SESAR

THE ROADMAP FOR SUSTAINABLE AIR TRAFFIC MANAGEMENT

European ATM Master Plan

EDITION 2

EXECUTIVE SUMMARY - **AIRSPACE USERS**

Updated with SESAR's first developments

OCTOBER 2012

founding members

EUROPEAN UNION

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INTRODUCTION:
What is the European ATM Master Plan?

Within the Single European Sky (SES) initiative, the European ATM Master Plan (Master Plan) is the agreed roadmap driving the modernisation of the Air Traffic Management system and connecting SESAR[1] research and development with deployment. It is the key tool for SESAR deployment, providing the basis for timely, coordinated and efficient deployment of new technologies and procedures.

The first edition of the European ATM Master Plan was endorsed on 30 March 2009 and adopted on 12 June 2009 by the SESAR Joint Undertaking (SJU) which is responsible through EU Council Regulation for the maintenance of the Master Plan.

This 2012 edition of the Master Plan embeds major updates which mark a clear distinction compared with the initial document:

- it takes benefit of the first results achieved by the SESAR Programme to prioritise a set of essential changes that either provides significant performance benefits and/or forms a pre-requisite towards the implementation of the target concept;
- it prepares for the SESAR deployment phase, developing stakeholder roadmaps which provide a temporal view (up to 2030) of the ATM Technology Changes required and updating the Business View, providing a basis for timely and synchronised deployments;
- it promotes and ensures interoperability at global level, in particular in the context of ICAO.

PERFORMANCE VIEW:
What are the performance needs and targets?

Air traffic has not evolved in line with the forecast underpinning the 1st edition of the Master Plan. Although there are still considerable uncertainties regarding the near future, the consensus economic forecasts are for a resumption of near-trend growth in the medium-term and it is on this basis that the Master Plan is developed.

The proposed SES strategic performance objectives presented in this document provide a practical expression of the SES high-level political goals, in terms of measurable Key Performance Indicators (KPIs), and are based on the best current estimation of traffic growth. The SES performance-driven approach focuses on the four Key Performance Areas (KPAs) of environment, cost-efficiency, safety, and capacity/quality of service.

SESAR contributes to meeting these SES strategic performance objectives and drives R&D activities towards the achievement of a set of validation targets.

1 As part of the Single European Sky initiative, SESAR (Single European Sky ATM Research) represents its technological dimension. It will help create a “paradigm shift”, supported by state-of-the-art and innovative technology. The SESAR programme will give Europe a high-performance air traffic management infrastructure which will enable the safe and environmentally friendly development of air transport.

DEPLOYMENT VIEW:
What is required to be deployed to achieve performance needs and targets?

The transition towards the target Operational Concept follows three complementary Steps. Step 1, Time-based Operations is the focus of the current Master Plan and progresses through Step 2, Trajectory-based Operations to Step 3, Performance-based Operations. Step 1 starts from the Deployment Baseline consisting of operational and technical solutions that have successfully completed the R&D phase and have been implemented or are being implemented.

As shown in the figure, the Master Plan identifies essential operational changes for Step 1 which should establish the foundations for the subsequent steps while responding to the performance needs. These changes are grouped in 6 Key Features that describe the main strategic orientations and are the means to deliver performance to achieve the performance goals. The civil-military dimension is an integral part of these operational changes.

How and when will it be deployed?

The operational changes are enabled through improvements to technical systems, procedures, human factors and institutional changes supported by standardisation and regulation.

The human element remains pivotal to the success of SESAR, and in ensuring that SESAR delivers the benefits expected in environment, cost efficiency, safety, and capacity. The SESAR concept of operations will drive changes to the procedures being used by all stakeholders, and in particular will start to modify responsibilities between technology, controllers and flight crew. This needs to be supported by relevant regulatory changes.

The Master Plan includes roadmaps of the identified changes per stakeholder group ensuring that their deployment is planned in a performance driven and synchronised way (e.g. between ground and air deployments) to maximise the benefits achieved.

