ICAO APAC Webinars – Fundamentals of ANS

Airport Collaborative Decision Making *(A-CDM)*

Mr. Fredrik Lindblom, CANSO SME
Mr. Punya R. Shakya, Regional Officer, AGA

SPEAKER - Fredrik Lindblom

M.Sc. in Digital Communication Systems and IT

~19 year in Air Traffic Management and Airport Ops.

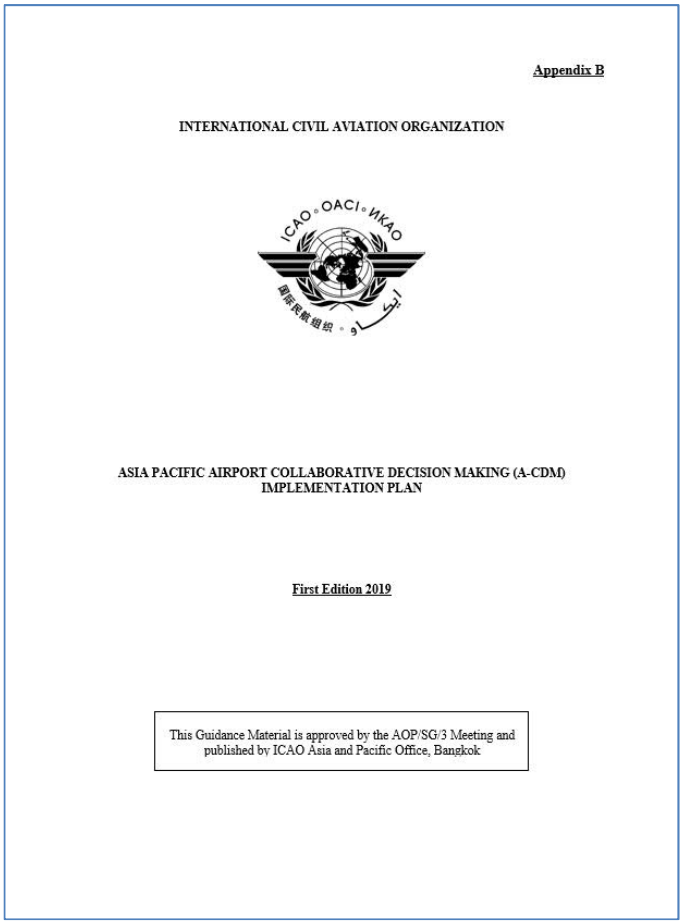
- Swedish ANSP, LFV for 12 years.
- Started working on A-CDM back in 2007
- Worked on related development for DMAN & AMAN.
- A-SMGCS and Remote/Digital TWR
- Product Manager from Saab's CDM & Efficiency product suite, now Sales Director in APAC
- Supported airports and ANSP to developing and implementing A-CDM Concept and system solutions in
- Trained ~1400 users on A-CDM

Co-chair of the CANSO ATFM/A-CDM workgroup

- Supporting the work of A-CDM Guidance material and "how to measure benefits for ANSP after implementing A-CDM" and "ATFM to A-CDM integration guidelines"

Part of the ICAO APAC A-CDM Tasks Force as SME for CANSO

What We Will Cover Today



Appendix B

INTERNATIONAL CIVIL AVIATION ORGANIZATION

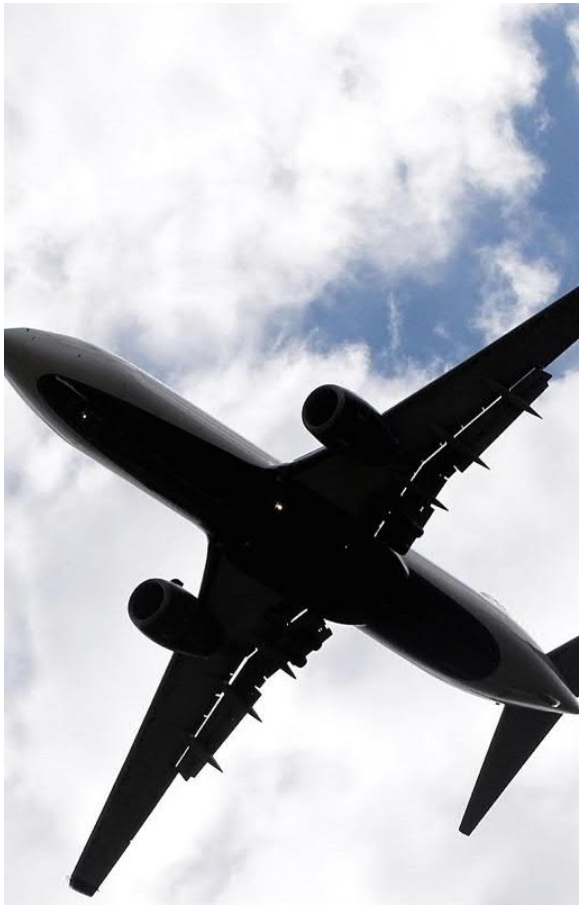
ASIA PACIFIC AIRPORT COLLABORATIVE DECISION MAKING (A-CDM) IMPLEMENTATION PLAN

First Edition 2019

This Guidance Material is approved by the AOP/SG/3 Meeting and published by ICAO Asia and Pacific Office, Bangkok

- Quick Facts on A-CDM
- Why A-CDM and Benefits
- What is A-CDM?
  - What is it REALLY about
  - "Building Blocks"
- "Best Practices" when implementing A-CDM
- Expectations of ICAO
- Focus Going Forward for A-CDM Task Force
- Q&A Session

Quick Facts



- ✓ Airport CDM (A-CDM) aims at **improving the overall efficiency of airport operations** by **optimizing** the use of resources and improving the **predictability** of events.
- ✓ It focuses especially on **aircraft turn-round and pre-departure sequencing processes.**

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Quick Facts

A-CDM = Airport Collaborative Decision Making

It is a concept of operations originally defined by Eurocontrol

- **29 European airports are fully A-CDM "compliant" and more are to come**
- **In APAC 50 airports are operating to A-CDM procedures (varying degree).**
- **Airports in ME, South America and Africa are starting to adopt A-CDM**

INTERNATIONAL DOCUMENTS & STANDARDS

- *ICAO Doc 9971: Manual on Collaborative Air Traffic Flow Management (ATFM)*
- ***APAC A-CDM Implementation Plan***
- *CANSO Guidelines*
- Airport CDM Implementation Manual Version 5
- *Eurocae Specifications:*
  - *ED - 141MinimumTechnicalSpecification for Airport-CDM*
  - *ED-145 Airport CDM Interface Specification*
  - *ED-146 Guidelines for Test and Validation related to A-CDM interoperability*

THE NEED for A-CDM?!?!

- ✓ Inefficiency on the airport due to non-optimised turnaround and sequencing performance
- ✓ Poor punctuality and performance (such as airport start delays)
- ✓ First come first served principles for start-up which specifically lead to poor sequencing that impacts airport throughput
- ✓ Lack of transparency on overall airport plan, or lack of a 'single version of the truth‘
- ✓ Poor compliance to Estimated Off Block Time (EOBT) and non-compliant ICAO Filed Flight Plans (FPL)
- ✓ Long taxi queues and non-optimized throughput
- ✓ Poor interface with handling agents where airlines do not have access to real time systems on turnaround and delay status.
- ✓ Poor recovery of airport after disruption.

A-CDM BENEFITS

http://www.eurocontrol.int/publications/a-cdm-impact-assessment

Local Airport Benefits

- Average taxi-out time savings between 0.25 and 3 minutes per departure.
- Average schedule adherence improvements between 0.5 and 2 minutes per flight.
- Reduction in push-back delays after start-up approval.
- Improved ground handling resource utilisation.
- Reduction in the number of late stands and gate changes.
- Increased ATFM slot adherence.
- Increased peak departure rates at the runway.
- Improved management of and recovery from adverse conditions.
- Improved take-off time predictability by 85% during adverse conditions.

A-CDM BENEFITS

Incheon Airport:

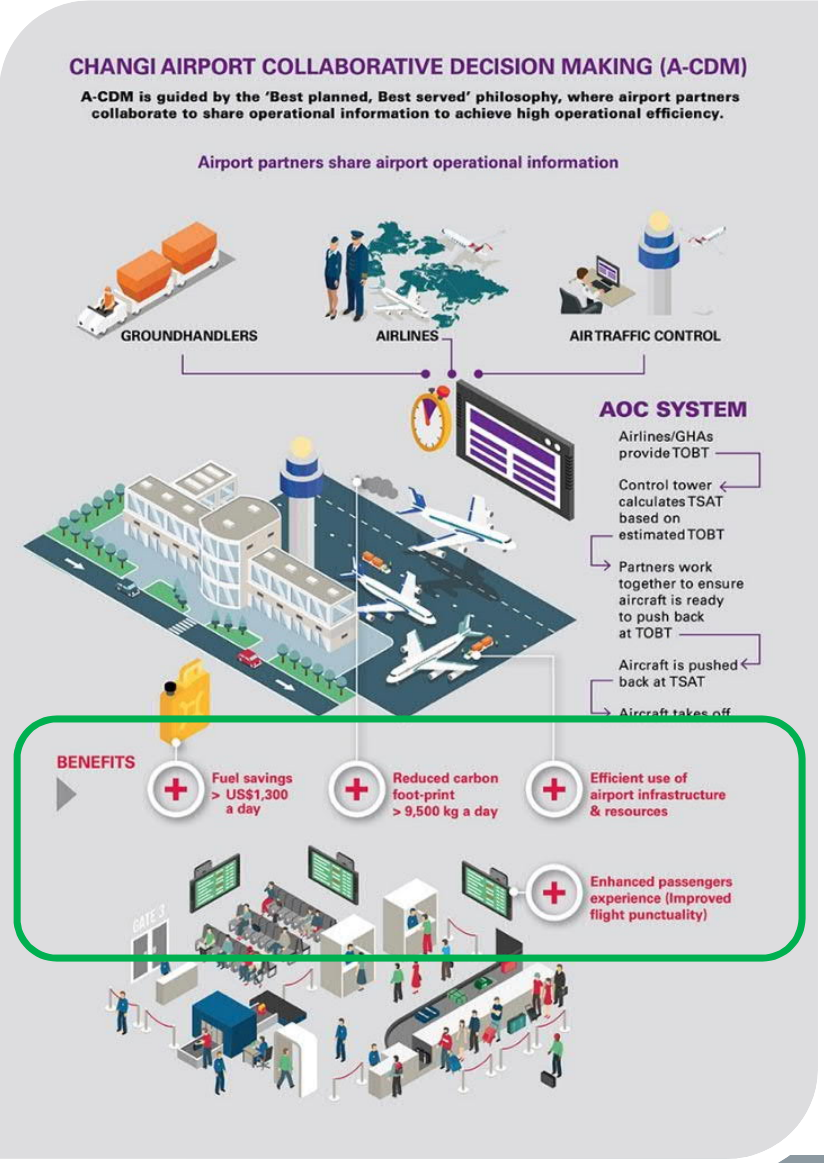
- According to the result of A-CDM operation from Jan. 2018 to Jun. 2018:
  - Average taxi-out time was reduced by 8.1% (1.5 minutes per flight) and;
  - Average taxing fuel was reduced by 9.8% (77 lbs. per flight) comparing to that of 2017 respectively.

Source: Incheon A-CDM Introduction, IP5, ICAO APAC Task Force#3, August 2018.

Mumbai Airport:

- The average fuel saving is observed to be around 1.5 minutes.
- Increased safety due to reduced number of simultaneous aircraft movements on maneuvering area and reduction in R/T congestion
- Optimization of resource utilization by stakeholders due to enhanced predictability.
- Sharing of information is leading to better terminal activities' management.

Source: Case Study - A-CDM at Mumbai Airport, Part of CANSO A-CDM guidelines, 2016.



