FROM INNOVATION TO SOLUTION

ENABLING GREENER FLIGHT TRAJECTORIES

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SESAR vision

An Aviation Strategy FOR EUROPE

European ATM Master Plan
THE ROADMAP FOR DELIVERING HIGH PERFORMING AVIATION IN EUROPE
Executive View — Edition 2015

State of Harmonisation Document

2013-2028 | Global Air Navigation Capacity & Efficiency Plan
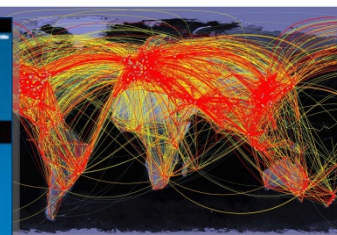
Air Traffic Flow Chart 2040

DEPLOYMENT PROGRAMME 2015
30 September 2015
LET'S DELIVER TOGETHER

SAR SOLUTIONS ALOGUE
First Edition

SECURITY
· Ensuring high levels of security

COST EFFICIENCY
· Up to **40%** reduction in air navigation services costs per flight

CAPACITY
· Up to **30%** reduction in departure delays
· Up to **10%** additional flights landing at congested airports
· A system capable of handling up to **100%** more traffic

ENVIRONMENT
· Up to **10%** reduction in CO_2 emissions
· Positive impact on noise and air quality

SAFETY
· Improvement by up to a factor of **4**

OPERATIONAL EFFICIENCY
· Up to **6%** reduction in flight time
· Up to **10%** reduction in fuel burn

SESAR JOINT UNDERTAKING

SESAR life cycle

➢ To define, develop and deploy the technology that is needed to increase ATM performance and build Europe's intelligent air transport system
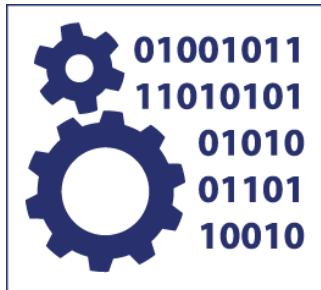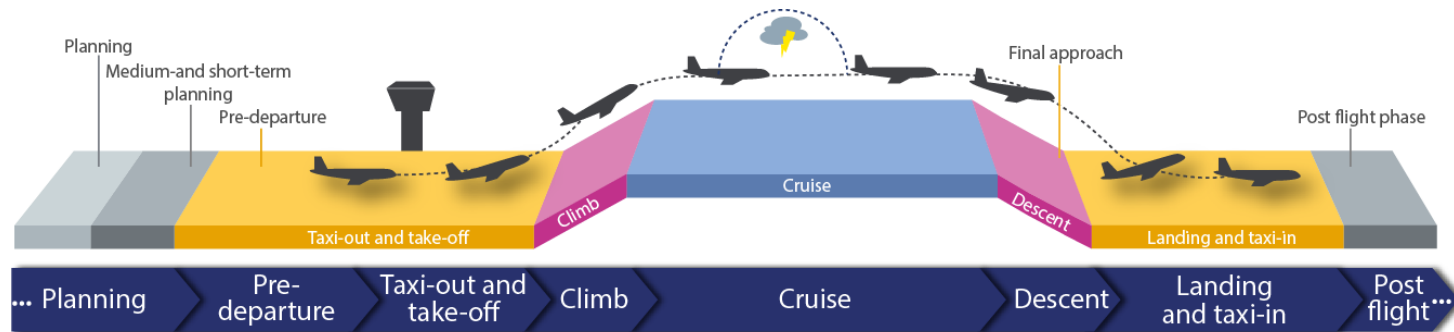
SESAR Solutions refer to new or improved operational procedures or technologies that aim to contribute to the modernisation of the European and global ATM system.

- 63 SESAR Solutions, divided into 4 areas (Key Features)

- 24 Solutions are already being deployed across Europe
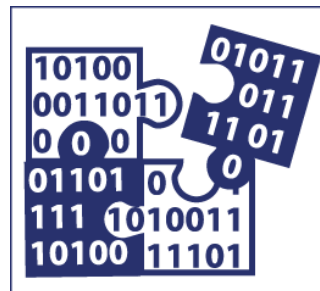
Flight-centric approach: system capabilities

Enabling greener trajectories

-500 kg FUEL BURN

-1.6 tonnes CO₂

SESAR target

Reduce fuel burn by between **250 and 500 kg per flight by 2035** – between **0.8 to 1.6 tonnes of CO_2 emissions** per flight

In the air

Free routing
=
Reduction in fuel burn between 6% and 12% per flight.

