholders worked on the basis of *“first come first served”* in the start-up sequence of aircraft. A-CDM works on the premise of *“best planned best served”*, whereby ATC will optimise the predeparture sequence, by generating Target Start-up Approval Times (TSAT), using Target Off-Block Times (TOBT) submitted by Aircraft Operators or their delegate (e.g. Ground Handling Agents). It is a collaborative approach amongst all the A-CDM stakeholders and the success is ultimately dependent on the accuracy of TOBTs which are managed by Aircraft Operators.

5.5 To aid the generation of accurate TOBTs and TSATs in the A-CDM process, timely and accurate information updates are very important. The key information needed is ELDT, EIBT, ALDT and AIBT from the arriving flight that is linked to the departing flight. Timely update of this information is related to the A-CDM milestones.

## A-CDM IMPLEMENTATION GUIDANCE

### Overview of A-CDM Phases

6.1 A-CDM project activities may be grouped into three phases as illustrated in Figure 1:

- Initiation;
- Implementation; and
- Operation and monitoring.

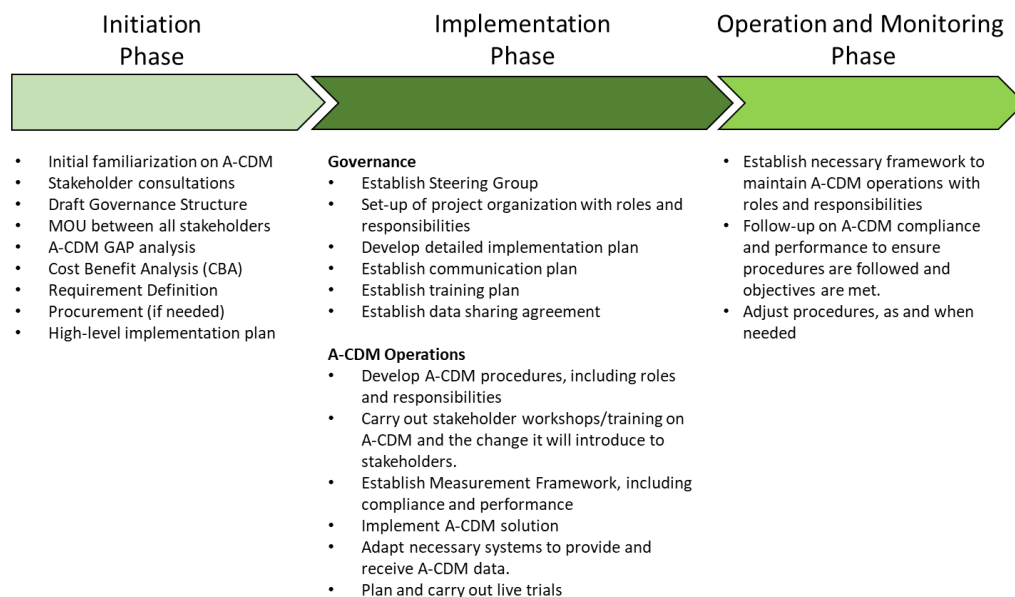


Figure 1 - Phases of A-CDM Project

6.2 The initiation phase is about defining the need, including gap analysis, making the cost and benefit analysis, and ultimately getting a decision to go ahead to invest in the implementation phase.

6.3 The project implementation phase is to undertake the activities to successfully carry out the A-CDM project, which is different from many other implementation projects due to its multi-stakeholders' involvement and impact on operations.

6.4 The operations phase is about when A-CDM is up and running. A-CDM with its procedures and supporting systems and sharing of information will be up and running 24/7 – 365 in most cases. This will also require the necessary efforts and tasks to make it successful.

6.5 This plan focuses on highlighting some of the most critical activities to consider in the implementation phase.

### Key Considerations for A-CDM Implementation Phase

6.6 A-CDM Steering Group comprising of all relevant stakeholders, which is a minimum of the Airport Operator, Ground Handling Agents, ANSP and Aircraft Operators, should be set up before any implementation, with the responsibility to agree on the A-CDM processes, procedures, performance framework, data sharing and common definitions. Generally, this is initiated by the Airport Operator.

6.7 The A-CDM Steering Group should define clear roles and responsibilities in the implementation phase for the A-CDM stakeholders, i.e. “**who**” is doing “**what**” and “**when**” in the implementation project. This is not to be confused with the “roles and responsibilities” of the stakeholders in the A-CDM process, which is something different and addressed in the “Harmonization Framework” section.

6.8 A-CDM Project Management Team should be established and involve all A-CDM stakeholders during design and implementation of A-CDM project.

6.9 Ensuring early engagement with stakeholders and instilling a collaborative culture will support the success of an A-CDM implementation. This process should create clarity across A-CDM stakeholders on the objectives of the implementation, and the expectations from each party. With clear and agreed objectives across all key stakeholders, A-CDM implementation should yield projected benefits and will prevent sub-optimal operations or limited return on investment for the airport.

6.10 As A-CDM is a change in procedures, it can also be a huge cultural and behavioural change for all A-CDM stakeholders that should not be underestimated. In order to address this challenge, appropriate communication and training plans should be put in place to facilitate the understanding and impact of A-CDM for each stakeholder.

6.11 Local A-CDM Operational Procedures should be developed in collaboration with the stakeholders. These procedures need to detail at a minimum “roles and responsibilities”, i.e. “**who** is doing **what**, **when** and **how**” in the A-CDM process. During this work, implementers should look to other A-CDM procedure manuals and related materials to leverage experience gained and lessons learnt. Examples can be found at ICAO APAC Website under e-Documents at <https://www.icao.int/APAC/Pages/eDocs.aspx>. The section “Harmonization Framework” also outlines particular parts that should be considered to ensure harmonization.

6.12 The implementation should be in a phased approach, including trials, with a minimum of disturbance to A-CDM stakeholders’ operations.

6.13 A framework of reviews to track progress of A-CDM implementation should be created by the A-CDM steering group. This framework aims to ensure that the implementation phase timelines and objectives are met.

6.14 Performance framework to measure key performance indicators should be established as early as possible in the implementation phase.

6.15 Wherever ATFM is operational, it is desirable to integrate with local A-CDM to achieve optimal situational awareness for all stakeholders.

#### Stakeholder Access to A-CDM Data

6.16 A-CDM requires airport stakeholders to exchange timely operational information which enables collaboration in the efficient management of operations at an airport.

6.17 Data exchanges via the common interfaces should support the entire data related to A-CDM elements and milestones. Full scope messaging will provide context to enhance situational awareness.

6.18 Aviation Information Data Exchange (AIDX) could be utilized for data exchange of A-CDM data among stakeholders using commercial flight identification (outside the ATM

domain). AIDX is an eXtensible Markup Language (XML) messaging standard for exchanging flight data among airlines, airports, ground handlers and other third party data consumers.

6.19 The adoption of an open source technology for an A-CDM Information Sharing Platform (ACISP) is encouraged in order to reduce the license cost to A-CDM stakeholders wishing to implement data exchange via the common Application Programming Interface (API).

#### Achieving an Effective and Efficient Turnaround Process

6.20 The turnaround process encompasses the complete management of an aircraft from the arrival at an airport to the departure (from AIBT to AOBT) that needs to be effective and efficient in order to contribute to a successful A-CDM implementation.

6.21 The A-CDM turnaround process involves stakeholders, operational services, data points and algorithms that are instrumental to successful turnaround of an aircraft.

6.22 To ensure good interaction amongst stakeholders, the understanding, management and ownership of TOBT is of utmost importance. This will improve performance of the turnaround.

6.23 A departure sequence capability should be introduced that produces Target Start-up Approval Times (TSATs) and Target Take Off Times (TTOTs). This is to deliver transparency, better recovery and improvements to Calculated Take-Off Time (CTOT) compliance. The capability should evolve with the A-CDM implementation and the “Operation and Monitoring” phase.

6.24 The Variable Taxi Times (VTTs) are of utmost importance for the A-CDM processes to work, including producing automated updates to Estimated In Block Times (EIBTs) as well as the Target Start-up Approval Times (TSATs) and Target Take Off Times (TTOTs). The practical implementation of VTTs can vary from static values (e.g. fixed taxi times from runways to gates) to highly dynamic VTTs that take ground movement patterns, changes at the airfield and changes to traffic flows due to weather into account. How advanced and dynamic, the VTTs need to be considered in the implementation where the complexity of traffic patterns and airport layout are factors to be considered. The more accurate the VTTs are, the better the overall predictions and sequencing of traffic will be.

6.25 The Minimum Turn-Round Time (MTTT) is also very important for the A-CDM processes to work. It comes into play to help calculating Target Off Block Times (TOBTs) based on Estimated In Block Times (EIBTs) or Actual In Block Times (AIBTs). The MTTTs will depend on factors such as aircraft type, possibly type of stand, airline procedures, destination etc. The values and implementation of MTTTs should be discussed in close cooperation with the Airline Operators to ensure accurate values are used. MTTTs not presentative of the operations will result in less accurate TOBTs as well as TSATs and TTOTs, as long as TOBTs are not manually controlled by the Airline Operator or Ground Handling Agents.

#### Building a Continuous Improvement Culture

6.26 A-CDM implementation involves the interaction of multiple stakeholders, processes and systems. A culture of continuous improvement amongst all stakeholders will benefit all involved.

6.27 Following its implementation, the environment at an airport will change and may require adjustments in the A-CDM processes.

6.28 After A-CDM implementation, it is important that focus remains on continuous improvement and developing the overall A-CDM system to ensure optimized utilization of airport infrastructure. The project should be able to support a suitable improvement mechanism.

6.29 A-CDM stakeholders should be able to monitor improvements from an A-CDM implementation. This should consist of:

- a) Exchange of experience at regular intervals.
- b) Ad-hoc meetings before any major release of new software or update of the A-CDM implementation (procedural or functional). Ideally, this should be supported by a consensus achieved by discussion amongst impacted stakeholders.
- c) ICAO Asia/Pacific Office can be approached to solicit views on new implementations or improvement opportunities.

6.30 Where ATFM exists, the Airport-CDM and ATFM should collaborate to improve airport operations especially for capacity planning and impact of performance degradation at other airports.

#### Measure Effectiveness of A-CDM Implementation

6.31 With the implementation of A-CDM, there will be a change from current operating procedures as it introduces two new time elements, namely Target Off Block Times (TOBTs) and Target Start-up Approval Times (TSATs) and the procedures around these time elements. More specifically the operational changes relates to:

- The management, including input and updates as needed, of Target Off Block Times (TOBTs) for either the aircraft operator or the ground handler.
- The management, including input and updates as needed, of TSATs for the Air Navigation Service Provider (ANSP)
- The start-up and push back procedures.

6.32 It is very important that the impacts of these procedure changes are measured, so that the effectiveness of the A-CDM implementation can be assessed. This will allow all stakeholders to effectively monitor how the A-CDM procedures are complied with and identify where improvement can be made, which is just as important as getting A-CDM implemented in the first place.

6.33 Key performance indicators (KPIs) related to TOBT and TSAT are required to assess the effectiveness of an A-CDM implementation.

6.34 Other KPIs may be used as supplement for monitoring the performance of the A-CDM.

#### *Measurements of TOBT*

6.35 Achieving inputs and updates of TOBT as accurate as possible is one of the first steps in the A-CDM implementation. The Aircraft Operators or Ground Handling Agents will need to provide TOBT for all the departing flights to enable the A-CDM procedures to flow efficiently and effectively. Without TOBT, there will be no predictability of departure readiness and TSAT will not be available.

6.36 The following measurements are related to TOBT.

Table 1 - Measurement of TOBT

| Name of indicator   | TOBT input participation rate                                                                                                                                                                                                                                                                                                                                                  |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Value of Indicator  | Allows the A-CDM project team to see the amount of participation from airlines/ground handling agents in TOBT inputs before proceeding to measure the accuracy and use TOBT for pre-departure sequencing.                                                                                                                                                                      |
| Data requirement    | Manual TOBT updates/inputs                                                                                                                                                                                                                                                                                                                                                     |
| Formula             | Track number of TOBT inputs from each airline and ground handling agent through different time references before departure, e.g. at TOBT-10mins, -20min and -40mins                                                                                                                                                                                                            |
| Indicator Forms     | Participation rate in TOBT inputs and when does it occur                                                                                                                                                                                                                                                                                                                       |
| Tips/Warning        | <p>It is important to achieve a high % of participation in order for the A-CDM concept to work.</p> <p>A-CDM with low participation rate will lead to questions on fairness when TSAT is used for pushback and eventually the collaborative concept may fail.</p> <p>To improve participation rate, more A-CDM awareness workshops or compliance measures may be required.</p> |
| System requirements | Data analysis tool of the A-CDM portal if available or TOBT input records                                                                                                                                                                                                                                                                                                      |

Table 2 - Accuracy of TOBT

| Name of indicator  | TOBT Accuracy                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Value of Indicator | <p>Allows airlines/ground handling agents to understand whether their TOBT submission workflow/process is effective in achieving an accurate TOBT.</p> <p>Allows the A-CDM project team to assess whether the TOBT quality is acceptable and can be used to generate TSAT.</p> <p>It also gives a general indication of compliance rate for TOBT submission.</p>                               |
| Data requirement   | <ul style="list-style-type: none"> <li>• TOBT</li> <li>• Actual Ready Time (ARDT) and/or Actual start-up request time (ASRT)</li> </ul>                                                                                                                                                                                                                                                        |
| Formula            | <ul style="list-style-type: none"> <li>• Compare TOBT against ARDT and/or ASRT</li> <li>• Compare TOBT against AOBT</li> </ul>                                                                                                                                                                                                                                                                 |
| Indicator Forms    | <ul style="list-style-type: none"> <li>• Accuracy of TOBT</li> <li>• TOBT compliance rate</li> </ul>                                                                                                                                                                                                                                                                                           |
| Tips/Warning       | <p>Low TOBT accuracy with high TOBT participation rate indicates that the airline/ground handling may have to improve their internal workflow/process for updating of TOBT.</p> <p>How to measure the accuracy of the TOBT depends on the procedures applied for the A-CDM implementation. To be able to measure the TOBT accurately, it is highly recommended that pilot shall call ready</p> |

| Name of indicator   | TOBT Accuracy                                                                                                                                                                                                                                   |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                     | within a window of the TOBT and that ATC indicates this time via an ARDT or ASRT.                                                                                                                                                               |
| System requirements | <ul style="list-style-type: none"> <li>Data analysis tool of the A-CDM portal if available or TOBT input records</li> <li>AOBT from appropriate source ARDT and/or ASRT from an Electronic Flight Strip system or alternative means.</li> </ul> |

**Note:** Some European airports benchmark their TOBT compliance at 80%.

#### Measurement of TSAT

6.37 A Pre-Departure Sequencer/Departure Manager solution might be used for pre-departure sequencing in the A-CDM implementation, which should be generating an optimal TSAT to achieve the best sequence to maximize runway throughput and regulate traffic to holding point. However, if ATC or pilots are not adhering to the TSAT, the benefits will not be achieved.

6.38 TSAT compliance plays an important role in achieving the objective of reducing taxi-out time and also shows the level of commitment to TSAT in the A-CDM procedures.