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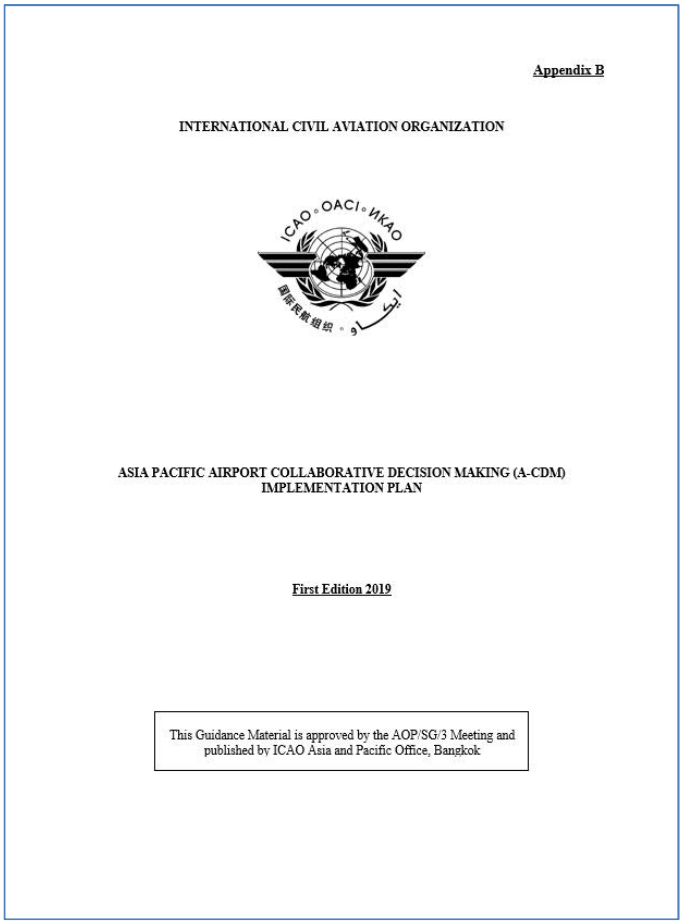

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  - "Building Blocks"
- "Best Practices" when implementing A-CDM
- Expectations of ICAO
- Focus Going Forward for A-CDM Task Force
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What is **Airport Collaborative Decision Making?**

- **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**
- **A-CDM requires collaboration** between **all airport stakeholders**

What is **Airport Collaborative Decision Making?**

”FIRST COME FIRST SERVED” principles

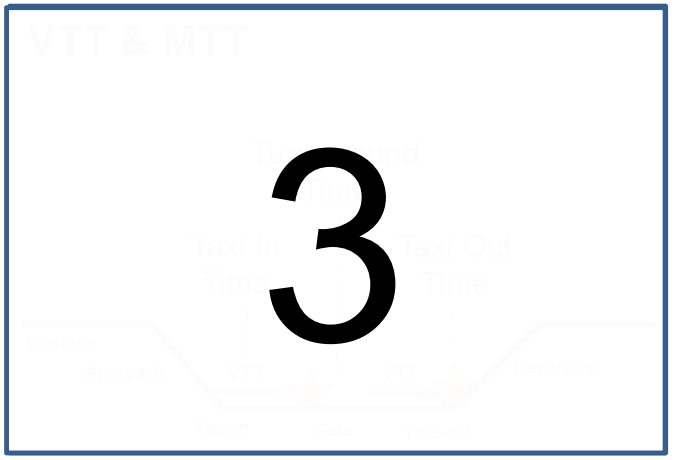
What is **Airport Collaborative Decision Making?**

"BEST PLANNED BEST SERVED"

=

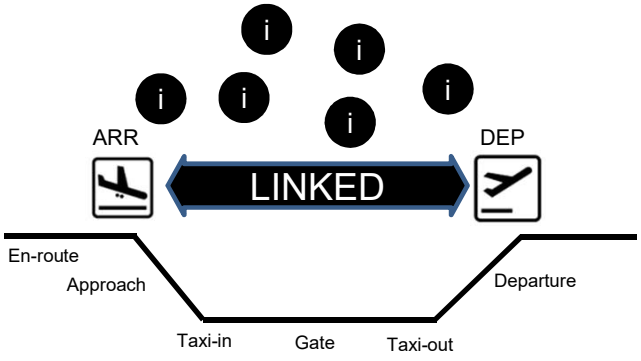
OPERATIONS WITH TOBT & TSAT

A-CDM ”Buildings Blocks”

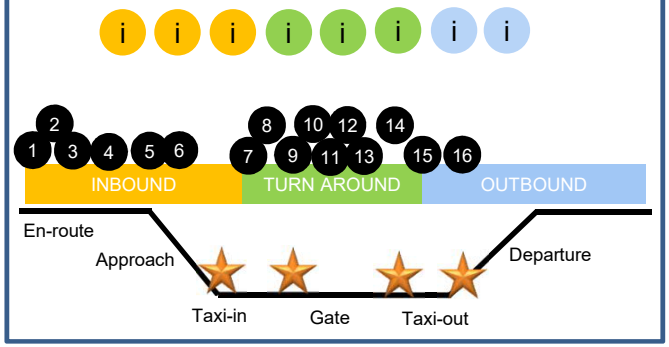


A-CDM ”Buildings Blocks”

Info Sharing



Milestone Approach



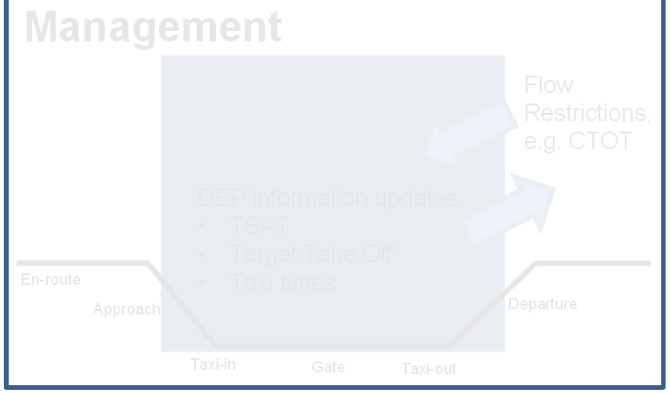
VTT & MTT

Pre-Departure Sequence

CDM in Adverse Conditions

A-CDM creates predictability and common awareness during e.g. typhoons, thunderstorms…de-icing ☺

Integration with Flow Management

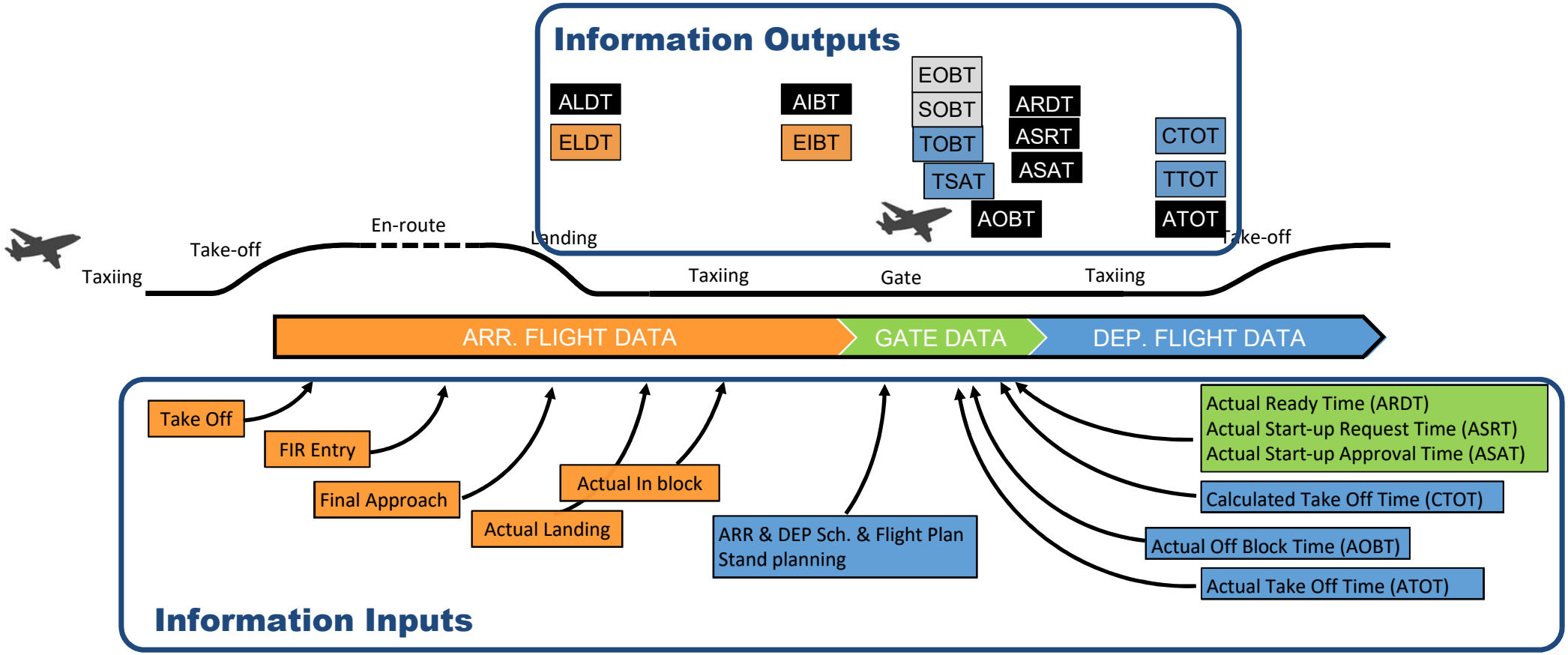


Information Sharing

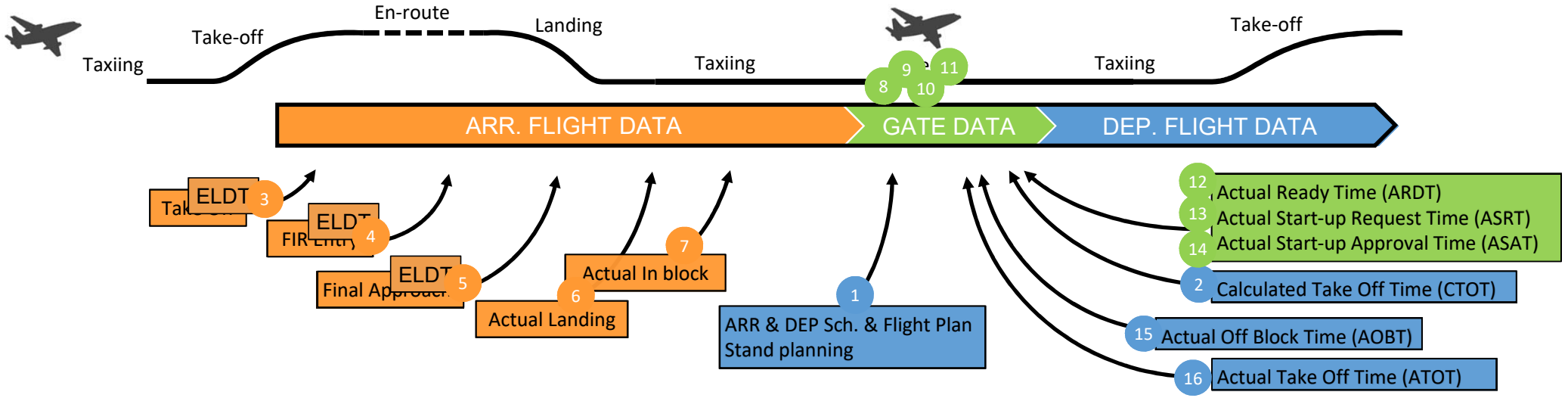
WHAT TIME IS IT?

- ✓ **Single source of the "TRUTH"** – all stakeholders look at the SAME information.

