Final Project Report

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Abstract

The objective of project 05.07.03 has been to develop and validate concepts of operation and operational requirements for allocating sector responsibilities in the TMA. Two threads of research have been considered under the project, namely Multi-Sector Planner in a Co-ordinated Boundaries operation and Multi-Sector Planner in a Collaborative Control operation. The project has developed an initial V2 Co-ordinated Boundaries concept and performed an initial V2 validation for the Collaborative Control thread. These concepts are expected to be matured further in SESAR2020 through the PJ10-01a High Productivity Controller Team Organisation and PJ10-01c Collaborative Control solutions.

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This deliverable consists of SJU foreground.

Acronyms

Acronym	Definition
ATC	Air Traffic Control
ATM	Air Traffic Management
CWP	Controller Working Position
FDP	Flight Data Processing
IBP	Industry Based Platform
MD/MC	Medium Density / Medium Complexity
MSA	Multi-Sector Area
MSP	Multi-Sector Planner
OI	Operational Improvement
OSED	Operational Service and Environment Description
TMA	Terminal Manoeuvring Area

1 Project Overview

Project 05.07.03 has developed and validated concepts of operation (and associated operational functional requirements) for advanced methods of allocating responsibilities to the Sector Team in the TMA, namely the Multi-Sector Planner in a Co-ordinated Boundaries operation and the Multi-Sector Planner in a Collaborative Control operation.

1.1 Project progress and contribution to the Master Plan

The project was initiated towards the end of the SESAR1 programme due to the following factors:

- To allow sufficient progress to be made on the corresponding Multi-Sector Planner concepts in the en-route domain. This work formed the starting point for the TMA research and so needed to reach a certain maturity before initiating the TMA work. This also helped to ensure a consistent and coherent approach to Multi-Sector Planner concepts across both en-route and TMA.
- The need for sufficient progress to be made on the controller tools for separation provision in the TMA as this is a key enabler for the Multi-Sector Planner TMA concepts.

Nevertheless, despite the delayed start, the project has made progress on the Multi-Sector Planner concepts as they apply to the TMA, as described further below.

Co-ordinated Boundaries

The starting point for the Co-ordinated Boundaries work of P05.07.03 was the research performed for this concept in the en-route domain by P04.07.08. This concept is considered the first step of an evolution thread from the traditional Planner-Executive (or Planner-Tactical) sector team that is by far the prevailing ATC structure adopted across both en-route and TMA operations (albeit, with the ability to combine those roles at quiet times so that a single Controller operates the sector).

Unlike the Collaborative Control concept, in Co-ordinated Boundaries the inter-sector co-ordination procedures within the multi-sector group are unchanged so there is still a requirement to set an explicit co-ordination level at the boundary between Executive Sectors (which may be a standing agreement or Controller selected level etc.); so, for every Executive Sector, there remains a defined entry and an exit level for each flight.

The OI CM-0304 (Sector Team Operations Adapted to New Responsibilities in the TMA, 1 Planning to several Tactical Controllers team structure) encompasses this concept for the TMA. Unfortunately, project timescales precluded further validation of this OI due to it starting late in the SESAR1 programme. The project, however, has developed the concept further for the application to the TMA and published an initial OSED describing the concept and operational requirements.

Collaborative Control

As per the Co-ordinated Boundaries thread of work, the project was able to build upon some initial research performed in the en-route domain by P04.07.08. Under this concept, co-ordination is performed by exception rather than by procedure. By only performing co-ordination when it is required to resolve a separation problem, the concept overcomes some of the limitations that can be encountered in the Co-ordinated Boundaries concept, in that the workload for the planner controller associated with planning coordinations at each sector boundary (both internal to the multi-sector and external) becomes a limiting factor.

The project was able to take advantage of an opportunity to perform an initial V2 real-time simulation using an IBP with TMA controller tools being developed and validated under P05.07.02. The

validation was conducted in a medium density/medium complexity TMA environment. It was devised to gather evidence of the feasibility and operational acceptability of the concept and further investigate the nature of system support required to present the right information for each controller role.