Table 3 - Measurement of TSAT

| Name of indicator  | TSAT Compliance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Value of Indicator | Allows the A-CDM project team to assess whether ATC is following the TSAT for pushback and also pilots' adherence to the TSAT procedure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Data requirement   | <ul style="list-style-type: none"> <li>TSAT</li> <li>Actual Start-up Approval Time (ASAT)</li> <li>AOBT</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Formula            | <ul style="list-style-type: none"> <li>Compare ASRT and/or ASAT against TSAT</li> <li>Compare AOBT against TSAT</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Indicator Forms    | <ul style="list-style-type: none"> <li>TSAT compliance rate</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Tips/Warning       | <p>If the compliance level is low, it may mean either the A-CDM procedures are not followed by ATC/Pilots or ATC did not enforce TSAT compliance or the TOBT submitted by airlines/ground handling agents is not up to desired accuracy.</p> <p>How to measure the compliance to the TSAT depends on the procedures applied for the A-CDM implementation. To be able to measure the compliance it is highly recommended that pilot request within a window of the TSAT and that ATC indicates this time via an ASRT. ATC shall also give the start-up approval within the given TSAT window and indicate this via an ASAT.</p> |

| Name of indicator   | TSAT Compliance                                                                                                                                                                                                                                                    |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System requirements | <ul style="list-style-type: none"><li>• Data analysis tool of the A-CDM portal if available or TSAT records from DMAN/PDS</li><li>• AOBT from appropriate source</li><li>• ASRT and/or ASAT from an Electronic Flight Strip system or alternative means.</li></ul> |

**Note:** Some European airports benchmark their TSAT compliance at 80%.

## HARMONIZATION FRAMEWORK

### A-CDM Terminologies and Definition

7.1 As more and more airports adopt A-CDM, it is important that implementations strive for harmonization with respect to certain areas. This relates to certain procedures, roles and responsibilities as well as having common understanding of terminologies.

7.2 Groups with limited interaction often develop their own semantic references; airport stakeholders are not an exception as they may use different terminologies to cover the same reality. A lack of common definitions and understanding of terms across the stakeholder community can exacerbate misunderstanding and contribute to the lack of common situational awareness.

7.3 As an example, “arrival time” to an air traffic controller (ATCO) could mean at the point of touchdown, whereas for an airline or ground handling agencies “arrival time” may be understood as the time when an aircraft is at the gate. This disparity in a common definition of terms leads to a lack of shared awareness and clarity of the operational picture, which can lead to confusion and result in increased inefficiencies.

7.4 As A-CDM brings stakeholders together as part of the procedures and collaboration, it is of highest importance to implement common acronyms and definitions that are agreed and understood by all. To ensure harmonization not only at the local airport level in an A-CDM implementation but at the regional APAC level the following A-CDM definitions are highly recommended to be adopted as part of an A-CDM implementation.

7.5 These acronyms and definitions are aligned with overarching ICAO definitions, where applicable, as well as EUROCONTROL A-CDM acronyms and definitions.

Table 4 – A-CDM Acronyms and Definitions

| Acronyms | Definition                              | Explanation                                                                                                                                         |
|----------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| ACGT     | Actual Commence of Ground Handling Time | The time when ground handling on an aircraft starts, can be equal to AIBT (to be determined locally)                                                |
| ACZT     | Actual Commencement of De-icing Time    | The time when de-icing operations on an aircraft starts                                                                                             |
| ADIT     | Actual De-icing Time                    | The actual time that the de-icing activity takes. Metric AEZT – ACZT                                                                                |
| AEGT     | Actual End of Ground Handling Time      | The time when ground handling on an aircraft ends.                                                                                                  |
| AEZT     | Actual End of De-icing Time             | The time when de-icing operations on an aircraft end                                                                                                |
| AGHT     | Actual Ground Handling Time             | The total duration of the ground handling of the aircraft. Metric AEGT - ACGT                                                                       |
| AIBT     | Actual In-Block Time                    | The time that an aircraft arrives in-blocks.                                                                                                        |
| ALDT     | Actual Landing Time                     | The time that an aircraft lands on a runway.                                                                                                        |
| AOBT     | Actual Off-Block Time                   | Time the aircraft pushes back /vacates the parking position.                                                                                        |
| ARDT     | Actual Ready Time                       | When the aircraft is ready for start-up/push back or taxi immediately after clearance delivery, meeting the requirements set by the TOBT definition |
| ARZT     | Actual Ready for De-icing Time          | The time when the aircraft is ready to be de-iced                                                                                                   |

| Acronyms | Definition                              | Explanation                                                                                                                                                                                                                             |
|----------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASAT     | Actual Start Up Approval Time           | Time that an aircraft receives its start-up approval                                                                                                                                                                                    |
| ASBT     | Actual Start Boarding Time              | Time passengers are entering the bridge or bus to the aircraft                                                                                                                                                                          |
| ASRT     | Actual Start Up Request Time            | Time the pilot requests start up clearance                                                                                                                                                                                              |
| ATOT     | Actual Take-Off Time                    | The time that an aircraft takes off from the runway.                                                                                                                                                                                    |
| ATTT     | Actual Turnaround Time                  | Time taken to complete turnaround.<br>Metric AOBT – AIBT                                                                                                                                                                                |
| AXIT     | Actual Taxi-In Time                     | Time taken to taxi to stand after landing<br>Metric AIBT – ALDT                                                                                                                                                                         |
| AXOT     | Actual Taxi-Out Time                    | Time taken from pushback to take-off<br>Metric ATOT – AOBT                                                                                                                                                                              |
| CTOT     | Calculated Take-Off Time                | A time calculated and issued by the appropriate air traffic management unit as a result of tactical slot allocation, at which a flight is expected to become airborne                                                                   |
| ECZT     | Estimated Commencement of De-icing Time | The estimated time when de-icing operations on an aircraft are expected to start                                                                                                                                                        |
| EDIT     | Estimated De-icing Time                 | Metric EEZT – ECZT                                                                                                                                                                                                                      |
| EEZT     | Estimated End of De-icing Time          | The estimated time when de-icing operations on an aircraft are expected to end                                                                                                                                                          |
| EIBT     | Estimated In-Block Time                 | The estimated time that an aircraft will arrive in-blocks.<br><b>NOTE</b> – This can sometimes be referred to as Estimated Time of Arrival (ETA) by Aircraft Operator. It is important to clarify the ETA in relation to EIBT and ELDT. |
| ELDT     | Estimated Landing Time                  | The estimated time that an aircraft will touch-down on the runway.<br><b>NOTE</b> – This can sometimes be referred to as Estimated Time of Arrival (ETA) by ATC. It is important to clarify ETA in relation to EIBT and ELDT.           |
| EOBT     | Estimated Off-Block Time                | The estimated time at which the aircraft will start movement associated with departure; also associated with the time filed by aircraft operator in the flight plan                                                                     |
| ERZT     | Estimated Ready for De-icing Time       | The estimated time when the aircraft is expected to be ready for de-icing operations                                                                                                                                                    |
| ETOT     | Estimated Take-Off Time                 | The estimated take off time taking into account the EOBT plus EXOT.                                                                                                                                                                     |
| ETTT     | Estimated Turnaround Time               | The time estimated by the AO/GHA on the day of operation to turn-round a flight taking into account the operational constraints                                                                                                         |
| EXIT     | Estimated Taxi-In Time                  | The estimated taxi time between landing and in-block                                                                                                                                                                                    |
| EXOT     | Estimated Taxi-Out Time                 | The estimated taxi time between off-block and take off. This estimate includes any delay buffer time at the holding point or remote de-icing prior to take off                                                                          |
| MTTT     | Minimum Turnaround Time                 | The minimum turnaround time agreed with an AO/GHA for a specified flight or aircraft type                                                                                                                                               |

| Acronyms | Definition                    | Explanation                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SIBT     | Schedule In-Block Time        | The time that an aircraft is scheduled to arrive at its first parking position.                                                                                                                                                                                                                                                                                                              |
| SOBT     | Schedule Off-Block Time       | The time that an aircraft is scheduled to depart from its parking position; associated with airport slot allocated<br><b>NOTE</b> – this is typically referred to as Scheduled Time of Departure (STD) by the Aircraft and Airport Operators.                                                                                                                                                |
| TOBT     | Target Off-Block Time         | The time that an Aircraft Operator or Ground Handling Agent estimates that an aircraft will be ready, all doors closed, boarding bridge removed, push back vehicle available and ready to start up / push back immediately upon reception of clearance from the control tower.                                                                                                               |
| TSAT     | Target Start-up Approval Time | The time provided by ATC taking into account TOBT, CTOT and/or the traffic situation that an aircraft can expect start-up / push back approval.                                                                                                                                                                                                                                              |
| TLDT     | Target Landing Time           | Targeted Time from the Arrival management process at the threshold, taking runway sequence and constraints into account. It is not a constraint but a progressively refined planning time used to coordinate between arrival and departure management processes.<br>Each TLDT on one runway is separated from other TLDT or TTOT to represent vortex and/ or SID separation between aircraft |
| TTOT     | Target Take-Off Time          | The Target Take Off Time taking into account the TOBT/TSAT plus the EXOT.<br>Each TTOT on one runway is separated from other TTOT or TLDT to represent vortex and/ or SID separation between aircraft                                                                                                                                                                                        |

#### Roles and Responsibilities of A-CDM stakeholders

7.6 This section outlines the general responsibilities of the A-CDM stakeholders as part of the A-CDM process and procedures. It is recommended that any implementer tries to adopt this approach as far as practically feasible. However, it is recognised that local airport rules etc. might prohibit this.

7.7 The **Aircraft Operator** is generally responsible for:

- Providing the Flight Plan and any subsequent updates, i.e. DLA/CHG messages.
- Managing and providing TOBT either themselves or through their authorised GHA.
- Ensuring the flight crew is aware of the channels where TOBT and TSAT information can be obtained, as it is dependent on local procedures.
- Ensuring that their flight crew are aware of start-up and pushback procedures.

- Any change in registration or type of aircraft of ARR/DEP flights, the same should be provided to A-CDM system either directly or through a connected system (like AODB, CHG/FPL message)

7.8 The **Ground Handling Agent**, when authorised by aircraft operator, is responsible for providing information as mentioned in the responsibilities listed above for the Aircraft Operator

7.9 The **Airport Operator** is generally responsible for:

- Providing flight schedule information and any changes therein;
- Providing aircraft parking stand and gate planning/allocation and any changes therein; and
- Overall coordination of the A-CDM process during implementation and operations, including monitoring of performance of A-CDM operations.

7.10 The **Air Navigation Service Provider (ANSP)** is generally responsible for:

- Providing runway-in-use and planned runway-in-use;
- Providing expected runway capacity, and minimum arrival/departure separation;
- When applicable, providing flow control restrictions, e.g. Minutes in Trail and/or Miles in Trail; and
- Ensuring that start-up is issued in accordance with TSAT

7.11 ELDT can be collected from different sources, such as airlines, ANSP and ATFM. In the arrival phase of the flight, ANSP is normally the source for providing the latest updates on ELDT.

7.12 The role of the ANSP can vary in the context of A-CDM in relation to how the pre departure sequencing is handled. There are two different scenarios as follows:

- (a) If pre departure sequencing capability available (e.g. a DMAN already installed in the ATC TWR): the ANSP should make arrangements to integrate pre departure sequencing tool's output with A-CDM system.
- (b) If pre departure sequencing capability not available: the ANSP should provide appropriate procedures and requirements to generate pre departure sequence.

7.13 The **Air Traffic Flow Management Unit (ATFMU)**, when established, is generally responsible for:

- Balancing of Demand and Capacity;
- Receiving relevant A-CDM data from airports;
- Coordination of Calculated Take Off Times (CTOTs/ATFM slots); and
- Provision of updated ATFM restrictions

7.14 In cases where de-icing is applied, the **De-icing Operator** is generally responsible for:

- Providing the de-icing status of the aircraft

- Prediction of the Estimated De-icing Times such as ECZT, EEZT

#### Standardization of A-CDM Procedures

7.15 Since the introduction of A-CDM, there have been many airports that have adopted the A-CDM philosophy. The expansion of implementations has led to some differences in procedures and processes. These differences may create problems for stakeholders. A harmonized approach can reduce workload. Although these differences do not constitute a compromise to safety, they create unnecessary additional layers of complexity.

7.16 Standardisation of certain A-CDM procedures to drive efficiency and overall performance is necessary. On the other hand, individual airport may have its unique implementation plan and should have the flexibility to layout its local processes and procedures, which are adapted to its own environment and operational need. However, there are a number of standards that could be applied globally (e.g. TOBT/TSAT procedures and compliance windows). The operations of stakeholders need to be standardized wherever possible, as the burden of differing processes may bring in inefficiency, confusion and costs.

7.17 The way in which procedures and processes are designed needs to incorporate input from A-CDM stakeholders. This should be a collaborative approach, which ultimately all the stakeholders agree to.

7.18 Non-compliance of procedures should be discussed by the steering group, to remove the difficulties faced by the A-CDM Stakeholders.

#### Target Off Block Time (TOBT) and Target Start-up Approval Times (TSAT)

7.19 The Target Off Block Time (TOBT) and Target Start-up Approval Time (TSAT) are critical to the A-CDM process. Based on an accurate prediction of aircraft readiness for departure, the TOBT, from Aircraft Operator, or appointed/designated Ground Handling Agents, ATC can plan the optimal pre-departure sequence and TSAT at which aircraft are dispatched from the parking stands. This dynamic mechanism between the prediction of when all ground handling activities will end, i.e. at the defined TOBT and the allocation of TSAT, are the core pillars of A-CDM. This is also what it referred to as “Best planned, best served” principles.

7.20 TOBT is defined as “The time that an Aircraft Operator or Ground Handling Agent estimates that an aircraft will be ready, all doors closed, boarding bridge removed, push back vehicle available and ready to start up / push back immediately upon reception of clearance from the control tower.”

7.21 TOBT can be predicted by tracking the flight events, so-called Milestones, that occur prior to landing and during the turnaround process. In order to achieve TOBT accuracy, close coordination of turnaround activities and sharing of operational information among different stakeholders are needed.

7.22 TOBT is the most important timing of the turnaround process and this timing is essential for the calculation of TSAT.

7.23 The TOBT should be confirmed/input at least “X1” minutes prior to the SOBT/EOBT and available for all stakeholders [**X1 is preferably 30-40**].

7.24 TSAT is defined as “the time provided by ATC taking into account TOBT, CTOT and/or the traffic situation that an aircraft can expect start-up / pushback approval”. In order to determine the TSAT an A-CDM implementation should consist of departure management capability (including VTT), such as Pre-Departure Sequencer or Departure Manager.

7.25 The TSAT should be published at least “X2” minutes prior to the TOBT and available for all stakeholders [**X2 is preferably 30-40**].

#### Sharing of TOBT and TSAT

7.26 Sharing of the TOBT and TSAT information to flight crew is fundamental for a successful A-CDM implementation. Dependent on the local procedures and total system solution this information sharing may be done in multiple ways. How it is done needs to be agreed with the stakeholders. Examples of how to share the TOBT and TSAT to the flight crew are:

- VDGS / A-VDGS (preferred)
- Mobile application available to flight crew
- Airport Operator or Ground Handler designated role communicates TOBT and TSAT directly to flight crew.
- Aircraft Operator or Ground Handler communicates the TOBT and TSAT.
- ATC communicate the TSAT when pilot reports ready for start-up and pushback (only applicable when Pilot reports to ATC ready at TOBT)

#### A-CDM Start-up Procedures

7.27 Currently, airports that have fully adopted A-CDM processes, exhibit differences in their requirements for when pilots should be ready for start-up and pushback, and report ready for start-up and pushback. These differences may cause confusion, in particular to pilots who operate several airports.

7.28 The operating procedure related to Start-up and Pushback in the A-CDM process must clearly define the requirement of the time at which pilot should initiate call for start-up.

7.29 Irrespective of the TSAT, the aircraft should report/be ready for start-up/pushback at TOBT +/- “X3” minutes [**X3 is preferably 5**].