Information Sharing = Info Outputs & Inputs

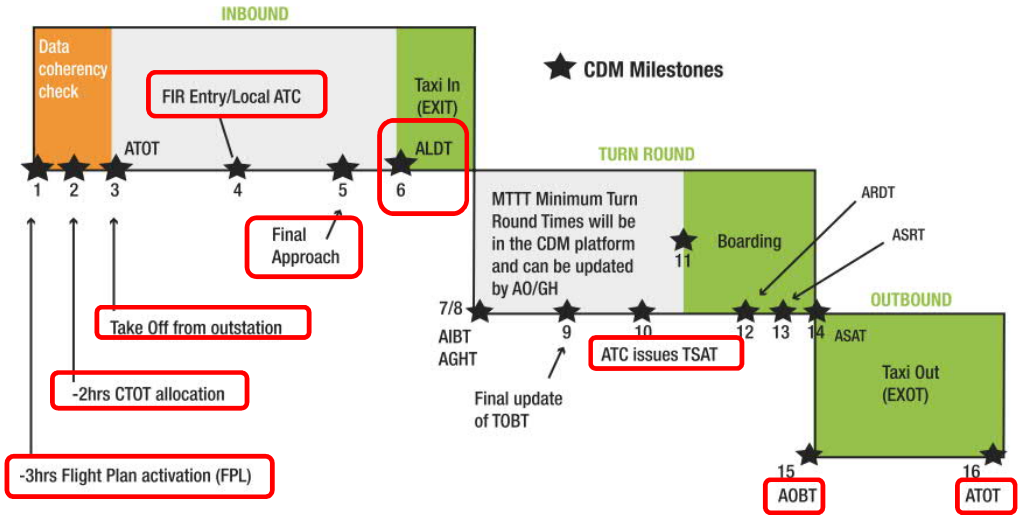


Milestone approach

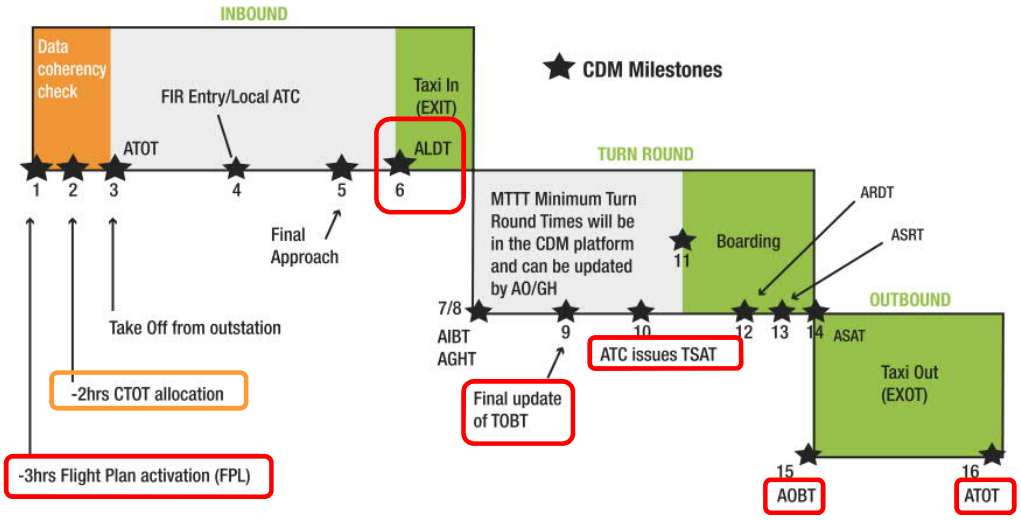


Milestone approach

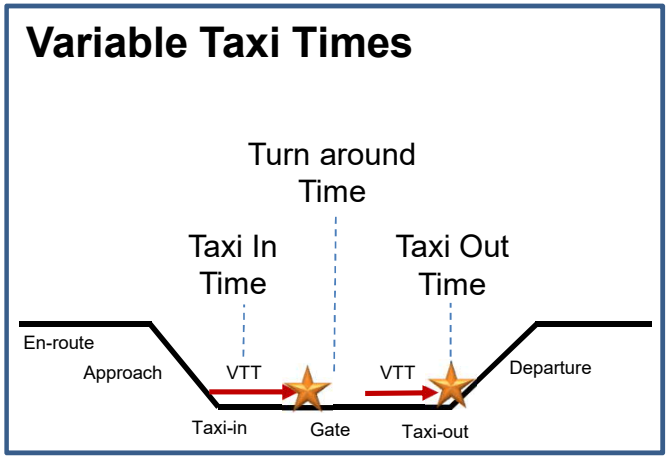
EUROCONTROL = 10 Mandatory

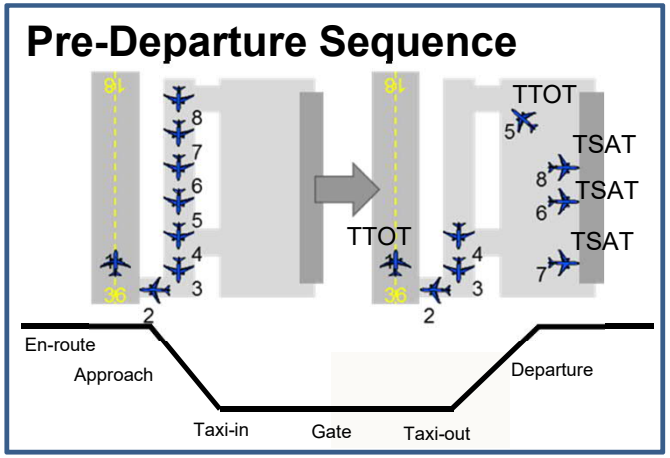


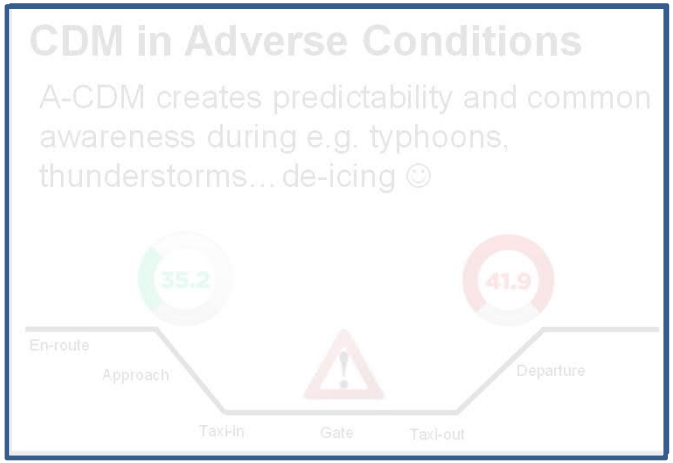
ICAO APAC = 6 (+1) Mandatory

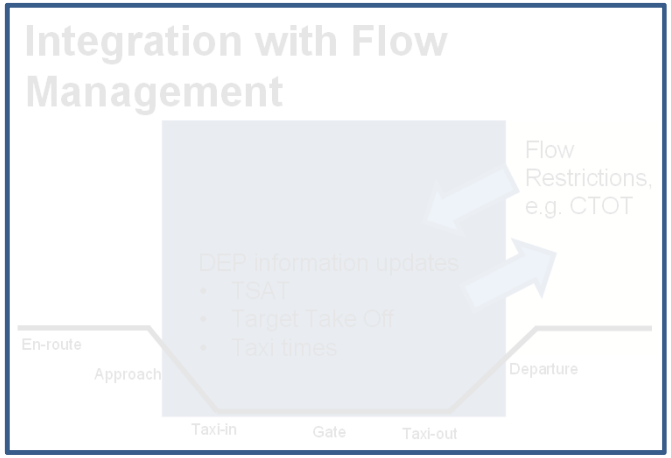


A-CDM ”Buildings Blocks”

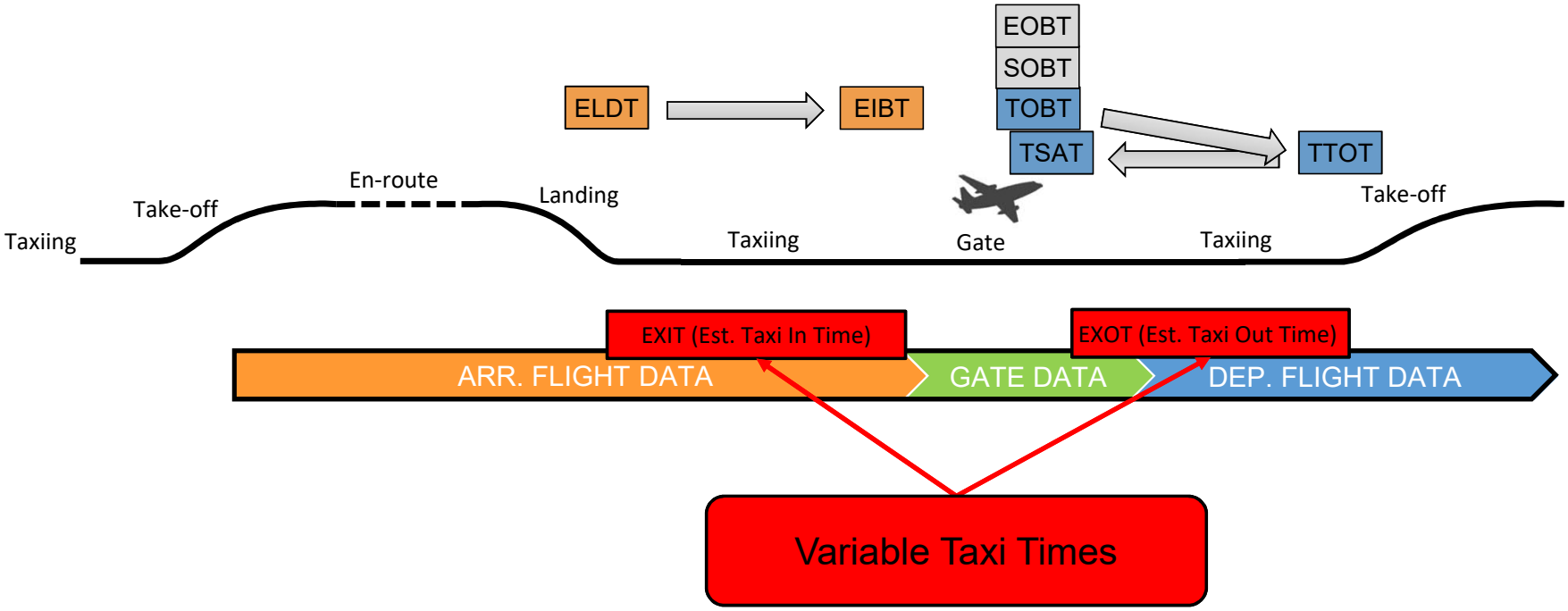








Variable Taxi Times (VTTs)

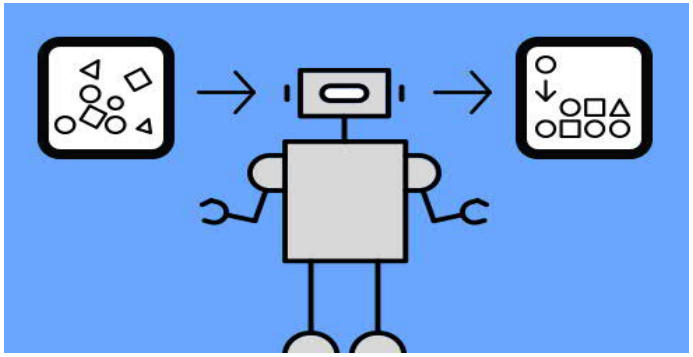


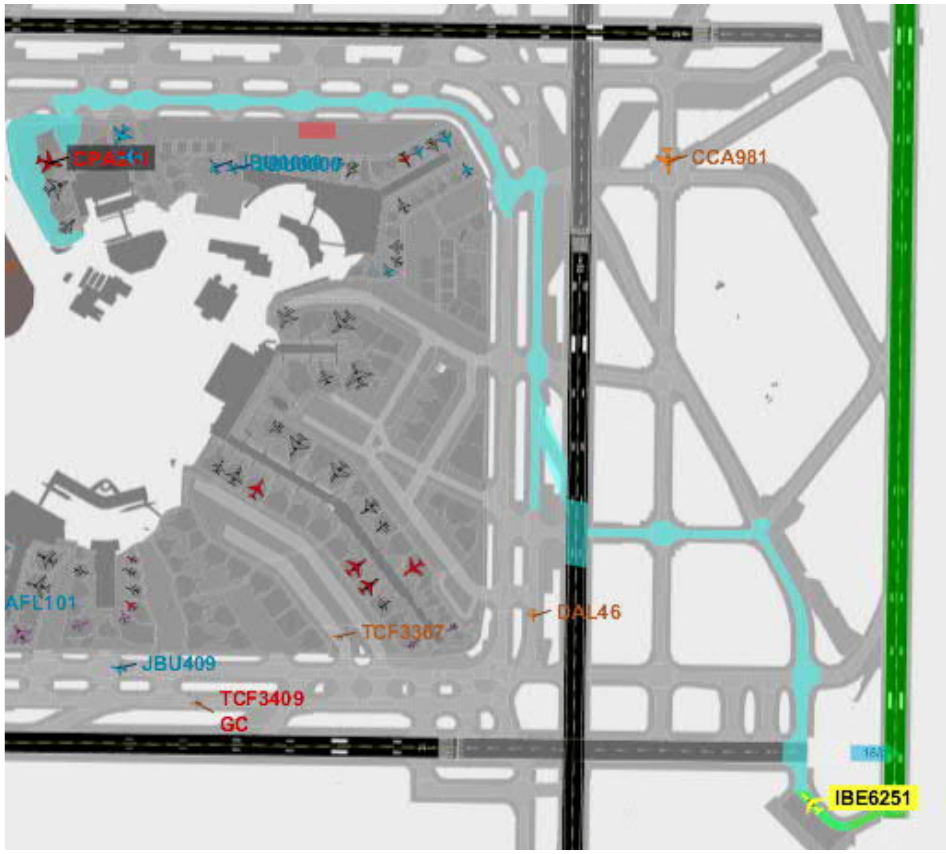
Variable Taxi Times (VTTs)

”Table Look Up”

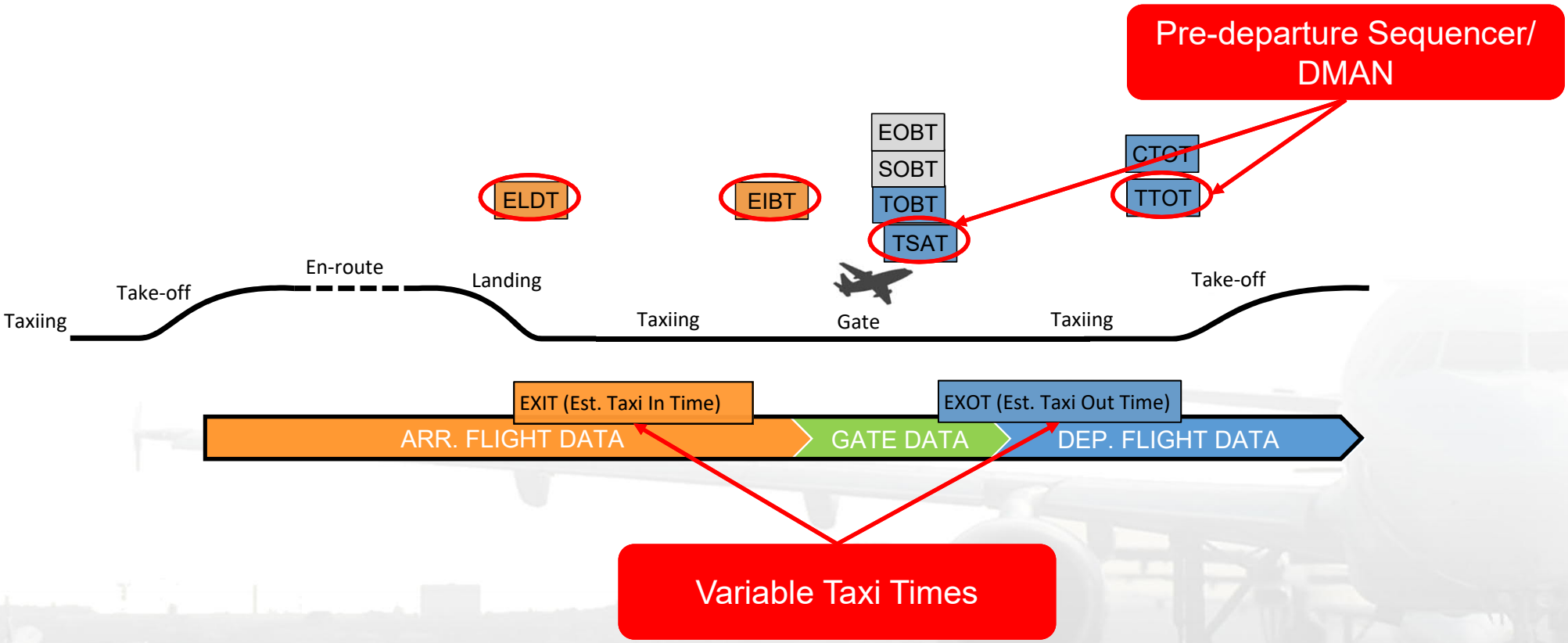
	RWY 1	RWY 2
Gate X	05:00	07:00
Gate Y	07:00	06:00
Gate Z	12:00	14:00

