FROM INNOVATION TO SOLUTION

THE SESAR PROGRAMME

Patrick KY,
Executive Director

SESAR WORKSHOP, 25 June 2013, Washington DC
Change in Air Traffic Management infrastructure is inevitable.
What is changing with SESAR

**Partnership**
- 3000 persons, 110 companies, Airspace users, military, staff,...

**Pragmatism**
- Technologies validated in a real life operational environment
- Demonstration flights (e.g. Green flights)

**Business cases**
- Involvement of suppliers, integrators and buyers
- Direct link to standardisation and regulation
1. Bringing ATM to the Internet Age
2. Sustainability push
3. Regulatory alignment
Technological Revolution in ATM

• Replace VHF radio by digital communication
• Integrate the aircraft/flight and the airport in the ATM System
• Automate
Once the A/C enters the ATC arrival horizon, at least 40' before landing:

1. ATC uplinks to A/C the route clearance to follow down to runway - (via CPDLC).
2. Crew loads the route clearance into the FMS and updates FMS winds and temperatures data (via AOC datalink function). A/C downlink of 4D predicted trajectory (ADS-C).
3. ATC requests Reliable RTA interval for merge point (via ADS-C). A/C downlinks Reliable RTA interval (via ADS-C).
4. ATC uplinks feasible RTA.
5. Crew inserts RTA in FMS as active data. A/C downlinks A/C 4D predicted trajectory (via ADS-C).
6. 4D trajectory agreed by crew and ATC ➔ Descent can be flown in full managed.
Sustainability push

- ATM business models will change (unbundling, PPP, Airlines-Airports-ATM joint ventures,…)
- New capacity will be created and owned by heterogeneous stakeholders
- Off-the-shelf non ATM products will provide the basic infrastructure
Regulatory Alignment

- No compromise on Safety
- Business models are linked to economies of scale
- International standards
- Regulatory drum-beat enforces necessary changes even if the business case is not positive
Single European Sky builds on five pillars

Performance
- Performance scheme
- Performance Review Body
- Functional Airspace Blocks
- Network Manager
- National Supervisory Authorities

Safety
- EASA: ATM Competence
- Crisis coordination cell

Technology
- SESAR
- ATM Master plan
- SESAR Joint Undertaking
- Common projects

Airports
- Airport observatory

Human factor
- Specific sectorial dialogue Committee
- Consultative expert group on social dimension of the SES
THE EUROPEAN ANSWER

• The Governments of the 27 European States all signed up for the Single European Sky policy
• The Single European Sky ATM Research programme is the technological pillar of the Single European Sky
• Managed by a Public Private Partnership (SESAR Joint Undertaking), the programme is aiming at developing and validating in 8 years the technologies and procedures of the future ATM System

SESAR JOINT UNDERTAKING
SESAR DELIVERY

MASTER PLAN

2010

2011

2012

2013

2014

Performance 2020+

Trajectory Based Operations

2017

Time Based Operations

2014

Programme

R&D Projects

Maturity
- Concept
- Requirements
- Prototype
- Validation
- Safety and Business Cases

2011

2012

2013

2014
FUEL EFFICIENCY

KEY SESAR SOLUTIONS
RELEASE 2

AMAN and Extended AMAN horizon

AMAN AND EXTENDED AMAN HORIZON

Validation of the operational aspects related to the use of Extended AMAN as supporting tool and application of P-RNAV procedures in complex TMA

Supporting tool enabling arrival traffic sequencing up to the en-route phase

AENA & NATS - Madrid & London TMA

RESULTS

• Changes in trajectory allows for the in-cruise absorption of flight delays
• Optimization of arrival sequence allows reduction of holding (average reduction of 4.8min/aircraft) and optimized runway throughput. Aircraft stack holding time in London was reduced by between 78% and 87%
• Fuel Burn per Flight reduced by ~10% (average of 942kg/flight)
• Improvements in cost efficiency by reducing fuel burn
• Includes validation of non-nominal scenario that combines thunderstorms over en-route sectors
• Sharing the same information by all En-Route and TMA controllers increases the situation awareness in all CWPs improving safety and quality of service.
COST-EFFECTIVENESS

