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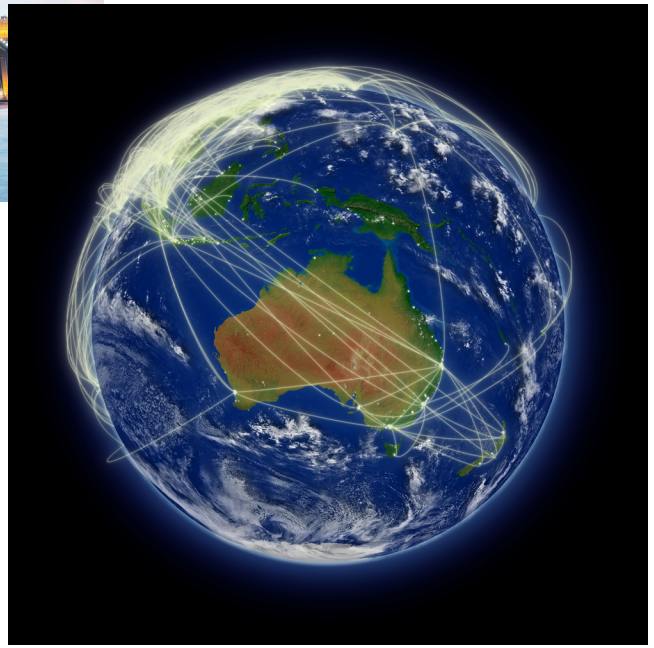
A-CDM

Second ICAO A-CDM Implementation
Seminar / Workshop

Stephen O'Flynn
Sao Paulo
2016-10-20

Australia

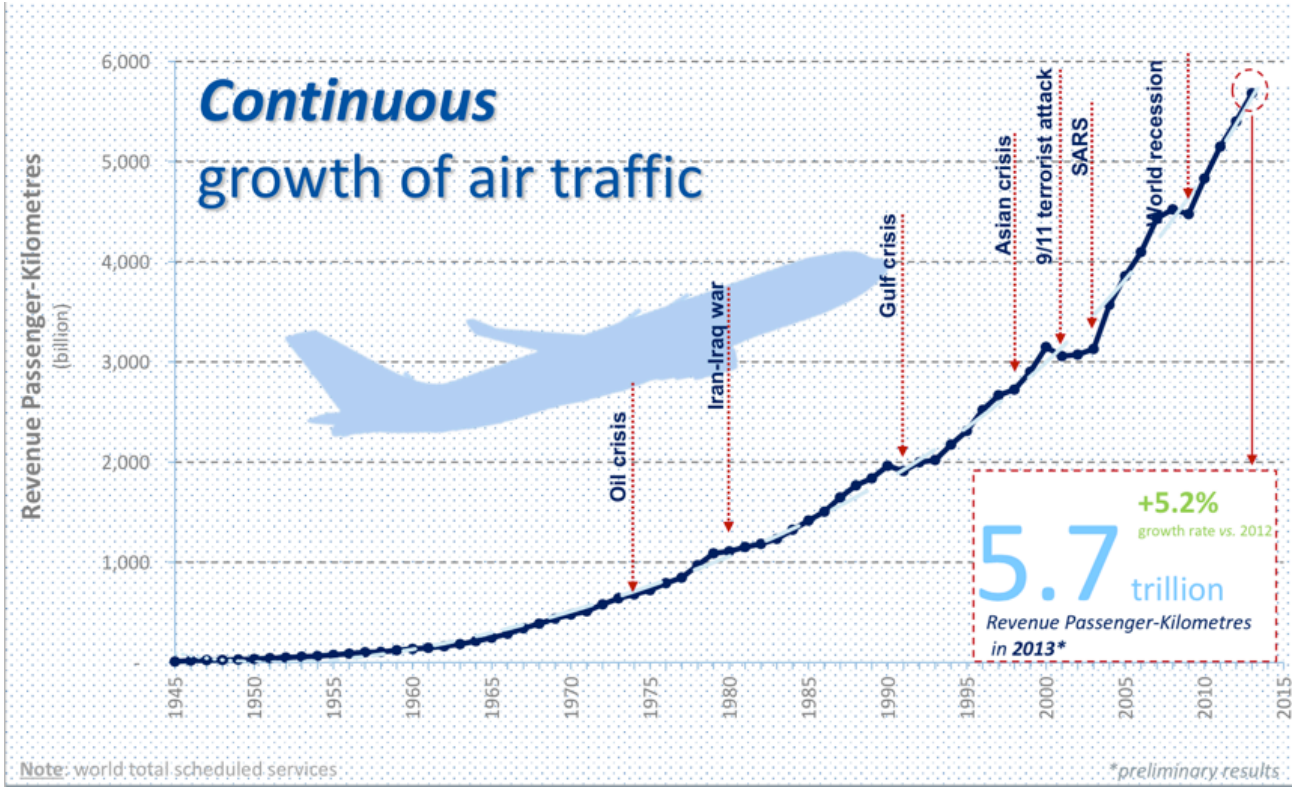


Agenda

- First determine what the problem is and what are the costs.
- Baseline capacity – essential.
- What is A-CDM
- Benefits of A-CDM
- Local Implementation versus network
- Systems to maximise benefits
- Summary

How to Determine the Problem?

Global Traffic growth



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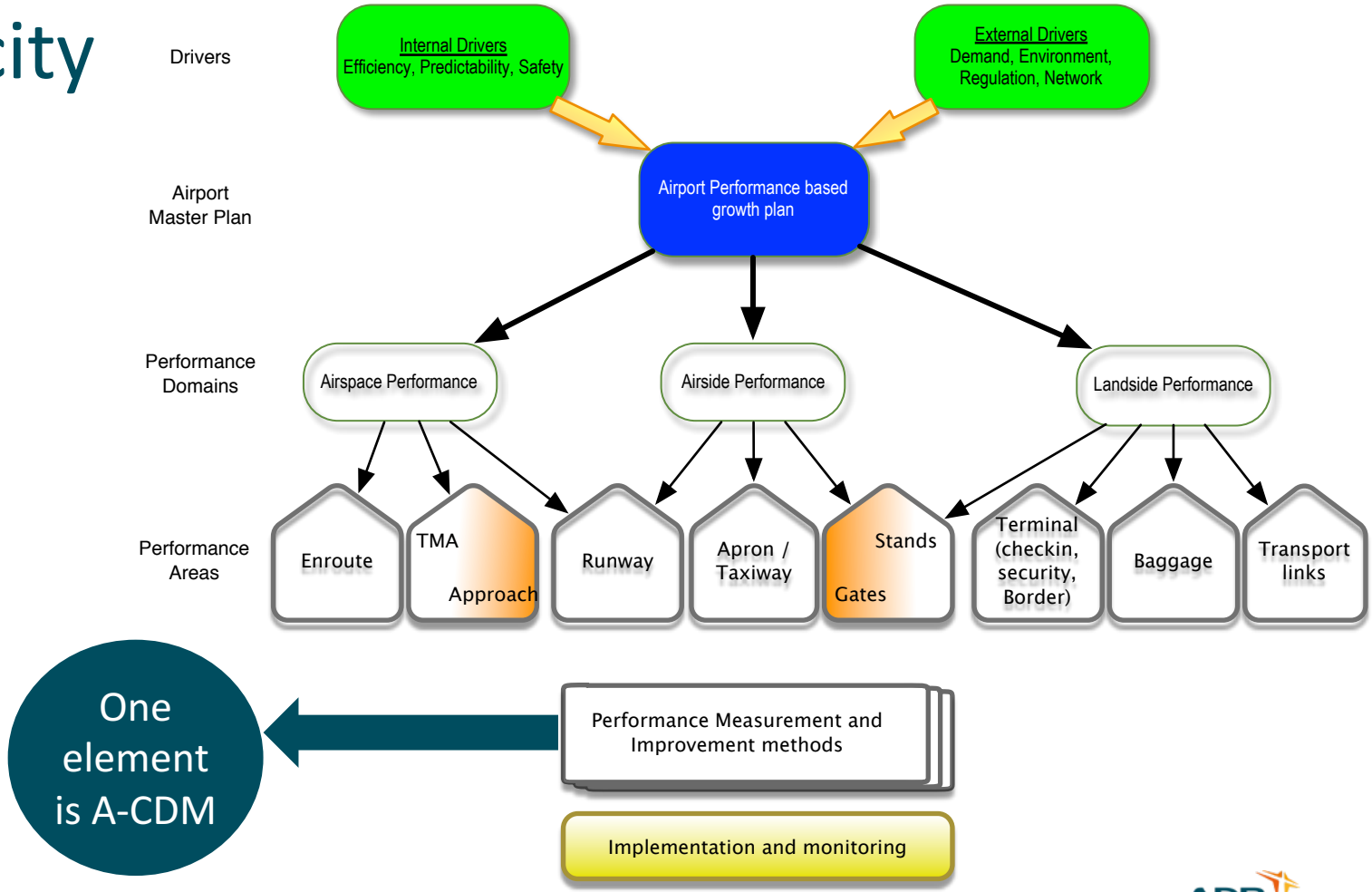
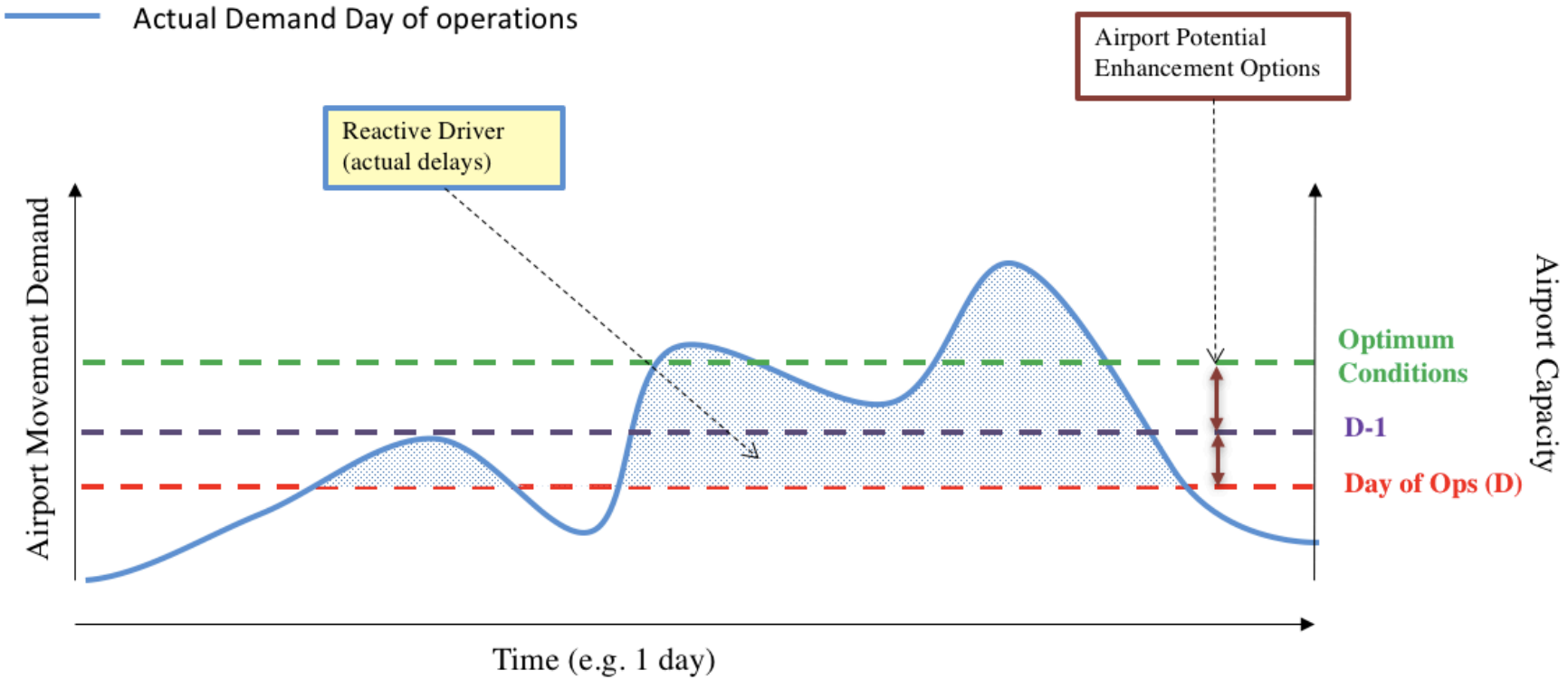
South America

