SESAR 1 Solutions Implementation

Key Feature – High Performing Airport Operations

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8th SESAR Innovation Days
Salzburg (Austria)
3 – 7 December 2018
The focus is on SESAR solutions that are contributing to High performance Airport Operations SESAR Key feature.

The aim – analysing deployment progress and determining which SESAR solutions are the most “attractive” for airports.
**SESAR SOLUTIONS**

**SESAR Solution** is a new improved procedure or technology, elaborated to modernise and improve the existing ATM system.

**SESAR Solutions** are delivered in a structured way through a release process.
SESAR DEPLOYMENT

ATM Master Plan

Regulated/mandatory deployment according to Commission Regulation (EU) 716/2014 facilitated by SESAR DM

Voluntary deployment followed up through Master Plan Level 3

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Key Feature-High Performing Airport Operations

Salzburg (Austria)
3-7 December 2018
# PCP AND NON PCP SOLUTIONS

<table>
<thead>
<tr>
<th>Solution no.</th>
<th>Solution name</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Runway status lights</td>
</tr>
<tr>
<td>02</td>
<td>Airport safety nets for controllers: conformance monitoring alerts and detection of conflicting ATC clearances</td>
</tr>
<tr>
<td>04</td>
<td>Enhanced traffic situational awareness and airport safety nets for vehicle drivers</td>
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<td>Single remote tower operations for medium traffic volumes</td>
</tr>
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<td>Remotely provided air traffic service for contingency situations at aerodromes</td>
</tr>
<tr>
<td>21</td>
<td>Airport operations plan (AOP) and its seamless integration with the network operations plan (NOP)</td>
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<td>Automated assistance to controllers for surface movement planning and routing</td>
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<td>D-TAXI service for controller-pilot data-link communications (CPDLC) application</td>
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<td>Manual taxi routing function</td>
</tr>
<tr>
<td>47</td>
<td>Guidance assistance through airfield ground lighting</td>
</tr>
<tr>
<td>48</td>
<td>Virtual block control in low visibility procedures (LVPs)</td>
</tr>
<tr>
<td>52</td>
<td>Remote tower for two low density aerodromes</td>
</tr>
<tr>
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<td>Pre-departure sequencing supported by route planning</td>
</tr>
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<td>54</td>
<td>Flow based integration of arrival and departure management</td>
</tr>
<tr>
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<td>Precision approaches using GBAS Category II/III</td>
</tr>
<tr>
<td>61</td>
<td>A low-cost and simple departure data entry panel for the airport controller working position</td>
</tr>
<tr>
<td>64</td>
<td>Time-based separation</td>
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<tr>
<td>70</td>
<td>Enhanced ground controller situational awareness in all weather conditions</td>
</tr>
<tr>
<td>71</td>
<td>ATC and AFIS service in a single low-density aerodrome from a remote controller working position (CWP)</td>
</tr>
<tr>
<td>106</td>
<td>DMAN Baseline for integrated AMAN DMAN</td>
</tr>
<tr>
<td>116</td>
<td>De-icing management tool</td>
</tr>
</tbody>
</table>
The Data Sources Used

LSSIP
- Timeline: Nov 2017- Feb 2018
- Data: end 2017
- Area: ECAC
- Nature: Public use/Limited access

SURVEY
- Timeline: Dec 2017- Feb 2018
- Data: end 2017
- Area: ECAC
- Nature: Public use/Limited access

NM
- Timeline: Continuous
- Data: end 2017
- Area: ECAC
- Nature: Limited access

The Data Sources Used

The official Master Plan monitoring mechanism

State

National Focal Points involved in the development of the document

Template Guidance

Local Single Sky Implementation (LSSIP) document

Tools

On-line database

Master Plan Level 3 Implementation Report

Currently mostly objective driven

Solution driven

Support of dedicated Contact Person per State

EUROCONTROL

EUROCONTROL

Template Guidance

Local Single Sky Implementation (LSSIP) document

On-line database

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SESAR 1 Solutions implementation
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### SOLUTIONS CONSIDERED IN THE ANALYSIS

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ANALYSIS OF SESAR 1
DEPLOYMENT AT AIRPORTS

Period of analysis: 2017 - 2024

A. Implementation trend by categories
B. Performance view
C. Implementation locations

Which SESAR solutions are the most "attractive" for airports?
ANALYSIS OF SESAR 1 DEPLOYMENT AT AIRPORTS