KEY SESAR SOLUTIONS
RELEASE 2

CDM & Sector Team Ops

CDM & SECTOR TEAM OPS

Validation of the benefits of a Multi-Sector Planner concept in a complex operating environment, including roles and responsibilities

NATS En-Route Airspace

RESULTS

• Improvement of **situational awareness** and **task sharing** thanks to new support tools
• Increase of controller’s **productivity** through automatic calculation of optimal arrival sequences and coordination support
• Flexibility in resourcing and deployment of ATCOs resulting in improvements in **cost-efficiency**; improvement in ability to resource to demand, providing significant reduction in costs associated with staff overheads
• Flight **efficiency** gains through improved profiles
Assess the capability of the Traffic Complexity Management tool to perform prediction of airspace complexity issues with an increased anticipation.

EUROCONTROL MUAC

RESULTS

• Ability to manage more traffic with no increase to ATCO workload
• Benefits to ATCO productivity
• Traffic Complexity Management Tool is validated in an integrated environment adapted to the data accuracy expected from IOP and i4D improvements
• Allows the prediction of airspace complexity issues with an increased anticipation (up to 120 min before the congestion occurs)
TIME BASED SEPARATION

Validation of the use of Time Based Separation minima by Tower Air Operations Controllers, in particular the use of new controller practices and procedures in combination with controller support tools, conducted

NATS - Heathrow Airport

RESULTS

• Significant improvements and benefits for airport operations with TBS in terms of:
• **Increased aircraft landing rates**, including in stronger wind conditions, with up to **5 additional aircraft per hour were landed** with TBS compared to DBS, with a mean of 2 additional aircraft per hour
• **Reduction of holding times** (mean reduction of 0.9 min with a max. reduction of 9.4 min) and **stack entry to touchdown times** (mean reduction of 1.4 min, with a max. reduction of 9.3 min)
• The TBS Method of Operations is now considered to be **achievable and ready for deployment**
SAFETY

KEY SESAR SOLUTIONS RELEASE 2

Airport Safety Nets

AIRPORT SAFETY NETS

Validation through Shadow Mode live trials of the usability of a tool for detection of Conflicting ATC Clearances for the controller and the generated alert Messages on the HMI

DFS - Hamburg Airport

RESULTS

• The **overall** results indicate a **useable** system
• **Reduced** number of Runway conflict by **5 %** when ATC is supported by the Conflicting ATC Clearance Tool
• **Safety** improvements at airports through better **situational awareness** and conflicting alert systems while increasing **capacity**
• ATCOs most positive about the predictive conflict indication
• Nearly no nuisance alerts generated by the new safety net
Validation of a Point Merge System in Extended TMA (E-TMA) coupled with the used of an AMAN, with the objective of replacing radar vectoring by a more efficient traffic synchronization mechanism.

Live trials in Paris ACC between June and December 2012, involving DSNA, MUAC and Belgocontrol.

RESULTS

Implementation of AMAN + Point Merge leads to benefits in terms of:

- Increased in safety resulting from a more structured airspace, with positive impacts in terms of controller and pilot situational awareness;

- Reduced controller workload, due to the reduction in frequency usage, that could allow to increase capacity;

- Positive impacts on predictability due to a standardization of ATCO methodology as well as improved trajectory prediction and reduction in the number of open loops.