7.30 Pilots should request start-up/pushback clearance at the TSAT +/- “X4” minutes [**X4 is preferably 5**].

7.31 ATC will approve start-up/pushback or advise the pilots of the current/updated TSAT.

7.32 Any time the TOBT or TSAT cannot be met, or an earlier departure is required, the TOBT should be updated expeditiously by Aircraft Operator or/Ground Handling Agent.

7.33 Departure clearance should be requested via Data Link Departure Clearance (DCL) at TOBT/TSAT +/- X5 minutes (X5 is defined by the local airport authority). If DCL is not available, departure clearance should be requested via RTF/Clearance Delivery at TOBT/TSAT +/- X5 minutes.

#### Milestone Approach

7.34 The Milestone approach is defined to:

- (a) Start and end the A-CDM process for any flight that is defined to be part of the A-CDM process and;
- (b) Update information about the flight at certain points during the inbound, turnaround or outbound phase.

7.35 In the A-CDM Process, 16 milestones are defined as per the EUROCONTROL Manual. It is important to note that not all 16 have to be used for a successful A-CDM implementation at an airport but some are required and some are optional. Ultimately, which milestones are used is dependent of the local A-CDM rules, procedures and data availability.

7.36 The Figure 2 depicts all the 16 milestones as they occur in relation to the flight phases, i.e. inbound, turn around and outbound. Please note that the figure does not show how the milestones occur in relation to time. Another important note is that Milestones 1 and 2 are related to the outbound flight from the A-CDM airport and not related to the inbound flight coming to the A-CDM airport.

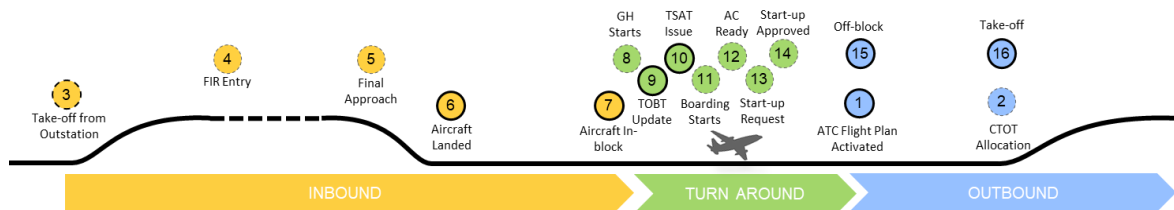


Figure 2: 16 Milestones of A-CDM in relation to the Flight Phases

7.37 The Table 5 provides a comprehensive overview of the milestones including:

- What the purpose of the milestone is;
- How the Milestone is triggered;
- What data needs to be provided;
- A-CDM Actions;
- Example of system(s) that can provide the data; and
- Whether the Milestone is required or optional.

Table 5: Overview of the 16 A-CDM Milestones

| Milestone                                | Purpose of the Milestone                                                                                                                                                                                                                                                                           | Milestone is triggered by                                                                                                                                       | Data Elements                                                                                                                                                                 | A-CDM Actions                                                                                                                                                    | Example of system(s) that typically has this data (and should share it)                                                                          | Required/ Optional                                                                                                                               |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>MS1<br/>ATC Flight Plan Activated</b> | <ul style="list-style-type: none"> <li>Starts the A-CDM process for a flight</li> <li>To check the data consistency between Airport Slot and Airline's flight plan data (EOBT vs SOBT, aircraft registration and aircraft type)</li> </ul>                                                         | <ul style="list-style-type: none"> <li>ATC flight plan is submitted by Aircraft Operator (this happens typically at EOBT-3hrs but can also be later)</li> </ul> | <ul style="list-style-type: none"> <li>Schedule Time of departure and arrival for the flight (STD/SOBT and ETA/SIBT)</li> <li>Flight Plan EOBT</li> <li>Gate/Stand</li> </ul> | <ul style="list-style-type: none"> <li>Calculate: ELDT, EIBT, TOBT, TSAT, TTOT</li> <li>Present/Disseminate: ELDT, EIBT, EOBT, SOBT, TOBT, TSAT, TTOT</li> </ul> | <ul style="list-style-type: none"> <li>TWR Flight Data Processing System</li> <li>ACC Flight Data Processing System</li> <li>AODB/RMS</li> </ul> | <ul style="list-style-type: none"> <li>Required</li> </ul>                                                                                       |
| <b>MS2<br/>CTOT Allocation</b>           | <ul style="list-style-type: none"> <li>To allow early awareness of departure delay if there are en-route/destination airport constraints</li> </ul> <p>Note 1: Multi-Nodal ATFM Trial currently issues CTOT at latest time of EOBT-1.5hrs</p> <p>Note 2: BOBCAT CTOT is available at EOBT-2hrs</p> | <ul style="list-style-type: none"> <li>CTOT issued by relevant ATFM Unit/cross-border ATFM nodes</li> </ul>                                                     | <ul style="list-style-type: none"> <li>CTOT</li> </ul>                                                                                                                        | <ul style="list-style-type: none"> <li>Calculate: TSAT BASED on CTOT</li> <li>Present/Disseminate: ELDT, EIBT, EOBT, SOBT, TOBT, TSAT, CTOT</li> </ul>           | <ul style="list-style-type: none"> <li>ATFM System or similar capability</li> </ul>                                                              | <ul style="list-style-type: none"> <li>Required for a fully integrated A-CDM – ATFM solution but not for a local A-CDM implementation</li> </ul> |
| <b>MS3<br/>Take-off from Outstation</b>  | <ul style="list-style-type: none"> <li>To provide an ELDT at early stage by using FPL EET + ATOT.</li> <li>To revise system generated TOBT, TSAT and TTOT if required</li> <li>Allow early awareness of deviation from scheduled in-block time for resource planning.</li> </ul>                   | <ul style="list-style-type: none"> <li>Take-off from up-station</li> </ul>                                                                                      | <ul style="list-style-type: none"> <li>ELDT</li> </ul>                                                                                                                        | <ul style="list-style-type: none"> <li>Re-calculate: EIBT, TOBT, TSAT, TTOT</li> <li>Present/Disseminate: ELDT, EIBT, EOBT, SOBT, TOBT, TSAT, TTOT</li> </ul>    | <ul style="list-style-type: none"> <li>ACC Flight Data Processing System</li> <li>ACARS</li> </ul>                                               | <ul style="list-style-type: none"> <li>Optional</li> </ul>                                                                                       |
| <b>MS4<br/>FIR Entry</b>                 | <ul style="list-style-type: none"> <li>To estimate ELDT and prompt alert if potential gate conflict is anticipated.</li> <li>To revise system generated TOBT</li> </ul>                                                                                                                            | <ul style="list-style-type: none"> <li>Aircraft crosses a defined fix on FIR boundary or enters the FIR.</li> </ul>                                             | <ul style="list-style-type: none"> <li>ELDT</li> </ul>                                                                                                                        | <ul style="list-style-type: none"> <li>Re-calculate: EIBT, TOBT, TSAT, TTOT</li> <li>Present/Disseminate: ELDT, EIBT, EOBT,</li> </ul>                           | <ul style="list-style-type: none"> <li>ACC Flight Data Processing System</li> <li>Extended AMAN</li> <li>ACARS</li> </ul>                        | <ul style="list-style-type: none"> <li>Optional</li> </ul>                                                                                       |

| Milestone                         | Purpose of the Milestone                                                                                                                                                                                                                                                                           | Milestone is triggered by                                                                | Data Elements                                                                 | A-CDM Actions                                                                                                                                                      | Example of system(s) that typically has this data (and should share it)                                          | Required/ Optional                                         |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
|                                   | <ul style="list-style-type: none"> <li>Allow early awareness of deviation from scheduled in-block time for resource planning.</li> </ul>                                                                                                                                                           |                                                                                          |                                                                               | SOBT, TOBT, TSAT, TTOT                                                                                                                                             |                                                                                                                  |                                                            |
| <b>MS5 Final Approach</b>         | <ul style="list-style-type: none"> <li>To provide a highly accurate and stable ELDT/TLDT as landing sequence is confirmed</li> <li>To revise system generated TOBT</li> <li>Allow for awareness of deviation from scheduled in-block time for resource planning.</li> </ul>                        | <ul style="list-style-type: none"> <li>Aircraft enters the TMA</li> </ul>                | <ul style="list-style-type: none"> <li>TLDT or ELDT</li> </ul>                | <ul style="list-style-type: none"> <li>Re-calculate: EIBT, TOBT, TSAT, TTOT</li> <li>Present/Disseminate: TLDT/ELDT, EIBT, EOBT, SOBT, TOBT, TSAT, TTOT</li> </ul> | <ul style="list-style-type: none"> <li>ACC Flight Data Processing System</li> <li>AMAN</li> <li>ACARS</li> </ul> | <ul style="list-style-type: none"> <li>Optional</li> </ul> |
| <b>MS6 Aircraft Landed</b>        | <ul style="list-style-type: none"> <li>To revise system generated TOBT</li> <li>Allow for awareness of deviation from scheduled in-block time for resource planning.</li> </ul>                                                                                                                    | <ul style="list-style-type: none"> <li>Aircraft touches down on runway</li> </ul>        | <ul style="list-style-type: none"> <li>Actual Landing Time (ALDT)</li> </ul>  | <ul style="list-style-type: none"> <li>Re-calculate: EIBT, TOBT, TSAT, TTOT</li> <li>Present/Disseminate: ALDT, EIBT, EOBT, SOBT, TOBT, TSAT, TTOT</li> </ul>      | <ul style="list-style-type: none"> <li>ACC Flight Data Processing System</li> <li>AMAN</li> <li>ACARS</li> </ul> | <ul style="list-style-type: none"> <li>Required</li> </ul> |
| <b>MS7 Aircraft In-Blocks</b>     | <ul style="list-style-type: none"> <li>To revise system generated TOBT</li> </ul>                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Aircraft arriving at the parking stand</li> </ul> | <ul style="list-style-type: none"> <li>Actual Block In-Time (AIBT)</li> </ul> | <ul style="list-style-type: none"> <li>Re-calculate: TOBT, TSAT, TTOT</li> <li>Present/Disseminate: ALDT, AIBT, EOBT, SOBT, TOBT, TSAT, TTOT</li> </ul>            | <ul style="list-style-type: none"> <li>A-SMGCS</li> <li>Docking System</li> <li>ACARS</li> <li>AODB</li> </ul>   | <ul style="list-style-type: none"> <li>Required</li> </ul> |
| <b>MS8 Ground Handling Starts</b> | <ul style="list-style-type: none"> <li>To revise system generated TOBT</li> </ul> <p>Note: For a normal turnaround flight MS8 and MS7 occur at the same time. MS8 and MS7 will not be the same for flights which are on the first operation of the day/are delayed/have been long term parked.</p> | <ul style="list-style-type: none"> <li>Actual start of turnaround activities</li> </ul>  | <ul style="list-style-type: none"> <li>AGHT</li> </ul>                        | <ul style="list-style-type: none"> <li>Re-calculate: TOBT, TSAT, TTOT</li> <li>Present/Disseminate: ALDT, AIBT, EOBT, SOBT, TOBT, TSAT, TTOT</li> </ul>            | <ul style="list-style-type: none"> <li>Same as MS7</li> </ul>                                                    | <ul style="list-style-type: none"> <li>Optional</li> </ul> |

| Milestone                            | Purpose of the Milestone                                                                                                                                                                                            | Milestone is triggered by                                                                                                                                                                                                                                      | Data Elements                                                                         | A-CDM Actions                                                                                                                                        | Example of system(s) that typically has this data (and should share it)                                                                   | Required/ Optional                                         |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| <b>MS9<br/>TOBT<br/>Update</b>       | <ul style="list-style-type: none"> <li>Confirm and take control of TOBT</li> <li>To check the feasibility of TOBT vs SOBT/EOBT.</li> </ul>                                                                          | <ul style="list-style-type: none"> <li>TOBT confirmation/update into A-CDM portal from EOBT-“X1” minutes</li> </ul> <p>Note: “X1” is need to be determined locally to fit the operations at the airport. Recommended to be 30 to 40 minutes.</p>               | <ul style="list-style-type: none"> <li>TOBT</li> </ul>                                | <ul style="list-style-type: none"> <li>Re-calculate: TSAT, TTOT</li> <li>Present/Disseminate: ALDT, AIBT, EOBT, SOBT, TOBT, TSAT, TTOT</li> </ul>    | <p>Manual input via:</p> <ul style="list-style-type: none"> <li>A-CDM Portal</li> <li>Mobile Apps</li> <li>Airline/GHA systems</li> </ul> | <ul style="list-style-type: none"> <li>Required</li> </ul> |
| <b>MS10<br/>TSAT Issue</b>           | <ul style="list-style-type: none"> <li>To allow decision making based TOBT and TSAT values</li> <li>Create a stable pre-departure sequence</li> </ul>                                                               | <ul style="list-style-type: none"> <li>At TOBT – “X2” minutes, TSAT will be published</li> </ul> <p>Note: “X2” is need to be determined locally to fit the operations at the airport. Recommended to be 30 to 40 minutes.</p>                                  | <ul style="list-style-type: none"> <li>TSAT</li> </ul>                                | <ul style="list-style-type: none"> <li>Re-calculate: TTOT</li> <li>Present/Disseminate: ALDT, AIBT, EOBT, SOBT, TOBT, TSAT, TTOT</li> </ul>          | <ul style="list-style-type: none"> <li>A-CDM/PDS</li> </ul>                                                                               | <ul style="list-style-type: none"> <li>Required</li> </ul> |
| <b>MS11<br/>Boarding<br/>Starts</b>  | <ul style="list-style-type: none"> <li>To check if boarding has started as expected.</li> </ul>                                                                                                                     | <ul style="list-style-type: none"> <li>Actual start for Boarding of passengers</li> </ul>                                                                                                                                                                      | <ul style="list-style-type: none"> <li>ASBT</li> </ul>                                | <ul style="list-style-type: none"> <li>Re-calculate: -</li> <li>Present/Disseminate: ALDT, AIBT, EOBT, SOBT, TOBT, TSAT, TTOT</li> </ul>             | <ul style="list-style-type: none"> <li>AODB/RMS</li> <li>Manual input in A-CDM Portal</li> </ul>                                          | <ul style="list-style-type: none"> <li>Optional</li> </ul> |
| <b>MS12<br/>Aircraft<br/>Ready</b>   | <ul style="list-style-type: none"> <li>Post analysis to measure aircraft readiness against the TOBT</li> <li>Automate removal of TOBT and TSAT based if rules are not followed based on local procedures</li> </ul> | <ul style="list-style-type: none"> <li>The call from the pilot to ATC to report ready within “X3” minutes of TOBT</li> </ul> <p>Note: The value of “X3” is based on local procedures. “X3” is highly recommended to be +/5 minutes</p>                         | <ul style="list-style-type: none"> <li>Actual Ready Time (ARDT)</li> </ul>            | <ul style="list-style-type: none"> <li>Re-calculate: -</li> <li>Present/Disseminate: ALDT, AIBT, EOBT, SOBT, TOBT, ARDT, TSAT, TTOT</li> </ul>       | <p>Manual input in</p> <ul style="list-style-type: none"> <li>Electronic Flight Strip System</li> <li>A-CDM portal/HMI</li> </ul>         | <ul style="list-style-type: none"> <li>Optional</li> </ul> |
| <b>MS13<br/>Start Up<br/>Request</b> | <ul style="list-style-type: none"> <li>To measure pilot’s adherence to TSAT.</li> <li>Automate removal of TOBT and TSAT based if rules are not followed based on local procedures</li> </ul>                        | <ul style="list-style-type: none"> <li>The call from the pilot to ATC to request pushback/start-up clearance within “X4” minutes of TSAT.</li> </ul> <p>Note: The value of “X4” is based on local procedures. “X4” is highly recommended to be +/5 minutes</p> | <ul style="list-style-type: none"> <li>Actual Start-up Request Time (ASRT)</li> </ul> | <ul style="list-style-type: none"> <li>Re-calculate: -</li> <li>Present/Disseminate: ALDT, AIBT, EOBT, SOBT, TOBT, ARDT, ASRT, TSAT, TTOT</li> </ul> | <p>Manual input in</p> <ul style="list-style-type: none"> <li>Electronic Flight Strip System</li> <li>A-CDM portal/HMI</li> </ul>         | <ul style="list-style-type: none"> <li>Optional</li> </ul> |