- Growth prediction 4.7% - 6% over 20 years
- Low Cost market
  - 2003 = 10%
  - 2016 = 40%
- Pax to double to 525 million by 2034.
- Over 6000 new aircraft over 20 years
  - More than double current
- 80% of population live in cities. Take double the number of flights as today by 2034.
- 20yr GDP growth 3.6% above global 3.2.
- By 2034: 9 megacities (over 10 million)

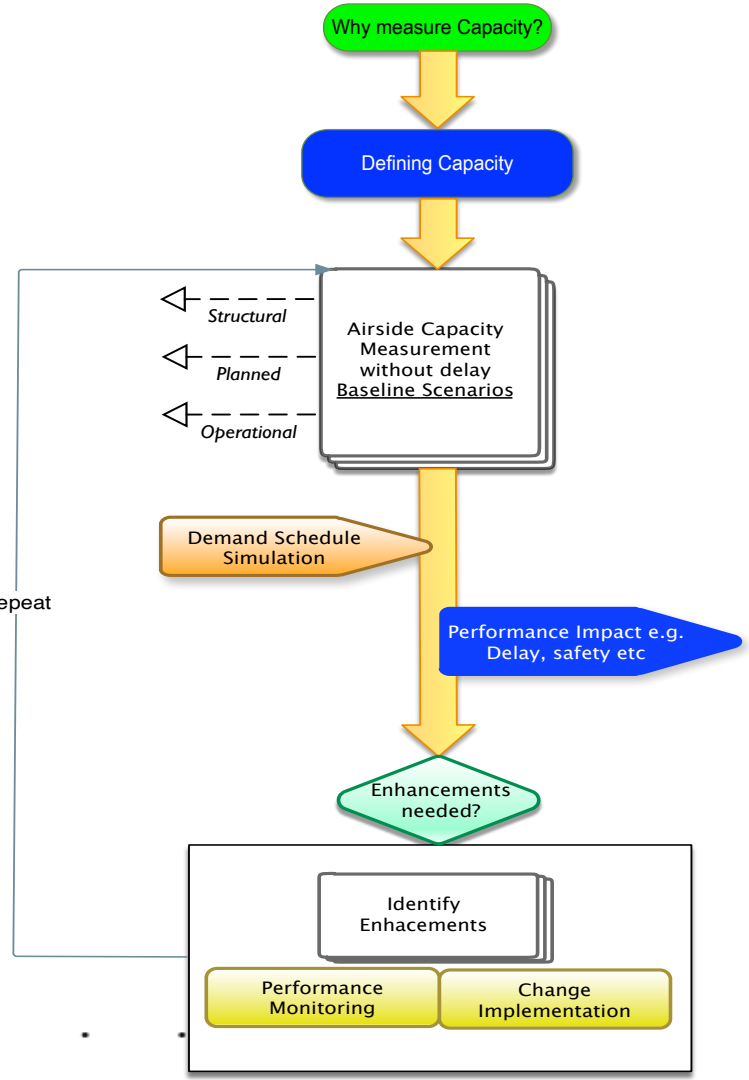
Capacity

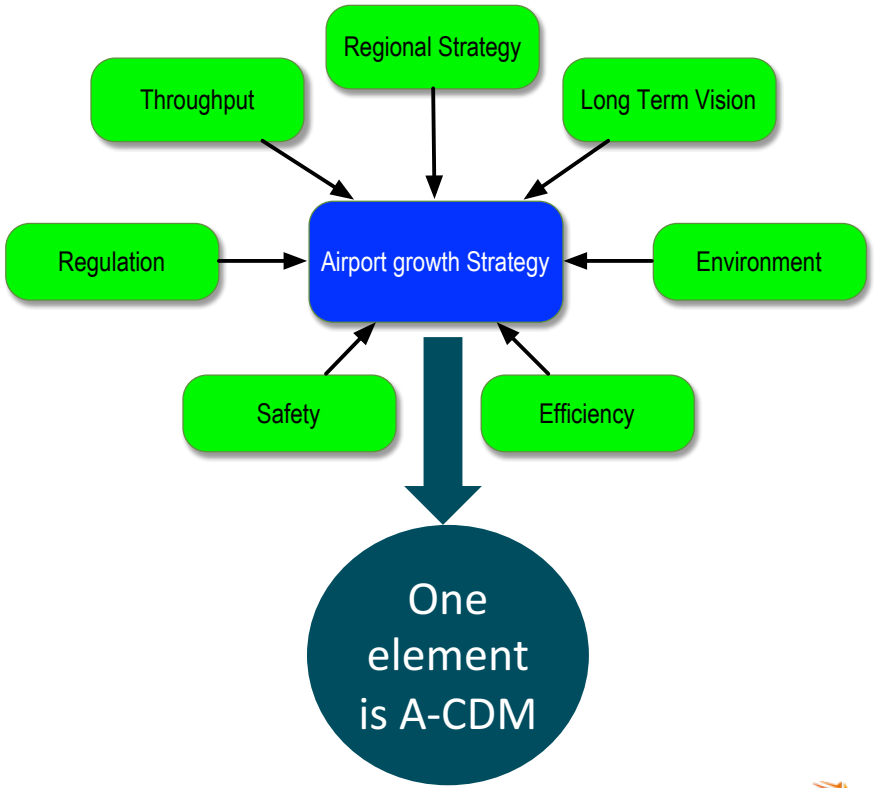

Drivers
Internal Drivers
Efficiency, Predictability, Safety
External Drivers
Demand, Environment, Regulation, Network
Airport Master Plan
Airport Performance based growth plan
Performance Domains
Airspace Performance
Airside Performance
Landside Performance
Performance Areas
Enroute
TMA
Approach
Runway
Apron / Taxiway
Stands
Gates
Terminal (checkin, security, Border)
Baggage
Transport links
One element is A-CDM
Performance Measurement and Improvement methods
Implementation and monitoring