Available documents: VALR, VALP, SPR, OSED (+ Safety Assessment Report)
Part of SES High Level Goals is apportioned to SESAR in Master Plan 2012

Performance targets are set for each project

Performance achievement is measured through validation
SESAR STEP 1 CONTRIBUTION TO PERFORMANCE PER KPA

**KPA**

**Fuel Efficiency**

SES High Level Goals Intermediate Target allocated to SESAR Step 1

- 1. Business & Mission Trajectory (18%)
- 2. CDA (9%)
- 3. Free Routing (9%)
- 4. Sector Team Operations (8%)
- 5. CCD (6%)
- 6. Other OFAs (39%)

46% performance objective secured through validation

- 1. Business & Mission Trajectory
- 2. CDA
- 3. Free Routing
- 4. Sector Team Operations
- 5. CCD
- 6. Other OFAs

SES High Level Goals -2.8%

1. Business & Mission Trajectory (18%)
2. CDA (9%)
3. Free Routing (9%)
4. Sector Team Operations (8%)
5. CCD (6%)
6. Other OFAs (39%)

**Cost-Efficiency**

SES High Level Goals -6%

- 1. Conflict Detection, Resolution and Monitoring (13%)
- 2. Enhanced Decision Support Tools and Performance Based Navigation (10%)
- 3. Sector Team Operations (9%)
- 4. Business & Mission Trajectory (7%)
- 5. Dynamic Sectorization & Constraint Management (6%)
- 6. Other OFAs (40%)

25% performance objective secured through validation

- 1. Conflict Detection, Resolution and Monitoring
- 2. Enhanced Decision Support Tools and Performance Based Navigation
- 3. Sector Team Operations
- 4. Business & Mission Trajectory
- 5. Dynamic Sectorization & Constraint Management
- 6. Other OFAs

SES High Level Goals -14%
SESAR STEP 1 CONTRIBUTION TO PERFORMANCE PER KPA

**KPA**

**Airspace Capacity**

SES High Level Goals Intermediate Target allocated to SESAR Step 1 +27%

SES High Level Goals +40%

20% En-Route Performance objective secured through validation

75% TMA Performance objective secured through validation

**TMA**

1. Conflict Detection, Resolution and Monitoring (11%)
2. Business & Mission Trajectory (10%)
3. Enhanced Decision Support Tools and PBN (8%)
4. i4D + CTA (8%)
5. Integrated AMAN DMAN (7%)

**En-Route**

1. Business & Mission Trajectory (10%)
2. Sector Team Operations (10%)
3. Conflict Detection, Resolution and Monitoring (8%)
4. Dynamic Sectorisation & Constraint Management (8%)
5. Free Routing (7%)

**Other OFAs**
**SESAR STEP 1 CONTRIBUTION TO PERFORMANCE PER KPA**

**Airport Capacity**

1. Runway Occupancy Time Management (25%)
2. Integrated AMAN DMAN (17%)
3. i4D + CTA (6%)
4. AMAN and Extended AMAN Horizon (6%)
5. Guidance Assistance to aircraft & vehicles (5%)
6. Other OFAs (41%)

**Safety** requires a different approach and the performance assessment is mainly a qualitative one at this stage. Top contributing solutions are distributed across several influence factors:

1. Airport Safety Nets (4.8% Rinc)
2. Enhanced STCA (1.4% MAC-ER, 1.6% MAC-TMA, 2.8% CFIT)
3. Approach Procedure Vertical Guidance (2.4% CFIT)
4. Enhanced Situational Awareness (1.6% Rinc)
5. iCWP Airport (0.9% Rinc)
GLOBAL COOPERATION & INTEROPERABILITY

• Standards built on SESAR and NextGen developments will support harmonised Implementation and Regulation

• Programme level coordination enhanced by interoperability and wider industry buy-in.

EC/FAA Coordination
EU- US /SESAR NextGen coordination

• Identifying interoperability issues that needs to be harmonised.

• Strong coordination with the FAA/NextGen and other regional modernisation programmes is essential for standardisation activities in ICAO and EUROCAE and RTCA.

• The need for global interoperability and standards requires support at the ICAO level and a concerted approach is essential.
• Change is inevitable and it will have in-depth consequences for our industry

• Sustainable solutions are developed in partnership with a performance-driven approach, to make a smooth transition to industrialisation and subsequent deployment

• The EU – US (SESAR-NextGen) MoC is the important mechanism of collaboration and to progress interoperability standards on key capabilities.