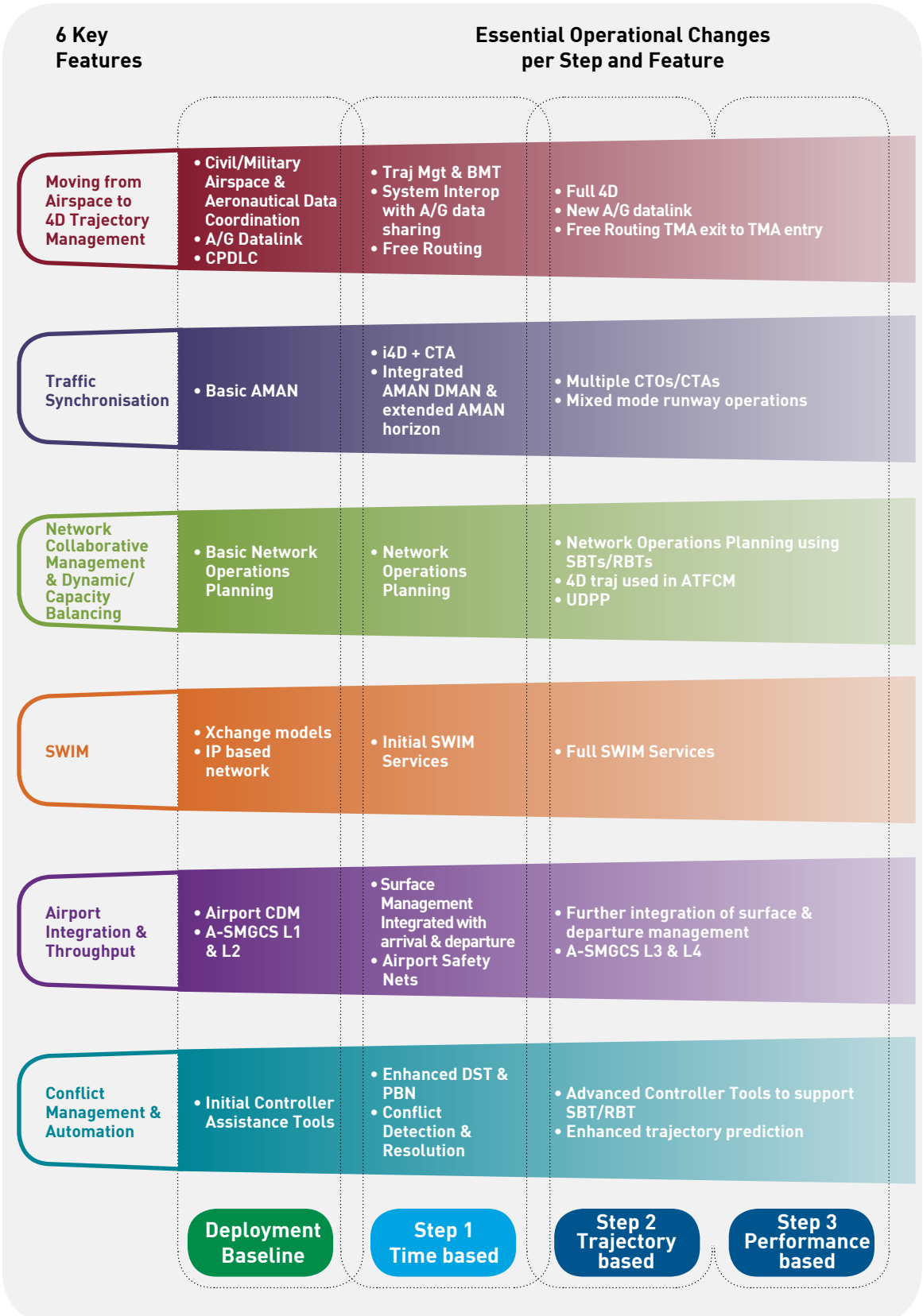
BUSINESS VIEW:
What are the costs and the benefits?

The SESAR programme is a key contributor to the achievement of the Single European Transport Area[2] and enables smart economic growth for Europe. SESAR will provide an effective remedy to air transport capacity bottlenecks, fills gaps in the air traffic management system, enables significant reduction of CO_2 emissions, increases safety, and reduces overall costs. SESAR benefits all European stakeholders and extends beyond the air transport industry.