Capacity versus Demand

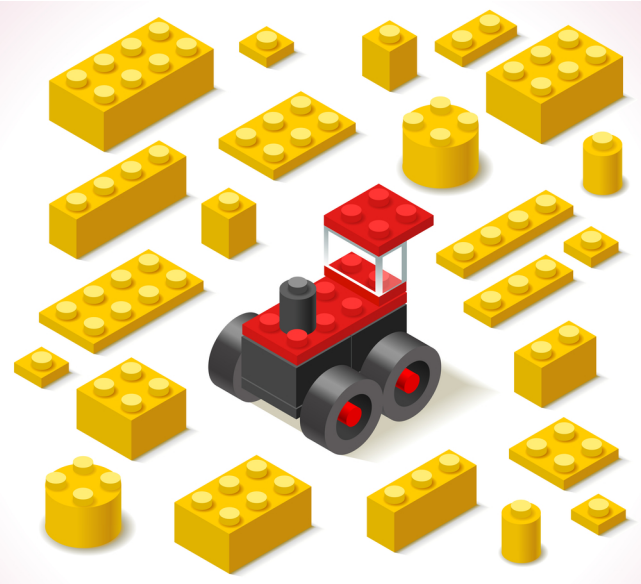


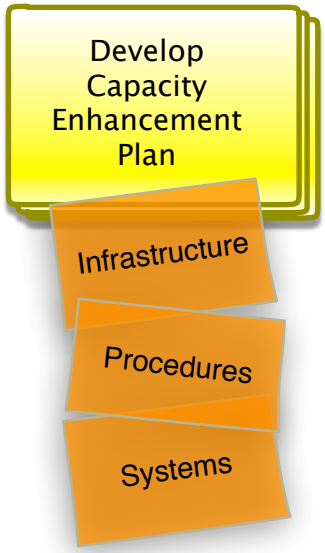
The Capacity process

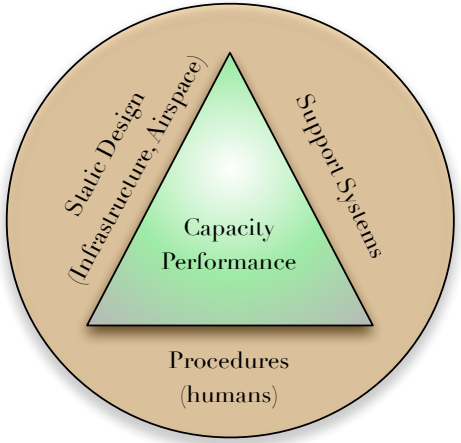




A-CDM: A modular concept not an application







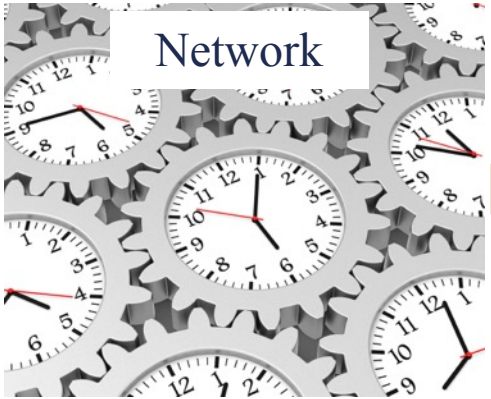
Multi Operational Objectives

- Allocation
- Turn Mgmt
- Billing
- Coordination
- Safety

- VTT
- Predictability
- Emissions
- Safety
- Robustness

- Sequencing
- Predictability
- HIRO
- Safety
- Robustness

- Turn Mgmt
- Coordination
- VTT
- Predictability
- Emissions
- Robustness
- Sequencing
- Predictability
- Robustness



- Coordination

Problem definition

Inefficient turn process resulting in

- Reduced capacity
- Unnecessary fuel burn
- Delays
- Bad resilience

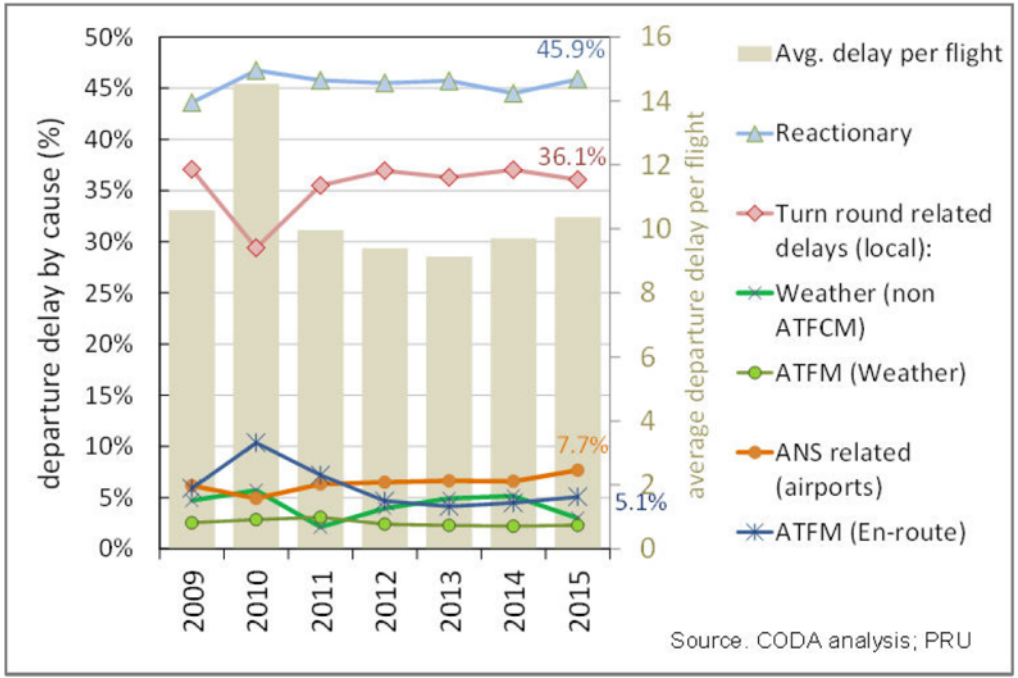


Figure 2-6 Historical breakdown of European departure delay by cause in 2015 [Ref-2]

Delay cost

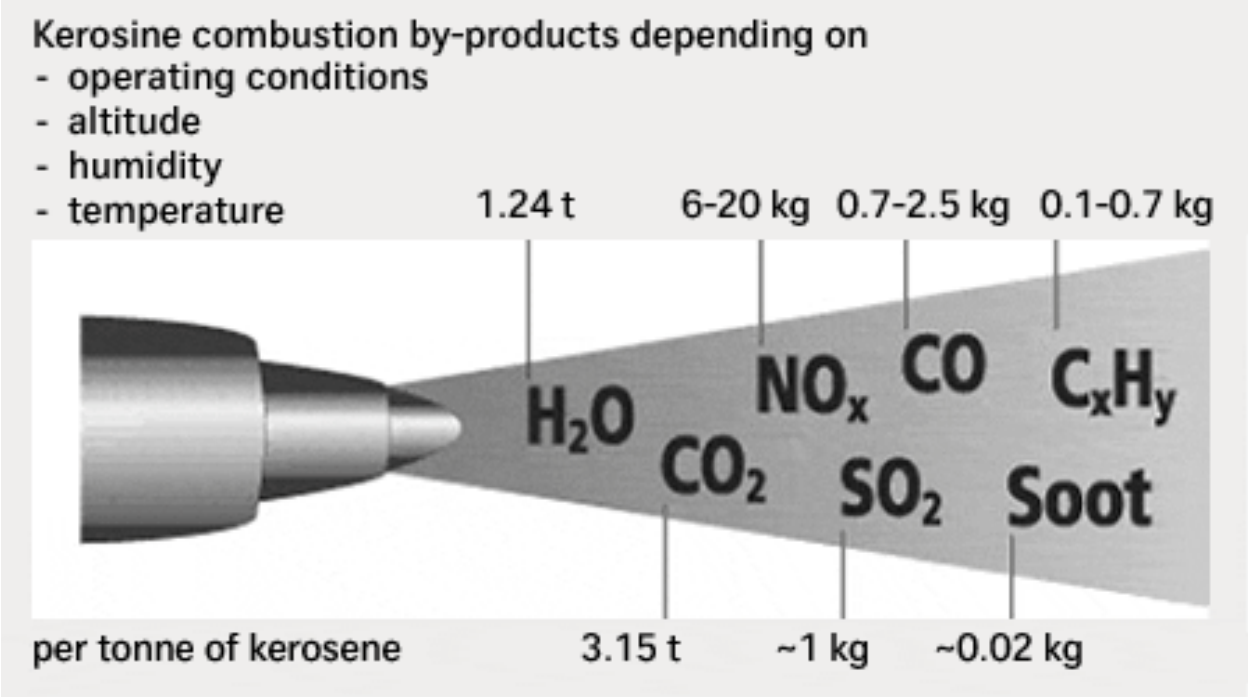
Delay cost

Data from Eurocontrol Standard Inputs for Cost benefits Analysis

Base Scenario *Delay cost per minute (€)*	**Tactical without network effect**		**Tactical with network effect**		**Strategic**	
	Ground	**Airborne**	**Ground**	**Airborne**	**Ground**	**Airborne**
Fuel costs	0.2	22.8	0.2	22.8	1.5	27.5
Maintenance costs	0.6	1.2	0.7	1.3	-	14.4
Crew costs	7.3	7.3	8.8	8.8	8.4	8.4
Ground and passenger handling	-	-	-	-	-	-
Airport charges	0.5	-0.0	0.5	0.1	-	-
Aircraft ownership costs[2]	-	-	-	-	14.1	14.1
Passenger compensation	17.3	17.3	31.2	31.2	-	-
Direct cost to an airline	**25.8**	**48.6**	**41.4**	**64.2**	**24.0**	**64.4**
Passenger opportunity cost	27.1	27.1	48.7	48.7	-	-
Overall cost	**52.9**	**75.7**	**90.1**	**112.9**	**24.0**	**64.4**

(cells with a "-" have no delay cost allocated)

Environmental Cost



What is A-CDM?

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What is A-CDM

The joint publication entitled “Airport CDM,” issued by Airport Council International, EUROCONTROL, and IATA, states (EUROCONTROL 2009):

“..the right information at the right time to the right people..”

A Concept

What is A-CDM?

What could it mean for airlines?

Shorter queues for the runway

Shorter taxi times

Better assignment of ground crew

Frequently updated status of their flights

Option of swapping TOBTs

Better predictability for connecting pax

Cost savings

What is A-CDM?

What could it mean for the airport?

Less noise and emissions (CO2 and NOx)

Better punctuality

Better gate management

Better assignment of equipment

Better assignment of ground crew

Reduction in operating costs

What is A-CDM?

What could it mean for air traffic control?

