SESAR Overview
EUROPEAN CONTEXT
Facts and Figures for Europe

- About 10 millions of flights per year in 2007 (peak days beyond 33,000 flights)
- Fragmented airspace with 72 en route control centres managed by 27 different air navigation service providers maintaining more than 20 different ATM systems
- ATM cost in Europe > € 4 Billion per year
- Fragmented decision-making
European Challenges

A new Air Traffic Management System is required:

For the benefit of all air space users: airlines, business & general aviation, airports, air navigation service providers, military, passengers & citizens
WHAT IS SESAR?
SESAR is Organised in 3 Phases:

**Definition phase**
Resulted in the European ATM Master Plan

**Development phase**
Managed by the SESAR Joint Undertaking
Based on the Master Plan, results in Standards, new operational procedures, new technologies and pre-industrial components,

**Deployment phase**
Implements the results of the development phase, delivers the performance increase foreseen in the ATM Master Plan

2006-2008
2008-2014
2015-2025
SESAR
A public private partnership:

Airspace Users
- Ensure technology and operations developed deliver tangible benefit to users. Validate close to the market.

Staff associations
- Secure buy-in given the changes in the role of the Human in the System (Pilots/Controllers/Engineers)

ANSPs
- Innovations from the private sector, contributions from service providers and facility owners, contributing 700 MEUR

The supply industry

Airports
- Maintain buy-in from member states. Major contributor across the work programme, contributing 700 MEUR

Eurocontrol

European Commission
- Maintain buy-in from EU member states, link to SES framework, contributing 700 MEUR
The 4 Goals of SESAR

- Enabling EU skies to handle 3 times more traffic
- Improving safety by a factor of 10
- Reducing the environmental impact per flight by 10%
- Cutting ATM costs by 50%
Working Together in a Private-Public-Partnership for Deployment
And also:

- **Specific working arrangements with:**
  - Airspace users
  - Military users
  - Staff representatives
  - Regulatory authorities
  - Standardisation bodies

- **Specific calls for tenders:**
  - Innovative research
  - Independent studies
  - Long term scientific networks
SESAR Work Programme
Each Phase of Flight
Towards Implementation

• **IP1 - Deployment 2008-2012**
  - Improve the current system
  - Prepare for Trajectory/Time-based Operations
  - A ‘baseline’ for SESAR and transition to new operating concepts
  - Content is ‘maturity’ based

• **IP2 - Development for Deployment 2013-2019**
  - Described by the SJU Work Programme [www.sesarju.eu]
  - Over 250 projects, addressing all aspects of ATM
  - Validation using operational trials where practicable
  - Early implementation with quick-win projects included

• **IP3 - Research and Development for Deployment from 2020**
  - Under development in the SJU Work Programme
  - Long-term research agenda and Scientific Committee being established
International Cooperation

- ATM modernisation is a global endeavour
  - Cooperation with FAA
  - Discussions with others countries
- Need to be pragmatic
SESAR-FAA Collaboration
Background

- Two of the major ATM change Programmes
  - EUROPE - SESAR
  - USA - NextGen

- Interoperability (for Airline Operations) is key to success for both Europe and the US.

- Alignment required in key areas by Identifying operational and technical topics of interest within a cooperation framework.

- SESAR, using its Public-Private partnership, will engage partner organisations to deliver results on a number of key topics.
SESAR-FAA Collaboration Framework

- Transversal Activities
- Information Management
- Trajectory Management
- Collaborative Projects
- CNS & Airborne Interoperability

Joint Executive Oversight
Key Topics - draft

Transversal Activities
- System & Service Architecture
- Operations Concept & Roadmap
- Separation Management
- Standardisation Roadmap
- Regulation Roadmap
- Performance Framework
- Validation of Interoperability
- Business Cases and Investment Planning
- Environment

Collaborative Projects
- AIRE

Information Management
- SWIM interoperability
- AIM interoperability
- MET Information Exchange

CNS & Airborne Interoperability
- Collision Avoidance Systems
- Avionics Roadmap
- Airborne Separation Assistance (ASAS)
- Future Collision Avoidance (TCAS)

Communications
- Datalink Services & technology
- Flexible Communications Architecture

Navigation
- Performance Based Navigation
- Global Navigation Satellite System (GNSS)
- Approach with Vertical Guidance (APV)

Surveillance
- ADS-B Services & Technology

Trajectory Management
- Trajectory Definition & Exchange
- Future Flight Planning
- Traffic Management
- Dynamic Flight Plan Update
- UAS Integration
Concept and Validation
Main Concept Elements

Automation Support
Human-centred system

SWIM
Sharing of information system wide
‘The Aviation Intranet’

Network Operations Plan
Collaborative decisions

Interoperable
Air and Ground systems
Airport operations

Performance based 4-D trajectory management
Efficient a/c separation modes
ATM Operational Roadmap

- SESAR Definition Phase ATM Service Level
  - 0 / 1
  - 1 / 2
  - 2 / 3
  - 3 / 4
  - 4 / 5

- Initial Operating Capability
  - 2013
  - 2017
  - 2020
  - 2025

- Performance Based Operations
- Trajectory Based Operations
- Time Based Operations

R&D, Implementation, Available
ATM Operational Services

- There is a need to identify all the Projects that contribute to the design, validation and verification of a same common ATM theme.