A. Implementation trend by categories

1. **Safety nets and visual aids** (Safety): 01, 02, 04, 26, 47, 48, 70
2. **Integration in the Network** (Network): 21, 53, 61, 116
3. **Arrival, departure and Surface Operations** (ARR/DEP/SO): 22, 23, 54, 55, 64, 106
4. **Remote Tower Services** (RTS): 12, 13, 52, 71

By 2024

- 16 airports will be congested
- Airports in 17 States will need more capacity

Six different capacity gap mitigation
ANALYSIS OF SESAR 1 DEPLOYMENT AT AIRPORTS

A. Implementation trend by categories

83 implementation plans → 2017

258 implementation plans → planned for 2024

Network and ARR/DEP/SO → similar solutions deployment trend

Safety → lower rate in planned solutions deployment

RTS → lower numbers in overall deployment

Cumulative number of solution implementations by categories
## Analysis of SESAR 1 Deployment at Airports

### A. Implementation trend by categories

**Base year: 2017**

- **40 solution implementations** → **end of 2018**
- **30 solution implementations** → **per year** for the **next six years**

**Safety** solution implementations → **focus in 2020**

**ARR/DEP/SO** solution implementations → **focus in 2023 and 2024**

<table>
<thead>
<tr>
<th>Year</th>
<th>Safety</th>
<th>ARR/DEP/SO</th>
<th>Network</th>
<th>RTS</th>
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<tr>
<td>2017</td>
<td>18</td>
<td>31</td>
<td>29</td>
<td>5</td>
</tr>
<tr>
<td>2018</td>
<td>8</td>
<td>13</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>2019</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>4</td>
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<tr>
<td>2020</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>7</td>
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<tr>
<td>2021</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td>2022</td>
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<td>4</td>
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<td>2023</td>
<td>0</td>
<td>17</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>2024</td>
<td>9</td>
<td>12</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**Number of implementation cases planned for the period 2017-2024**
ANALYSIS OF SESAR 1 DEPLOYMENT AT AIRPORTS

A. Implementation trend by categories

258 implementation cases by 2024

Network Solutions ↓ 62 airports

ARR/DEP/SO Solutions ↓ 45 airports

Safety Solutions ↓ 37 airports

RTS Solutions ↓ 26 airports

92 airports
B. Performance view

Performance

CAPACITY GAINS WITH TIME-BASED ARRIVALS

Time-based separation

Today, aircraft making their final approach to land are obliged to maintain minimum separation distances. These distances are fixed regardless of wind conditions. When winds exceed these distances in strong headwinds or tailwinds, the time develop between aircraft may mean lower flight levels per hour and frequent airport capacity, leading to delays and increased holding times, which results in increased fuel burn.

SESAR’s time-based separation (TBS) replaces current distance separations with time intervals in order to adapt to wind conditions. It provides consistent time-based spacing between arriving aircraft in order to maintain runway approach capacity.

The TBS software uses real-time information about the weather, airspeed, ground speed, heading and altitude to display time-based separation and arrival speed information to the approach controller. No changes are required on board the aircraft, but the controller uses the real-time separation indicators to manage the final approach separations.

TBS research included analysis of the arrival paths of over 100,000 aircraft using time of the environment to measure the behaviour of aircraft wake vortexes. The procedure now is in daily use at London Heathrow, where, in strong wind conditions, it delivers up to five additional aircraft landings with TBS per hour compared to traditional distance-based separation procedures. TBS results in a reduction of 0.7 minutes holding time, and on average a reduction of 4 minutes between stack-entry and touchdown times.

The SESAR Solution is available for industrialisation. TBS entered into full-time service at London Heathrow in March 2018. The solution is due for synchronised deployment across Europe in accordance with the Pilots Common Project.

Analysis has shown that there has been to increased risk to wake turbulence encounters, and no increase in the number of go-arounds following introduction of time-based separations at London Heathrow.

This solution is linked to European ATM specifications (STD-058).