The Business View is a high level view, which does not replace the need for dedicated stakeholder business cases and cost benefit analyses. Mature solutions, supported by business cases containing a clear quantification of the deployment performance expectations will be the outcome of validation. Pending the validation of the assumed benefits, the approach has been to consider the monetisation of the performance validation targets as a first indication of potential benefits.

Investments required to implement the changes described in the Master Plan for all 3 Steps have been estimated to be between 23 and 32 Bn€ for civil stakeholders for the period 2014-2030. These include investments for Deployment Baseline, Step 1 and Step 2. While estimates of the investment required in the shorter term (Deployment Baseline and Step 1) have been recently updated, the costs for Step 2 correspond to estimates provided during the Definition phase. The investment cost for Step 2 will be reviewed once the technologies and functions supporting this step mature. No further cost assessments have been performed by the Military, earlier estimated to reach 7 Bn€. For Scheduled Airlines, taking into account the investments required for Step 1, SESAR is estimated to create a direct net positive impact of at least 5 Bn€ in the 2014-2030 period provided timely and synchronised deployment is achieved. To this value it is necessary to add other benefits such as those from delay avoidance and flight cancellation savings. In addition, Deployment Baseline and Step 1 will establish the basis on which Steps 2 & 3 will be deployed and thus bring further benefits.

2 White Paper 2011: Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system – EC COM(2011) 144 final


6 Key Features
Essential Operational Changes per Step and Feature
Moving from Airspace to 4D Trajectory Management
• Civil/Military Airspace & Aeronautical Data Coordination
• A/G Datalink
• CPDLC
• Traj Mgt & BMT
• System Interop with A/G data sharing
• Free Routing
• Full 4D
• New A/G datalink
• Free Routing TMA exit to TMA entry
Traffic Synchronisation
• Basic AMAN
• i4D + CTA
• Integrated AMAN DMAN & extended AMAN horizon
• Multiple CTOs/CTAs
• Mixed mode runway operations
Network Collaborative Management & Dynamic/ Capacity Balancing
• Basic Network Operations Planning
• Network Operations Planning
• Network Operations Planning using SBTs/RBTs
• 4D traj used in ATFCM
• UDPP
SWIM
• Xchange models
• IP based network
• Initial SWIM Services
• Full SWIM Services
Airport Integration & Throughput
• Airport CDM
• A-SMGCS L1 & L2
• Surface Management Integrated with arrival & departure
• Airport Safety Nets
• Further integration of surface & departure management
• A-SMGCS L3 & L4
Conflict Management & Automation
• Initial Controller Assistance Tools
• Enhanced DST & PBN
• Conflict Detection & Resolution
• Advanced Controller Tools to support SBT/RBT
• Enhanced trajectory prediction
Deployment Baseline
Step 1 Time based
Step 2 Trajectory based
Step 3 Performance based

The investment figures should be taken with caution as underlying figures had a very high variance, in particular for Airport Operators and Regional Airlines. They may not be applicable to all sub-categories of stakeholders. In addition, whereas for airborne investments, up-to-date cost estimates from manufacturing industry were available for the ANSP investments this was not the case. There is a need for more detailed analysis of the cost of SESAR to ANSPs and of its integration in ANSP investment cycles. Cost inputs from the manufacturing ground industry will be important for this analysis.

The time lag between the upfront SESAR investments by the different stakeholders and the full realisation of benefits will present a risk to SESAR deployment. The risk is to create a last-mover advantage whereby each stakeholder would wait until all others have proceeded with SESAR investments. This should be addressed through the effective implementation of SESAR Deployment governance and incentive mechanisms.

This second edition of the European ATM Master Plan outlines the essential operational changes and technological changes that are required to contribute to achieving the SES performance objectives, preparing the Master Plan to become a key tool for SESAR deployment and providing the basis for timely and coordinated deployment of the efficient technologies and procedures.

The Master Plan provides the best actualised view on the products, technologies and operational procedures, which can be further industrialised and deployed in order to satisfy the needs of the European citizens.