| Milestone                             | Purpose of the Milestone                                                                                                                                                                      | Milestone is triggered by                                                                                                                                                                                                                                           | Data Elements                                                                         | A-CDM Actions                                                                                                                                              | Example of system(s) that typically has this data (and should share it)                                                           | Required/ Optional                                         |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| <b>MS14<br/>Start Up<br/>Approved</b> | <ul style="list-style-type: none"> <li>To measure ATC's adherence to TSAT</li> <li>Automate removal of TOBT and TSAT based if rules are not followed based on local procedures</li> </ul>     | <ul style="list-style-type: none"> <li>The call from ATC to pilot to give clearance for push and start clearance within "X5" minutes of TSAT.</li> </ul> <p>Note: The value of "X5" is based on local procedures. "X5" is highly recommended to be +/-5 minutes</p> | <ul style="list-style-type: none"> <li>Actual Start-up Approve Time (ASAT)</li> </ul> | <ul style="list-style-type: none"> <li>Re-calculate: -</li> <li>Present/Disseminate: ALDT, AIBT, EOBT, SOBT, TOBT, ARDT, ASRT, TSAT, ASAT, TTOT</li> </ul> | <p>Manual input in</p> <ul style="list-style-type: none"> <li>Electronic Flight Strip System</li> <li>A-CDM portal/HMI</li> </ul> | <ul style="list-style-type: none"> <li>Optional</li> </ul> |
| <b>MS15<br/>Off Block</b>             | <ul style="list-style-type: none"> <li>To check if the aircraft has gone off blocks as per TSAT</li> <li>Update Target Take-Off Time (TTOT) generated by DMAN/PDS if required</li> </ul>      | <ul style="list-style-type: none"> <li>Aircraft commence pushback</li> </ul>                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>Actual Off Block Time (AOBT)</li> </ul>        | <ul style="list-style-type: none"> <li>Re-calculate: TTOT</li> <li>Present/Disseminate: ALDT, AIBT, EOBT, SOBT, AOBT, TTOT</li> </ul>                      | <ul style="list-style-type: none"> <li>A-SMGCS</li> <li>Docking System</li> <li>ACARS</li> <li>Manual input</li> </ul>            | <ul style="list-style-type: none"> <li>Required</li> </ul> |
| <b>MS16<br/>Take Off</b>              | <ul style="list-style-type: none"> <li>End of A-CDM process and relevant stakeholders are updated with the take-off information.</li> <li>Flight is removed from the A-CDM process</li> </ul> | <ul style="list-style-type: none"> <li>Aircraft lift-off the runway</li> </ul>                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>Actual Take-Off Time (ATOT)</li> </ul>         | <ul style="list-style-type: none"> <li>Re-calculate: -</li> <li>Present/Disseminate: ALDT, AIBT, EOBT, SOBT, AOBT, ATOT</li> </ul>                         | <ul style="list-style-type: none"> <li>A-SMGCS</li> <li>ACARS</li> </ul>                                                          | <ul style="list-style-type: none"> <li>Required</li> </ul> |

A-CDM Performance Indicators

7.38 In order to measure the performance of A-CDM, the post-implementation performance needs to be compared against the same performance indicators that were utilised before implementation.

7.39 Measurement of A-CDM performance is an iterative process and the feedback mechanism is an integral part of it.

7.40 Measurement of A-CDM performance can be better realized based on commonly agreed indicators.

7.41 Table 6 below provides examples of A-CDM performance indicators for reference.

Table 6 – Examples of A-CDM Performance Indicators

| Strategic Performance Indicator          | Performance Driver     | Performance Indicator                                                                                           | Performance Measurement                                                                                                                                                                                                                                                                                                                                                     | Milestone Measurement                                                                                              | Stakeholders                         |
|------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| 1) Improve punctuality and reduce delays | Turnaround punctuality | Turnaround compliance                                                                                           | <ul style="list-style-type: none"> <li>➤ (ARDT - AIBT) - MTTT &gt; or = 5 minutes (%)</li> <li>➤ (ARDT - AIBT) - (SOBT - SIBT) &gt; or = 5 minutes (%)</li> <li>➤ AOBT - ARDT &gt; or = 5 minutes (%)</li> </ul>                                                                                                                                                            |                                                                                                                    | Aircraft Operator<br>Airport         |
|                                          | Arrival punctuality    | In Block Time accuracy                                                                                          | <ul style="list-style-type: none"> <li>➤ ALDT - ELDT (minutes)</li> <li>➤ ALDT - ELDT &gt; or = 5 minutes (%)</li> <li>➤ AIBT - SIBT &gt; or = 15 minutes (%)</li> <li>➤ AIBT - EIBT (minutes)</li> <li>➤ AXIT - EXIT (minutes)</li> <li>➤ # of missed approaches, go arounds per day per RWY (Include explicit times for the missed approaches for each runway)</li> </ul> | @ Milestones 3, 4 and 5<br>@ Milestones 3, 4 and 5<br><br>@ Milestones 3, 4, 5 and 6<br>@ Milestones 3, 4, 5 and 6 | Aircraft Operator<br>Airport         |
|                                          | Departure punctuality  | <ul style="list-style-type: none"> <li>➤ Off Block accuracy (lag)</li> <li>➤ Reduce departure delays</li> </ul> | <ul style="list-style-type: none"> <li>➤ AOBT - SOBT &gt; or = 15 minutes (%)</li> <li>➤ ATOT - TTOT &gt; or = 5 minutes (%)</li> <li>➤ Measure delay @ AOBT-SOBT (minutes)</li> <li>➤ AXOT - EXOT (minutes)</li> </ul>                                                                                                                                                     | @ Milestones 4,5,6,7,9,10,12, 13,14,15<br>@ Milestones 4,5,6,7,9,10,12, 13,14,15                                   | Aircraft Operator<br>Airport<br>ATFM |

| Strategic Performance Indicator    | Performance Driver                                                             | Performance Indicator                                                                                                                                                                                                            | Performance Measurement                                                                                                                                                                                                                                                                                       | Milestone Measurement              | Stakeholders                        |
|------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------------------|
|                                    | Reduce taxi out delay in minutes                                               | <ul style="list-style-type: none"> <li>➤ Average taxi out time in minutes across a 12 month period</li> <li>➤ Taxi-out time against benefit baseline (lead)</li> <li>➤ Taxi-out time accuracy (lag)</li> </ul>                   | <ul style="list-style-type: none"> <li>➤ Taxi-out delay (minutes) to benefit baseline (minutes and fuel)</li> <li>➤ Average (ATOT – AOBT) – benefit baseline (minutes)</li> <li>➤ Taxi Out Time delay converted to fuel consumption on a flight by flight basis based on # engines and engine type</li> </ul> | @ Milestone 15                     | ATC<br>Aircraft Operator<br>Airport |
| 2) Optimise Airport Infrastructure | Improvement in the gate/bay/stand Utilisation % Time                           | Overall gate/bay/stand actual occupation time                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>➤ Compare the overall actual gate/bay/stand occupation time with scheduled gate/bay/stand occupation time (minutes deviation) per flight</li> <li>➤ Measure ARDT - AIBT per gate/bay/stand per flight by aircraft type</li> </ul>                                      | N/A                                | Airport Aircraft Operators          |
|                                    | Improvement in the gate/bay/stand Utilisation % Usage                          | <ul style="list-style-type: none"> <li>➤ Gate/bay/stand usage</li> <li>➤ Assess gate/bay/stand delay (lag)</li> </ul>                                                                                                            | <ul style="list-style-type: none"> <li>➤ Measure # of turns (rotations) on each gate/bay/stand per day by Aircraft type</li> <li>➤ AOBT - SOBT (minutes)</li> <li>➤ AOBT - SOBT &gt; or = 15 minutes (%)</li> <li>➤ Average TSAT – TOBT &gt; or = 15 minutes (%)</li> </ul>                                   | @ Milestones 9, 10, 12, 13, 14, 15 | Airports                            |
| 3) Gate /Bay / Stand Management    | Reduce the number of late gate/bay/stand changes (e.g. 10 minutes before ALDT) | <ul style="list-style-type: none"> <li>➤ Gate/bay/stand allocation and passenger gate/bay/stand freezing time (lag)</li> <li>➤ Gate/bay/stand allocation accuracy (lag)</li> <li>➤ Gate/bay/stand/bay conflicts (lag)</li> </ul> | <ul style="list-style-type: none"> <li>➤ # of late gate/bay/stand changes within [(ALDT- 10 min) to ALDT]</li> <li>➤ Number of gate/bay/stand changes after landing [ALDT to AIBT]</li> <li>➤ # of bay conflicts per day</li> </ul>                                                                           | @ Milestones 4, 5, 6, 7            | Airports                            |

| Strategic Performance Indicator | Performance Driver                                                      | Performance Indicator                                                                                              | Performance Measurement                                                                                                           | Milestone Measurement | Stakeholders                          |
|---------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------------------------|
| 4) Strategic Slot Management    | Increase the # of flights that meet strategic slot compliance           | Airport strategic slot adherence                                                                                   | <ul style="list-style-type: none"> <li>➤ AIBT - SIBT +/- 30 minutes (%)</li> <li>➤ AOBT- SOBT +/- 30 minutes (%)</li> </ul>       | N/A                   | Aircraft Operators<br>Airports        |
| 5) Reduce emissions             | Reduce emission from engines on ground                                  | Emission from engines on ground (lead)                                                                             | <ul style="list-style-type: none"> <li>➤ Taxi-out delay (minutes) to benefit baseline (minutes and Co2)</li> </ul>                | N/A                   | ATC<br>Aircraft Operators<br>Airports |
| 6) Congestion                   | Reduce number of aircraft moving simultaneously on the manoeuvring area | <ul style="list-style-type: none"> <li>➤ Number of aircraft queueing on sequence in high demand periods</li> </ul> | <ul style="list-style-type: none"> <li>➤ Queue length (ATOT-AOBT) over a 15 min period, per hour over a 24 hour period</li> </ul> | N/A                   | ATC<br>Aircraft Operators<br>Airports |
| 7) ATFM Slot adherence          | Increase ATFM slot adherence                                            | Number of aircraft compliant with ATFM slot (CTOT)                                                                 | <ul style="list-style-type: none"> <li>➤ ATOT – CTOT</li> </ul>                                                                   | @ Milestone16         |                                       |

## INTEROPERABILITY OF A-CDM WITH OTHER SYSTEMS

8.1 This section, referring to the ICAO Aviation System Block Upgrades (ASBU) framework, links the ASBU modules and elements related to Airport Collaborative Decision Making (A-CDM) and outline a project framework to integrate/interoperate A-CDM with other systems of Air Traffic Management (ATM) in accordance with the time frame of ASBU Block 1 modules and elements.

### Interactions between A-CDM and Other Systems

8.2 In the global aviation network, each airport is a node serving other aviation entities to achieve the safe, secure and efficient interoperability of ATM systems as a whole. The ASBU framework underpins and realizes such principle with a systems engineering approach to set the target implementation time frames for sets of operational improvements, referred to as ‘modules’, including A-CDM, Air Traffic Flow Management (ATFM) and various enablers of ATM efficiency and effectiveness.

8.3 There are two Blocks of A-CDM incorporating four ASBU elements relevant to the scope of guidance in this document: ACDM-B0/1 – *Airport CDM Information Sharing (ACIS)*, ACDM-B0/2 – *Integration with ATM Network Function*, ACDM-B1/1 – *Airport Operations Plan (AOP)* and ACDM B1/2 – *Airport Operations Centre*. The Block 0 elements combine and reconcile efforts of aviation entities in-and-around an airport to achieve an effective and efficient turnaround process. As the upgrade from Block 0, Block 1 elements will pave the way towards a cross-border network of collaborative ATFM, the node-based decision making process at airports will be enhanced by sharing up-to-date relevant information and by taking into account the preferences, available resources and the requirements of the stakeholders at the airport.

8.4 To achieve the aims of Block 1 A-CDM elements, the implementation phase of Block 0 elements should be ideally interoperable-by-design so that A-CDM is not only a local system serving an airport but also a node with adequate capabilities and features for integration with domestic air traffic flow management and interoperability with other systems of the cross-border net-centric airspace.

8.5 To effectively formulate and develop the implementation phase of A-CDM, the following ASBU modules and elements as well as their interactions with A-CDM should be studied in depth and incorporated gradually, where relevant, into an A-CDM implementation:

- (a) Air Traffic Flow Management (ATFM) under NOPS B0/1-5 and NOPS B1/1-10.
- (b) System Wide Information Management (SWIM) over the Common **Regional** **aeRonautical** Virtual Private Network (CRV) under SWIM-B2/1-5.
- (c) Flight Information Exchange Model (FIXM) under FICE-B0/1 and B2/1-9.

8.6 Appendix 1 provides more information about the ASBU modules and elements interacting with A-CDM. Full details are available on the ICAO GANP Portal at <https://www4.icao.int/ganportal/ASBU>.

### Systems View of A-CDM and Other Systems

8.7 In the contemporary context of ATM systems, ‘system’ has moved beyond the equipment for Communications, Navigation, Surveillance and ATM (CNS/ATM) and ‘interoperability’ has moved beyond the computerisation interfaces documented by the Interface Control Document (ICD). In the most general sense, system means a configuration of parts joined together by a web of relationships e.g. a man-made system encompassing actors and machines as well as the interoperability between equipment and procedures. The systems engineering approach can be extended, beyond the formulation of high level requirements of ASBU modules and elements, deep down for the development

and implementation of the ASBU elements selected by individual aviation entities concerned including airport authorities and air navigation services providers.

8.8 Being holistic in flavour, efforts of systems engineering can harmonise and entail outcomes of all specialties and actors to enable a successful system which achieves users' satisfaction. To address specific operational needs of A-CDM and ATFM at a region, sector or airport, systems engineering efforts would be needed to mix and match the adoption of evolving operational concepts and the acquisition of numerous emerging technologies such as Demand and Capacity Balancing (DCB), Linked Arrival Management and Departure Management (AMAN/DMAN), Flight and Flow Information for the Collaborative Environment (FF-ICE), AIXM, FIXM, CRV, SWIM, etc.

8.9 Before implementation of the selected solutions, systems engineering principles can be used to tackle domain-specific problems and evaluate trade-offs between innovations and risks. Harmonising with the global wheel of ASBU, systems engineering practice can be followed to orchestrate the complete development of various CNS/ATM systems by applying a set of life-cycle building blocks and aligning technologies to meet targets of ASBU.

8.10 Under the systems view, A-CDM can be implemented as a specific application of CDM in the airport environment and ATFM facilities are being developed in an ecosystem with a domestic and cross-border network of many advanced, legacy and aged systems that airports are physical nodes inside virtual ATFM nodes on the network. Appendix 2 provides use cases for interoperability of A-CDM with other systems, especially for ATFM.