• Harmonized positions are essential for global interoperability and the business of aviation.
FROM INNOVATION TO SOLUTION

INITIAL 4D CONCEPT AND DEMONSTRATION FLIGHT

Pierre BACHELIER, Head of ATM Program
AIRBUS
SESAR workshop
Washington DC, 25th June 2013
Initial 4D: The Operation

- Share and synchronize airborne and ground trajectory.
- “Flying to Time constraints” to optimize sequences as defined by ATC.

4D trajectory = computed 3D trajectory + times estimates considering route, altitude and time constraints (RTA)
Initial 4D: Expected benefits

**Expected benefits**

- **Better flight efficiency:**
  - Flight profile and fuel burn optimization.
  - Avoiding penalizing vectoring instructions (path stretching, holding patterns, etc.).

- **Better planning:**
  - Increased predictability of the real trajectory and arrival time.
  - Early agreement with the flight crew on the trajectory to be flown.

- **Improved safety:**
  - Through enhanced anticipation of traffic situation by ATC.
Initial 4D: Cockpit Integration

EIS
Electronic Information System (Displays)

ATSU
Air Traffic Service Unit (Communication)

Avionics A429 link

FMS
Flight Management System (Navigation and Guidance)
The 4D Trajectory is a basis for a multitude of services (separation, situation awareness, enhanced prediction, flow and capacity management....)

(*)Courtesy of MUAC and NORACON

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FDP Graphical display*  FDP Tabular display*  Arrival Manager (AMAN)*
Initial 4D challenges and achievements

SESAR validation campaign is ensuring the maturity

• Closely coordinated Airborne and Ground developments
• Stepped and integrated Air/Ground validation
CONCLUSION

• Initial 4D **technical feasibility** is demonstrated. Technical enablers validated: ATC system, ADS-C, CPDLC, FMS

• **Benefits**: Flight efficiency, better predictability

• **Next steps**
  – More validation activities on-going (2013-2014)
  – **Large Scale Demonstrations** (2017-2018)
  – **Start of deployment** in Europe planned in 2018 (Pilot Common Project)
    • Full **coordination** is needed between airborne and ground developments to enable future operations with the performance expected by the users at the target date
    • Business: Airbus and industry partners push to ensure **return on investment** for users
Thank You and See the Video

SESAR flight Trial performed on February 10th, 2012

Jane’s ATC award
THANK YOU!

Pierre BACHELIER

pierre.bachelier@airbus.com
## AGENDA

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<td>SESAR project - En Route &amp; Descent Phase Delay Absorption at London Heathrow</td>
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<td>2</td>
<td>Operational Trial of SESAR concept</td>
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<td>Arrival Management using Better Trajectory Data</td>
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<td>Taking Delay at the Departure Airport</td>
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<td>5</td>
<td>Linking the Arrival Manager with the Departure Manager</td>
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</table>
Benefits of Extended Arrival Management

NOW
• Reduce holding in the TMA
  • enhance safety
  • reduce fuel and emissions
  • enable better departure profiles

NEXT
• Smooth delivery of arrivals
  • Improve en route capacity, i.e. steady stream of aircraft and reduced number of bunches
• Depart in response to arrival constraints
  • Further fuel/emissions reductions
Near Term SESAR Extended AMAN Horizon project: London Heathrow

Original AMAN Horizon approx. matches FIR Boundary
Near Term SESAR Extended AMAN Horizon project: London Heathrow

AMAN horizon extended to 550nm using European Flight Data (ETFMS)
Near Term SESAR Extended AMAN Horizon concept: London Heathrow

Neighbouring ANSPs act on en route delay information at 500nm

NATS controllers act on descent phase delay information at circa. 160nm
Operational Trials: En Route Delay Absorption: Heathrow 350NM
(Functional Airspace Block Europe Central XMAN & Atlantic Interoperability Initiative to Reduce Emissions 3)