On the ground

Take-off and landing

Optimised taxi and runway usage
=
Fuel savings of approximately 10% per flight

Continuous descent/climb operations
Advanced precision approaches
*Extended arrival management
=
*EUR 1.25 million in fuel savings and 5,000 tonnes of CO2
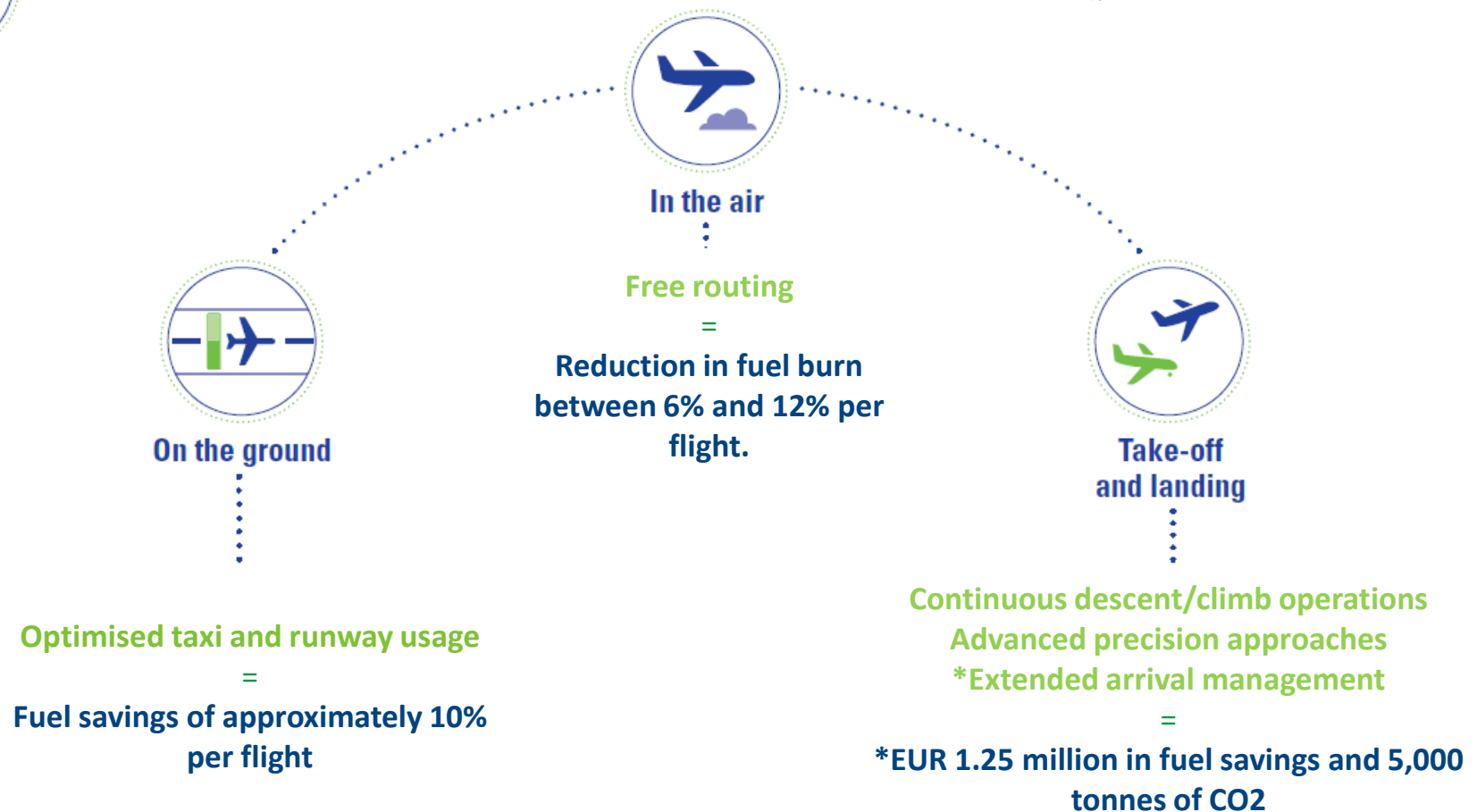
SESAR & Noise abatement