”Machine Learning”





Pre-Departure Sequencing

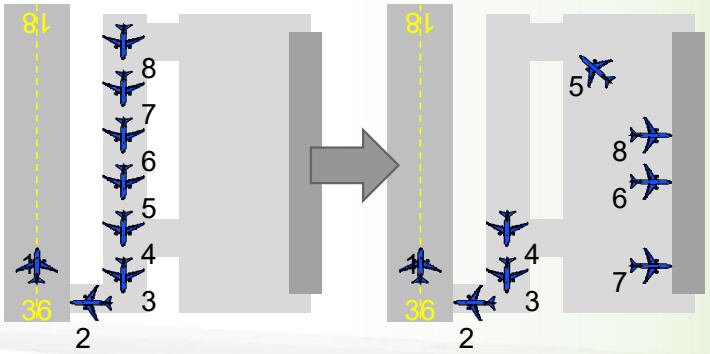


Pre-Departure Sequencing

PDS/DMAN two key features:

- Establish a pre-departure sequence;
- Create an optimized runway departure sequence

Physical Queue



Virtual Queue to save taxi time and fuel

ORIGINAL SEQUENCE		
ACID	WC	DFIX
JBU87	L	WAVEY
DAL42	S	MERIT
DAL98	H	MERIT
AAL50	H	RBV
JBU11	L	RBV

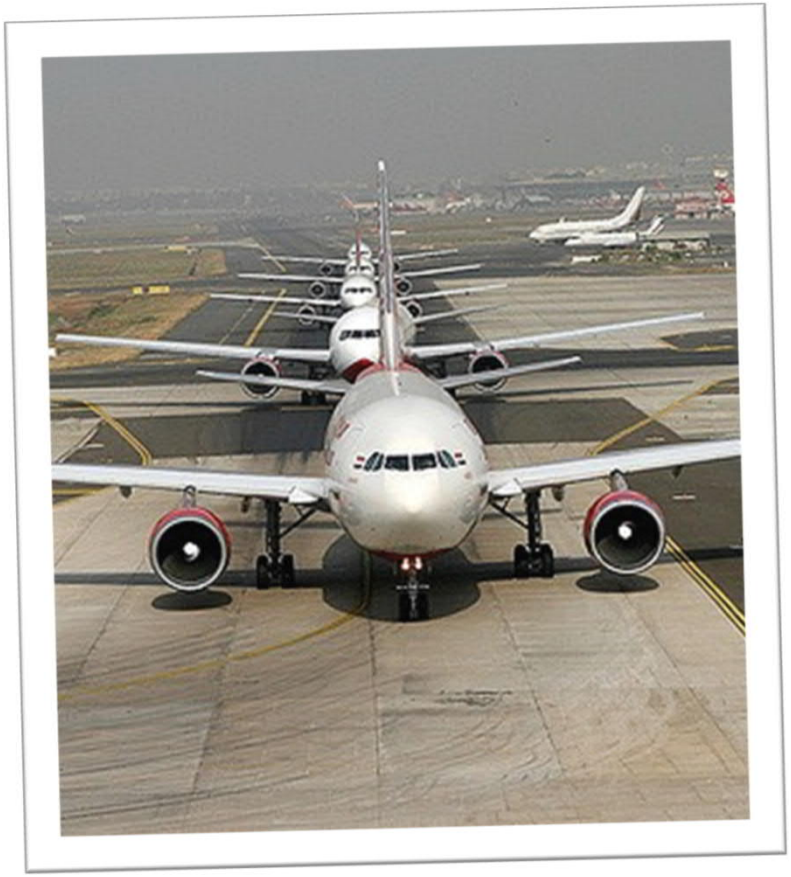
MODIFIED SEQUENCE		
ACID	WC	DFIX

Improved runway throughput & reduced delay

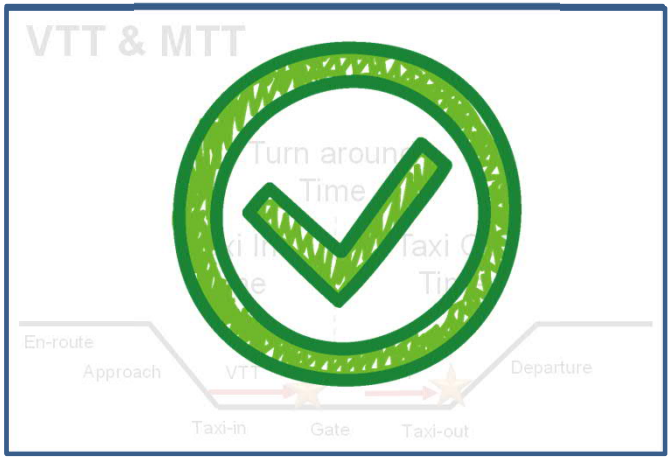
TSAT & TTOT

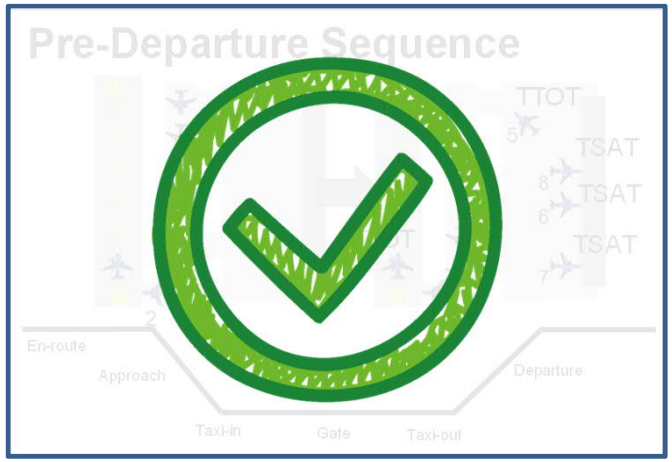
Pre-Departure Sequencing

- **The PDS/DMAN bases its TSAT and TTOT calculation using the following parameters:**
  - TOBT
  - Estimated Taxi Out Times (EXOT)
  - Runway configurations
  - Departure Rates
  - De-icing operations
  - ATFM CTOT
  - Aircraft type/Wake turbulence category
  - Arrival flights (taking ELDT/ALDT into account)
  - Airborne restrictions (closed fixes, minutes or miles in trail restrictions)
  - Runway closures and other closures (e.g. taxi ways etc.)
  - Standard Instrument Departures (SIDs)
  - Routing from A-SMGCS



A-CDM ”Buildings Blocks”





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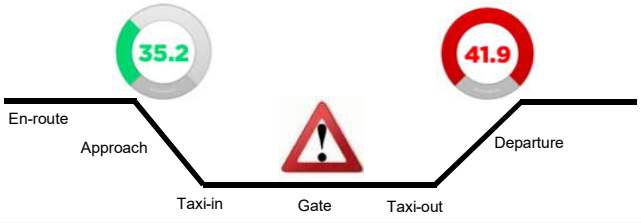
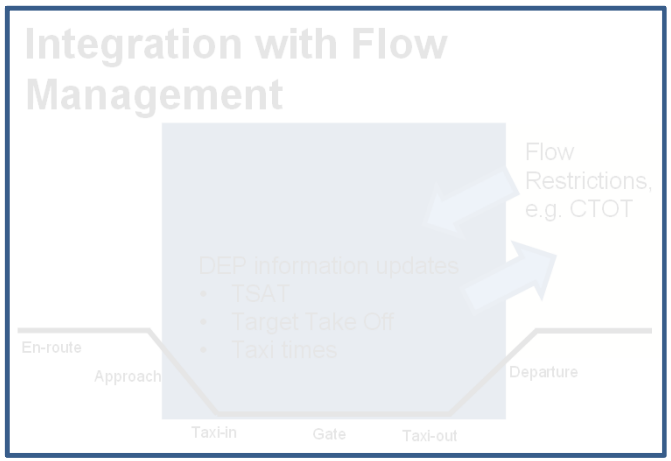
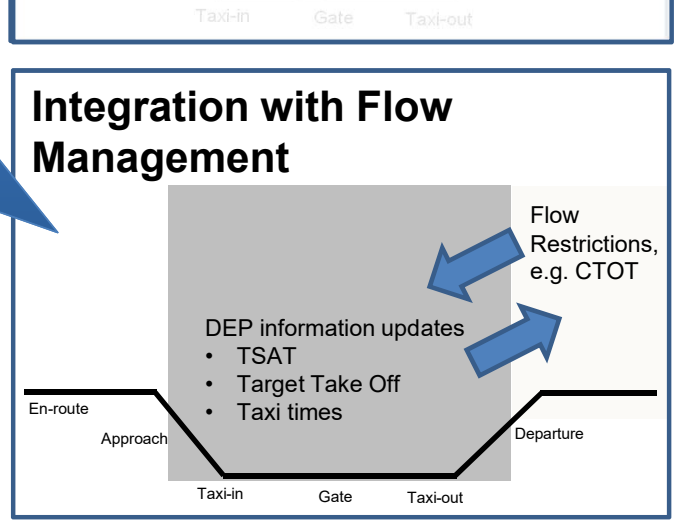




A-CDM ”Buildings Blocks”

- VERY WELL defined, tested and implemented in EUROPE!
- Outside of Europe the ATFM Concepts look different – **FOCUS FOR ICAO & CANSO GOING FORWARD**



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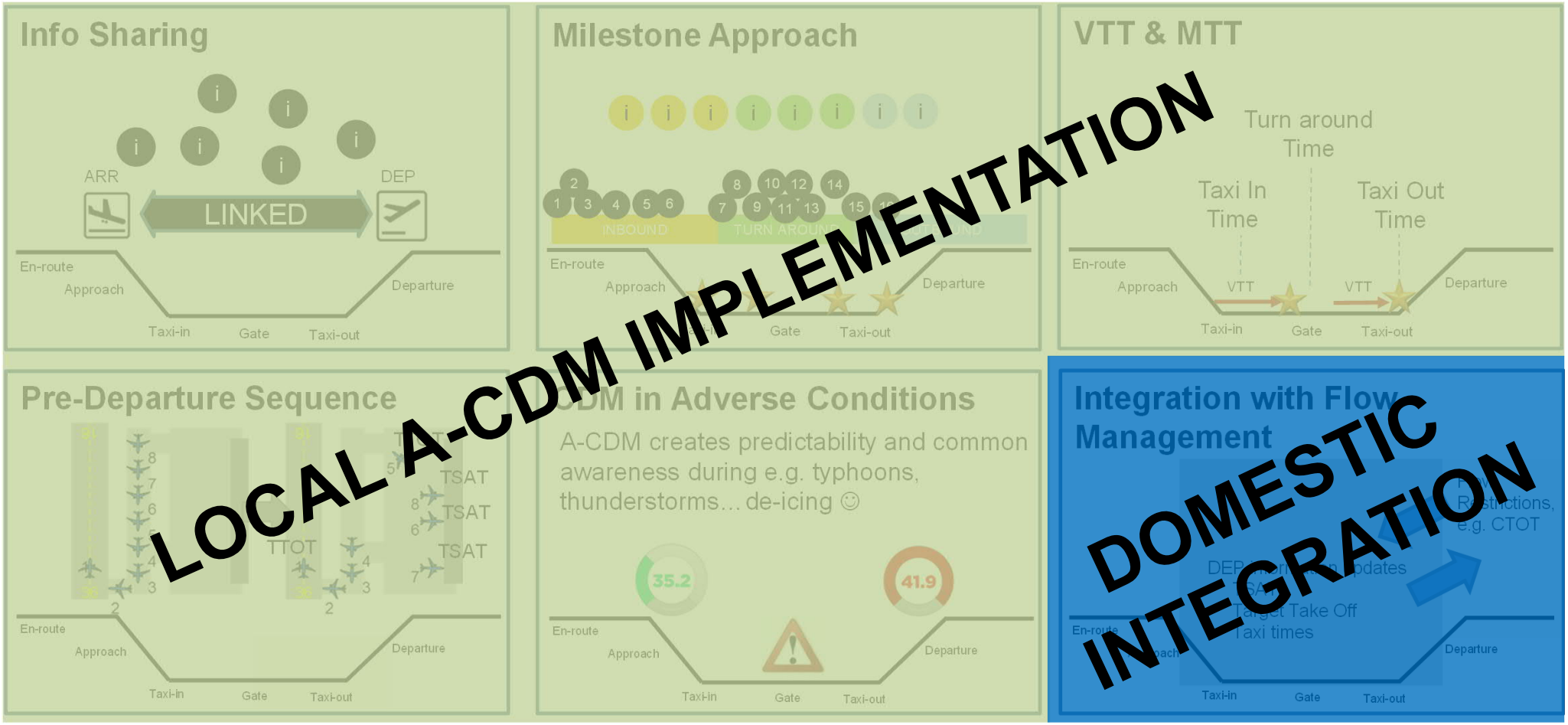