More predictable volume of air traffic

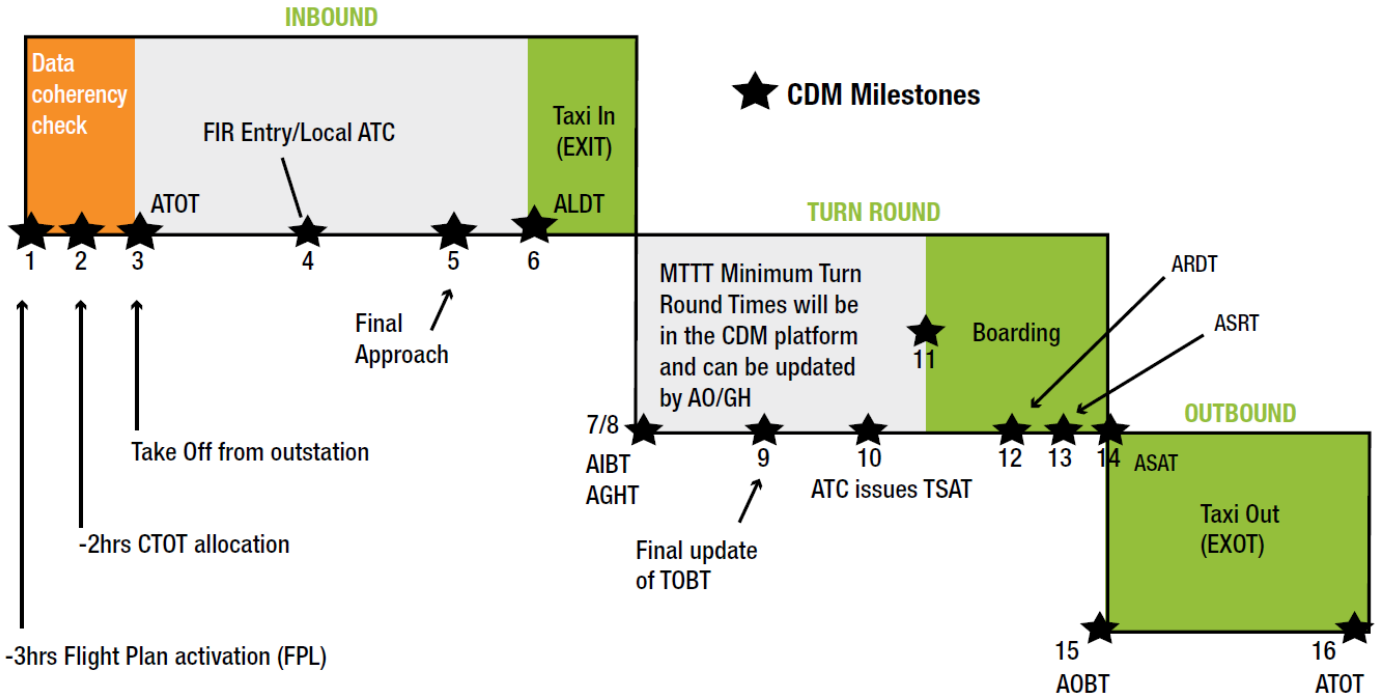
Predictable surface operations

Improved arrival and departure integration

Enabler for improved operations

Enabler for Network Benefits

The A-CDM Process

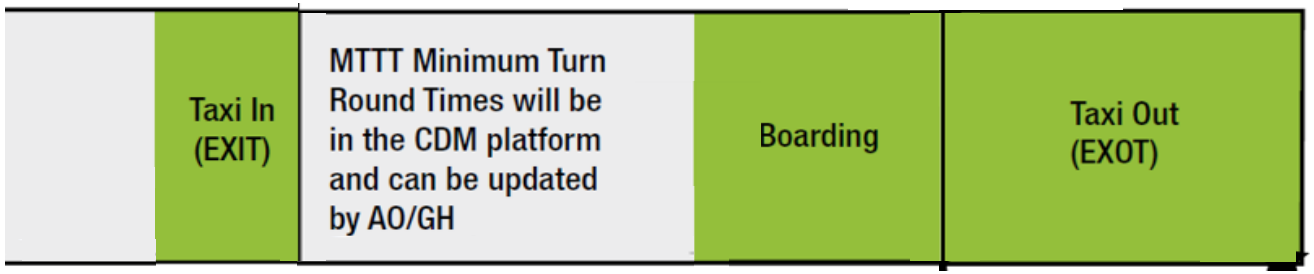


ATC

Airport
Airline
Ground handling

ATC

The Process



ATC
Airport
Airline
Ground handling

Time

The Milestones

Number	Milestones	Time Reference	Mandatory / Optional for Airport CDM Implementation
1	ATC Flight Plan activation	3 hours before EOBT	Highly Recommended
2	EOBT – 2 hr	2 hours before EOBT	Highly Recommended
3	Take off from outstation	ATOT from outstation	Highly Recommended
4	Local radar update	Varies according to airport	Highly Recommended
5	Final approach	Varies according to airport	Highly Recommended
6	Landing	ALDT	Highly Recommended
7	In-block	AIBT	Highly Recommended
8	Ground handling starts	ACGT	Recommended
9	TOBT update prior to TSAT	Varies according to airport	Recommended
10	TSAT issue	Varies according to airport	Highly Recommended
11	Boarding starts	Varies according to airport	Recommended
12	Aircraft ready	ARDT	Recommended
13	Start up request	ASRT	Recommended
14	Start up approved	ASAT	Recommended
15	Off-block	AOBT	Highly Recommended
16	Take off	ATOT	Highly Recommended

Benefits

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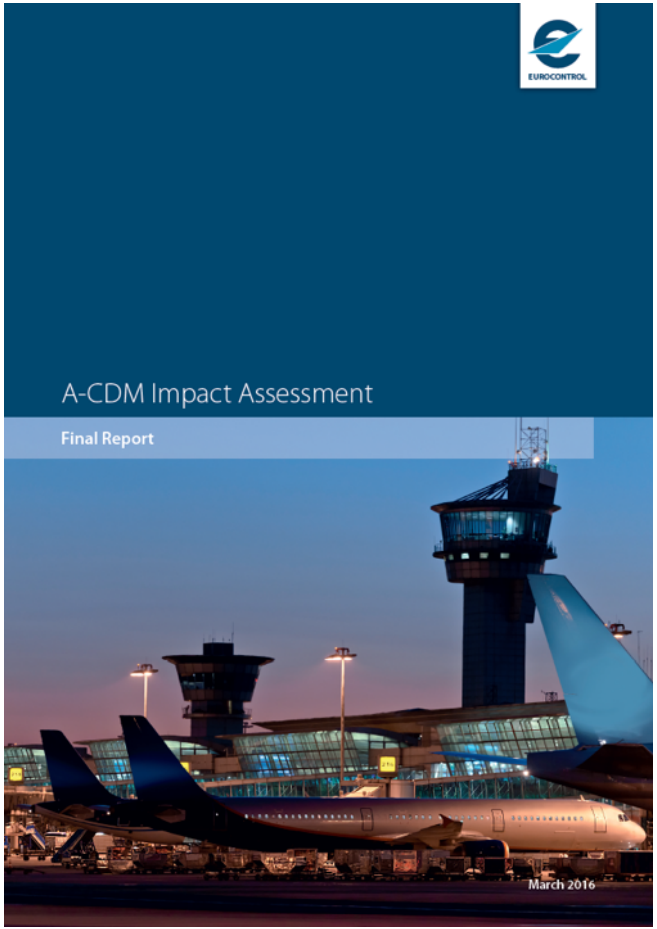
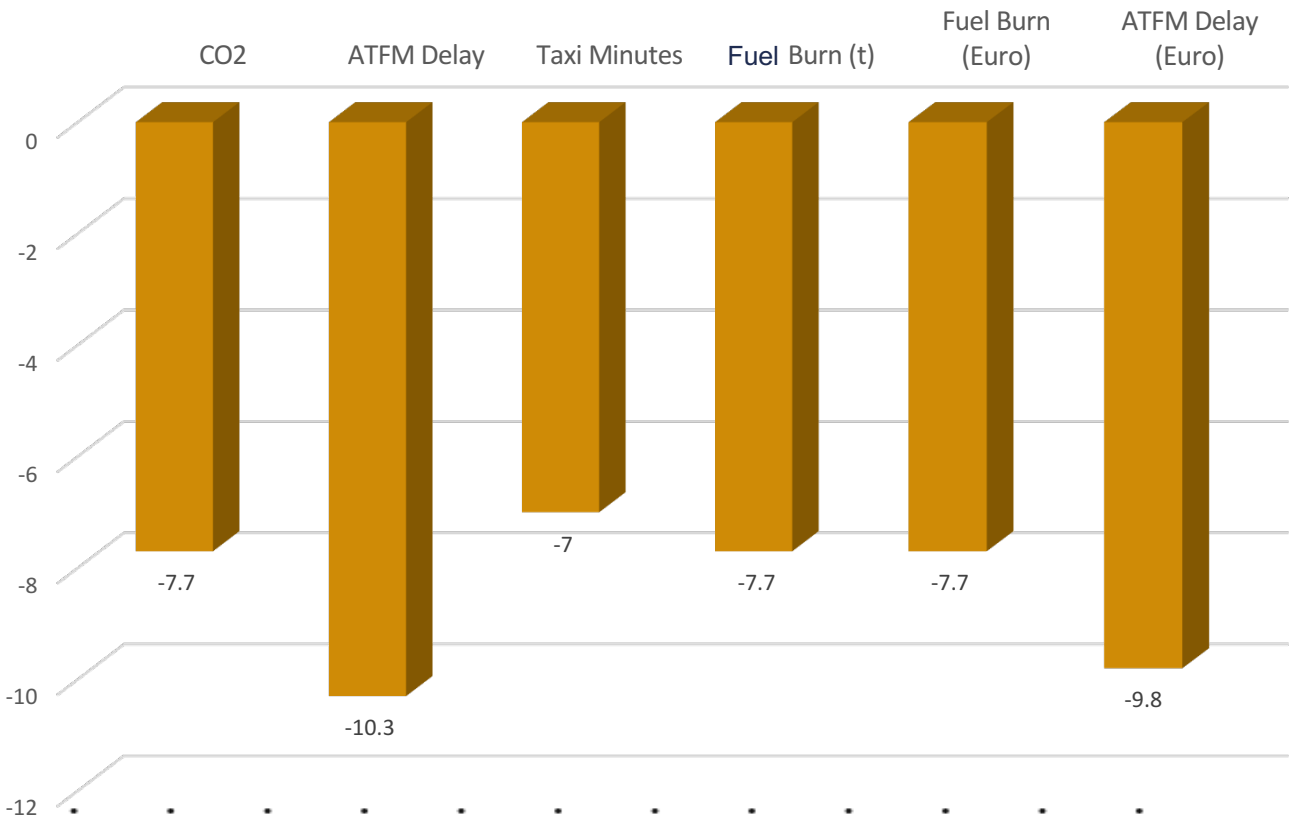
2016 Eurocontrol Study