Key Feature-High Performing Airport Operations

SESAR 1 Solutions Implementation

Salzburg (Austria)
3-7 December
2018
# Analysis of SESAR 1 Deployment at Airports

## B. Performance View

### Number of Contributors by Performance Area, Period 2017-2024

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
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<tr>
<td>Cost Efficiency</td>
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<td>7</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>7</td>
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<tr>
<td>Capacity</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>26</td>
<td>4</td>
<td>18</td>
<td>12</td>
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<tr>
<td>Operational Efficiency</td>
<td>62</td>
<td>25</td>
<td>6</td>
<td>7</td>
<td>24</td>
<td>2</td>
<td>22</td>
<td>14</td>
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<tr>
<td>Safety</td>
<td>24</td>
<td>10</td>
<td>5</td>
<td>20</td>
<td>1</td>
<td>3</td>
<td>13</td>
<td>9</td>
</tr>
</tbody>
</table>

*Number of contributors*
ANALYSIS OF SESAR 1
DEPLOYMENT AT AIRPORTS

B. Performance view

Safety

Operational efficiency

Capacity

Cost efficiency

Environment

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C. Implementation locations

92 airports

Legend:
- 2-3 Solutions (17)
- 4-5 Solutions (32)
- 6-7 Solutions (10)
- 8+ Solutions (2)
- 0-1 Solutions (3)

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C. Implementation locations

14 (out of 21) solutions → fully implemented at one or more airports

41 airports → one solution, fully implemented

11 airports → two or more solutions, fully implemented

Slot coordination levels:
- Level 1
- Level 2
- Level 3

<table>
<thead>
<tr>
<th>Solution no.</th>
<th>Airports completed the implementation (100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>LFPG, ESSA</td>
</tr>
<tr>
<td>02</td>
<td>EGKK, EGLL, EBBR</td>
</tr>
<tr>
<td>13</td>
<td>EKCH, LHBP, EYVI</td>
</tr>
<tr>
<td>47</td>
<td>EVRA, EPWA</td>
</tr>
<tr>
<td>48</td>
<td>EVRA</td>
</tr>
<tr>
<td>55</td>
<td>EETN</td>
</tr>
<tr>
<td>61</td>
<td>LEMG, LEAL, LEIB, LEMN*, LFMN, EDDR, EDDE, EDDG, EDDC, EDDW, EGLC, EGSS, EGGW, EGGP, EGCC, EGPH, EGPD, UKBB</td>
</tr>
<tr>
<td>64</td>
<td>EGLL</td>
</tr>
<tr>
<td>70</td>
<td>EFHK, LFPG, LHBP, EVRA</td>
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<tr>
<td>106</td>
<td>EFHK, ESSA, ENGM, EKCH, EIDW, EGSS, EGLL, EGLC, EGKK, EBBR, EDDL, EDDF, LKPR, LFPG, LFPO, EDDM, LOWW, LSZH, LSGG, LFLL, LIMC, LIML, LIPZ, LIRF, LTBA, LEBL, LEPA, LEMD, LPPT</td>
</tr>
<tr>
<td>116</td>
<td>EFHK, LFPG</td>
</tr>
<tr>
<td>12,52,71</td>
<td>ESNO, ESNN</td>
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</tbody>
</table>
### Analysis of SESAR 1 Deployment at Airports

#### C. Implementation locations

<table>
<thead>
<tr>
<th>Performance Area</th>
<th>Traffic volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Medium to high</td>
</tr>
<tr>
<td></td>
<td>Low to medium</td>
</tr>
<tr>
<td>Safety</td>
<td>01,02,04,26,47,47,48,70</td>
</tr>
<tr>
<td>Operational efficiency</td>
<td>21,22,23,35,54,106,116*</td>
</tr>
<tr>
<td>Capacity</td>
<td>64</td>
</tr>
<tr>
<td>Cost efficiency</td>
<td>13,55</td>
</tr>
</tbody>
</table>

#### Solutions by Performance Area and Airport Traffic

**Example**

**EKCH:**
- **10 solutions** (02, 04, 13, 21, 22, 23, 26, 53, 64, 106)
- **6 solutions** are currently being implemented (02, 13, 21, 22, 53, 106)
  - **2 solutions** are fully implemented (106, 13)
  - **4 solutions** are still planned to be implemented (04, 23, 26, 64)
CONCLUSIONS

A total of **92 airports** are either implementing or planning to implement one or more **SESAR solutions**

By **2017** (inclusive), there were **83** solution implementations at airports in the **ECAC area**

By **2024**, that number will increase to a total of **258 implementations**

The most successful **solutions** with the biggest population of airports, (already implemented or planned to implement those solutions) relate to integration into the **network and ARR/DEP/SO operations**

**Capacity and operational efficiency-related solutions** will be the focus in **2021**, while **Safety** will be the focus in **2020**

Distribution of solutions by airport traffic level shows a **limited amount of solutions available for low to medium traffic** – the focus is on delivering performances at major, very busy airports
Thank you for your attention!

Questions please...