Employ various delay mechanisms (control techniques), as appropriate to traffic situation and airspace:

- Time to lose/gain
- Relative speed advisory
- Controlled Time of Arrival

pass delay information in a single format
Future FABEC XMAN Extended AMAN Horizon:
Overlapping 350nm Horizons:
EHAM, EDDF, EDDM, LFPG, EGLL, EGKK

Note: 350nm is horizon for FABEX XMAN local trial
Arrival Management using Better Trajectories

• Needs accurate aircraft ETA
  – now: centralised network management service (ETFMS) and individual AMAN calculations
  – future: common trajectory service held in flight object servers
  – initially based on ground-calculation (validation exercise planned for 2014-15) but evolving to include shared aircraft trajectory

• Pilots will manage flight to respect arrival (and other) constraints

• Controllers’ tools will show aircraft trajectories enabling all parties to work to a common plan
Next Steps in Delay Absorption

• If delay greater than can be absorbed in the air, take delay on the ground
  – Currently work on this for small feeder airports in Swedish airspace

• Concept under discussion:
  – destination airport AMAN sends Target Time of Arrival to European Network Manager for check against other constraints (e.g. en route congestion)
  – resulting constraint sent to departure airport Airport-Collaborative Decision Making system

• Later stage goal to permit negotiation to give operators some flexibility in how they respect constraints
NATS is running a SESAR coupled AMAN-DMAN exercise with London Gatwick Airport:

- Gatwick achieves 53 movements per hour on a single runway
- Developing a coupled AMAN-DMAN to assess balance between arrivals and departures up to an hour ahead
- Aim is to set an appropriate arrival and departure rate to match the balance
- Closer to time of execution, a more precise arrival-departure pattern set

Numerous other exercises within SESAR on related aspects
FROM INNOVATION TO SOLUTION

THANK YOU!

Adrian.clark@nats.co.uk
AGENDA

Why

What

How

When

?
Efficient data communication services are required to enable the key SESAR principles.
Data Communication in a 4 D Business & Mission Trajectory context

- Need connection FMS – data comm and safe high transfer rates

More than 50% of SESAR Operational Improvements require efficient data communications
• **Development and definition, planning, exchange and execution of 4D Business or Mission Trajectories** through Required Time of Arrival (RTA) and Controlled Time of Arrival CTA:

  • Operational procedures and technical definition and airborne system design for **“initial 4D”** mature, robust and interoperable with ground procedures and systems. – including ADS-C and CPDLC supporting elements.

  • **“Full 4D”** function aiming to provide significant benefits, on predictability and flight efficiency for all phases of flight, based on precise 4D trajectory management.

  • **Assess capability levels by military aircraft** in relation to interoperability of Business Trajectory and Mission Trajectory and how military aircraft capabilities will comply with the 4D principles.
AGENDA

Why

What

How

When
Supporting all airspace users

- Mainline aircraft
- Regional aircraft
- Business aircraft
- General Aviation
- Military aircraft
- Remotely Piloted Aircraft Systems (RPAS)
Key Air and Ground System Enablers

**En-Route**

- FMS with RTA capability
- ETA min/max window
- Extended Projected Profile (EPP)
- Data link capability supporting CPDLC and ADS-C

**Ground-Ground coms**
- Current solution is limited
- SWIM is a pre-requisite for full conceptual support

**Ground trajectory prediction tools**
- Supporting EPP
- i4D+CTA HMI

**TMA**

- Extended AMAN Horizon (i.e. 200 NM)
- ETA min/max support
- CTA negotiation

- Ground-Ground coms
- Current solution is limited
- SWIM is a pre-requisite for full conceptual support

**Extended AMAN Horizon (i.e. 200 NM)**
- ETA min/max support
- CTA negotiation
Technology and Requirements

- Technology development is a long term action (but must be expedited)
- Operational Requirements not able to provide all of the detailed elements required for technology development
- Requires an iterative approach with initial technical developments based on initial and early view of customers upcoming operational requirements
Separating the Issues

- ‘Data com’ Services
  - CPDLC, DCL, D-TAXI, i4D, etc...