Airspace Users' Perspective

The Master Plan provides roadmaps for scheduled airlines, business aviation and military airspace users with applicability data only for general aviation. Furthermore it contains a CNS roadmap aligned with ICAO.

The roadmaps result from a detailed inventory of all available and planned technology changes derived from manufacturing industry. The technology changes are aggregated into functional groupings for display on the roadmap with full traceability to the individual changes provided.

Airspace Users Needs

As the performance needs are of prime importance, the roadmaps are based on improving ATM performance. This avoids a pure technology push without bringing benefits to airspace users. The airspace user roadmaps are synchronised with other stakeholder roadmaps to ensure deployment is achieved in a coordinated manner avoiding the situation whereby airspace users make their investments too early.

DEPLOYMENT VIEW

Clear, agreed and, most importantly, stable milestones are essential to form a basis for both the forward and retrofit of aircraft fleets. Ground system deployment must be timely, and synchronised with investments in the air to maximise the promised performance benefits. The substantial lead times associated with aviation investment means that planning to hard dates is much more preferable than trigger criteria (eg, traffic growth). Airspace users believe that appropriate and structured incentives should drive and steer deployment and to optimise transition to the future operational architecture.

The deployment costs have been computed for the timeframe 2013 to 2030, whereas all ground investments are expected to be fully implemented by 2026 (with the exception of SWIM). The costs include capital costs, one-off costs such as training and changes in operating costs and exclude research and development costs.

BUSINESS VIEW

Any substantial investment by scheduled airlines and other airspace users in new technology, avionics and systems designed to improve ATM performance must be supported by a comprehensive and hardy business case which demonstrates a significant and positive net return. As well as having confidence in any Cost/Benefit model employed, airspace users must also have high confidence in the data and projections employed to underpin the analysis. Sensitivity to future scenarios (e.g., fuel costs, traffic projections) must demonstrate that the raft of potential performance outcomes all show positive net benefits.

The potential performance benefits to airlines and other airspace users are in fuel savings, airport charge reduction, CO_2 reduction, delay cost savings, ANS charge reduction, accommodated flights, avoided flight cancellation (LVP) and operating cost savings. These benefits are based on the assumption that 80% of the annual flights are scheduled airline flights and the number of aircraft to be retro- and forward fitted.

Furthermore, benefits are highly dependent on the assumptions on traffic growth, whereas two different scenarios have been considered; C, the STRATFOR 2010 long term forecast with an average annual growth rate of 2.8% in 2009 to 2030 and C Prime with a rate of 2.5% for the same timeframe that is updated with the 2012 medium term forecast.

For two possible scenarios, namely the basic package containing only essential changes and the target scenario including the full scope of changes, the forward fit costs at the end of 2030 will represent 40% of Scheduled Airlines airborne investments in Step 1 for the Target Package and 45% for the Basic Package. An acceleration of SESAR deployment to reach 80% of fleet equipage in 2030 can be expected to increase retrofit cost shares of the total airport investments, meaning that a balance will have to be found between the acceleration of equipage to secure quick return on investment and reducing cost of retrofit.

The total cost of retrofit for scheduled aviation vary between 1 062 M€ and 2 027 M€ for the basic, and 3 236 M€ and 5 628 M€ for the target package, whereas the cost for forward fit are expected to range between 1 247 M€ to 2 070 M€ and 3 003 M€ to 4 338 M€ for the basic and target packages respectively.

The total airborne investment cost for the two scenarios are expected to be 1 589 M€ for the basic and 4 454 M€ for the target package (for the C Prime traffic scenario with the C traffic scenario values being insignificantly smaller).

While this version of the ATM Master Plan is mainly focused on capacity, Airspace Users are particularly focused on the potential improvements in cost effectiveness and quality of service (operating efficiency, predictability and flexibility)" which should be the focus of the next version of the ATM Master Plan.

RISKS

A number of risks to the outcomes of the ATM Master plan have been identified. From the Airspace Users point of view, the most critical concerns are:

- Delays in the implementation of the Deployment Baseline. (MP risk 6)
- Investment to support deployment beyond Deployment Baseline is not secured. (MP risk 5)
- Interoperability and global harmonisation are not ensured. (MP risk 4)

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