"While **airport noise is essentially a local concern**, it can represent an **obstacle to the implementation of ATM improvements** that offer other important airport performance gains, such as fuel efficiency. Each **airport needs to reduce the environmental impact per flight** in accordance with local priorities and trade-offs."

SESAR

THE ROADMAP FOR DELIVERING HIGH PERFORMING AVIATION FOR EUROPE

European ATM Master Plan

Executive View   Edition 2015

Our approach
- Recognise that a one-size solution does not fit all
- Develop standardised methodology to assess noise
- Real-operational validations and flight trials
- Assess trade-offs between noise, operational efficiency, cost efficiency and CO_2
- Maximise aircraft enablers

SESAR Solutions addressing noise

Approach procedures with vertical guidance
Precision landings enabled by GBAS
Localizer performance with vertical guidance using ground based augmentation systems.

Optimised 2D/3D routes
Optimised route network using advanced RNP; advanced continuous descent approach (ACDA), CCD, CDO, cruise climb.

Airport operations planning
Improved planning will result in a reduction of delays, airborne and ground holding times.

Precision landings enabled by GBAS
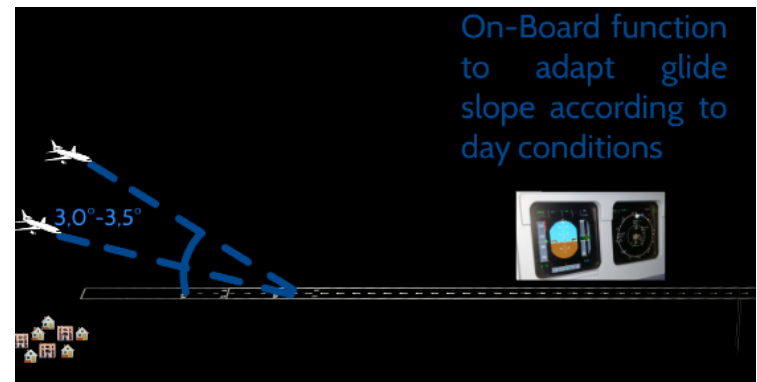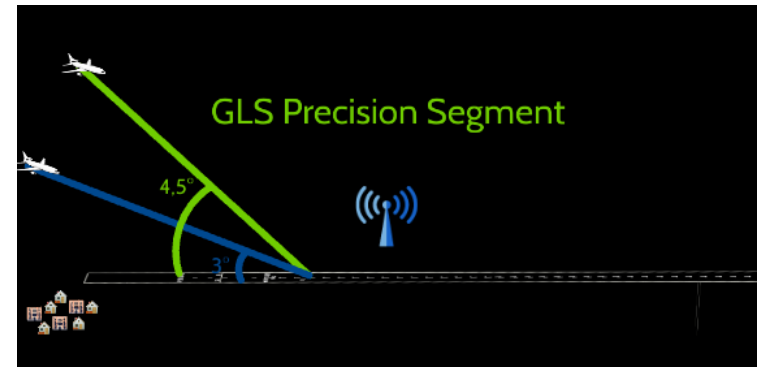
SESAR Project: 06.08.08

Validated (V2 maturity):
- Increased glide slopes
- Multiple runway aiming points
- Double slope approaches
- Approaches integrating curved transitions from required navigation performance (RNP) segments to GBAS landing system (GLS)

Location:
- Amsterdam
- Arlanda-Stockholm
- London Heathrow
- Frankfurt
- Milan-Malpensa