- In this illustration, the ATM Operational Service “Queue Management” for the Flight Phase “Descent” is isolated by linking the ATM Operational Service with the Flight Phase.

- The ATM Operational Service “Queue Management” for the Flight Phase “Descent” has contributions from various Projects under different WPs (Operational and System).

- These interdependencies must be identified to ensure coherent design, validation and verification, and to manage scheduling, changes, and defaults.
Validation and Verification

Deploying SESAR

Performance Based

Three Phase Maturity Lifecycle

Close to Operations “Live Trials”

Integrated Operational and Technical Validation

Safety Operability Feasibility Performance

Deployment Oriented Deliverables
Keys to Validation and Verification

• ATM Community Participation (Users, Providers, Staff .. )

• Focus:
  • Time to Market
  • Close-to-Market --Target Operational Deployment Environment (Live Trials)
  • Early Benefit (mature concepts, procedures and products)

• Coherent Validation and Verification
  • Top Down, Incremental & Structured Approach;
  • Supported by WPB, WP3 & WP16 (i.e. Transversal WP)
  • Designed and Executed by Projects

• Continuous Maturity Assessment
TECHNOLOGY EXAMPLES
Airborne CNS

• **Communications Systems**
  • Flexible communication for voice and datalink
  • Future ATS Datalink with civil-military interoperability
  • SWIM - a/c on the network with seamless and secure operation

• **Navigation Systems**
  • Optimised arrival and approach for emissions & noise
  • Support RNP to Precision Approach transitions
  • Multi-constellation GNSS, transition to future GNSS based systems
  • Systems suitability for Approach with Vertical Guidance

• **Surveillance Systems**
  • ADS-B 1090 higher performance
  • ADS-B In/Out for Military transport aircraft
  • ADS-B and other surveillance data fusion for enhanced operations
TECHNOLOGY EXAMPLES
Airborne Flight Management

- **Flight Management Avionics**
  - Initial and full 4-D Trajectory management and data exchange with ground systems
  - Architecture evolution and roadmap with International agreement
  - Continuous cruise climb support

- **Safety Nets and protection systems**
  - TCAS evolution for all a/c types and multi-threat
  - ASAS Self Separation technical feasibility
  - Weather hazards and Wake Vortex detection systems
  - Flight control and separation optimisation in wake encounter
  - Enhanced and Synthetic Vision systems
TECHNOLOGY EXAMPLES
Non Avionic CNS

• **Communications Systems**
  - Wireless Communication Infrastructure over ground, satellite and airport segments interoperable between Civil & Military
  - Ground Communication Infrastructure supporting SWIM

• **Navigation Systems**
  - GNSS positioning and timing enhancements in support of civil and military operations
  - GBAS for Cat II/III operations
  - Multi-constellation GNSS for Cat II/III operations

• **Surveillance Systems**
  - ACAS Monitoring without radar
  - Enhancements for ADS-B in support of new ATM applications
  - ADS-B ground station development in support of ASAS applications
  - Weather sensing, monitoring and infrastructure technology updates
TECHNOLOGY EXAMPLES
En-Route & Approach ATM

• Data Processing
  • ACAS information integration into ATM Surveillance
  • Enhanced Air-Ground Datalink routing and information processing
  • Flight Object handling and advanced Interoperability

• Separation & Airspace Management
  • Precision Trajectory clearances and ASAS procedure support
  • System support for flexible use of airspace

• Controller Tools
  • Sequence and Queue Management, Route Optimisation
  • Advanced Conflict Detection & Resolution tools
  • Precision Conformance Monitoring

• Safety Nets
  • ACAS information integration into ATM Safety Nets
TECHNOLOGY EXAMPLES

Airport

• Runway Management
  • Wake Vortex & Wind Shear detection, prediction and decision support
  • Foreign object detection

• Surface Management
  • Improved surveillance for enhanced safety and capacity
  • Sequencing, Routing & Guidance tools including Safety Nets

• Tower Management
  • Integrated data processing & tools for improved Flight Management
  • Remotely operated towers, including multiple controlled airports
  • Augmented dynamic vision for local and/or remote towers

• Airport CDM & Collaborative Planning
  • AMAN, SMAN, DMAN & MET integrated with decision support tools
TECHNOLOGY EXAMPLES
Network Management

- **Network Planning**
  - Airspace design & optimisation tools
  - Capacity and airspace long-term organisational planning tools
  - Scenario Management (Flow, Capacity & Dynamic Airspace) tools
  - Demand data forecasts, logic and management tools

- **Aeronautical Information**
  - Model extension (AIXM 5), harmonisation, access, dynamic updates
  - Migrate from a Message-centric to Data-centric approach
  - Context-aware briefing tools for information management

- **Network Operations**
  - Network performance optimisation tools
  - Optimum 4-D route determination and flight planning support tools
  - SWIM enabled network demand and capacity balancing tools
Finally, some Key facts

- 250 projects
- 16 work packages
- Initiation phase 3-6 months starting in June 09
- 63 Projects launched to date
- Consistent engineering methodology applied
- Validation ‘close to market’
- Performance partnership
CONCLUSION

1. Public Private Partnership

2. Addresses all flight phases

3. Key components:
   • Performance based
   • Automated support to human
   • Collaborative environment using SWIM
   • Interoperability

4. Coordination with FAA/NextGen
Thank you ...