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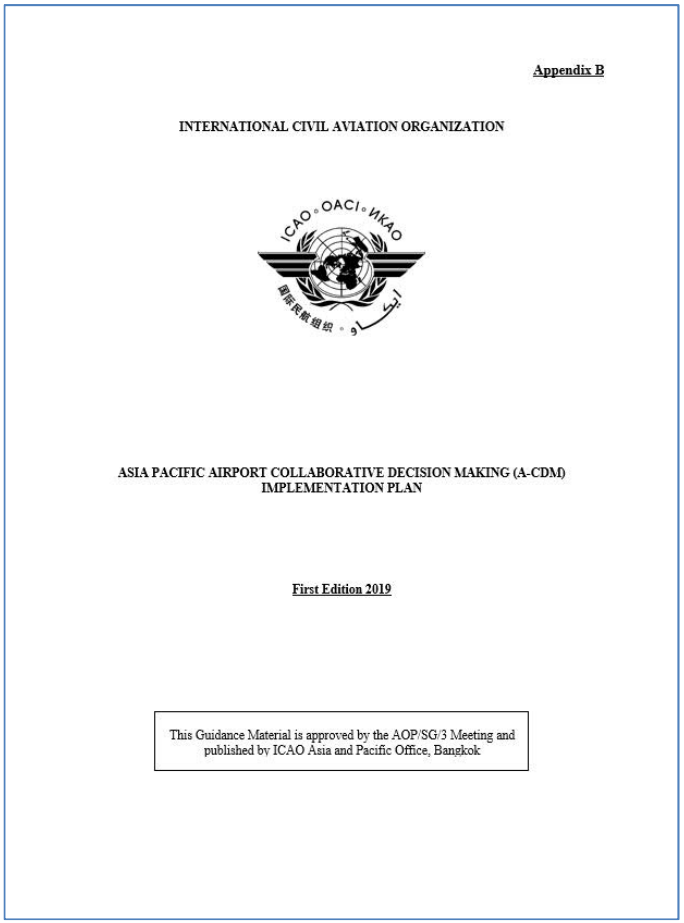

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- Expectations of ICAO
- Focus Going Forward for A-CDM Task Force
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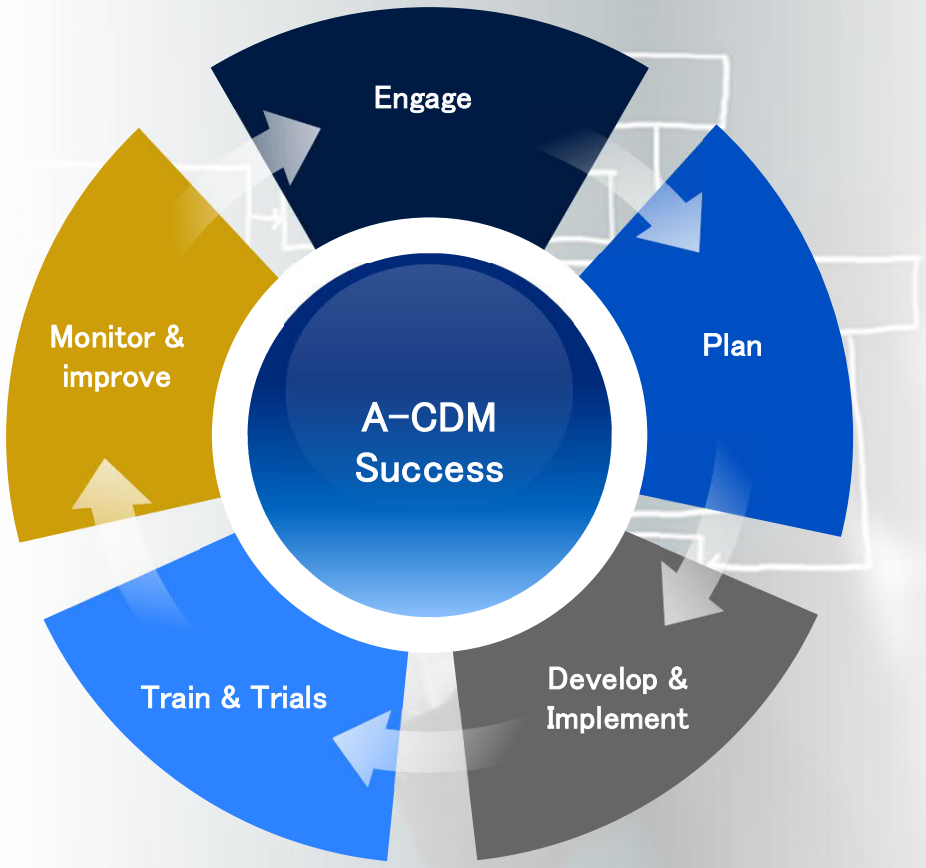
“Best Practices” when implementing A-CDM

- ✓ **Bring in all stakeholders from the start!**
- ✓ **Commonly define and agree on strategic objectives**
- ✓ **MOU?**



Get TOP Management onboard!

1. Establish a Steering Committee incl **ALL Stakeholders**

2. Agree on…

Agree on WHY!!! – SET STRATEGIC OBJECTIVES

Reduce taxi times

- Target 1-min annual reduction
- Target 3 mins reduction by 2021
- Reduction of carbon emission by 28,800 tons

Increase on time performance

- Common target for all service providers

Improved passenger experience

- Improve passenger experience under flow control

Maximize Runway Capacity

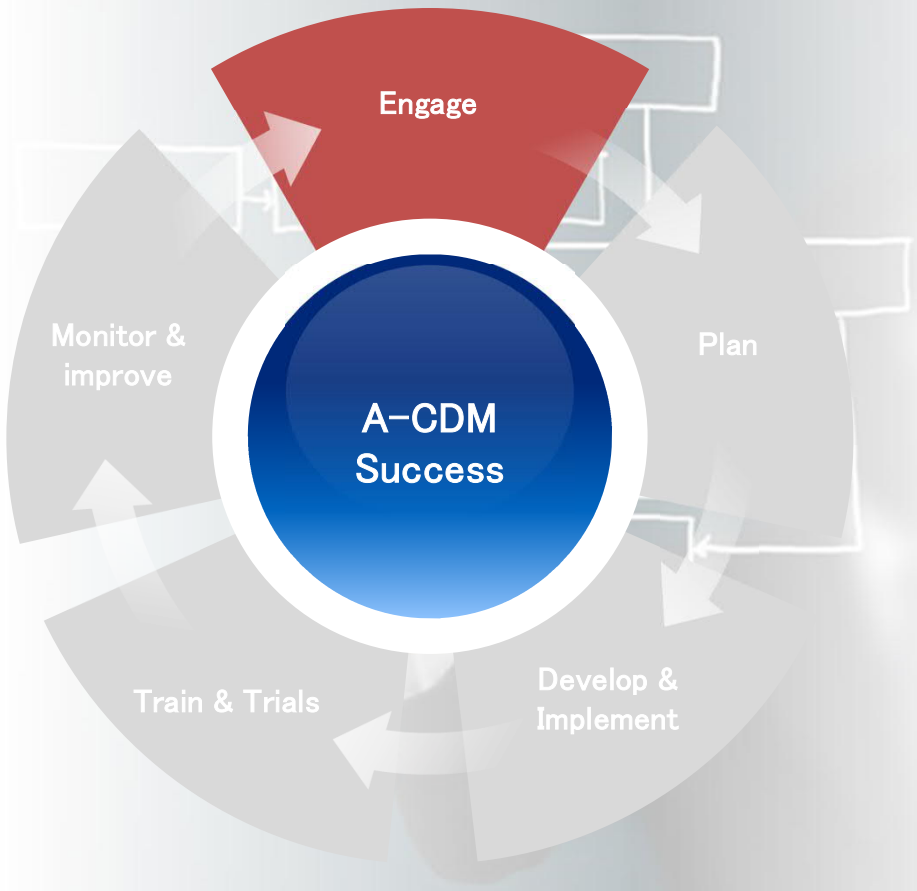
Get TOP Management onboard!

3. Set the high-level “rules of engagement”…

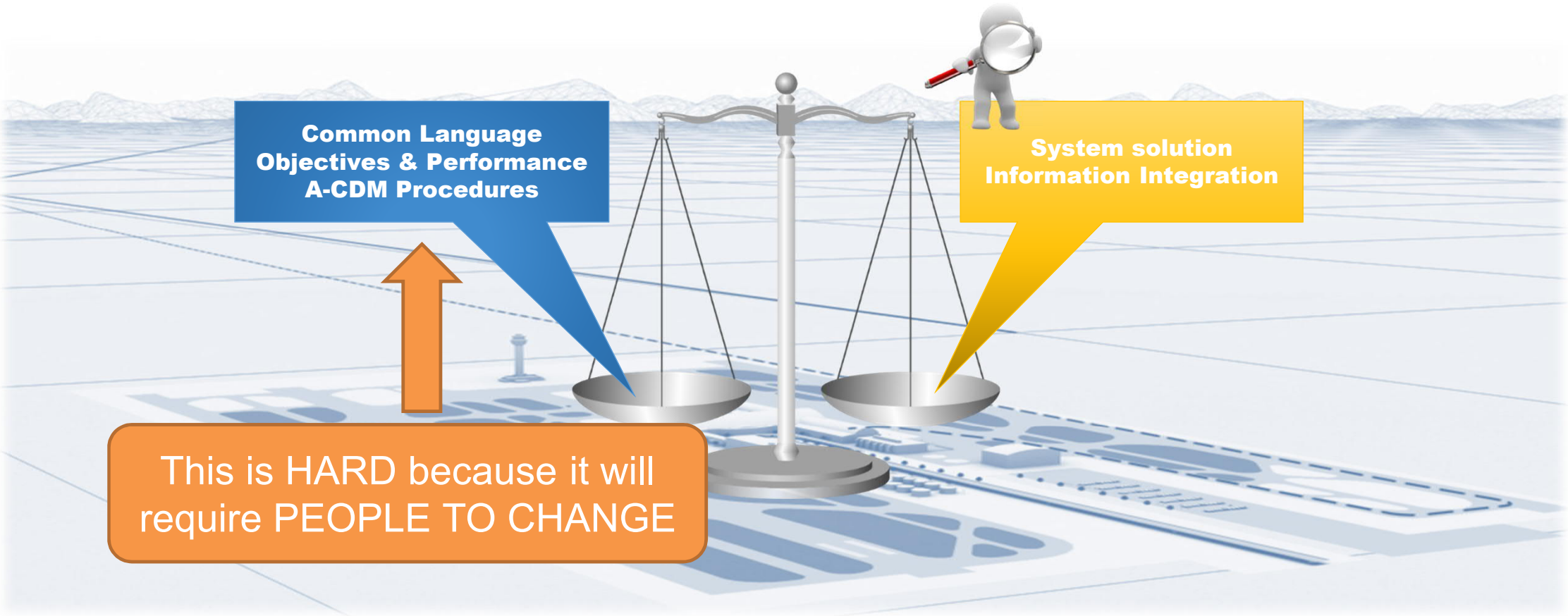
Memorandum of Understanding (MoU)

“Best Practices” when implementing A-CDM

- ✓ **Understand the challenge**
- ✓ **Address all aspects**
- ✓ **Create the organization that shall lead and manage the program**
- ✓ **Do not underestimate the time it takes**

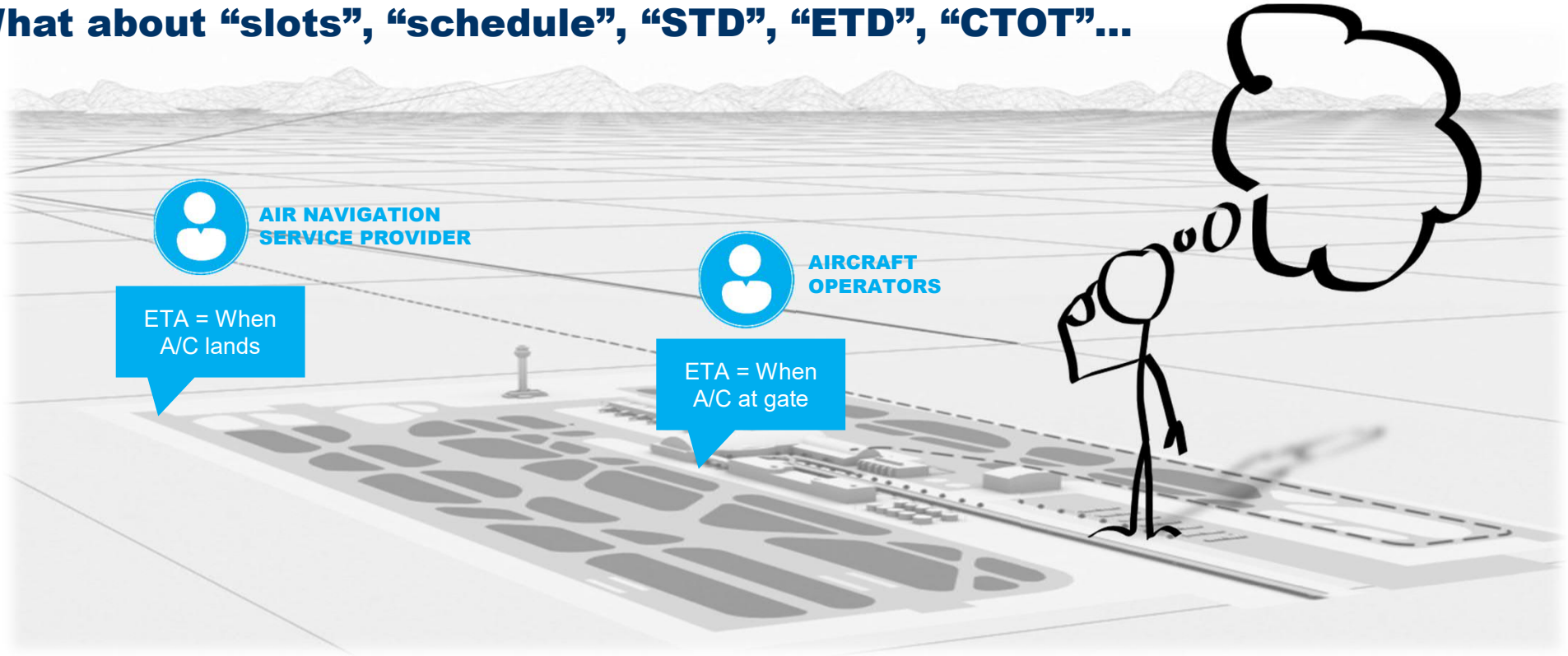


This is NOT an IT Project ONLY



Common “Language”