The following OIs, as defined by the Integrated Roadmap Dataset 15, have been addressed by this project:

Code	Name	Project contribution	Maturity at project start	Maturity at project end
CM-0304	Sector Team Operations Adapted to New Responsibilities in the TMA, 1 Planning to several Tactical Controllers team structure	The project has developed an OSED describing the Co-ordinated Boundaries concept and methods of operation as adapted to TMA operations.	V1	V1 / (Partial V2 See §1.2)
CM-0305	Sector Team Operations Adapted to New Responsibilities and Operating Procedures involving reduced Coordination in the TMA	Project real-time simulation activities addressed feasibility and operational acceptability of the concept in a medium density / medium complexity TMA environment.	V1	V1 / (Partial V2 See §1.2)

1.2 Project achievements

For the Co-ordinated Boundaries thread of work, the project has developed the en-route concept further making it applicable to the TMA. It has published a preliminary V2 OSED describing a potentially feasible concept, operating methods, nature of system support required and operational requirements as they apply to the TMA. As the project started late in the SESAR1 programme, after corresponding research had been performed in the en-route domain, further validation was not feasible in the project timescales.

The real-time simulation performed for the Collaborative Control concept was an initial V2 validation activity. This was the first time that any real-time simulation using system support has been performed for this advanced concept. Due to the early maturity of the concept, the validation was defined to assess the operational feasibility and acceptability through qualitative means only. This has provided valuable feedback to further mature the concept in SESAR2020 as part of the PJ10-01c Collaborative Control solution. Additionally, the controller feedback has confirmed the expected benefit mechanisms of the concept, namely that flight efficiency gains are possible (fewer clearances to facilitate aircraft to the sector exit) as well as cost efficiencies for ATC being able to operate with one Multi-Sector Planner supporting several Executive Controllers.

1.3 Project Deliverables

The following table presents the relevant deliverables that have been produced by the project.

Reference	Title	Description
D22	Step 1 V2 Preliminary OSED (Co-ordinated Boundaries)	This document describes the concept, operating methods and operational requirements applicable to Multi-Sector Planner for a Co-ordinated Boundaries operation in the TMA.

Note that the project also contributed to consolidated deliverables provided by P05.07.02. In particular:

- P05.07.02 D77 (Preliminary V2 OSED for Step 1) consolidates the concept description for a Collaborative Control Multi-Sector Planner operation in the TMA; and
- P05.07.02 D75 (MD MC Multi Airport TMA-V2b Validation Report VP738-VP741) consolidates the validation results, conclusions and recommendations from the V2 Collaborative Control real-time simulation (VP-267) performed in a medium density / medium complexity TMA environment using controller tools developed under P05.07.02.

1.4 Contribution to Standardisation

There is not expected to be any impact on standardization from the TMA Multi-Sector Planner concepts.

1.5 Project Conclusion and Recommendations

The conclusions and recommendation of each concept development thread are outlined below.

Co-ordinated Boundaries

The concept work undertaken by the project has developed the concept further to the point where a preliminary V2 OSED has been published that describes potentially feasible operating methods and the nature of system support required in the TMA to support Multi-Sector Planner in a Co-ordinated Boundaries operation.

The project recommends that the concept and requirements that it has developed for Co-ordinated Boundaries in a TMA environment are validated and further refined through the SESAR2020 PJ10-01a High Productivity Controller Team Organisation solution.

Collaborative Control

The main findings from the Collaborative Control validation are:

- It is feasible to implement the concept in a medium density/medium complexity TMA with separation provision tool support (as developed under P05.07.02).
- Controllers understood the concept very quickly and qualified it as a "natural" way of handling traffic in operational environments where most aircraft are climbing or descending through sector boundaries (i.e. vertical sector boundaries).

- The concept has the potential to increase flight efficiency as controllers require fewer clearances to facilitate the aircraft to the Multi-Sector Area exit level and point.

The project recommends that additional validation activities and associated developments are conducted for the Collaborative Control concept through the SESAR2020 PJ10-01c solution, in particular:

- Requirements are explored to reduce undesired risks (false positives) being displayed to the controller as traffic density increases.
- New FDP and CWP requirements are assessed to present the correct information needed for each controller role.
- The applicability of the concept is tested under different sector layouts (e.g. lateral boundaries between the internal sectors of the Multi-Sector Area) and operational environments.

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] P05.07.03, Step 1 V2 Preliminary OSED (Co-ordinated Boundaries), D22, 00.01.00, 31/05/2016

[5] P05.07.02, Preliminary V2 OSED for Step 1, D77, 00.01.00, 30/05/2016

[6] P05.07.02, MD MC Multi Airport TMA-V2b Validation Report VP738-VP741, D75, 04/05/2016

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