#### Project Framework for Integration/Interoperation of A-CDM with ATFM Systems

8.11 In line with the timeframe of ICAO ASBU, the outcomes from Block-0 implementations of A-CDM and ATFM could be leveraged to ensure the interoperability of equipment, procedures and practices among the pioneering aviation authorities and administrations in the Asia Pacific Region. This will set the guidelines and successful templates for all aviation entities to join the roadmap.

- 8.12 A good practice for development and implementation of A-CDM initiatives should:
- (a) Utilize ATFM measures e.g. CTOT from NOPS-B0 (ATFM) and various milestones from ACDM-B0 e.g. (list to be advised) to collectively improve the efficiency and effectiveness of air traffic services and airport operations;
  - (b) Contribute to regional and sub-regional efforts for the standardisation of flight and flow data as well as the development of Implementation Guidelines and Interface Control Documents for ASBU Block 1 Implementations;
  - (c) Collaborate among stakeholders on development aligning with A-CDM-B1 module's aim for integration of A-CDM with ATFM;
  - (d) Leverage the solid foundation established from ACDM-B0 and NOPS-B0 modules and take A-CDM into consideration when developing ATFM techniques and algorithms for network operations in multi-nodal and/or harmonised settings;
  - (e) Explore the performance improvement through the application of CRV and SWIM for regional FIXM Extension to pave the way for the acquisition of full data-driven ATFM and A-CDM facilities;

- (f) Realise the potential of FIXM for richer content exchanges, as promulgated in ASBU FICE-B1 module, between automated systems of A-CDM and the ATFM network in the APAC region; and
- (g) Establish the systems engineering plan that holistically covers conceptualisation, development, acquisition and implementation of the abovementioned ASBU Block 1 initiatives and trials to bring fruitful outcomes to aviation users of the systems.

8.13 Beyond the document-based interoperability of equipment interfaces, regional and/or sub-regional coordination should be made to develop model-based interfaces for computerisation between A-CDM, ATFM and ATC systems, with the following steps:

- (a) Make agreements between the A-CDM and ATFM communities on the choice of '**Milestones**' for developing interoperable procedures between A-CDM and ATFM.
- (b) Compromise the '**Compliance**' of flights meeting both A-CDM milestones and ATFM measures.
- (c) Develop and materialise Concept of Operations (CONOPS) for Interoperability between A-CDM and ATFM processes.
- (d) Identify data items and the 'Timeline' of their exchanges needed to realise the CONOPS and develop the common operating procedures for processing and utilizing the data items.
- (e) Research and develop model-based '**Interfaces**' to enable the automation of data processing and information utilization.
- (f) Develop and implement operational trial projects to verify and validate the interoperable elements and components.
- (g) Articulate the outcomes of trial to develop reference models with reusable elements and components so as to minimise the redesign efforts of Members.
- (h) Complete formal adoption of the reference models e.g. FIXM Extension into the ICAO documents.

8.14 Instead of a big bang implementation, the steps suggested above should be performed in an iterative manner, via forums and working groups among experts from members of APA-CDM/TF and ATFM/SG. The incremental approach has to bridge in-depth studies of integration/interoperation between A-CDM and ATFM as well as to foster close liaison for developing A-CDM and ATFM network operations in more collaborative manner.

## CURRENT SITUATION

### A-CDM Task Force Survey Outcome

#### *Overview of Survey Results*

9.1 The Survey Questionnaire was sent out to 39 States (including USA) and 2 SAR (Hong Kong, China and Macao, China). 15 APAC States/Administrations (Australia, Bhutan, China, Hong Kong China, Fiji, India, Japan, New Zealand, Pakistan, Philippines, Republic of Korea, Singapore, Thailand, USA and Viet Nam) responded to Survey Questionnaire.

9.2 The percentage of States/Administrations responding to survey questionnaire was 38.5%.

9.3 At the time of the survey the APAC Seamless ATM Plan, Version 2.0, September 2016, included the expectation that all high-density aerodromes (aerodromes with more than 100,000 aircraft movements per annum) should operate an A-CDM system serving the Major Traffic Flow (MTF) and busy city pairs.

9.4 Based on 2015 ICAO data, the 51 busiest Asia/Pacific aerodromes were (Page 41 of APAC Seamless ATM Plan, Rev. 2.0 refers, in alphabetical order):

1. Australia (Sydney, Melbourne, Brisbane);
2. China (Beijing, Shanghai Pudong and Hong Jiao, Guangzhou, Hong Kong, Xi'an, Shenzhen, Chengdu, Kunming, Hangzhou, Chongqing, Xiamen, Wuhan, Zhengzhou, Changsha, Nanjing, Qingdao, Urumqi, Dalian, Guiyang, Tianjin, Haikou, Sanya);
3. India (New Delhi, Mumbai, Chennai, Bangalore);
4. Indonesia (Jakarta, Surabaya, Bali, Makassar );
5. Japan (Haneda, Narita, Fukuoka, Osaka, Sapporo, Naha);
6. Malaysia (Kuala Lumpur);
7. New Zealand (Auckland);
8. Philippines (Manila);
9. Republic of Korea (Incheon, Jeju, Gimpo);
10. Singapore (Changi);
11. Thailand (Suvarnabhumi, Don Mueang);
12. United States (Honolulu); and
13. Viet Nam (Ho Chi Minh, Hanoi).

9.5 The percentage of States/Administrations responding to survey questionnaire, where A-CDM was recommended to be implemented, was about 85%.

9.6 With the high percentage in response rate of approximately 85%, the survey was considered to be finalized.

9.7 A summary of A-CDM survey is presented in **Table 7** that includes respondents, what airports are part of the current implementation scope and by what year.

#### *Important Notes*

9.8 Bhutan and Pakistan have no plans for A-CDM as it is deemed by the States that their airports will not implement A-CDM. Therefore, they are not considered as part of the survey results.

9.9 Philippines indicated implementation of extended ATFM but not how that specifically relates to what airport/airports. Due to ambiguous replies to the survey questions, these replies are not included as part of the survey results.

9.10 Survey replies from USA were not included in the report as those airports are outside APAC Region.

9.11 The legend for the **Table 7** is as follows:

- A Year value of “0” indicates that no data was provided by the respondent
- **Green marked airports** indicates that implementation is completed.
- **Yellow marked Administrations/airport** indicates they are not included in the Survey results in this version of the document.

Table 7: Summary of A-CDM Survey (Updated at APA-CDM/TF/4)

| Administration          | Airport                  | Year Implemented/Planned |
|-------------------------|--------------------------|--------------------------|
| <b>Australia</b>        | <b>Brisbane</b>          | 2019                     |
|                         | <b>Sydney</b>            | 2020                     |
|                         | <b>Perth</b>             | 2020                     |
|                         | <b>Melbourne</b>         | 2020                     |
| <b>Bhutan</b>           | <b>No info</b>           | 0                        |
| <b>China</b>            | <b>Kunming Changshui</b> | 2014                     |
|                         | <b>Beijing Capital</b>   | 2017                     |
|                         | <b>Shanghai Hongqiao</b> | 2013                     |
|                         | <b>Shanghai Pudong</b>   | 2016                     |
|                         | <b>Chengdu Shuangliu</b> | 2017                     |
|                         | <b>Guangzhou Baiyun</b>  | 2016                     |
|                         | <b>Xi'an Xianyang</b>    | 2017                     |
|                         | <b>Shenzhen Baoan</b>    | 2016                     |
| <b>Hong Kong, China</b> | <b>HKIA</b>              | 2017                     |
| <b>Fiji</b>             | <b>Nadi</b>              | 2018                     |
| <b>India</b>            | <b>Bengaluru</b>         | 2013                     |
|                         | <b>Delhi</b>             | 2013                     |
|                         | <b>Mumbai</b>            | 2015                     |
|                         | <b>Kolkata</b>           | 2018 (APA-CDM/TF/4)      |
|                         | <b>Chennai</b>           | 2018 (APA-CDM/TF/4)      |
|                         | <b>Shamshabad</b>        | 0                        |
|                         | <b>Jaipur</b>            | 2019 (APA-CDM/TF/4)      |
|                         | <b>Ahmedabad</b>         | 2019 (APA-CDM/TF/4)      |
|                         | <b>Trivandrum</b>        | 2019 (APA-CDM/TF/4)      |
|                         | <b>Guwahati</b>          | 2019 (APA-CDM/TF/4)      |
|                         | <b>Chitose (Sapporo)</b> | 2018                     |
| <b>Japan</b>            | <b>Narita</b>            | 2020                     |
|                         | <b>Haneda</b>            | 2020                     |
| <b>Malaysia</b>         | <b>Kuala Lumpur</b>      | 2021 (APA-CDM/TF/4)      |
| <b>New Zealand</b>      | <b>Wellington</b>        | 2015                     |
|                         | <b>Auckland</b>          | 2016                     |
|                         | <b>Christchurch</b>      | 2019                     |
| <b>Pakistan</b>         | <b>No info</b>           | 0                        |
| <b>Philippines</b>      | <b>Manila</b>            | 2022 (APA-CDM/TF/4)      |
| <b>Singapore</b>        | <b>Changi</b>            | 2016                     |
| <b>ROK</b>              | <b>Incheon</b>           | 2017                     |

| Administration | Airport      | Year Implemented/Planned |
|----------------|--------------|--------------------------|
|                | Gimpo        | 2020 (APA-CDM/TF/4)      |
|                | Gimhae       | 2020 (APA-CDM/TF/4)      |
|                | Jeju         | 2020 (APA-CDM/TF/4)      |
| Thailand       | Suvarnabhumi | 2020 (APA-CDM/TF/4)      |
|                | Don Muang    | 2020 (APA-CDM/TF/4)      |
| Vietnam        | Tan Son Nhat | 2020                     |
|                | Noi Bai      | 2020                     |
|                | Da Nang      | 2021                     |

### *Notable Issues*

9.12 The implementation of A-CDM in the APAC region is moving forward and already up to date 16 airports have implemented A-CDM according to response from the member states. According to the survey, 16 more will implement A-CDM by the end of 2021. However, some respondents have indicated very aggressive time plans in relation to where they are in the process. Their responses indicate some underestimation of the complexity and time actually needed to implement A-CDM.

9.13 The responses to the survey indicate some areas where further investigations might be needed, or where more clear guidance material and also training would be of help. These areas are:

- **Relationship between the A-CDM conceptual elements and milestones.** These are discrepancies in the responses indicating that the implementation of milestones and their purpose might not be fully understood.
- **How to measure the success of an A-CDM implementation.** All respondents indicated very clear objectives related to implementation A-CDM but at the same time not all have established how to measure that these objectives are achieved – this holds true for some of the airport that have already implemented A-CDM as well.
- **Getting all stakeholders engaged as well as managing an A-CDM project.**

## PERFORMANCE IMPROVEMENT PLAN

10.1 A-CDM-related performance expectations at A-CDM program airports are illustrated in **Table 8** to map with APAC Seamless ANS Plan and Regional Framework for Collaborative ATFM expectations.

10.2 APAC States/Administrations should consider performance expectation dates provided in the **Table 8** while planning for implementation of A-CDM at their airports.

**Table 8 - A-CDM-related performance expectations mapped to relevant APAC Seamless ANS Plan and Regional Framework for Collaborative ATFM expectations**

| GANP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Seamless ANS Plan, V 3.0, Nov. 2019                                                                                                                                                             |                                                             | Regional Framework for Collaborative ATFM                                                                                                                                                                                                                            |                          | APA-CDM Implementation Plan (proposed)                                                                                                                                                                                           |                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| ASBU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Performance Expectation                                                                                                                                                                         | Timeframe                                                   | Performance Expectation                                                                                                                                                                                                                                              | Timeframe                | Performance Expectation                                                                                                                                                                                                          | Timeframe                                                                                          |
| <p><b>ACDM-B0/1:</b> Airport CDM Information Sharing (ACIS)</p> <p><u>Description:</u><br/>This element represents the first collaboration step among stakeholders involved in aerodrome operations. It consists in the definition of common specific milestones for flight events occurring during surface operations. The stakeholders involved have to, based on accurate operational data, achieve the agreed milestones.</p> <p><u>Maturity level:</u><br/>Ready for implementation</p> <p><b>ACDM-B0/2:</b> Integration with ATM Network Function</p> <p><u>Description:</u><br/>This element consists in feeding arrival information from the network into A-CDM and at the same time to coordinate specific departure milestones. The involved stakeholders have to, based on accurate operational data, achieve the agreed milestones.</p> <p><u>Maturity level:</u><br/>Ready for implementation</p> | 7.3 All international aerodromes should operate an A-CDM system for Airport CDM Information Sharing (ACIS) integrated with the ATM network function consistent with ACDM-B0/1 – 2 (Priority 1). | PARS Phase II (expected implementation by 07 November 2019) | 7.17 ATFM, AMAN/DMAN and A-CDM systems should be integrated through the use of common fixes, terminology and communications protocols to ensure complementary operations.                                                                                            | Phase 1B<br>25 May 2017  | 1. Local A-CDM procedures, supported by systems supporting the exchange of TOBT and TSAT between aircraft operators and the ATC Control Tower, should be implemented                                                             | <b>Phase 1 – Local A-CDM</b><br><br><i>As soon as practicable, preferably before November 2020</i> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                 |                                                             | <i>FIXM version 3.0 or later, extended where necessary is the agreed format for exchange of ATFM information in the Asia/Pacific Region.</i>                                                                                                                         |                          | 2. All A-CDM Airports should establish variable taxi-times for all combinations of gate or apron and runway holding points                                                                                                       | <i>As soon as practicable, preferably before November 2020</i>                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                 |                                                             |                                                                                                                                                                                                                                                                      |                          | 3. Where implemented, pre-departure sequencing procedures and systems should be integrated with A-CDM.                                                                                                                           | <i>As soon as practicable, preferably before November 2020</i>                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                 |                                                             | 7.24 Tactical ATFM at ATFM Program Airports should be implemented using:<br><br>i. Ground Delay Programs (CTOT); or<br>ii. Minutes in trail (MINIT) or miles in trail (MIT) or other ATFM measures specified in ICAO Doc 9971 – <i>Manual for Collaborative ATFM</i> | Phase 1B,<br>25 May 2017 | 1. A-CDM and ATFM system should be integrated by:<br><br>a) ATFM systems taking TOBT and/or TTOT into account when determining CTOT (if applicable); and<br><br>b) A-CDM systems taking CTOT into account when determining TSAT; | <b>Phase 2 Domestic Integration</b><br><br><i>Preferably before November 2022</i>                  |

| Table 8 - A-CDM-related performance expectations mapped to relevant APAC Seamless ANS Plan and Regional Framework for Collaborative ATFM expectations |                                     |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                                             |                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------|
| GANP                                                                                                                                                  | Seamless ANS Plan, V 3.0, Nov. 2019 |           | Regional Framework for Collaborative ATFM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             | APA-CDM Implementation Plan (proposed)                                      |                                                              |
| ASBU                                                                                                                                                  | Performance Expectation             | Timeframe | Performance Expectation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Timeframe                   | Performance Expectation                                                     | Timeframe                                                    |
|                                                                                                                                                       |                                     |           | <p>7.25 All States should ensure that local ATC procedures and, where available, CDM processes facilitating compliance with received CTOT are implemented.</p> <p><i>Note 1: At controlled aerodromes, CTOT compliance should be facilitated through the cooperation of the aircraft operator and the issuance of ATC clearances. As a minimum, CTOT should be made available to the relevant ATC tower and the aircraft operator;</i></p> <p><i>Note 2: For flights departing aerodromes where an ATC service is not provided, CTOT information should be made available to the aircraft operator and the first ATS unit providing services to the flight.</i></p> <p><i>Note 3: States planning to implement ground delay programs should ensure adequate time is provided for local procedure development and promulgation at aerodromes where CTOT will be applied.</i></p> |                             | -                                                                           |                                                              |
|                                                                                                                                                       |                                     |           | 7.26 CTOT for individual aircraft should, where necessary, be revised, cancelled, suspended or de-suspended.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Phase 1B<br>25 May 2017     | 4. TSAT issued for individual aircraft should, where necessary, be revised. | <b>Phase 1 – Local A-CDM Preferably before November 2020</b> |
|                                                                                                                                                       |                                     |           | Distributed multi-nodal ATFM information distribution capability utilizing FIXM version 3.0 (or                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Phase 2,<br>8 November 2018 | N/A                                                                         |                                                              |