Benefits


CO2
ATFM Delay
Taxi Minutes
Fuel Burn (t)
Fuel Burn (Euro)
ATFM Delay (Euro)
0
-2
-4
-6
-8
-10
-12
-7.7
-10.3
-7
-7.7
-7.7
-9.8

Arrival Predictability Benefits

The distribution of reliable arrival updates between airport partners has demonstrated improvements in the following areas:

- Stand planning
- Ground handling resource allocation
- Fleet planning
- Departure punctuality

Off-Block Predictability Benefits

Target Off-Block Time (TOBT) and Target Start-up Approval Time (TSAT) are the most important data elements within the A-CDM process

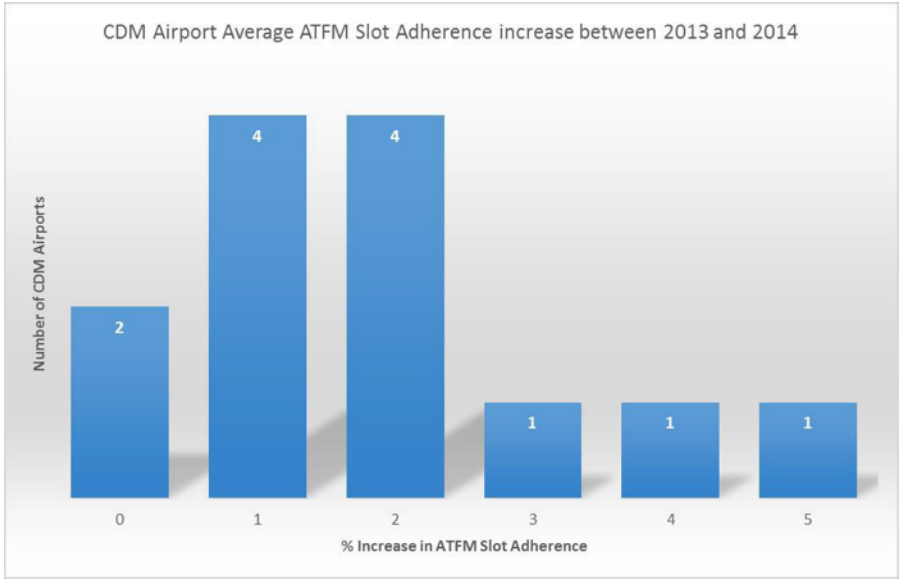
- ATCO Workload
- Asset Location Optimisation-Push vehicle operators
- Push delay
- Departure Rate
- Apron Movements-Taxi time improvements
- Off-Block Delay
- Winter Operational Resilience

Take-Off Predictability Benefits

Take-off accuracy

ATFM Slot Adherence

Single engine Taxi Procedure



Benefits

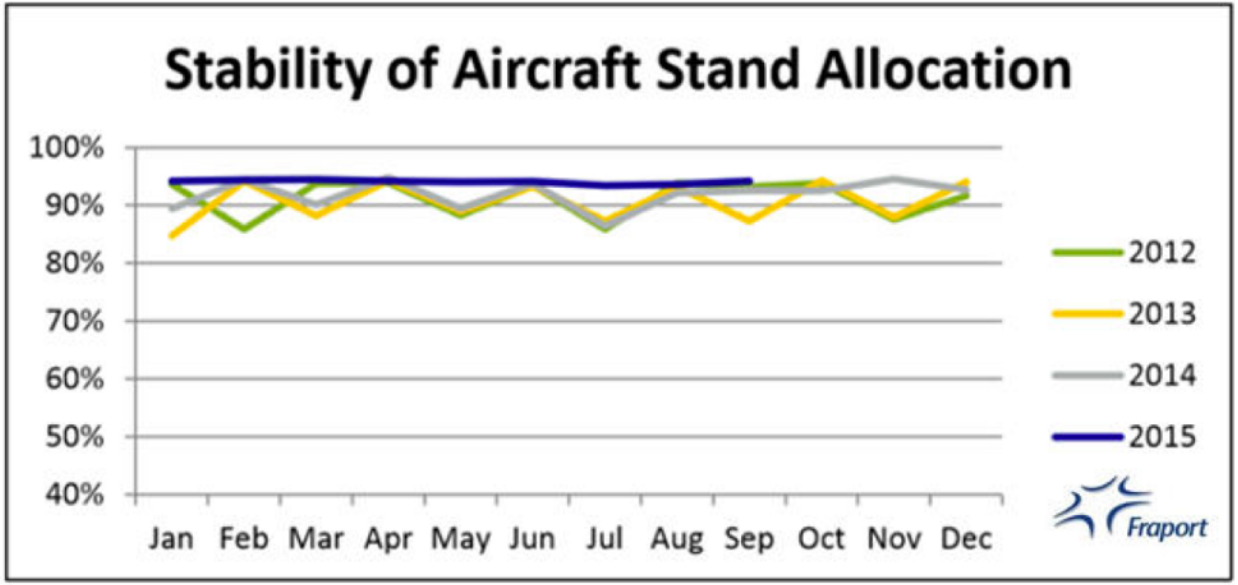


Figure 2-4 Impact of refining EXIT tables on stand stability at Frankfurt airport in 2015 (Source – Fraport)

Benefits

Positive gains

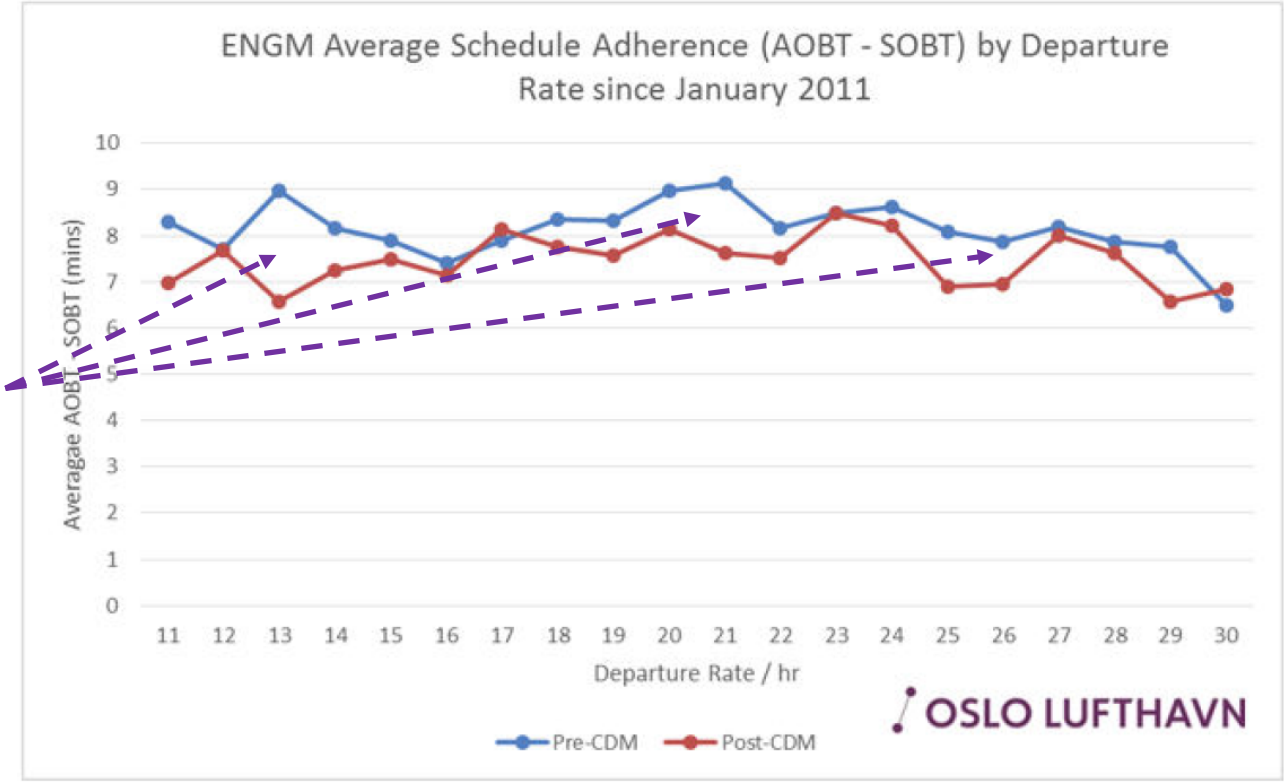


Figure 2-16 Average schedule delay by departure rate at Oslo (Source – PRU data analysis)

Benefits

20 minutes faster to recover!