- The Estimated Time of Arrival (ETA) example. **What is it?**
- **What about “slots”, “schedule”, “STD”, “ETD”, “CTOT”…**

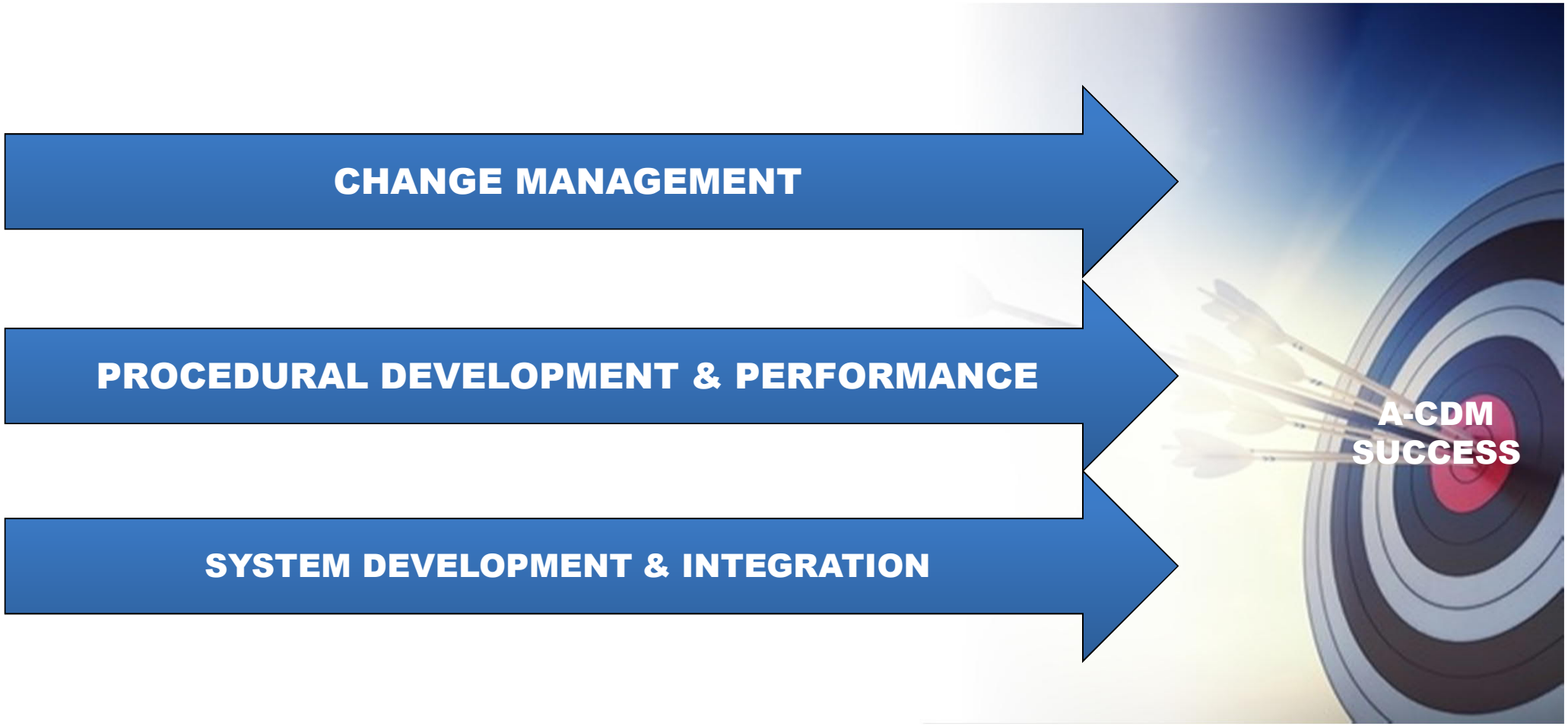


Common “Language”

Acronyms	Definition
ACGT	Actual Commence of Ground Handling Time
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
AGHT	Actual Ground Handling Time
AIBT	Actual In-Block Time
ALDT	Actual Landing Time
AOBT	Actual Off-Block Time
ARDT	Actual Ready Time
ARZT	Actual Ready for De-icing Time
ASAT	Actual Start Up Approval Time
ASBT	Actual Start Boarding Time
ASRT	Actual Start Up Request Time
ATOT	Actual Take-Off Time
ATTT	Actual Turnaround Time
AXIT	Actual Taxi-In Time
AXOT	Actual Taxi-Out Time
CTOT	Calculated Take-Off Time

Acronyms	Definition
ECZT	Estimated Commencement of De-icing Time
EDIT	Estimated De-icing 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
ETOT	Estimated Take-Off Time
ETTT	Estimated Turnaround Time
EXIT	Estimated Taxi-In Time
EXOT	Estimated Taxi-Out Time
MTTT	Minimum Turnaround Time
SIBT	Schedule In-Block Time
SOBT	Schedule Off-Block Time
TOBT	Target Off-Block Time
TSAT	Target Start-up Approval Time
TLDT	Target Landing Time
TTOT	Target Take-Off Time

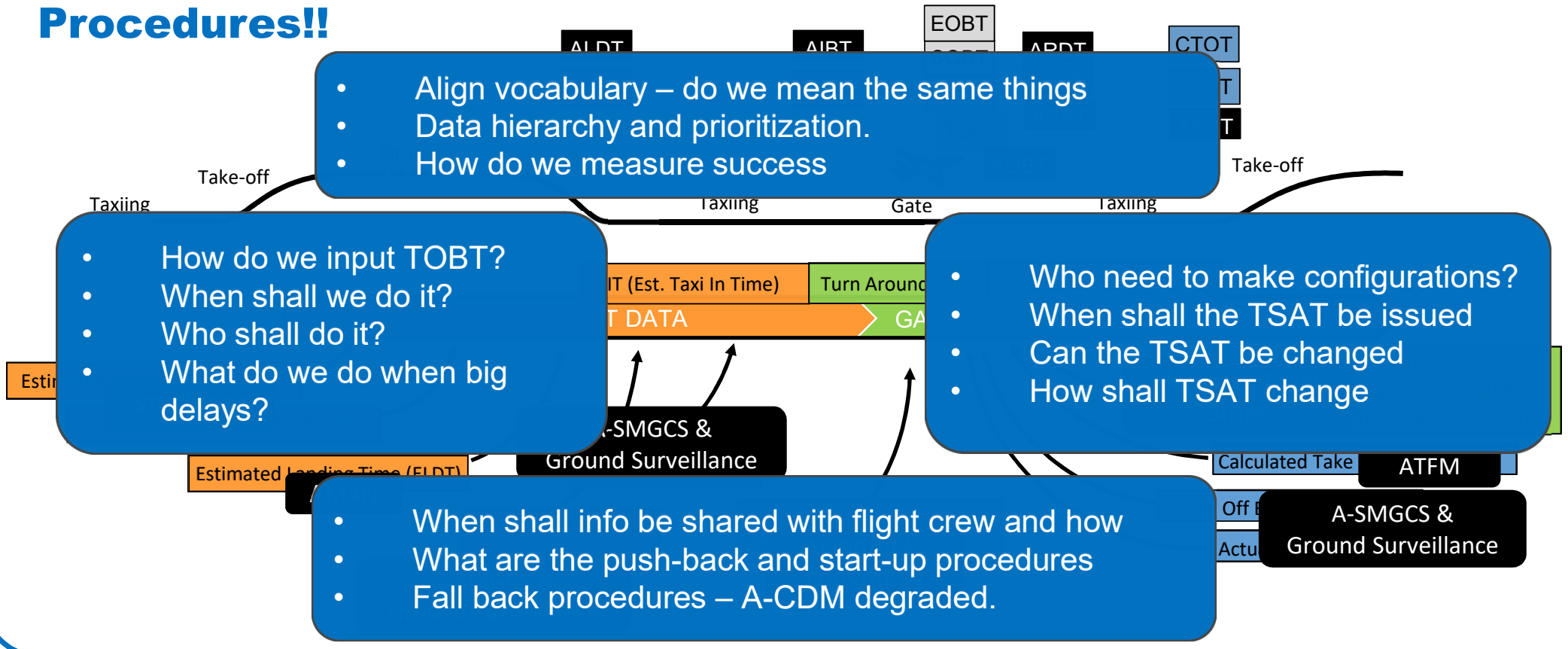
Address ALL aspects!



“Best Practices” when implementing A-CDM

A-CDM PROCEDURES & HARMONIZATION

Procedures!!



- Align vocabulary – do we mean the same things
- Data hierarchy and prioritization.
- How do we measure success

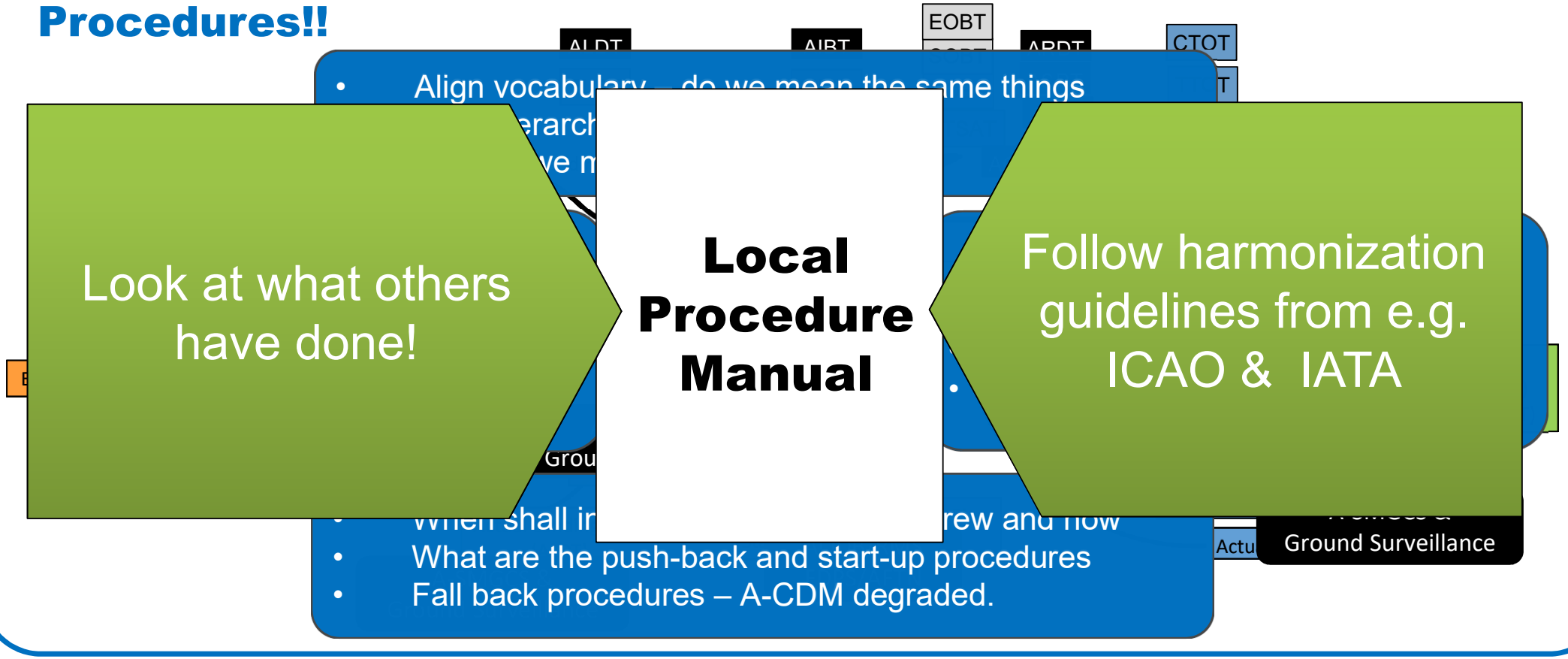
- How do we input TOBT?
- When shall we do it?
- Who shall do it?
- What do we do when big delays?

- Who need to make configurations?
- When shall the TSAT be issued
- Can the TSAT be changed
- How shall TSAT change

- When shall info be shared with flight crew and how
- What are the push-back and start-up procedures
- Fall back procedures – A-CDM degraded.

A-CDM PROCEDURES & HARMONIZATION

Procedures!!

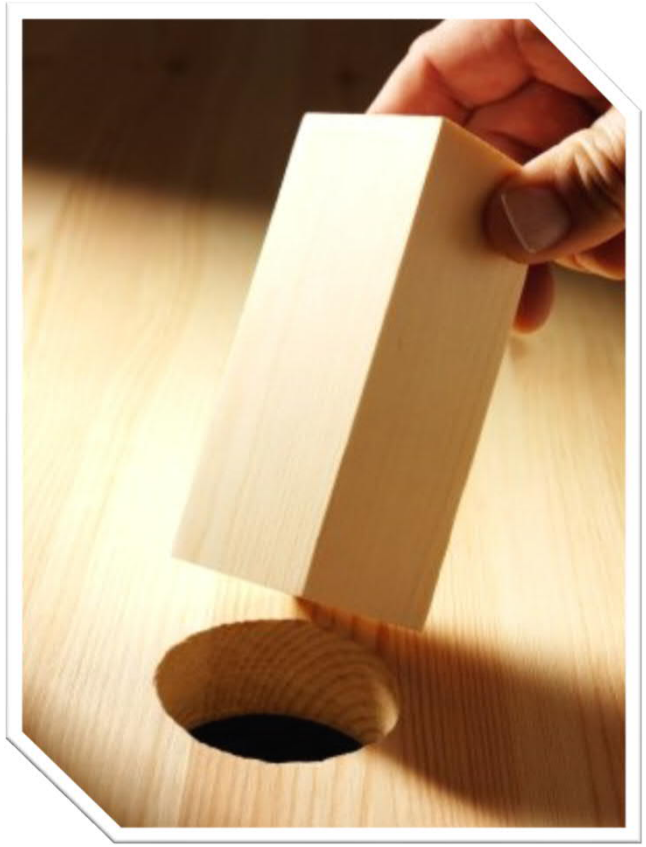


KEY HARMONIZATION ASPECTS

TOBT & TSAT CONFIRMATIONS

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].