**Table 8 - A-CDM-related performance expectations mapped to relevant APAC Seamless ANS Plan and Regional Framework for Collaborative ATFM expectations**

| <b>GANP</b> | <b>Seamless ANS Plan, V 3.0, Nov. 2019</b> |                  | <b>Regional Framework for Collaborative ATFM</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                          | <b>APA-CDM Implementation Plan (proposed)</b>                                                             |                                                           |
|-------------|--------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| <b>ASBU</b> | <b>Performance Expectation</b>             | <b>Timeframe</b> | <b>Performance Expectation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Timeframe</b>         | <b>Performance Expectation</b>                                                                            | <b>Timeframe</b>                                          |
|             |                                            |                  | <p>later) should be implemented, including:</p> <ul style="list-style-type: none"> <li>i. Sharing of ADP and dynamically updated demand and capacity data for all ATFM program airports, and for en-route airspace supporting the busiest city pairs and high density major traffic flows;</li> <li>ii. Slot allocation information for all flights subject to ATFM programs, including as a minimum CTOT, CTO and CLDT information;</li> <li>iii. Authorized user functions for slot amendment, cancellation or suspension (ATFMU), and slot-swapping (aircraft operator and ATFMU); and</li> <li>iv. Automated slot compliance monitoring and reporting, supplemented where necessary by authorized inputs by ATFMU, ATSU or airspace operator.</li> </ul> |                          |                                                                                                           |                                                           |
|             |                                            |                  | Full interoperability of cross border ATFM, A-CDM, AMAN, DMAN, ATM automation and airspace user systems should be implemented, utilizing FIXM 3.0 (or later), to provide seamless gate-to-gate collaborative ATFM operations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Phase 2, 8 November 2018 | Exchange A-CDM information with Cross Border ATFM for seamless gate-to-gate collaborative ATFM operations | <b>Phase 3 – Cross-boundary network ATFM integration.</b> |

| <b>Table 8 - A-CDM-related performance expectations mapped to relevant APAC Seamless ANS Plan and Regional Framework for Collaborative ATFM expectations</b> |                                                                                                                                                                           |                                                                       |                                                                                                                                                                                                                                                                                                                                 |                          |                                                                   |                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------|-----------------------------------------------|
| <b>GANP</b>                                                                                                                                                  | <b>Seamless ANS Plan, V 3.0, Nov. 2019</b>                                                                                                                                |                                                                       | <b>Regional Framework for Collaborative ATFM</b>                                                                                                                                                                                                                                                                                |                          | <b>APA-CDM Implementation Plan (proposed)</b>                     |                                               |
| <b>ASBU</b>                                                                                                                                                  | <b>Performance Expectation</b>                                                                                                                                            | <b>Timeframe</b>                                                      | <b>Performance Expectation</b>                                                                                                                                                                                                                                                                                                  | <b>Timeframe</b>         | <b>Performance Expectation</b>                                    | <b>Timeframe</b>                              |
|                                                                                                                                                              |                                                                                                                                                                           |                                                                       |                                                                                                                                                                                                                                                                                                                                 |                          |                                                                   | <b><i>Preferably before November 2025</i></b> |
|                                                                                                                                                              |                                                                                                                                                                           |                                                                       | 7.36 Ground Delay Programs utilizing CTOT should be applied to:<br><br>i. aircraft destined for constrained ATFM Program Airports, that have not yet departed; and<br><br>ii. aircraft planned to operate through constrained airspace where tactical ATFM measure CTO at RFIX or AFIX is in place, that have not yet departed. | Phase 2, 8 November 2018 | N/A.                                                              |                                               |
| ACDM-B1/1: Airport Operations Plan (AOP):                                                                                                                    | 7.18 All international aerodromes should operate an A-CDM system integrated with the ATM network, and an AOP and where practicable an APOC consistent with ACDM-B1/1 – 2. | Seamless PARS Phase III (expected implementation by 03 November 2022) | -                                                                                                                                                                                                                                                                                                                               | -                        | Develop and implement collaborative Airport Operations Plan (AOP) | <b><i>Preferably before November 2023</i></b> |
| ACDM-B1/2: Airport Operations Centre (APOC)                                                                                                                  | 7.18 All international aerodromes should operate an A-CDM system integrated with the ATM network, and an AOP and where practicable an APOC consistent with ACDM-B1/1 – 2. | Seamless PARS Phase III (expected implementation by 03 November 2022) |                                                                                                                                                                                                                                                                                                                                 |                          | -                                                                 | -                                             |

## RESEARCH AND FUTURE DEVELOPMENT

### The Evolution of A-CDM

11.1 A-CDM has its roots in Europe and is the foundation for many European SESAR concepts for use of better data and technology to make aircraft and airport operations more efficient. Wider potential for success lies in integrating the networks. Connectivity and data sharing amongst a constellation of A-CDM airports will ultimately deliver optimal performance. The wider benefits of A-CDM should be considered in addition to local enhancements.

11.2 The evolution of A-CDM, and the manner in which the implementation process is introduced throughout the world, should be given due consideration. The most replicated model of A-CDM is the European version, interfacing with EUROCONTROL. However, not all regions have such a centric ATM network, so the processes may be different in other regions. To assist in making the implementation of A-CDM more successful, it is recommended that a regional ATFM environment be established e.g. via a distributed multi-nodal ATFM network, which would enable a certain degree of harmonization and provide consistency for stakeholders.

11.3 One of the most important aspects of A-CDM from a global perspective is the architecture that interfaces airports with a central airspace management system. A model for exchanging information between A-CDM and ATFM should be kept in mind during A-CDM implementations.

11.4 The industry is seeing other facets of airspace management using A-CDM concepts to provide the required data to fulfil continuity between major traffic flows, and high density aerodromes. This will create other hybrid type A-CDM processes that are best suited for regional requirements. One such concept that has been developed in Southeast Asia is known as the Distributed Multi-Nodal ATFM Network. Some regional requirements like data exchange amongst different ATFM applications may require appropriate system design and adaptation, but the primary purpose remains to mitigate airborne flow constraints that contribute to overflow in ATC sector capacities, which result in unanticipated en-route delays.

11.5 As air traffic management evolves, and additional concepts are introduced by the industry, changes and adjustments to A-CDM may be required. This will most certainly contribute to the complexities of data exchange. However, the industry must not lose sight of harmonizing A-CDM.

### A-CDM and ATFM in Asia/Pacific Region

#### *Distributed Multi-Nodal ATFM and A-CDM*

11.6 The third Meeting of the APANPIRG ATM Sub-Group (ATM/SG/3), held in Bangkok Thailand from 3 – 7 August 2015, endorsed *Asia/Pacific Framework for Collaborative Air Traffic Flow Management (The Framework)* and its companion document – *Asia/Pacific Regional Air Traffic Flow Management Concept of Operations (CONOPS)*. Both documents, aligned with *Doc 9971 Manual on Collaborative Air Traffic Flow Management (ATFM)*, provide guidance and a common regional framework for regional ATFM development and harmonization.

11.7 The core concept of *The Framework* is the Distributed Multi-Nodal ATFM Network, envisaging the regional cross-border ATFM as interconnected States and/or sub-regional groups operating in an interoperable, multi-FIRs, multi-States, cross-border collaborative ATFM network, using common information, terminology and communication protocols for information exchange and sharing.

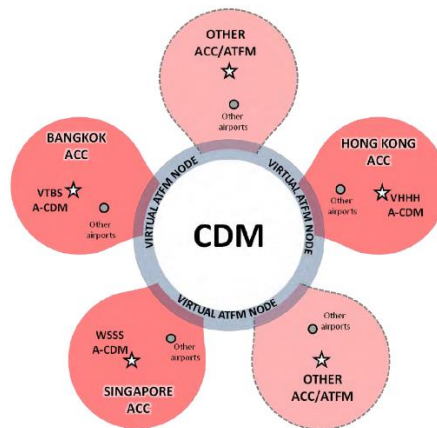


Figure 3 - Concept of A-CDM within a multi-nodal ATFM network

11.8 FIXM 3.0 (or later) was adopted as the agreed ATFM information exchange model. A minimum set of ATFM information was identified to be added into the FIXM Extension for ATFM information distribution and sharing in the region.

11.9 Based on *the Framework*, each State will develop ATFM capability according to its needs and requirements, and the overarching goal of seamless ATM across the Asia/Pacific Region. Under the concept of the Multi-Nodal ATFM Network, each State/Administration will form a node of the multi-nodal network, and should be led by an agreed ANSP as the “Node Leader”.

11.10 Within an ATFM node, there may be a number of airport operators with access to the Node arranged by the Node Leader, facilitating their participation in the cross-border ATFM initiatives, while the Node Leader should ensure the Node is ready and able to participate in the Regional Cross Border ATFM process.

11.11 The A-CDM allows the exchange of information for inbound and outbound flights and links the local A-CDM process to ATFM services, strengthening the link between the airport and ATFM services. The ATFM will be benefited from the A-CDM information regarding the flights’ departure while the A-CDM system will also be benefited from the information of the arriving flights from the ATFM system. The information exchange between A-CDM and ATFM will further improve the predictability.

11.12 In line with *the Framework*, the A-CDM development, implementation and integration with ATFM/ATM within a Node should be coordinated between the airport authorities and the Node Leader.

11.13 The adoption of the communication protocols for A-CDM information exchange depends on the scope of the communication, the agreed communication protocols stipulated in *the Framework* should be adopted if the communication is for cross-border, while any protocols considered appropriate by the stakeholders within a Node of the Multi-Nodal ATFM Network could be adopted if the communication is within a Node. The Aviation Information Data Exchange (AIDX), for example, is the most commonly used information exchange format for A-CDM application in some regions, and could be one of the optional formats for the information exchange between A-CDM and the Node in the Asia/Pacific region.

11.14 The A-CDM development in parallel with the ATFM development in the region required the identification of the minimum set of A-CDM data attributes for local A-CDM implementation, as well as the data attributes necessary for the integration between A-CDM and ATFM.

### *The Multi-Nodal ATFM Operational Trial Project*

11.15 The Multi-Nodal ATFM Operational Trial Project was evolved from a Tripartite CDM project by Hong Kong China, Singapore and Thailand in 2012. Up to now, there are 11 States/Administrations participated in the Project.

11.16 The Project was planned to be executed in 3 Phases. In Phase I, which was completed in 2016, the Project focused on the airport capacity and demand balancing by using the Ground Delay Program (GDP) as the ATFM measure. In Phase II, which has been started in late 2017, the airspace capacity and demand balancing has been taken into consideration. The Project expected to be integrated into the global ATFM network in its Phase III.

### *North Asia Regional ATFM Harmonization Group (NARAHG)*

11.17 The Northeast Asia Regional ATFM Harmonization Group (NARAHG) was jointly established by China, Japan and the Republic of Korea in 2014. In 2015, the NARAHG launched a Project to develop the Cross Region ATFM Collaborative Platform (CRACP).

11.18 The CRACP is one of the solutions for ATFM information exchange in cross-border ATFM networks. A desktop computer with CRACP application software forms a CRACP Terminal, which is installed in end-user's ATFM unit and is networked through Internet as in Stage 1 of the Project. The information exchanged between CRACP Terminals covers those required by ATFM/CDM process in the ATFM phases of pre-tactical, tactical and Post Operation Analysis.

11.19 The A-CDM systems, developed by China, Japan and ROK, respectively, have no connection with the CRACP at the moment.

### *FIXM version 4.1 Extension Data Attributes*

11.20 FIXM version 4.1 was released in December 2017 and the validation of FIXM version 4.1 Extension was completed in April 2018.

11.21 Based on the operational scenarios developed for the SWIM in ASEAN Demonstration, additional data attributes required to be exchanged among stakeholders involving in A-CDM operation and to support the integration between ATFM and A-CDM were identified. Considering that these data attributes are flight-specific, FIXM would be the appropriate information exchange model to support the aforementioned operations. Consequently, the FIXM version 4.1 Extension was further developed to include these data attributes.

11.22 **Table 9** shows the list of data attributes currently included in the FIXM version 4.1 Extension developed.

**Table 9: FIXM version 4.1 Extension Data Attributes**

| Estimated | Calculated | Target | Actual |
|-----------|------------|--------|--------|
|           |            | TOBT   | AOBT   |
|           |            | TSAT   |        |
|           | CTOT       | TTOT   |        |
| ETO       | CTO        |        | ATO    |
| ELDT      | CLDT       |        |        |

| Other                                                                                                                                         |                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Trajectory                                                                                                                                    | Aircraft Track                                                                                                                                                                                                                 |
| <ul style="list-style-type: none"> <li>• ETO</li> <li>• CTO</li> <li>• ATO</li> <li>• Flight level or Altitude</li> <li>• Waypoint</li> </ul> | <ul style="list-style-type: none"> <li>• Ground speed</li> <li>• Bearing</li> <li>• Flight level or Altitude</li> <li>• Position (Designator or Latitude/Longitude or Relative Point)</li> <li>• Time over position</li> </ul> |

11.23 A system-to-system interconnection test between Singapore and Thailand to validate the exchange of developed FIXM version 4.1 Extension was successfully conducted in March/April 2019 using the Flight Information Update use case, involving the distribution of ATFM and A-CDM related data attributes, designed based on the AMQP (Advanced Message Queuing Protocol) messaging protocol.

Participation of MET organisations in CDM

*Asia/Pacific Regional Guidance for Tailored Meteorological Information and Services to support Air Traffic Management Operations*

11.24 An ad-hoc group under ICAO APAC Meteorological Requirements Task Force (MET/R TF) developed the *Asia/Pacific Regional Guidance for Tailored Meteorological Information and Services to support Air Traffic Management Operations*. This guidance document, approved by APANPIRG/29, is available on the ICAO Asia/Pacific Regional Office eDocuments web-page at:

<https://www.icao.int/APAC/Pages/eDocs.aspx>

11.25 This guidance aims to foster States' implementation and enhancement of meteorological (MET) information and services for air traffic management within the Asia/Pacific region and captures most of the necessary processes from preparatory to operational phases.

*Participation of MET organisations in CDM*

11.26 MET CDM is a process involving the development within aeronautical meteorological services of an understanding of the effects of weather on ATM to support an accurate prediction of arrival/departure rates and en-route airspace capacity and configuration. The expected role of a MET organization in CDM is to provide necessary meteorological information at and around relevant aerodromes and air routes, and within relevant airspace, in a timely manner. Rapid identification of the possible cause of adverse weather conditions affecting ATM operations, and airport or airspace capacity, allows both ATM and MET organizations to take immediate action in a collaborative manner to mitigate the impact.

11.27 Future development of A-CDM should include development of the capability for MET organizations to actively participate in A-CDM processes, including the collaborative information exchange processes to support timely and relevant MET information supporting A-CDM.