Solutions to be delivered in SESAR 2020

GLS Precision Segment

4.5°

3°

On-Board function to adapt glide slope according to day conditions

3,0°-3,5°

SESAR demo: AAL

AUGMENTED APPROACHES TO LAND

Demonstrated (360 trial flights):
- Curved Required Navigation Performance (RNP) legs - Ground-Based Augmentation Systems (GBAS)
- Satellite-Based Augmentation Systems (SBAS)
- Synthetic Vision Guidance System (SVGS) - Enhanced Flight Vision System (EFVS)

Location:
- Bremen
- Frankfurt
- Zurich

Conclusion
- Maximises the noise benefit by supporting optimum continuous-descent operation during the initial and final approach phases of the flight
- Particularly attractive for small/regional airports without ground infrastructure

PARTNERS

Airspace users of business and commercial aviation will be represented by NetJets Europe, the European Business Aviation Association (EBAA), Lufthansa and Swiss.

NETJETS   EBAA

Lufthansa   SWISS

Avionics will be supplied and tested by Honeywell Aerospace and Elbit Systems.

Honeywell   Elbit Systems

Procedural design will be led by DFS, ANS CR and Skyguide with the support from DLR and Airbus ProSky. DSNA will provide airport operational procedures study.

DFS Deutsche Flugsicherung   Air Navigation Services of the Czech Republic

skyguide   DLR   DSNA

Airframe manufacturer and aircraft systems knowledge will be provided by Dassault Aviation and Airbus.

DASSAULT AVIATION   AIRBUS

The airports in Frankfurt and Zurich will also contribute to the consortium.

Fraport   ZURICH AIRPORT

SESAR demo: RISE

RISE
RNP IMPLEMENTATION SYNCHRONISED IN EUROPE

Demonstrated (160 flight trials):
- RNP AR approach
- RNP approach
- RNP1 to ILS approach
- RNAV Visual approach

Locations:
- Horta
- Madeira
- Ajaccio
- Iraklion
- Nice
- Mykonos
- Snatorini
- Iraklion
- Paphos
- Larnaca

Conclusions:
Sensitive zones around airports can be avoided
Shorter tracks and track miles savings
Enabling Continuous Descent operations

IMPACT: Standard noise impact assessment

Measurement of « noise » on receptors
(points on a grid)

Maximum noise events: L_{Amax}
Good if the OI is applied to all the aircraft
      Measuring the max extent of the noise
      Pb: can be 1 movement by day

Cumulative noise: L_{DEN}
      Average of the received noise
      Weighted according to the period of the day
      Good for the mixed traffics
      EU recommended metric
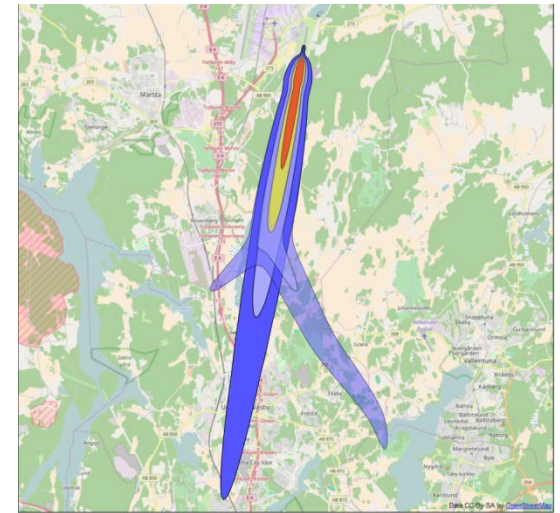
Addressing noise in SESAR 2020

Enhanced arrival procedures enabled by GBAS
Facilitate advanced arrival procedures (e.g. curved approaches, glide slope increase, displaced runway threshold). [Pj02-02]

Enhanced Terminal Area for efficient curved operations
Curved segment approaches to optimise procedures, including independent rotorcraft operations. [Pj02-11, 01-06. 02-05]

Arrival and Departure Management Information for Traffic Optimisation within the TMA
Identification and resolution of complex interacting traffic flows in the TMA and on the runway, through the use of AMAN and DMAN. [Pj01-02]

Enhanced Collaborative Airport Performance Management
Proactive assessment of the total airport capacity available taking into account weather and other operational conditions. [Pj04-02]

Exploratory Research and Demonstration Activities
Advanced methodologies, full trajectory operations, demonstrating SESAR solutions etc.

SESAR vision