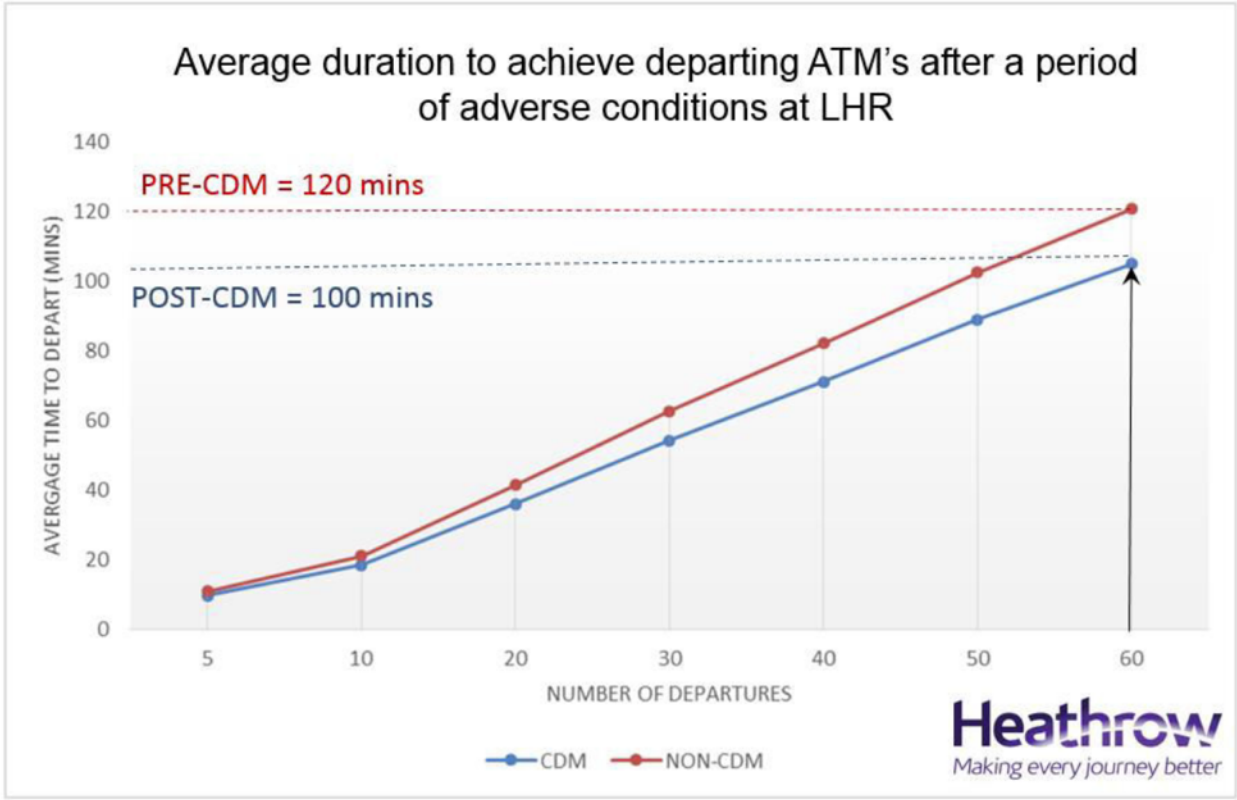


Figure 2-13 Average time to achieve number of departures after a period of reduced capacity at LHR (Source - data analysis of Heathrow Airport flight data)

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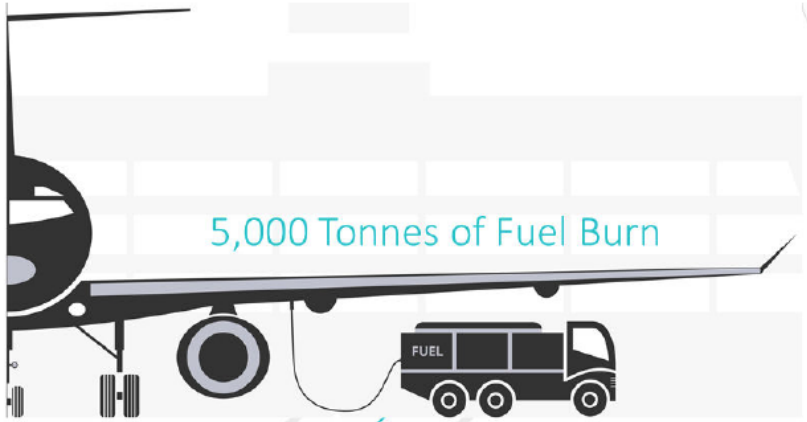
Benefits