## **APPENDICES**

### Appendix 1 – Relationships between A-CDM and ASBU Modules

#### Introduction

1. This appendix supplements the technical description of “Interoperability of A-CDM with Other Systems” to facilitate the formulation and development of the Implementation Phase of A-CDM and provides links to full details of Aviation System Block Upgrades (ASBU) elements in the ICAO document “Aviation System Block Upgrades – The Framework for Global Harmonization”.

#### A-CDM in the Global Aviation Network

2. In the global aviation network, each airport is a node serving other aviation entities to achieve the safe, secure and efficient interoperability of Air Traffic Management (ATM) systems as a whole. The ASBU framework underpins and realizes such principle with a systems engineering approach to set the target implementation time frames for sets of operational improvements including Airport Collaborative Decision Making (A-CDM), Air Traffic Flow Management (ATFM), and various enablers of ATM efficiency and effectiveness.

3. The ASBU elements in ACDM, combines and reconciles efforts of aviation entities in-and-around an airport to achieve an effective and efficient turnaround process. This process involves stakeholders, operational services, data points and algorithms that are instrumental to successful turnaround of an air aircraft. The performance of participating flights is usually measured by their compliance with the ‘milestones’ - the progress of a flight from the initial planning to the take off. The prime aim is to get the aircraft airborne as quick as reasonably practicable.

4. As the upgrade will pave the way towards a cross-border network of collaborative ATFM that the node-based decision making process at the airport will be enhanced by sharing up-to-date relevant information and by taking into account the preferences, available resources and the requirements of the stakeholders at the airport. With this advancement in interoperability, the collaborative Airport Operations Planning (AOP) and Airport Operations Centre (APOC) will enhance the planning and management of the Airport operation and allow full integration with ATM.

#### A-CDM with Air Traffic Flow Management

5. According to the ICAO Standards and Recommended Practices (SARPs) Annex 11 Chapter 1: “ATFM has the objective of ATFM contributing to a safe, orderly and expeditious flow of air traffic by ensuring the air traffic control capacity is utilized to the maximum extent possible, and that the traffic volume is compatible with the capacities declared by the appropriate Air Traffic Services authority.”

6. Building up from ASBU NOPS elements, ATFM is used to manage the flow of traffic in a way that minimizes delays and maximizes the use of the entire airspace. Collaborative ATFM can regulate traffic flows involving departure slots, smooth flows and manage rates of entry into airspace along traffic axes, manage arrival time at waypoints or flight information region (FIR)/sector boundaries and re-route traffic to avoid saturated areas.

7. With the improvements under ASBU NOPS elements, ATFM can be integrated with airspace organization and management (AOM) to accommodate the use of free routings. The ATFM algorithms and techniques can be enhanced to:

- (a) regulate traffic flows involving departure slots, smooth flows and
- (b) manage rates of entry into airspace along traffic axes,

- (c) manage arrival time at waypoints, flight information region or sector boundaries,
- (d) reroute traffic to avoid saturated areas, and
- (e) address system disruptions including crisis caused by human or natural phenomena.

8. According to the ICAO Manual on Collaborative Air Traffic Flow Management (Doc 9971), it is a general rule that “ATFM is needed whenever airspace users are faced with constraints on their operations, and in areas where traffic flows are significant”.

9. However, as limited by the current capabilities of most ATFM facilities, the ATFM process is commonly applied to regulating traffic flows (or balancing demand of airspace users) by means of ground delay program, level capping, airspace flow program, minimum departure, miles in trail, minutes in trail, etc. Some of these ATFM measures may counteract the benefits of the A-CDM turnaround process. In the worst case, passengers are delayed inside fuselage the aircraft has been off-block to taxiway or is airborne amid ‘flow control’.

10. In a nut shell, when delays of flight operations cannot be avoided, collaborative decisions must be made orderly and timely to balance the impacts on airports and airspaces for the sake of all aviation entities and stakeholders in an open and fair manner.

#### A-CDM with System Wide Information Management

11. The ASBU SWIM elements will create the aviation intranet to enable node-based A-CDM sharing up-to-date relevant information with other aviation entities including domestic, cross-border and regional AFTM units so that the preferences, available resources and the requirements of the stakeholders at the airport can be taken into account with a process of collaborative decision-making (CDM) by all parties concerned. The implementation of system-wide information management (SWIM) services provides the infrastructure and essential applications based on standard data models and internet-based protocols to maximize interoperability when interfacing systems for A-CDM, ATFM and other ATM functions.

12. The goal of SWIM is to realize a global network of ATM nodes, including the aircraft, providing or using information. Aircraft operators with operational control centre facilities will share information while the individual user will be able to do the same using other applications. The support provided by the ATM network will in all cases be tailored to the needs of the user concerned, e.g. A-CDM and ATFM.

13. In the Asia Pacific Regions, the current implementation of the Common **aeR**onautical Virtual Private Network (CRV) enables a cross-border, high-speed and secured communication network, which serves as a key enabler for implementation of a number of seamless ATM initiatives. The implementation and operation of CRV network is overseen by the ICAO CRV Operations Group (CRV/OG), while several civil aviation authorities are working on the data implementation and SWIM over CRV.

#### A-CDM with Cross-Exchange of Structured Information

14. Relevant ASBU element(s) addresses the need for information integration and supports a new concept of ATM information exchange fostering access via the SWIM services. This includes the cross-exchange of common elements with the initial introduction of the ATM Information Reference Model (AIRM), which integrates and consolidates ATM information in a transversal way. Key exchange models include:

- (a) Flight Information Exchange Model (FIXM) for flight and flow information and aircraft performance-related data,
- (b) ICAO Meteorological Information Exchange Model (IWXXM) for information related to weather, and
- (c) Aeronautical Information Exchange Model (AIXM) for digital format of the aeronautical information that is in the scope of Aeronautical Information Services (AIS) in accordance with the ICAO SARPs Annex 15.

15. The data interoperability between A-CDM and ATFM can be assured by the use of FIXM found on the concept of flight object and the widely adopted eXtensible Markup Language (XML). This common model of structured information for flight object will effectively enable ground-ground exchanges before departure, under relevant ASBU element(s), such as FICE.

16. Coordination with SWIM and ATFM are being made for inclusion of A-CDM attributes in the FIXM Extensions tailored for airports in the Asia Pacific Region.

#### A-CDM under Network-centric Collaborative Decision-Making

17. Merging the synchronized outcomes from a range of ASBU elements, SWIM would be required to support the implementation of collaborative decision-making (CDM).

18. By SWIM-enabled applications of CDM for more complex situations, ATM will be able to offer/delegate to the users the optimization of solutions to flow problems. It will let the user community take care of competition and their own priorities in situation when the network or its nodes (airports, sector) does no longer provide actual capacity commensurate with the satisfaction of the schedules.

## Appendix 2 – Use Cases for Interoperability of A-CDM with Other Systems

### Introduction

1. This appendix provides use cases to highlight ways that A-CDM can be implemented as a local system serving an airport as well as a node with adequate interfacing capabilities for integration and interoperation with air traffic flow management (ATFM) and other systems of the cross-border net-centric airspace.
2. In the context of System Wide Information Management (SWIM), “interoperability” means the ability of information and communication technology (ICT) systems and of the business processes they support to exchange data and to enable the sharing of information and knowledge. The interoperability of A-CDM can range from close integration of specialized computer systems in-and-around an airport implementation and loose coupling of service-based automation systems in a regional net-centric airspace.
3. To achieve effective and efficient sharing of information, a user interface is needed to allow quick and easy viewing and input of information taking into consideration heavy airport and air traffic control (ATC) workload scenarios.
4. To facilitate automated interactions, a system interface is needed to demark a shared boundary across which two or more of these different systems and their software applications to communicate, exchange data, and use the information that has been exchanged.
5. The interfacing capability of an A-CDM implementation can be categorized by the following use cases and options according to their degree of integration and spectrum of interoperability.

### Use Case 1 - Interfaces of Standalone A-CDM Platform

6. In an operation without A-CDM, information about key airside processes is typically sourced from multiple different systems leading to gaps and inefficiencies. With A-CDM, a common platform collates data from the airport and ATC systems and presents it to operational stakeholders in a format that helps them make more informed decisions.
7. In general, an A-CDM web portal can be used as a specially designed website that brings information from diverse sources in a uniform way so that stakeholders will access information about the key airside processes through the web portal. It is then incumbent on the stakeholders themselves to update their plans, resourcing decisions and working practices to make best use of the information and optimize performance accordingly.
8. The web portal essentially facilitates a common milestone process that corresponds to significant events across each of the airside processes to enable and ensure a level of consistency across the airport and its airside entities that are adopting an A-CDM information sharing function. The successful completion of each milestone triggers operational decisions for stakeholders concerned with future events in the process.
9. In addition to the web portal as user interface, an A-CDM platform may offer application programming interface (API) for other systems to automatically receive and send A-CDM information. These system interfaces may have an inter-system messaging capability based on proprietary communications protocols or various de facto engineering standards.

10. Through its system interfaces, an A-CDM platform can extract process-information about airport and flight operations. Then, the A-CDM algorithms can combine and evaluate the information collected. With both the user and system interfaces, the A-CDM will share the updated information and milestones (including pre-departure sequence and related estimated times) to optimize the flow of outbound traffic.

11. Options of interfacing automated systems for A-CDM may include:

- (a) Dedicated data links may be used between the A-CDM platform and each of its partnering systems for conveying milestones and messaging on one-to-one basis.
- (b) The A-CDM platform may be connected to the Aeronautical Fixed Telecommunication Network (AFTN) for sharing information with destination airports, air traffic control units, air traffic flow management units and the wider air transport network.
- (c) A cloud-based solution may be used to enable economies of scale by providing a common platform to multiple airports as a single A-CDM implementation and link the A-CDM implementation to other systems with a great range of interoperability allowing access by service-oriented APIs, web service, and the like based on open standards and industry good practices.

12. The deployment of a standalone A-CDM platform can reduce the exposure of existing critical systems like the Airport Operations Database (AODB) and Flight Data Processing System (FDPS) to the risks of corruption when introducing the new A-CDM. Moreover, existing systems can continue to follow their specific roadmaps for upgrade or replacement with minimum dependencies on the evolving A-CDM functions.

13. However, the lack of network-wide interoperability cannot automatically validate information in multiple disparate systems, while manual cross-checks are required to identify and resolve discrepancies on each system concerned. With more systems interacting with a standalone A-CDM implementation, the risks of errors and delays in the net-centric CDM process will be increased.

#### Use Case 2 - Net-centric Interfaces of A-CDM

14. Under the initiatives of Aviation System Block Upgrades (ASBU), SWIM suggests the use of service-oriented architecture (SOA) to realize the concept of information-centric and net-centric air traffic management (ATM) operations. As one of the prime objectives of net-centric CDM, airport integration with ATFM Unit shares more precise and detailed information about airside processes and an optimized departure sequence by taking into account both aerodrome and airspace slots as well as other prevailing operational circumstances such as weather changes and military aviation activities.

15. Several options for network connectivity and system interoperability are available for interfacing A-CDM via ATFM into the global aviation network.

16. An A-CDM platform may connect to an ATFM Unit via a dedicated AFTN connection, but the interoperability between A-CDM and ATFM is constrained by the text-based communications characteristics of AFTN.

17. An A-CDM platform may connect to an ATFM Unit via a peer-to-peer data link that can support internet protocol based (IP-based) communications according to the interface control document (ICD) agreed between the A-CDM platform and the ATFM Unit. The ATFM Unit will act a broker or agency to optimize the flow of air traffic in and out the airports, which participate in the A-CDM platform. The interface between A-CDM and ATFM may use communication protocols, which

are different from that of the global aviation network, so the ATFM Unit has to provide data conversion as well as align interactions between network actors.

18. The Unified Modeling Language (UML), as a developmental modeling language, can be used to provide a standard way for visualizing the design of system interfaces for SWIM-enabled applications as well as showing the structure of the data to be exchanged.

19. The use of Flight Information eXchange Model (FIXM), which is a UML model, will ensure both syntactic interoperability and semantic interoperability.

20. For specifying data formats and communication protocols, eXtensible Markup Language (XML) or Structured Query Language (SQL) standards are among the tools of syntactic interoperability. These tools are also useful for lower-level data formats, such as ensuring alphabetical characters are stored in a same variation of ASCII or a Unicode format (for English or international text) in all the communicating systems including ATS Messaging System (AMHS).

21. Beyond the ability of two or more computer systems to exchange information, semantic interoperability is the ability to automatically interpret the information exchanged meaningfully and accurately in order to produce useful outcomes as defined by the end users of both systems. To achieve semantic interoperability, both A-CDM and ATFM must refer to a common information exchange model, such as FIXM. Based on unambiguously defined content in all information exchange requests, what is sent from donor/owner is the same as what is understood at the requester/receptor.

22. Other open standards are expected to be applied at all levels of the SWIM framework, which include the World Wide Web Consortium (W3C) specifications (World Wide Web Consortium (W3C), 2013) and the standards for network layer exchange.

23. An A-CDM platform may connect to an ATFM Unit based on the implementation specifications of SWIM which may be defined on a local, sub-regional, regional and/or global scale conforming to open standards. The A-CDM milestones, together with process information for improving the milestones and related estimated times, are exchanged via the SWIM infrastructure based on information management standards. The seamless interoperable data exchange and services will benefit the global aviation network as a whole.

#### Use Case 3 - A-CDM Interfaces for Cross-border ATFM

24. In practice, an A-CDM implementation should establish a roadmap for maintaining and improving its interfacing capability based on the most cost-effective solutions at the time to serve its users and stakeholders. A system-view approach with reference to the above options and the ICAO ASBU roadmap could be a reasonable choice.

25. Under the systems view, A-CDM can be implemented as a specific application of CDM in the airport environment and ATFM facilities are being developed in an ecosystem with a cross-border network of many advanced, legacy and aged systems that airports are physical nodes inside virtual ATFM nodes on the network. An example of multi-nodal ATFM network, as illustrated in Figure A2-1, is being developed for the Southeast Asian sub-region and its adjacent Flight Information Regions (FIRs).

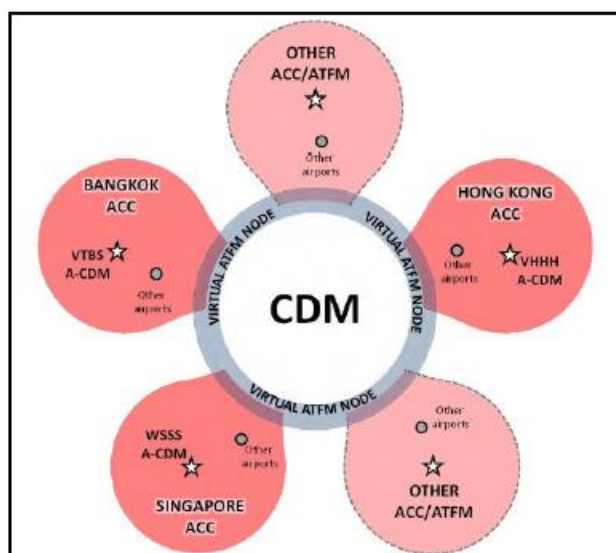


Figure A2-1 - Concept of A-CDM within a multi-nodal ATFM network

26. A mature ATFM network should provide a platform for airport operators and air traffic management units to collaboratively apply the most effective and efficient ATFM measures with considerations of the A-CDM milestones in a timely manner. One example would be the use of Calculated Take-Off Time (CTOT) from BO-NOPS (ATFM) and various milestones from B0-ACDM e.g. Target Off-Block Time (TOBT) and Target Start-up Approval Time (TSAT).