- ‘Data com’ networking
  - (FANS), ATN/OSI transition to ATN/IPS

- Physical Data link
  - VDL/2 transition to Future L band etc...

- Supporting Avionics
  - Retrofit and forward fit issues (FMS, Display, etc)

- Deployment
  - Budget, business cases, mandates, timescales
Data Comm Actions Required

SHORT TERM
- Initial Data Link
  - LINK 2000+
  - FANS1/A

MEDIUM TERM
- Initial 4D Trajectories & Airport Services

LONG TERM
- Full 4D Business Trajectories

ATN Standards & FANS1/A
- Converged Standards
- New Standards - TBD

ICAO ASBU BLOCK 0
- ICAO ASBU BLOCK 1
- ICAO ASBU BLOCK 3

FINISH ON TIME
STANDARDISE PLAN COMMIT
RESEARCH & DEVELOP
Standards supporting i4D Trajectory Ops

- **ICAO Provisions**
  - Standards and Recommended Practices (SARPs)
  - Technical Manual (use reference to industry standards)
  - Procedures for Air Navigation Services (PANS) ATM
  - PBN/RNP/ CDO/CCO

- **Industry standards** (under development in EUROCAE/RTCA)
  - OSED, SPR and Interop
  - Technical Specifications and Minimal Operational Performance Standards MOPS
  - Avionics Specifications
AGENDA

Why

What

How

When

?
GLOBAL COOPERATION & INTEROPERABILITY

- Standards built on SESAR and NextGen developments will support harmonised Implementation and Regulation

- Programme level coordination enhanced by interoperability and wider industry buy-in.

EU-US MoC Coordination Plan 4

EUROCAE

RTCA etc.

SESAR

NextGen

ICAO
communications Technology Roadmap

- VHF ACARS (continental)
- SatCOM ACARS (global)
- VDL Mode 2/ATN (continent)
  - New terrestrial (continental) e.g. LDACS?
  - New SatCOM (global) e.g. Iris?
  - Multi link Management
  - AeroMACS (airport)
  - Link 16 interconnection (Military)
  - New flexible avionics

Legends:
- Legacy or currently implemented technology
- Future technologies
European Deployment Planning

ATN B2 Services
- 4D TRAD
- D-TAXI
- Etc.

ATN B3 Services
- D-PBN*
- A-FIM*
- FIS Services
- SESAR Step 2

Future Services
- Future Services TBD

Development
- Standards Available

Deployment
- 2018

Industrialization
- 2018

Building Momentum

IOC

2014
2015-2018
2023

* New Services proposed by FAA
Conclusions

- Data communication needs to be seen from a **performance driven 4D ATM TBO context**.

- **Initial 4D is the first important step** towards understanding the full 4D needs of data communications in the integrated air and ground ATM procedures and systems design.

- We need to work together to achieve globally **endorsed ICAO provisions and agreed industry standards** to be interoperable and **timely ready for regional deployment planning** (SARPS, Standards (Services and technology) /Spectrum, Business case assessments – “BEBS” etc).

**SESAR/NextGen as leading modernisation programmes have a global responsibility. We need to make good use our MoC to agree on the steps towards global interoperability**
FROM INNOVATION TO SOLUTION

THANK YOU!

www.sesarju.eu
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Airport Engagement in SESAR via SEAC – the SESAR European Airports Consortium

Why did Airports become an S-JU member through SEAC?

- Airport involvement in the Definition Phase was less than 5% of total work.
- ATM related resources within airport companies are very rare.
- Only a group of major airports can make a meaningful contribution.