Munich Airport



16,000 Tonnes of CO_2
4,200 kg of SO_2

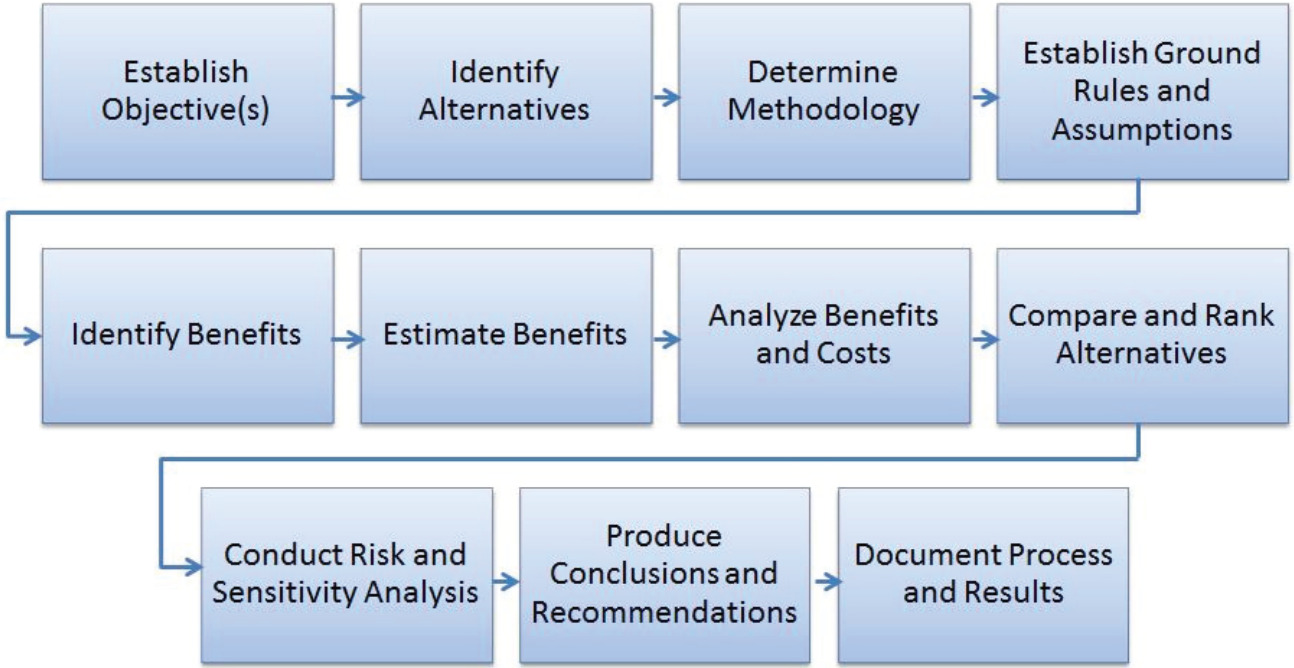
135,000 Minutes of Delay

370,000 Minutes of Taxi

3.9 million in Fuel
11.0 million in Delay

Benefits estimated between February 2014 and February 2015

Benefit Cost Analysis - Process



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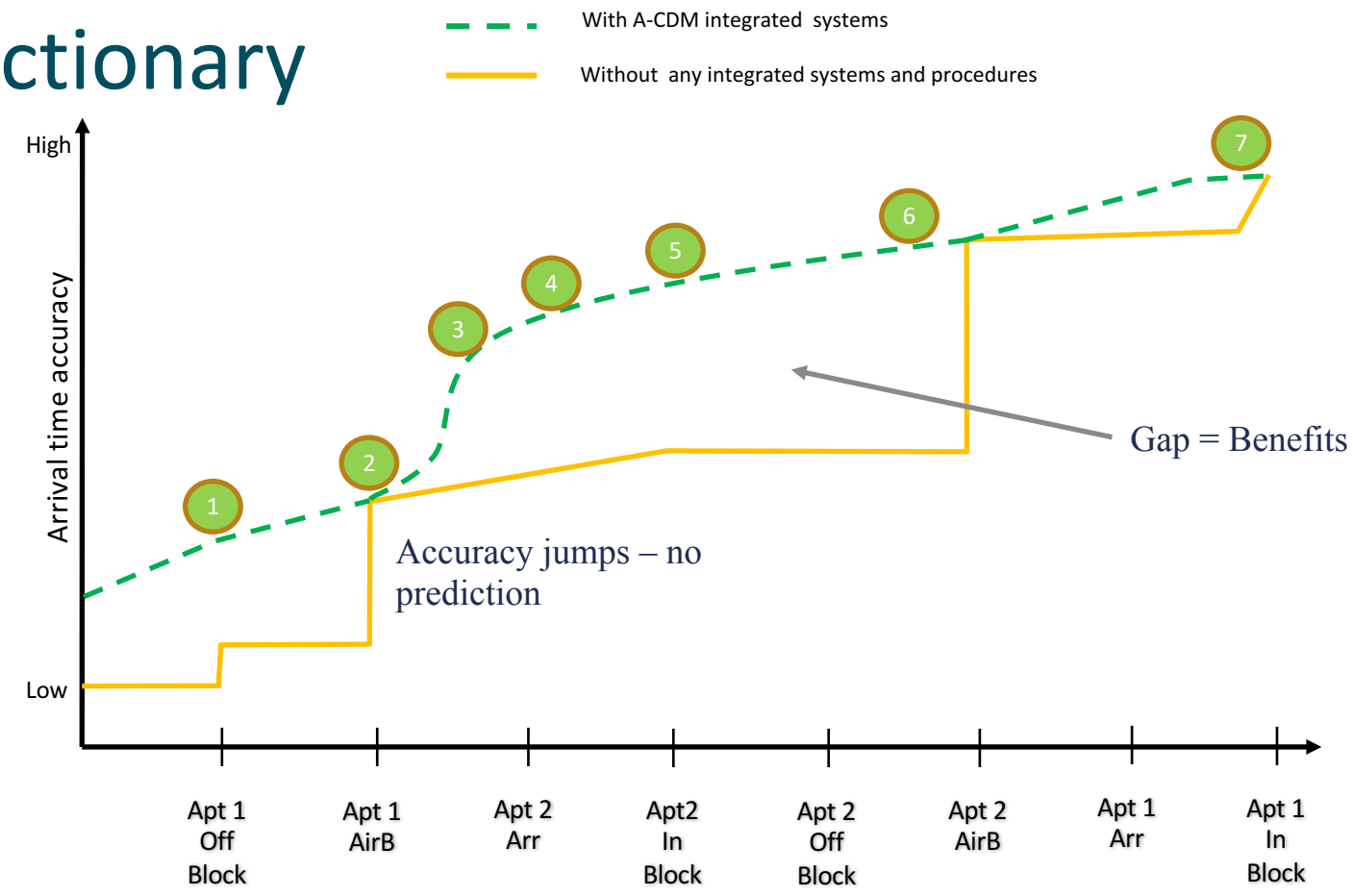
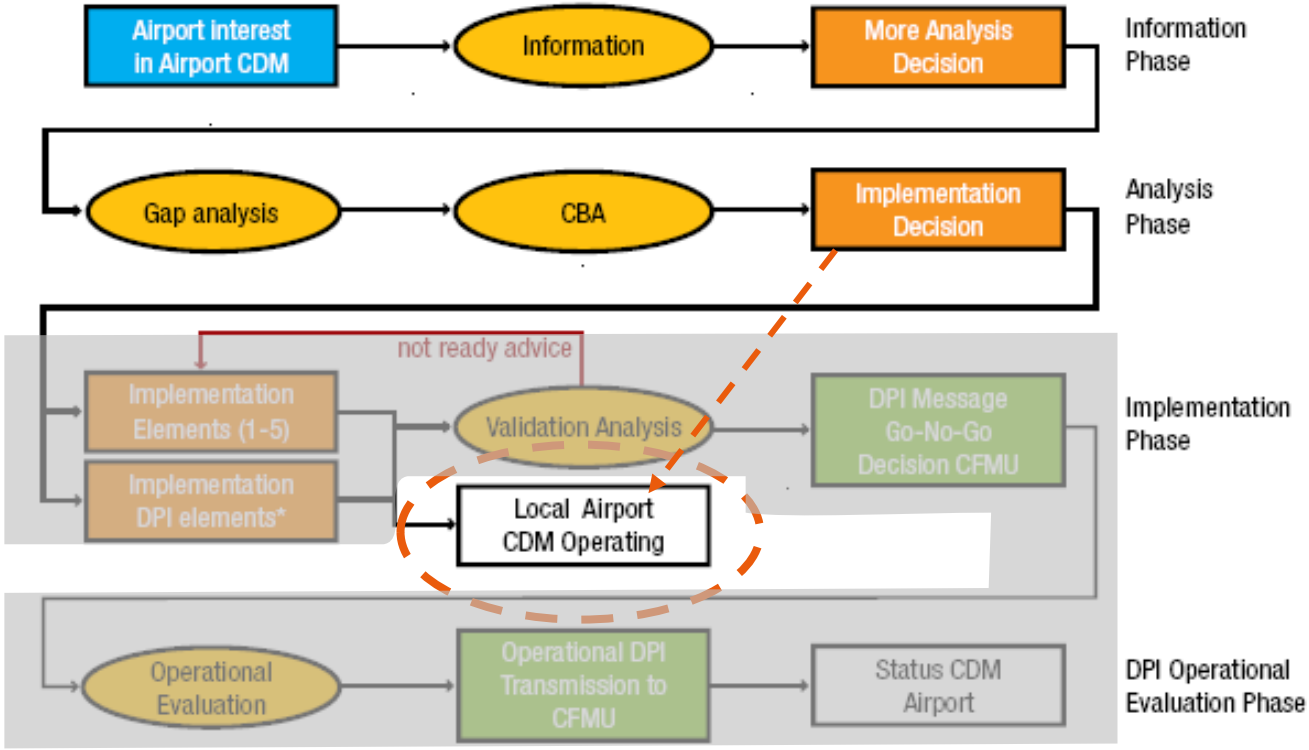
Reactionary



Implementation

Implementation: Local versus Network



Local CDM Implementation

What is the status of my flight(s)? What is happening?

HANDLING AGENT

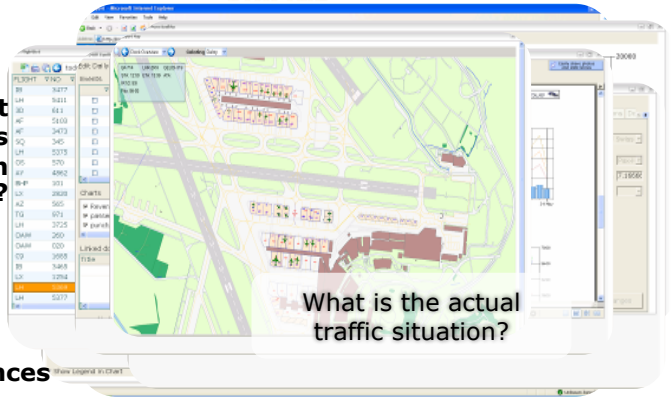
What quality do our providers deliver?

AIRLINE

CFO

What impact do actual irregularities have on our revenue?

What is/was going on today?



OPERATIONS CONTROL

What are the consequences of capacity reductions?

How well did we allocate the stands?

AIRPORT PLANNER

What is the actual punctuality and why?

CEO/MD/GM

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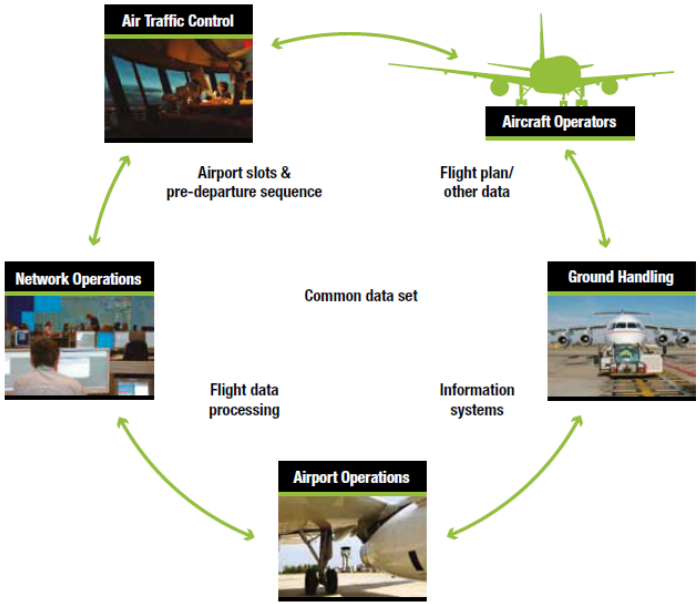
Implementation

What milestones and data are applicable?



Aircraft Operator/ Handling Agent

- planning data
- turn-round times
- flight plans
- movement data
- priority of flights
- aircraft registration and type changes
- TOBT
- movement messages

Air Traffic Control

- ELDT
- ALDT
- TSAT
- TTOT
- runway and taxiway conditions
- taxi times
- SID allocation
- runway capacity
- A-SMGCS data/ radar information

Airport CDM Information Sharing

Airport Operations

- stand and gate allocation
- environmental information
- special events
- reduction in capacity
- airport slot data
- ADES
- SOBT

Network Operations

Service Providers

- de-icing companies
- MET office (forecast & actual met. info)
- and others (fire, police, customs, fuel, etc...)

Systems to Maximise Benefits

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A-CDM Process

Milestone collection

Stakeholder Communication

A-SMGCS

Apron Management

AMAN/DMAN

Flight Strips

A-VDGS

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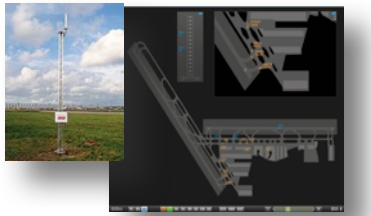
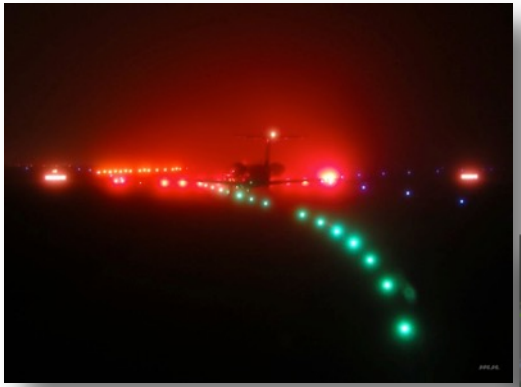
A-SMGCS – 4 Services

Surveillance Service



Guidance Service



Routing Service

Airport Safety Support Service

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Follow-the-Greens Validation VP-649: LVP OPS BENEFITS

LOW VIS

Reduces

TAXI TIMES (pre-SESAR to floating)	**37,8%**
FUEL BURN (pre-SESAR to floating)	**40,78%**
EMISSIONS	**40,78%**

Increases

SAFETY	**4** route deviations in pre-SESAR **none** with FtG
TRAFFIC FLUENCY	**> 65%** fewer stops

Improves

AIRPORT TAXI PERFORMANCE	**~ 100%** CAVOK performance

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Follow-the-Greens Validation VP-649: CAVOK OPS BENEFITS

Follow-the-Greens

Reduces

TAXI TIMES (pre-SESAR to FtG)	**17,4%**
FUEL BURN (pre-SESAR to FtG)	**18,48%**
EMISSIONS	(**~ 20%** in **CAVOK**)

CAVOK

Increases

TRAFFIC FLUENCY	(**~ 50% fewer stops** in **low-vis**)

Independent from the weather condition, FtG cuts R/T time in half → allows conclusion on controllers work load

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Whole system is only as good as the sum of the components

but at least as good as the worst component

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Summary

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Performance Strategy – baseline capacity