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



KEY HARMONIZATION ASPECTS

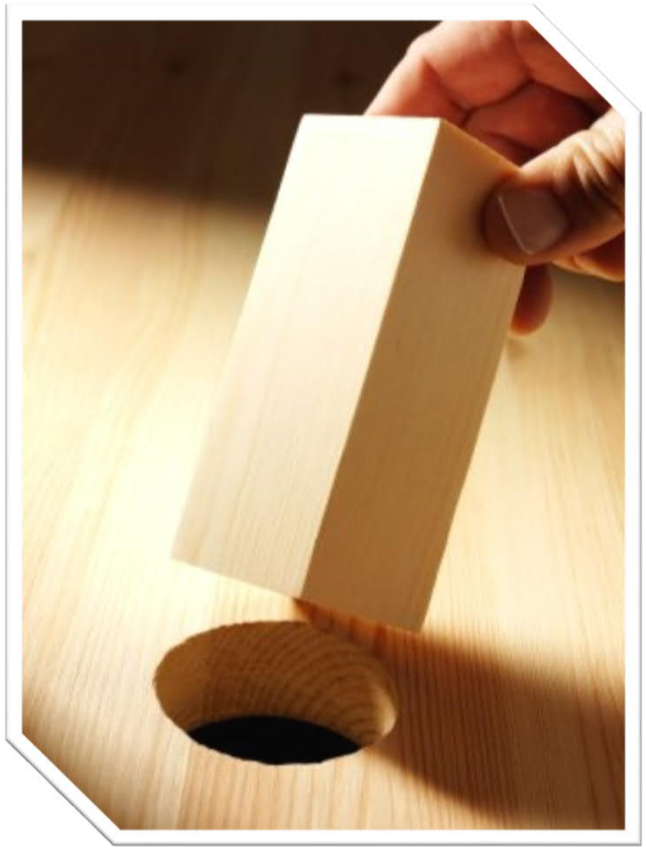
START-UP PROCEDURES

Irrespective of the TSAT, the aircraft should report/be ready for start-up/push-back at TOBT +/- "X3" minutes [X3 is preferably 5].

Pilots should request start/pushback clearance at the TSAT +/- "X4" minutes [X4 is preferably 5].

TOBT UPDATES

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.



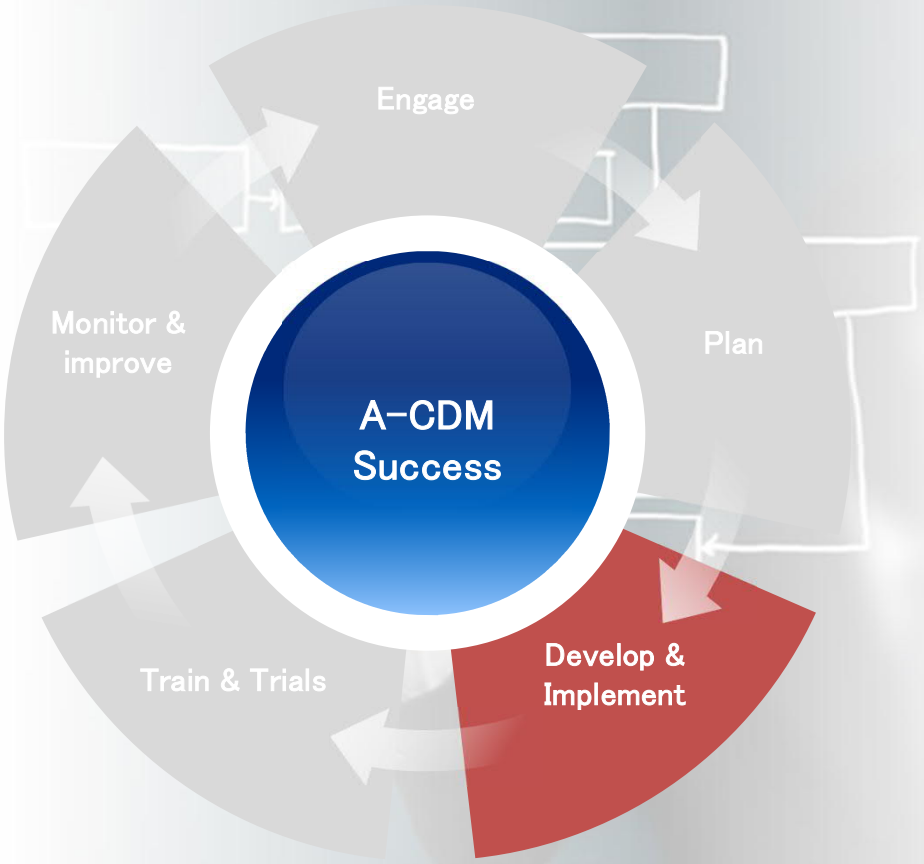
"Best Practices" when implementing A-CDM

TRAINING:

- ✓ **Do not underestimate the training efforts!**
- ✓ **Training needs to be tailored to each role**
- ✓ **Well-timed, close to launch**

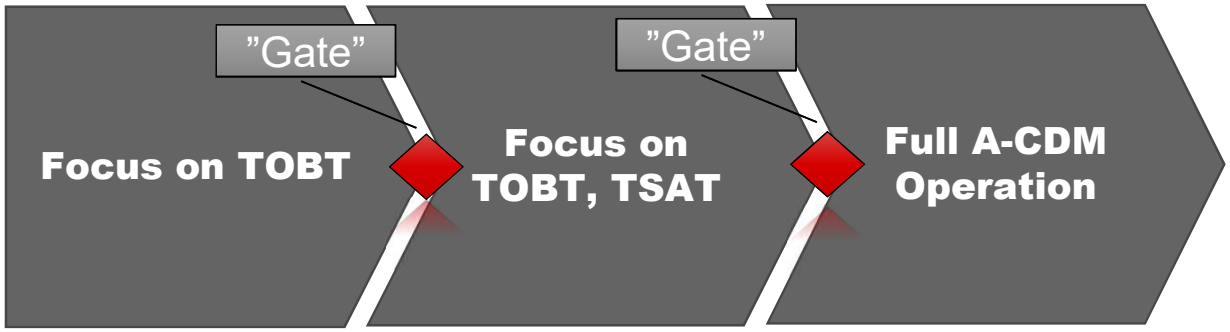
TRIALS:

- ✓ **Let trials take time – changes in procedures takes time to adjust to!**

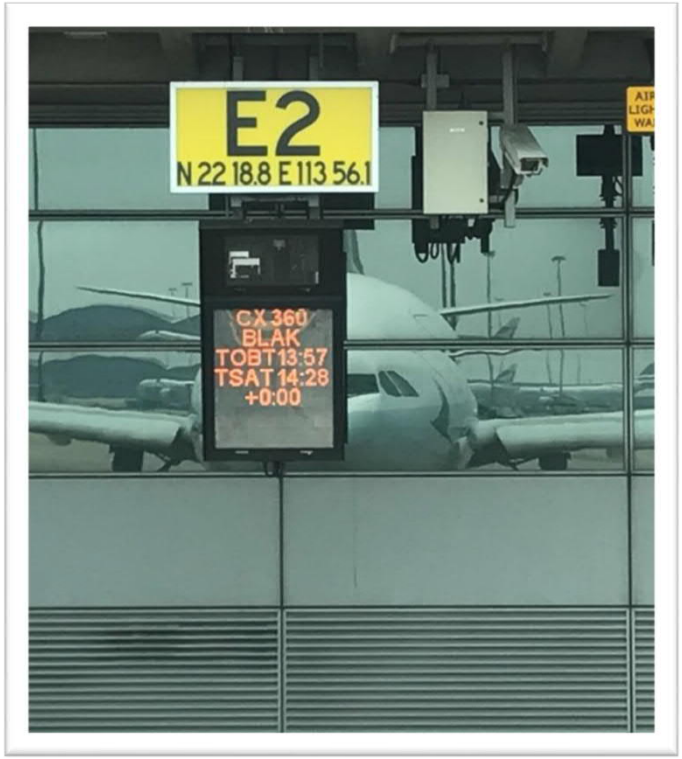


Trials

- Trials are a vital part of A-CDM Implementation
  - Getting used to managing TOBTs and TSAT will take time!
- Phased approach has shown to be successful

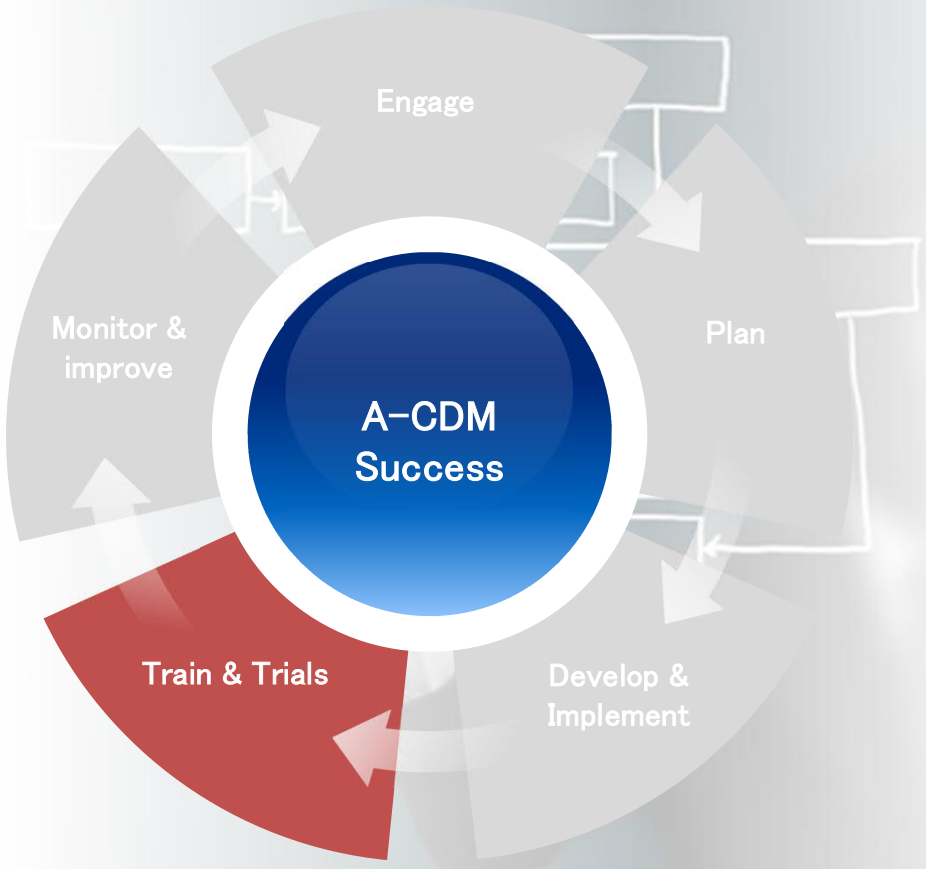


- Let the trials take the time needed!

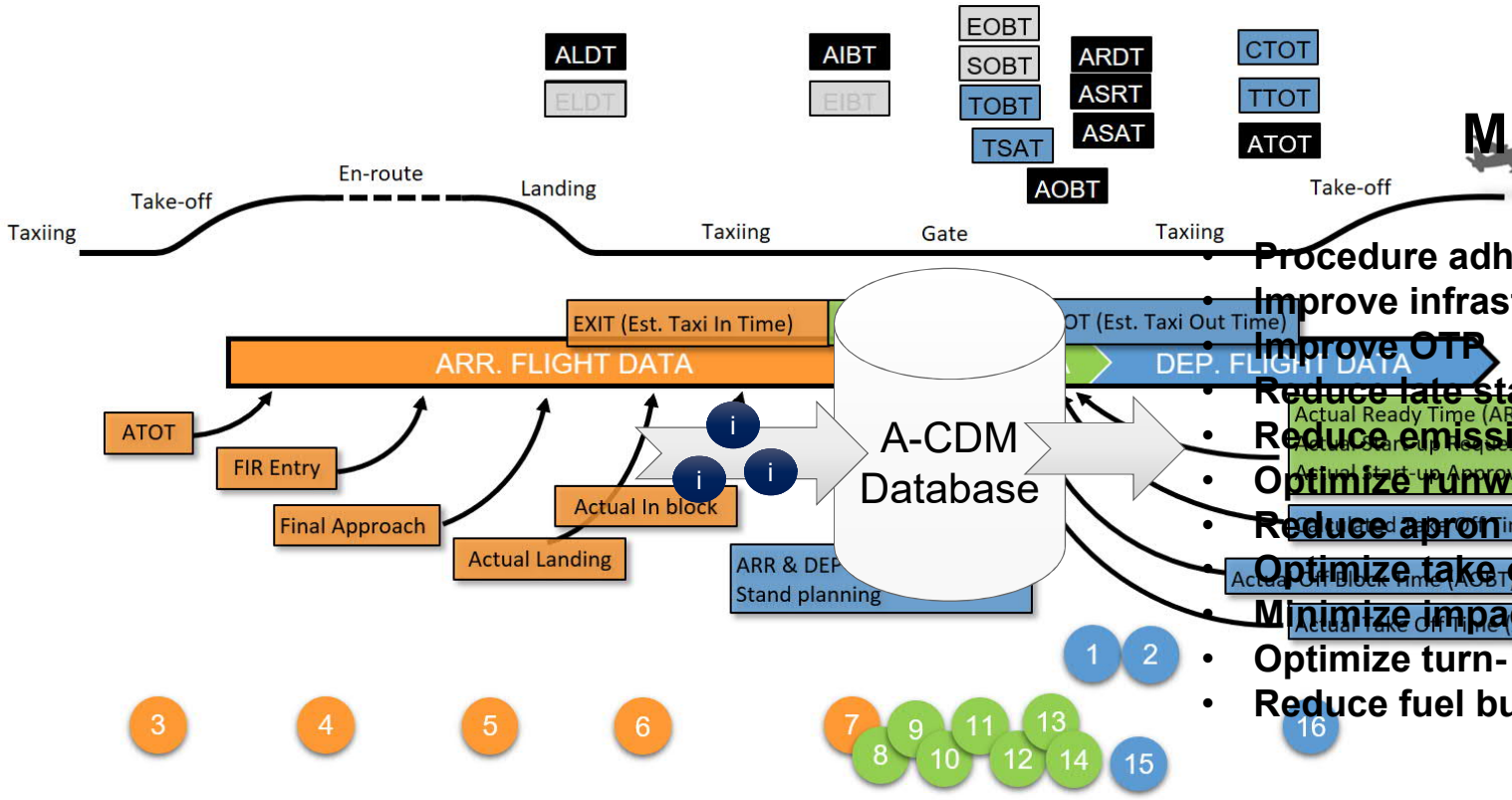


“Best Practices” when implementing A-CDM

- ✓ **Monitoring is an on-going and an essential component in understanding the success and weakness of the A-CDM procedures**
- ✓ **Outcomes and assessments must be shared within the stakeholder group**
- ✓ **If procedures do not meet the expected results and objectives, they need to be improved.**
- ✓ **Move away from BLAME culture**