27. Targeting a common goal through the systems view, the systems engineering (an interdisciplinary field of engineering and engineering management) should be applied to holistically tackle both technical and operational complexities of A-CDM, in particular when A-CDM being involved in cross-border ATFM. Data exchange schemes in compliance with FIXM and SWIM would be part of the practical solutions. Service orientation is a means for integration across diverse systems. Ultimately, the silo effect caused by islands of A-CDM and ATFM systems can be eliminated.

28. System-wide predictability and situation awareness of air traffic will be the fruit results from interoperable A-CDM and ATFM based on common data models, i.e. FIXM. In long run, the continuous improvement of predictability based on the concepts and tools of data analytics will not only be useful for planning, strategic and pre-tactical phases of AFTM but also help accurate decision making for operations related to A-CDM and the tactical phase of ATFM. The roles and interactions for integrated A-CDM and ATFM is summarized in **Table A2-1**.

Table A2-1: A-CDM roles within the ATFM Operational Phases

|            | Planning                | Strategic              | Pre-Tactical                                  | Tactical          | Post-Ops                   |
|------------|-------------------------|------------------------|-----------------------------------------------|-------------------|----------------------------|
| Time Frame | Continual               | < 6 months<br>> 1 day  | 1 day prior                                   | Day of operations | Day After                  |
| ATFM Role  | Strategic ATFM planning | Strategic DCB planning | AFTM Daily Coordination and Next Day Planning | Tactical ATFM     | Post-Ops Analysis          |
| ATC Role   |                         |                        |                                               | Tactical ATC      |                            |
| A-CDM Role |                         |                        | A-CDM Planning                                | A-CDM Operations  | A-CDM Performance Analysis |

29. With a view to delivering both the airport-based and network-based roles/functions, SWIM-compliant “enterprise services” can be applied to organizing distributed resources into an integrated solution that breaks down information silos and maximizes business agility. The service-oriented nature of SWIM modularizes ICT resources, creating the loosely coupled business processes of A-CDM and ATFM that integrate information across net-centric systems.
30. Being mutually dependent, a well-designed service-oriented architecture critically relies on the availability of business process solutions that are relatively free from the constraints of the underlying ICT infrastructure, because this enables the greater agility that businesses are seeking.
31. An SWIM-enabled application provides end users with more accurate and comprehensive information and insight into processes. It also offers the flexibility to access the service in the most suitable form and presentation factor, whether through the web browser or through a rich client. Dynamic applications are what enable businesses to improve and automate manual tasks, to realize a consistent view of customers and partner relations, and to orchestrate business processes that comply with internal mandates and external regulations.
32. Although SWIM is the external enabler entity of ATM and the benefits of SWIM arise from the end-user applications that make use of it and not SWIM itself, it can bring benefits by allowing end-user applications from the simple to the most complicated to make full use of the complete ATM data. For a simple start on local scale to interface an A-CDM platform with ATFM, existing infrastructures built on open standards can usually be reused without great changes, although some harmonization issues will need to be addressed.
33. To institute SWIM as “enterprise services”, systems engineering can help an A-CDM implementation to design and manage complex systems over their life cycles. The systems engineering process begins by discovering the real problems that need to be resolved, and identifying the most probable or highest impact failures that can occur – systems engineering involves finding solutions to these problems across the interdisciplinary domains of ATM. The outcome of such efforts will be an engineered system for integrated A-CDM and ATFM with a combination of SWIM-enabled components that work in synergy to collectively perform the net-centric CDM.

Appendix 3 - Examples of A-CDM guides, AIP Supplement, AIC for notification of A-CDM operational trial / implementation

*Note:- Examples are posted in ICAO APAC Website e-Documents and can be accessed at*

<https://www.icao.int/APAC/Pages/eDocs.aspx>

#### Appendix 4 - References

1. Manual on Collaborative Air Traffic Flow Management (Doc 9971), Third Edition, 2018
2. EUROCONTROL A-CDM Implementation Manual, Version 5, March 2017
3. Airport Collaborative Decision-Making: Optimisation through Collaboration, CANSO
4. IATA Recommendations for A-CDM Implementation

APA-CDM/TF TASK LIST

(Updated 23 29 April 2021)

|     | ACTION ITEM/PLANNED ACTIVITIES                                                                                                                                                                                                                      | RESPONSIBLE PARTY                        | TIME FRAME           | STATUS    | REMARKS                                                                         |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------|-----------|---------------------------------------------------------------------------------|
| 1/1 | Update group of expert names and contact details                                                                                                                                                                                                    | Group of Expert States                   | 8 December 2017      | Completed | Prepared and posted as IP/02 at ICAO APAC Meeting Webpage                       |
| 1/2 | Examine available guidance material for clear definition of what is A-CDM and what is not                                                                                                                                                           | Secretariat                              | Ongoing              | Completed | To be included in Draft Implementation Plan                                     |
| 1/3 | Check with ICAO HQ whether APA-CDM/TF Participants can be provided with a copy of Draft Doc 9971 3 <sup>rd</sup> Edition                                                                                                                            | Secretariat                              | 28 April 2017        | Completed | For use only on APA-CDM/TF work.                                                |
| 1/4 | Conduct survey of State A-CDM implementation status                                                                                                                                                                                                 | India/CANSO/Group of Experts/Secretariat | Before November 2017 | Completed | Results of Survey to be analyzed by APA-CDM/TF/2                                |
| 1/5 | Offline analysis of ICAO Doc 9971 Part 3, when available, and report recommendations to APA-CDM/TF/2                                                                                                                                                | China/Group of Experts                   | APA-CDM/TF/2         | Completed | Gap analysis between Doc 9971 and any identified needs.                         |
| 1/6 | Review the effectiveness of existing A-CDM programmes in the APAC Region                                                                                                                                                                            | CANSO/IATA                               | Ongoing              | Completed | Dependent on the development of a set of metrics                                |
| 1/7 | Develop a set of metrics for measurement of effectiveness of A-CDM implementation                                                                                                                                                                   | CANSO/IATA/ Group of Experts/            | APA CDM/TF/4         | Completed | Incorporated in Draft APAC A-CDM Implementation Plan                            |
| 2/1 | Re-circulate A-CDM implementation survey questionnaire to non-respondent States, seek clarification from States where information provided was unclear, and make the questionnaire (i.e. in MS Word file) available in the webpage for APA-CDM/TF/2 | Secretariat/CANSO                        | 15 December 2017     | Completed | Survey questionnaires and supplementary questionnaires had been sent to States. |

|     | <b>ACTION ITEM/PLANNED ACTIVITIES</b>                                                                                                                                                                                            | <b>RESPONSIBLE PARTY</b>                                              | <b>TIME FRAME</b> | <b>STATUS</b>    | <b>REMARKS</b>                                                                                                                                                                                                              |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2/2 | Finalize the interim report of the survey results incorporating information provided by States who have not responded to survey questionnaire and additional clarifications received from States                                 | India/CANSO/Group of Experts/Secretariat                              | 28 February 2018  | <b>Completed</b> | Presented in APA-CDM/TF/3 meeting.                                                                                                                                                                                          |
| 2/3 | First draft of Asia/Pacific Regional A-CDM Implementation Plan                                                                                                                                                                   | India/Singapore/CANSO/IATA/Group of Experts                           | 31 March 2018     | <b>Completed</b> | First draft of Asia/Pacific Regional A-CDM Implementation Plan presented in APA-CDM/TF/3 meeting.                                                                                                                           |
| 3/1 | Interoperability Milestones:<br>1. Develop Interoperability Operational Concept<br>2. Identify minimum A-CDM milestones for interoperability with cross-border ATFM; and<br>3. Prepare Operational Scenarios for FIXM Extension; | Hong Kong, China/India/Singapore/Thailand/CANSO/IATA/Group of Experts | APA-CDM/TF/4      | <b>Completed</b> | Developed FIXM v4.1 Extension based on A-CDM operational scenarios developed under the SWIM in ASEAN Demonstration project                                                                                                  |
| 3/2 | Coordinate with SWIM TF for inclusion of A-CDM attributes in FIXM Extension                                                                                                                                                      | Thailand/Secretariat                                                  | 31 August 2018    | <b>Completed</b> | SWIM TF Chair and Task Leaders web-conference planned for August 2018                                                                                                                                                       |
| 3/3 | Examine availability of A-CDM-specific MET information for inclusion by reference in A-CDM Plan.                                                                                                                                 | Secretariat                                                           | APA-CDM/TF/4      | <b>Completed</b> | Reference is made to the <i>Asia/Pacific Regional Guidance for Tailored Meteorological Information and Services to support Air Traffic Management Operations</i> and included in the Asia/Pacific A-CDM Implementation Plan |

Appendix J

|     | ACTION ITEM/PLANNED ACTIVITIES                                                                                                                                                                                      | RESPONSIBLE PARTY                                                            | TIME FRAME                                                                     | STATUS                              | REMARKS                                                                                                                                                                    |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3/4 | Provide examples of A-CDM guides, AIP Supplement, AIC for notification of A-CDM operational trial/ implementation                                                                                                   | Republic of Korea, Hong Kong China, other States that have implemented A-CDM | 28 February 2019                                                               | Completed                           | ROK has provided Incheon A-CDM Operational Manual                                                                                                                          |
| 3/5 | Provide examples of A-CDM performance measurement                                                                                                                                                                   | States that have implemented A-CDM                                           | 28 February 2019                                                               | Completed                           |                                                                                                                                                                            |
| 3/6 | Finalize Asia/Pacific Regional A-CDM Plan                                                                                                                                                                           | India/Singapore/Thailand/CANSO /IATA/Group of Experts                        | APA-CDM/TF/4                                                                   | Completed                           | Informal face-to-face meeting was held from 4 to 8 March 2019.<br><br>DRAFT Asia/Pacific Regional A-CDM Implementation Plan submitted to the APA-CDM/TF/4 for endorsement. |
| 4/1 | Develop frequently asked questions as live document                                                                                                                                                                 | CANSO/IATA                                                                   | September 2020                                                                 | <del>In progress</del><br>Completed | APA-CDM/TF/6 WP/05                                                                                                                                                         |
| 4/2 | Develop new survey questionnaire based on APAC A-CDM Implementation Plan                                                                                                                                            | CANSO/India/Hong Kong, China                                                 | APA-CDM/TF/5                                                                   | Completed                           | State Letter AN 3/3 – AP109/20 (AGA) dated 12 May 2020                                                                                                                     |
| 4/3 | Analysis of the completed survey                                                                                                                                                                                    | CANSO/India/Hong Kong, China                                                 | APA-CDM/TF/5                                                                   | Completed                           | APA-CDM/TF/5 WP/09                                                                                                                                                         |
| 4/4 | Interoperability of A-CDM with ATFM in collaboration with ATFM/SG Experts and SWIM TF                                                                                                                               | Hong Kong China/Thailand/Singapore/India/ CANSO/IATA                         | APA-CDM/TF/5                                                                   | Completed                           | APA-CDM/TF/5 WP/06<br>Continue in Tasks 5/2 & 5/3.                                                                                                                         |
| 5/1 | Develop a monitoring framework and monitor the progress of achieving the performance expectations as per Asia/Pacific A-CDM Implementation Plan and review the expectations as needed, in consultation with ATFM/SG | India to lead CANSO                                                          | Framework:<br>November 2020<br><br>Progress Monitoring Report:<br>APA-CDM/TF/6 | Completed                           | TOR item 3<br>APA-CDM/TF/6 WP/06<br><br>States to report to APAC Office A-CDM implementation status as per A-CDM Implementation                                            |

|     | ACTION ITEM/PLANNED ACTIVITIES                                                                                                                                                                                                                                                          | RESPONSIBLE PARTY                                                                             | TIME FRAME                                                                | STATUS                 | REMARKS                                                                                                                                 |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|     |                                                                                                                                                                                                                                                                                         |                                                                                               |                                                                           |                        | Monitoring Framework in a periodic basis.                                                                                               |
| 5/2 | Develop joint operational procedure guidance for the integration of ATFM and A-CDM operations, focusing the integration between A-CDM and "cross-border" ATFM in collaboration with Experts from ATFM/SG and SWIM TF.                                                                   | Hong Kong China to lead<br>China, India, Republic of Korea, Thailand, Group of Experts, CANSO | APA-CDM/TF/6                                                              | <b>In progress</b>     | APA-CDM/TF/6 WP/03<br><br>Task to be carried out by the APANPIRG technical body assigned ongoing responsibility for oversight of A-CDM. |
| 5/3 | Identify any other data attributes which are necessary to support the A-CDM and ATFM integrated operations (from A-CDM perspective), in addition to the ones already included in the current version of the FIXM v4.1 Extension in collaboration with Experts from ATFM/SG and SWIM TF. | Thailand to lead<br>Hong Kong China, India, Group of Experts, CANSO                           | APA-CDM/TF/6                                                              | <b>To be commenced</b> | Task to be carried out by the APANPIRG technical body assigned ongoing responsibility for oversight of A-CDM.                           |
| 5/4 | Update the Asia/Pacific A-CDM Implementation Plan                                                                                                                                                                                                                                       | India to lead<br>Thailand, CANSO                                                              | Editorial Changes:<br>November 2020<br><br>Other Changes:<br>APA-CDM/TF/6 | <b>Completed</b>       | APA-CDM/TF/6 WP/07                                                                                                                      |

## DRAFT Terms of Reference

### AIR TRAFFIC FLOW MANAGEMENT STEERING GROUP (ATFM/SG)

1. Having considered relevant documents such as the *Manual on Collaborative Air Traffic Flow Management* (Doc 9971), regional air traffic data and the Asia/Pacific Region city pairs and associated airspace and ATS routes and aerodromes experiencing the most significant traffic demand, and noting the Asia/Pacific Seamless ATM Plan provisions for structural airspace capacity increasing measures, develop an Asia/Pacific Regional ATFM Framework which addresses ATFM implementation and ATFM operational issues in the Asia/Pacific Region;
2. Identify, research and recommend appropriate guidance regarding:
  - a. capacity assessment and adjustment mechanisms;
  - b. regular review for all aerodromes and ATC sectors where traffic demand is expected to reach capacity, or is resulting in traffic congestion;
  - c. mechanisms for ATFM data gathering, collation and sharing between States, International Organizations and ICAO, which may include:
    - i. capacity assessments, including factors affecting capacity such as special use airspace status, runway closures and weather information;
    - ii. traffic demand information which may include flight schedules, flight plan data, repetitive flight plan data as well as associated surveillance updates of flight status; and
    - iii. ATFM Daily Plan;
  - d. compliance by airspace and aerodrome users with ATFM and A-CDM measures; and
  - e. any other guidance relevant to the Regional ATFM Framework and Asia/Pacific A-CDM Implementation Plan.
3. Maintain an overview of CDM/ATFM and A-CDM programs being conducted within the Region, with a view to facilitating their coordination and alignment, and to promote:
  - a. harmonized procedures;
  - b. Implementation of the performance expectations of the Regional ATFM Framework and Asia/Pacific A-CDM Implementation Plan;
  - c. Interoperability of A-CDM with ATFM
4. Review the effectiveness of existing and planned ATFM and A-CDM programs in the Asia and Pacific Region, and make specific recommendations regarding ATFM, including any adjacent airspace affecting the Asia and Pacific Regions, and research and recommend appropriate mechanisms for the on-going review of such programs.

5. The Group coordinates closely with other relevant bodies such as ~~the Airport Collaborative Decision Making Task Force (APA CDM/TF)~~, Airport Operations and Planning Sub-Group, the Meteorological Requirements Working Group (MET R/ WG and System-Wide Information Management Task Force (SWIM/TF).
6. The Group reports to the ATM Sub-Group.

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