The SEAC Consortium

- SEAC is a consortium created for the duration of the SESAR Programme.
- Together with the WP leader AENA, SEAC manages WP6 “Airport Operations”.
- SEAC contribution is limited to projects and tasks relevant for airports (mainly WP6).
- SEAC is a relatively small player in SESAR: 16.7 Mio € contribution (< 1.5% of total effort).
**SEAC Represents 5 of Europe’s Top 10 Airports**

- and over 325 mppa

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<td>14</td>
<td>Zürich</td>
<td>24.34</td>
<td>(SEAC)</td>
</tr>
</tbody>
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ACI-Europe traffic statistics for 2011
The Airport (R)evolution in SESAR:

- SESAR is building on **proven technologies** such as A-CDM, A-SMGCS, AMAN, etc.
- Based on the **ATM Masterplan** SESAR is developing a series of building blocks in the Airport environment
- This involves a series of philosophy-changes:
  - from time-based to performance-based operations
  - one continuous aircraft trajectory
  - integrating airports into the network
- One of the first building blocks ready for implementation at airports are the **Airport- and Network-Operations Plans (AOP / NOP)**
Operations before and after SESAR

- Local optimisation through A-CDM with point to point connection to the Network (ex CFMU)
- No network-wide common situational awareness especially for planning updates
- The airport as ‘Ground Coordinator’
Collaborative Network Operations Plan (NOP)
The Network Operations Plan (NOP) is a structured and coherent set of information (e.g. the current demand, the situation of airspace/airports), but also the influences of ones versus the other (DCB).

The NOP is “performance driven” the objective being to have the best possible plan and to show the actions required to reach this performance (i.e. minimum disruptions).

The NOP is the common view of the Network situation: the same information is available to all ATM Stakeholders.

The NOP is a rolling process, through continuous assessment of performance and identification of improvement and/or mitigation actions.
What does the NOP mean for Airports?

• Agreed demand and capacity figures for airports, current and future, are a vital input into the network operations planning (e.g. to ensure there is sufficient enroute capacity available in the correct locations).

• Integration of airport information such as changes to those capacity figures in real time will improve the network picture of ‘real capacity’ supporting better capacity planning.

• Airports to regularly update the NOP on any planned initiatives or special events that may affect airport operations (capacity or efficiency).

• Better management of adverse conditions
  Through common understanding of adverse conditions and better MET Information

• Post-ops analysis
  Support to effective post-ops analysis by facilitating stakeholders information sharing
Collaborative Airport Planning

AOP & APOC
Collaborative Planning is based on a number of “pillars”

**Airport Operations Plan (AOP)**
- Demand and capacity information
- Resource monitoring (aircraft, pax, bax/cargo) based on up-to-date timestamps
- Strategies for operations management (special events, weather, ..)
- Airport activities.

**A set of local Performance Targets** agreed between all stakeholders

**An Airport Operations Center (APOC)** based on the above, supporting an integrated airport operations management.
“The Airport Operations Plan (AOP) is a single, common and collaboratively agreed rolling plan available to all airport stakeholders whose purpose is to provide common situational awareness and to form the basis upon which stakeholder decisions relating to process optimisation can be made.”
Information sharing will be improved through the AOP

- **Wider scope**, e.g. overall airport resources, MET, key landside data
- **More anticipation**, starting as early as 6 months before operations
- **Improved quality** through more detailed monitoring leading to updates
- **One source of information** (for real !): the AOP

From milestones approach to Airport Performance Monitoring & Management

- More detailed monitoring of the aircraft process
- Monitoring of the impact of landside to the airside (pax & baggage process)
- The APOC: the Centre where collaborative decisions are made, CDM processes supported by decision support tools and what-if scenarios

**Variable taxi times**: supported by **Surface management**

**Pre-departure sequence**: supported by **Surface management and RWY management**

The **Airport Operations Centre (APOC)** to manage the **Airport Transit View (ATV)**
The Airport Transit View (ATV) is the description of the "visit" of an aircraft to the airport. It consists of three separate sections:

Final approach and “Surface-in” ground section of the inbound flight,

Turn-round process section in which the inbound and the outbound flights are linked,