Capacity versus Demand

- Delays
- OTP
- Service Rates
- Robustness

Environment

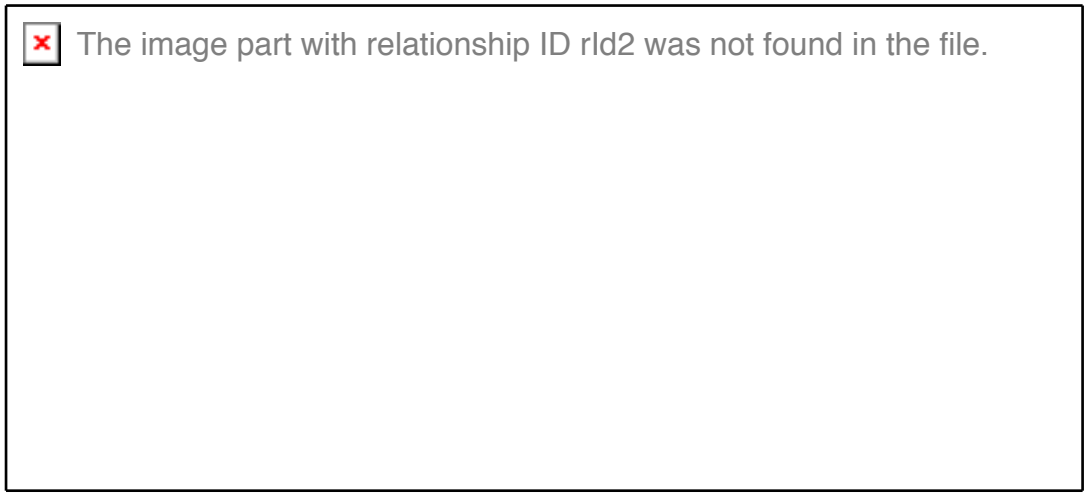
- Fuel Burn
- Ground noise

Network

- Reactionary Delay
- Network predictability

Safety

- ATC workload
- Incident Rate



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A-CDM Benefits

- ↑ ATOT accuracy
- ↓ Push delays
- ↓ Taxi savings
- ↑ Schedule adherence improvement
- ↑ Peak departure rates
- ↓ Late gate changes
- ↑ Adverse condition recovery
- ↑ Slot Adherence

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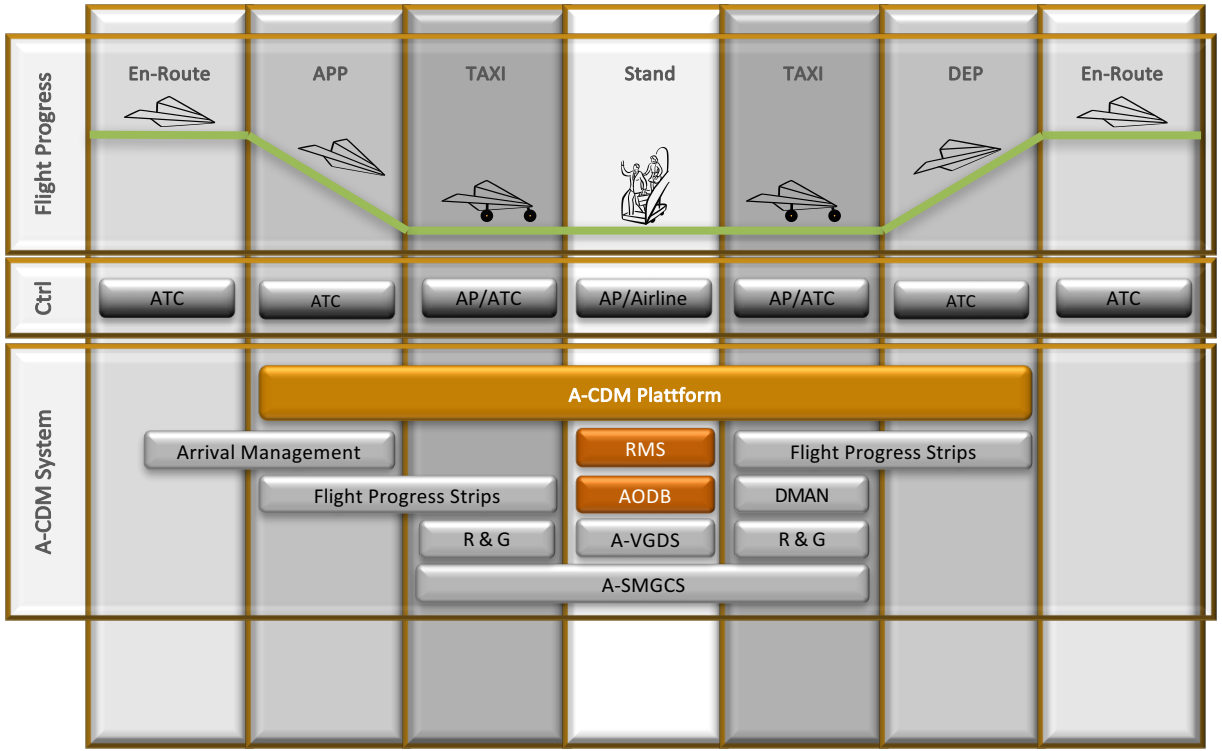
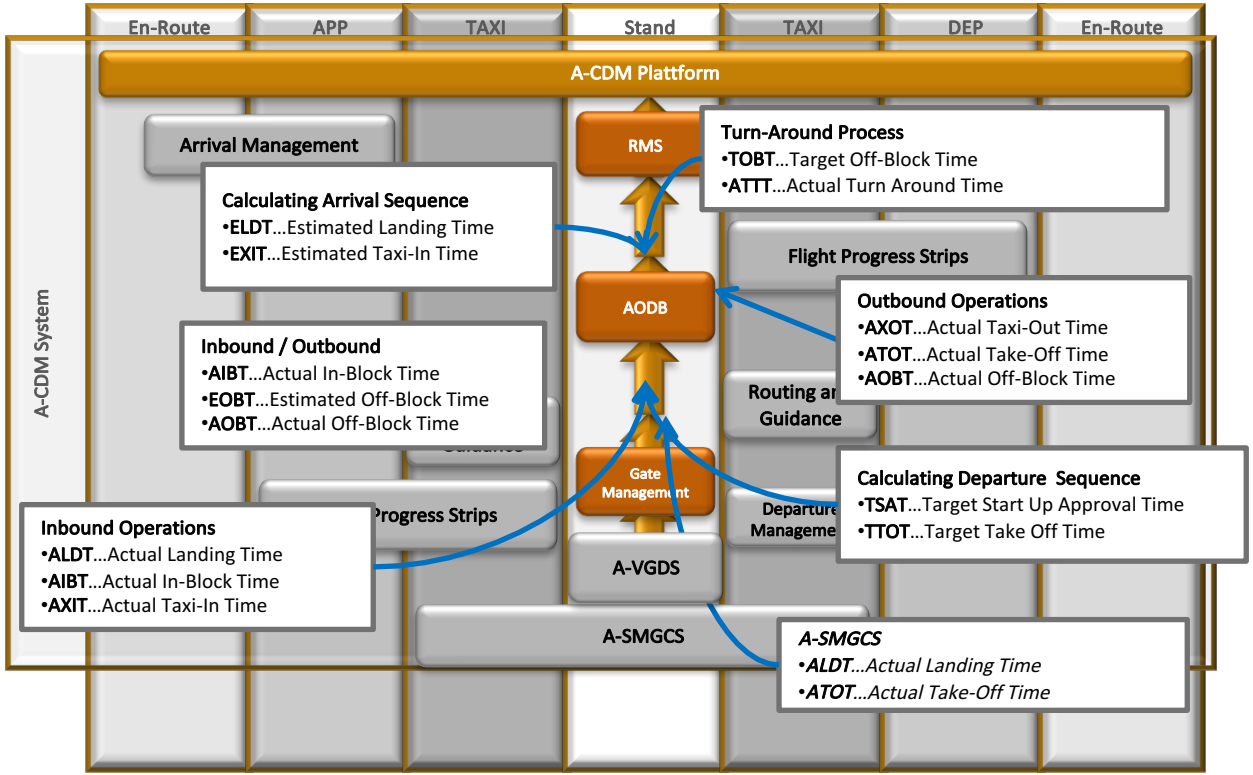
Systems to Maximise Benefits

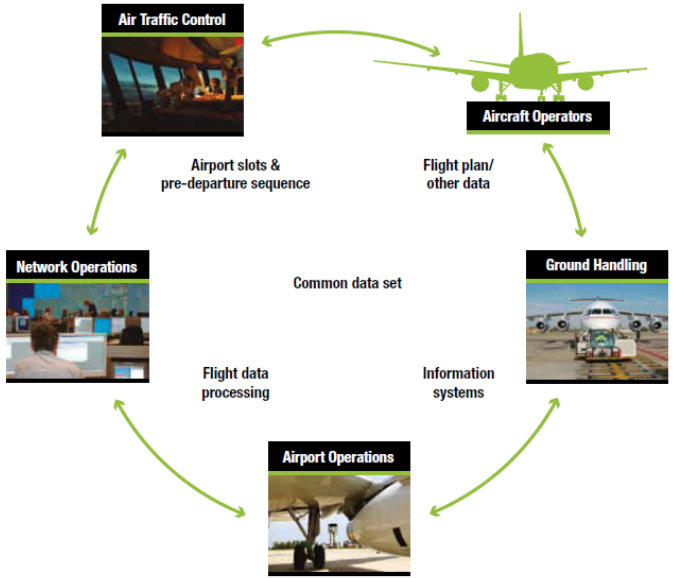


CDM Systems and Times



Collaboration

- Create a common platform
- Exchange of timestamps
- leads to:
  - Shorter turn around times; Less delays
  - Less fuel burn; Cost savings and greener Airport Operation
  - Increased Passenger service; Passenger Satisfaction
  - Better resource planning for fixed and mobile assets for the Airport community
  - Increase Efficiency



Thanks

for your attention

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