A-CDM EFFECTIVENESS & PERFORMANCE



MEASURE

- Procedure adherence
- Improve infrastructure usage
- Improve OTP
- Reduce late stands and gate changes
- Reduce emissions at the airport
- Optimize runway throughput
- Reduce apron and taxiway congestion
- Optimize take off and departure queue
- Minimize impact of delays
- Optimize turn- around time
- Reduce fuel burn

A-CDM EFFECTIVENESS & PERFORMANCE

EFFECTIVENESS

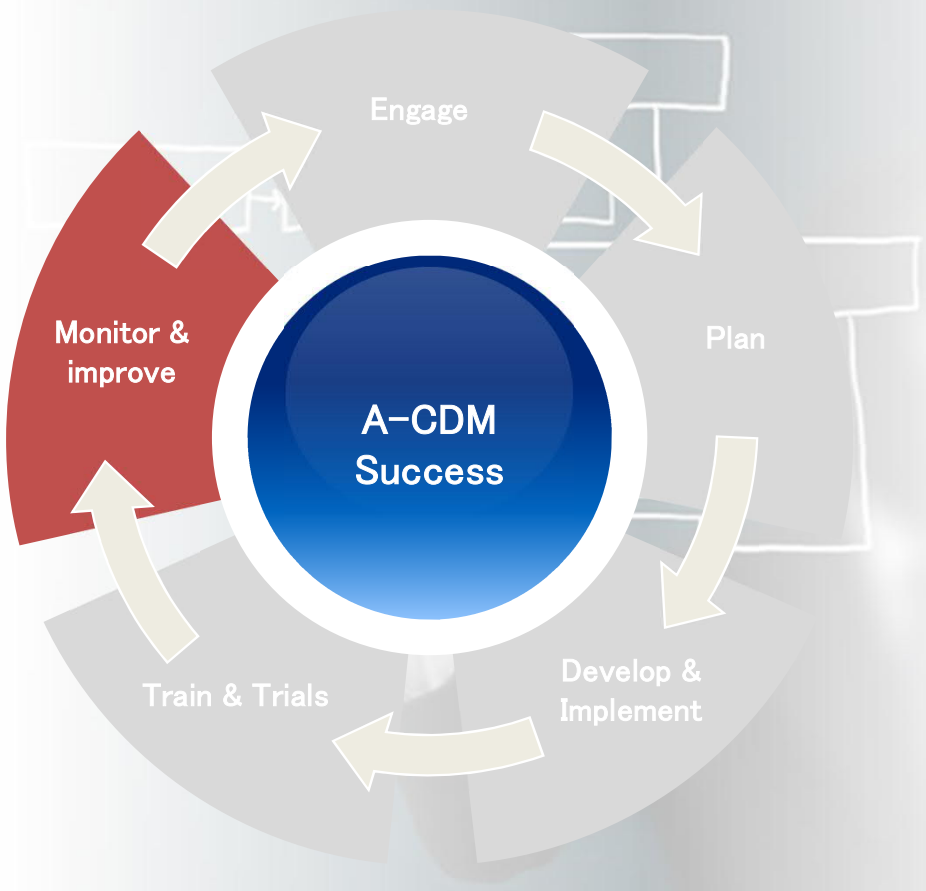
HOW WELL ARE WE COMPLYING WITH PROCEDURES

PERFORMANCE

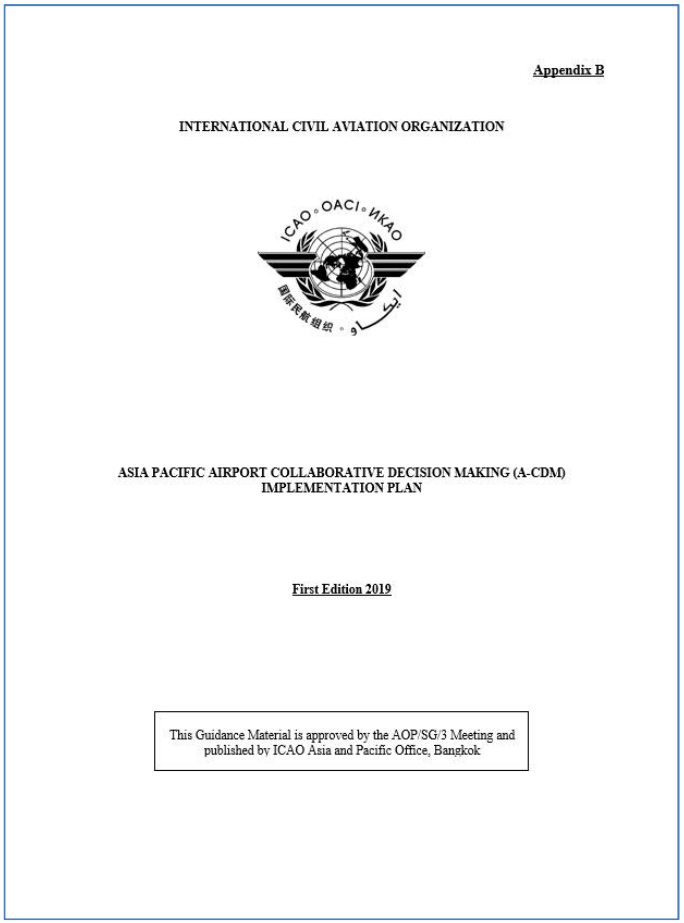
HOW WELL ARE WE MEETIGN SET OBJECTIVES

“Best Practices” when implementing A-CDM

A-CDM IS AN ONGOING ENGAGEMENT



What We Will Cover Today



Appendix B

INTERNATIONAL CIVIL AVIATION ORGANIZATION

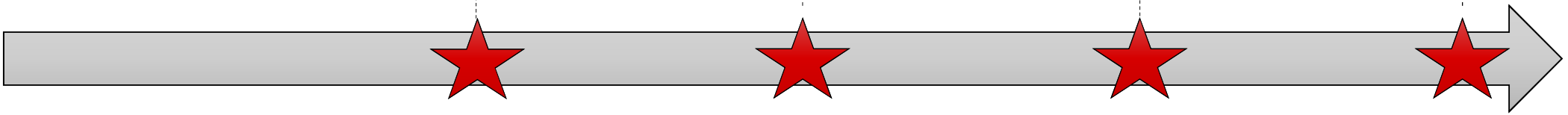
ASIA PACIFIC AIRPORT COLLABORATIVE DECISION MAKING (A-CDM) IMPLEMENTATION PLAN

First Edition 2019

This Guidance Material is approved by the AOP/SG/3 Meeting and published by ICAO Asia and Pacific Office, Bangkok

- Quick Facts on A-CDM
- Why A-CDM and Benefits
- What is A-CDM?
  - What is it REALLY about
  - "Building Blocks"
- "Best Practices" when implementing A-CDM
- Expectations of ICAO
- Focus Going Forward for A-CDM Task Force
- Q&A Session

Expectations of ICAO in APAC



- 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
- All A-CDM Airports should establish variable taxi-times for all combinations of gate or apron and runway holding points
- Where implemented, pre-departure sequencing procedures and systems should be integrated with A-CDM.

- A-CDM and ATFM system should be integrated by:

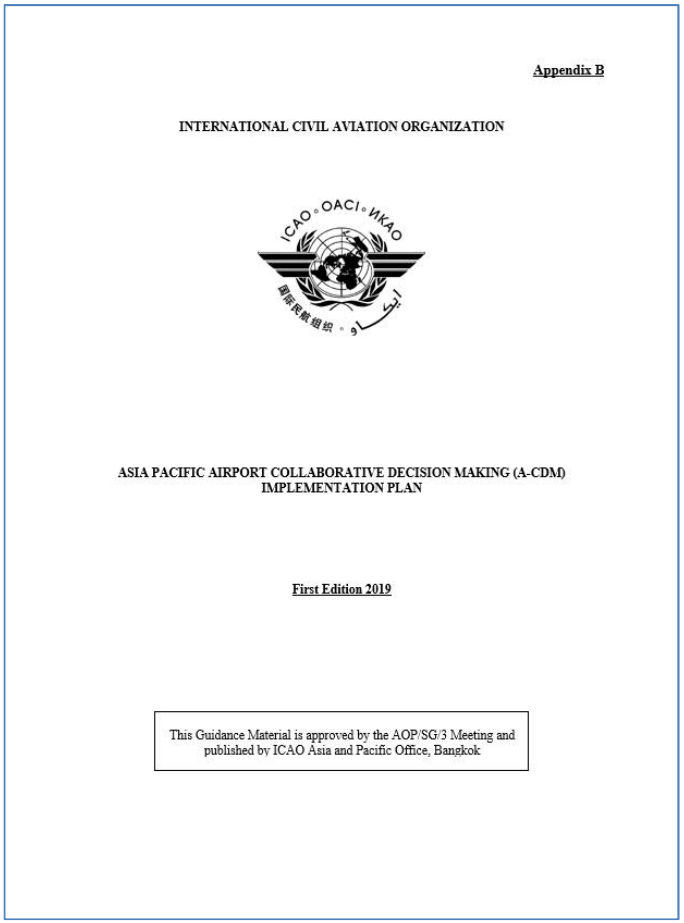
a) ATFM systems taking TOBT and/or TTOT into account when determining CTOT (if applicable); and

a) A-CDM systems taking CTOT into account when determining TSAT;

- Develop and implement collaborative Airport Operations Plan (AOP)

- Exchange A-CDM information with Cross Border ATFM for seamless gate-to-gate collaborative ATFM operations

What We Will Cover Today



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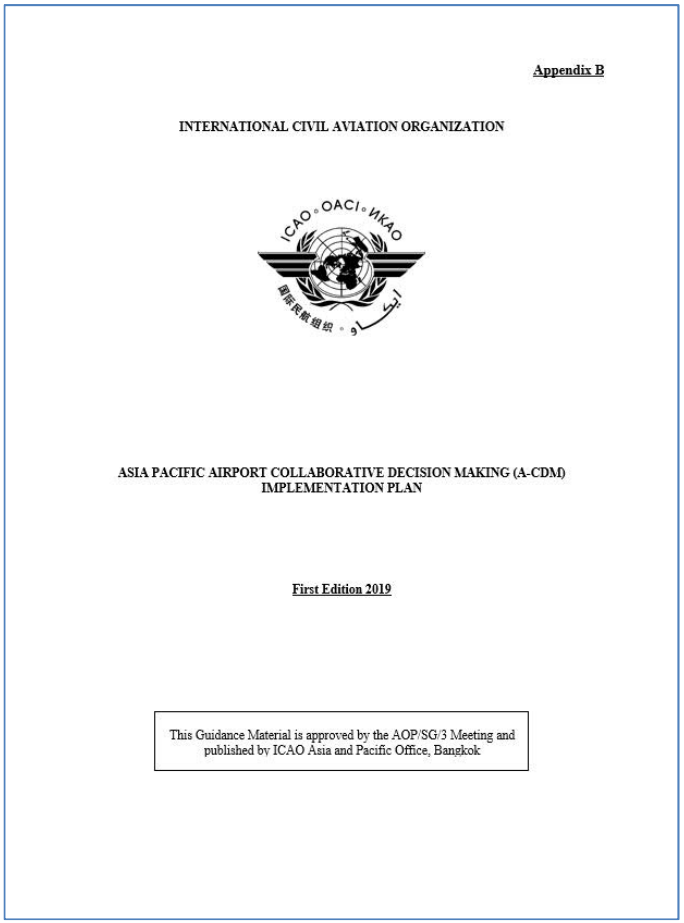
Focus Going Forward

- ✓ Creating an ”live” FAQ
- ✓ Develop Monitoring Framework & Monitor the progress
- ✓ Develop joint operational procedure guidance for the integration of ATFM and A-CDM operations, focusing the integration between A-CDM and "cross-border" ATFM

What We Will Cover Today



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