Contribution to

Work Package Final Report

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Abstract

This SESAR Sub-Work Package is responsible of the monitoring of En-Route trajectory and separation management concepts. It defines the necessary validations according to performance targets in order to deliver the SESAR programme with the relevant solutions.

New ATC tools (MTCD, TCT, EAP, Complexity,…), new procedures (PBN, RNP, ASAS,...), new operating mode and team organisation (MSP, EAP, LTM, …), airspace design (Free route) and new data exchange protocols (EPP) have been developed and validated.

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This deliverable consists of SJU foreground.

Acronyms

Acronym	Definition
ATM	Air Traffic Management
CTO	Control Time Over
EAP	Extended ATC Planner or Extended ATC Planning
MSP	Multi Sector Planner or Multi Sector Planning
WP	Work Package
TMF	Trajectory Management Framework
MTCD	Medium Term Conflict Detection
TCT	Tactical Controller Tool
PBN	Performance Based Navigation
RNP	Radio Navigation Procedures
IOP	Interoperability
EPP	Extended Projected Profile
LTM	Local Traffic Manager
ASAS	Airborne Separation Assurance Systems
PCP	Pilot Common Project
ACAS	Aircraft Collision and Avoidance System
TMA	Terminal Manoeuvring Area
OSED	Operational Services and Environment Description
SPR	Safety and Performance Requirements
SWP	Sub Work Package
CBA	Cost Benefit Analysis
OFA	Operational Focus Area
TCSA	Tactical Control by Speed Adjustement
FRA	Free Routing Airspace
ERATO	En-Route Air Traffic Organizer

CORA	COnflict Resolution Assistant
TA	Transversal Area
CONOPS	CONcept of OperationS
MONA	MONitoring Assistant
A-RNP	Advanced R
i4D	Initial 4D
TRACT	TRajectory Adjustment through Constraint of Time
RBT/MT	Revised Business Trajectory / Mission Trajectory

1 Sub-Work Package Overview

The Sub Work Package 04.07 is in charge of ensuring synchronisation, coherence and coordination of the En-Route trajectory and separation management concepts definition and validations within the SESAR programme.

The Sub-Work Package objectives, through the projects it encompasses, are the following:

- Refine the concept of En Route trajectory and separation management ;
- Define and perform the necessary validation activities including operability, safety & performance assessment at all levels;
- Demonstrate the operational feasibility of the En Route trajectory and separation management concept in a complete ATM environment (including systems).
- Accompany the maturity cycle and implementing process of En-Route trajectory and separation management concepts through the monitoring of PCP rules, specific task forces and working groups.

It ensured the delivery of validated and consolidated Operational Services and Environment Descriptions (OSED), safety and performance requirements (SPR), interoperability requirements (INTEROP high level part) and economic validation data to support Cost Benefit Analysis (CBA) to decide upon the possible deployment. It proposed updates of the operational concept, Datasets and ATM master plan.

The Sub-Work Package has in addition specific activities:

- Contribute to the management of the WP4
- Contribute to encourage and develop the involvement of Third Parties
- Monitor and ensure the application and respect of the programme rules, recommendations and guidance.

1.1 Sub-Work Package contribution to the Master Plan

SWP4.7 includes the following projects:

- Primary projects: P04.07.01, P04.07.02, P04.07.03, P04.07.04b, P04.07.06, P04.07.07, P04.07.08

Following initiation phase, projects P04.07.04a and P04.07.05 have been closed.

The Sub-Work Package encompasses the following Operational Focus Areas (OFA):

- OFA 03.03.01: Ground Based Separation Provision in En-Route
- OFA 03.01.03 : Free Routing

The following table presents for each project, the main goals and addressed topics:

Project	Content and objectives description
P04.07.01	This project focused on complexity management and the development of complexity definitions, algorithms and way to use it to evaluate the ATCO workload.

P04.07.02	This project focused on separation tools to provide assistance to PC and TC in En-Route. Enhanced MONA, MTCD and TCT have been studied and validated. A tool to provide CTO, TRACT, has been studied as well.
P04.07.03	This project was in charge of investigating the use of Performance Based Navigation for Separation needs in En-Route operations and across TMA and En-Route interface.
P04.07.04b	The objective of the project was to progress with the operational definition and validation of ASAS Separation (ASEP applications ASEP-ITF and ASEP ITM) in the North and South Atlantic Environment.
P04.07.06	It was in charge of introduction of ASAS separation application on the SESAR context.
P04.07.07	It was in charge of the implementation of the Dynamic Capacity Management in a high density area
P04.07.08	It focused on En-Route team organisation and responsibilities including MSP and EAP.

SWP04.07, as part of the WP4 management team, encompasses 7 primary projects. Its main role has been the coordination of the primary projects and the interface between them and WP04. This interface was mainly ensured by:

- Analysing, preparing and supporting the change requests submission and processing.
- Following the efforts consumptions and allocation,
- Ensuring the right use of the programme registers for project management aspects: Risks, Issues and opportunities, projects dependencies, exercises scheduling and joint monitoring.