“Surface-out” & Initial Climb ground section of the outbound flight”
LHR - ATM Improvement Initiatives

2012
- XS Block Times
- Stack Holding
- Delay
- Slot Indiscipline
- 40 yo airspace
- No spare capacity

Capacity Management
- DCB
- Review of Capacity Declaration Methodology
- Review slot
- Implementation of Airport CDM

Operational Freedoms
- Operational Trials
  - Optimising Runway Infrastructure Use

2013
- New Capacity Modeling Capability
- A-CDM Development

- Service and tactical ATM improvements

2014
- Enhanced Arrival Management
- Controlled Time of Arrival

- ATM Programme development

2016
- Required Time of Arrival
- Time Based Separation
- Airspace Redesign

- Integrated AOP / NOP

2018
- RP2 Begins
- APOC Deployment Begins
- Network Strategy and Operating Plan

- Development of APOC

2019
- Predictability
- Sustainability
- Efficiency
- Every flight, on time, every time

Operational Freedoms
- Service and tactical ATM improvements
- Interim APOC

Performance Management
- Operational Freedoms
The APOC is built around 4 main services:

The **Steer Airport Performance** service develops the performance standard (i.e., goals, targets, rules, thresholds, trade-off criteria and priorities) for airport operations and **sets an overall strategic direction**. Airport stakeholders develop a mutually agreed performance standard in a collaborative manner.

The **Monitor Airport Performance** maintains surveillance over **airport operations**, airport performance (against KPAs), airport environment (e.g. weather monitoring), supervising airport related information and any information that can impact the airport performance, providing observations, forecasts, alerts and warnings against predefined thresholds.
The *Manage Airport Performance* assesses the overall impact of warnings / alerts on upcoming airport operations and supports decision making activities (what-if, etc.) in accordance with AOP consistency rules.

The *Post-Operations Analysis Service* provides:
- A facility to **understand the airport performance** against the performance plan and identify the root causes of deviations,
- A facility to **assess the relevance of the performance plan**
- A **foundation for the development of new operational scenarios** and for assessing the relevance of existing ones.
Airline Operations Planning
AOC interactions

The AOC system is an integral part throughout the entire lifecycle of a single flight as well as the entire lifecycle of an entire flight schedule.

This can be summed up but is not limited to the following:

– Producing the flight schedule
– Producing the data that is needed to execute a flight
– Allowing efficient flight execution
– Receiving the data that is needed to produce a flight plan
– Receiving and processing data that is needed to support decision making in the planning as well as the execution phase
APT - AOC interaction (example)

The Airport Transit View (ATV) of a turnaround during the execution phase would cover the following phases of the flight including:

- Initial Approach which is fixed by the Targeted Initial Approach Fix Time (TIAT)
- Landing is fixed by the Targeted Landing Time (TLDT)
- In-Block time is fixed by the Targeted In-Block Time (TIBT)
- Off-Block time is fixed by the Targeted Off-Block Time (TOBT)
- Take-off time is fixed by the Targeted Take-Off Time (TTOT)
- Departure Fix is provided by the Targeted Departure Fix Time (TDFT)
• The NOP provides visibility of:
  – Network OPS Performance targets and KPIs;
  – Forecast Traffic Demand - Business/Mission Trajectories;
  – Service Providers’ Planned Resources and Capabilities;
  – Any detected “network influencer” (e.g. special event),
    • its impact on Demand Capacity Balance (assessment),
    • related DCB actions/measures
  – Residual Bottlenecks/Hot Spots
The NOP contains airport data amalgamated from all AOPs data agreed to be shared with the network (incl. airport constraints/events, airport capacities, timely ground trajectory information).

The NOP consolidates this information into a network view. NOP data is available to all authorised users in order to support their planning.

Airport x can access airport data from other airports if it is shared, and it should do so via the NOP.
FROM INNOVATION TO SOLUTION

THANK YOU!

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