SWP4.7 dealt, through the projects it coordinated, with several SESAR solutions. The following table gathers a synthesis of the different SESAR Solutions.

SESAR Solution (Id and Title)	Description
#19 : Automated support for Traffic Complexity Detection and Resolution	Automated tools support the ATC team in identifying, assessing and resolving local complexity situations. It relies on a real time integrated process for managing the complexity of the traffic with capability to reduce traffic peaks through early implementation of measures for workload balancing Traffic Complexity Assessment and Individual Traffic Complexity based solutions
#27 : MTCD and conformance monitoring tools	• Provide an aid to the Tactical Controller and the associated Conformance Monitoring (DFS exercise) • Provide an aid to the Tactical and Planner Controller, associated with Multi-Sector Planner (NATS exercise)
#32 : Free Route through the use of Direct Routing	Direct routing is established within direct routing airspace with the aim of providing airspace users additional flight planning route options on a larger scale across FIRs such that overall planned leg distances are reduced in comparison with the fixed route network and are fully optimised. Direct Routing Airspace defined laterally and vertically with a set

	of entry/exit conditions where published direct routings are available. A Direct Routing is a published segment of a great circle between 2 published waypoints.
#33 : Free Route through Free Routing for Flights both in cruise and vertically evolving above a specified Flight Level	Free routing is the ability of an airspace user to plan or re-plan a route according to user-defined segments. A User Defined Segment is a segment of great circle connecting any combination of two user defined or published waypoints. Free Routing Airspace is an airspace defined laterally and vertically, allowing Free route with a set of entry/exit features. Within this airspace, flights remain subject to air traffic control. Elements to determine the lower limit of FRA will be provided by the SESAR validations.
#63 : Multi Sector Planning	Multi-Sector Panning uses 1 Planner-2 Tactical configuration (1P-2T) within controller teams, instead of 1P-1T to handle the planning of flights and the communication with aircraft coming in and out of a multi-sector environment.
#104 : Sector Team Operations - En-route Air Traffic Organiser	The En-route Air Traffic Organiser (ERATO) operational concept relies on an electronic decision-making aid toolkit for En Route air traffic controller, including medium-term conflict detection (MTCD) monitoring aid; and a first step towards conflict resolution assistant (CORA) technology. It aims at facilitating air traffic and time management.

For OI Steps maturity level, please refer to SESAR 2020 transition CONOPS.

In addition to the above described SESAR Solutions, other solutions have been investigated but the outcome for R&D was not enough relevant for further activities. The related results, even closed, are very valuable for new investigation topics and can be found in the SWP4.7 project final reports.

1.2 Sub-Work Package achievements

The following SESAR Solutions are contributing to PCP ATM functions:

- SESAR Solution #32 : Free Route through the use of Direct Routing
- SESAR Solution #33 : Free Route through Free Routing for Flights both in cruise and vertically evolving above a specified Flight Level

These two solutions should significantly contribute to:

- Improve safety in En-Route operations,
- Reduce Fuel consumption and environmental impacts
- Enhance predictability and limit flight variability

In addition to these SESAR Solutions, Sub-Work package achievements, through tne projects and OFAs it encompasses, are the following:

- A strong contribution to the master plan development and V&V roadmap refinement.
- A Proactive involvement in the SESAR programme management (contribution to the OFA structure, cooperative approach for TMA and En-Route management process).
- Improvement in the domain of the utilization of the ATM complexity :
    - Complexity Prediction and Detection based on a predefined set of possible sector combinations
    - Complexity Reduction based on statistical approach
- Improvement in the domain of traffic separation with initial proven operational benefits with the utilization of controller tools such as TCSA, TCT, WeP – What else Probing and MONA.
- PBN use in En-Route separation (A-RNP navigation specification CRS, TPO and FRT, CRS spacing)
- Sector team operations: definition of new roles and organisation (MSP, EAP).
- Automated Support for Dynamic Sectorisation tools
- Operational benefits of different tools and its capacity to provide improved quality of complexity/workload prediction has been proven
- EPP task force which was monitored by WP4 issued a roadmap of related requirements coverage and an analysis of what would be needed to be covered in order to fully mature the use of the concept.

For detailed results, please refer to WP4 project final reports and release reports.

1.3 Work Package Conclusion and Recommendations

The Sub-Work package has been able to put in place the relevant methods and process to accompany the programme changes:

- It contributed to the governance process and adapted it to En-Route trjactory and separation management
- It supported the projects in the application of the programme guidance and recommendations
- It contributed to the management of the WP4 En Route Operations

2 References

[1] SESAR Programme Management Plan, Edition 03.00.01

[2] European ATM Master Plan

[3] Multilateral Framework Agreement (“MFA”) signed between the SJU, EUROCONTROL and its 15 selected members on August 11, 2009, amended on 14 June 2010, 19 October 2010 and 2 July 2012

[4] WP04.00, Work Package Management Plan - update 2, ,

[5] Name of project, Title of document, Identification number, Edition, date

[6] Name of project, Title of document, Identification number, Edition, date

[7] Note: list all WP and SWP deliverables here (except with black or red assessment outcomes)

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