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Authoring & Approval

Authors of the document

Beneficiary	Date
LFV (COOPANS)	03/03/2023

Reviewers internal to the project

Beneficiary	Date
LFV (COOPANS)	19/08/2022
SINTEF (NATMIG)	16/09/2022
SWEDAVIA	16/09/2022
NLR (AT-One)	24/02/2023

Reviewers external to the project

Beneficiary	Date
None	03/03/2023

Approved for submission to the S3JU By - Representatives of all beneficiaries involved in the project

Beneficiary	Date
NLR (AT-One)	03/03/2023
LFV (COOPANS)	03/03/2023
SINTEF (NATMIG)	03/03/2023
SWEDAVIA	03/03/2023
ACG (COOPANS)	03/03/2023
DLR (AT-One)	03/03/2023
EUROCONTROL	03/03/2023
NATS	03/03/2023
HAL (SEAC2020)	03/03/2023

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SORT

SAFELY OPTIMISED RUNWAY THROUGHPUT

This DEMO Report Part II Safety Assessment Report (SAR) for WP5 is part of a project that has received funding from the SESAR3 Joint Undertaking under grant agreement No 874520 under European Union's Horizon 2020 research and innovation programme.



Abstract

This document constitutes the DEMO Report-Part II Safety Assessment Report for WP5, hence is part of the contractual deliverable D1.4 (DEMOR). This document specifies the safety assessment activities that were carried out in SESAR 2020 VLD3 Wave 2 SORT under WP5 for exercise EXE-VLD-03-004, that was executed as live trials with shadow-mode technique at Stockholm ATCC building (conference room), Arlanda-Tower (conference room) and at Malmö ATCC (simulator room). The VLD was performed based on the concept of Integrated Arrival Departure Management. The operational environment is Stockholm-Arlanda approach and tower.

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1 Executive Summary

This document constitutes the Safety Assessment Report for WP5, hence is part of the contractual deliverable D1.4 (DEMOR). It specifies the safety assessment activities that were carried out in SESAR 2020 VLD3 Wave 2 SORT under WP5 for exercise EXE-VLD-03-004. The activities were conducted in accordance with the VLD3-W2-SORT DEMO Plan Part II (Safety Plan) for WP5, including the VLD safety demonstration with regards to the suitability of the concept of the Integrated Runway Sequence Function for the deployment and the safety acceptability of the VLD impact on current operations.

2 Introduction

This document is the Safety Report for the VLD-03-004 Exercise under WP5 of the SESAR 2020 VLD3-W2-SORT project, which is a live trial demonstration of Integrated Arrival Departure Management. It was conducted at Stockholm ATCC building (conference room) with live data, Arlanda Tower (conference room) with recorded data and at Malmö ATCC (simulator room) with both live data and recorded data. The operational environment is Stockholm-Arlanda approach and tower.

The demonstration was performed with shadow-mode technique in localities separate from the operations room and no Air Traffic Controller was asked to act on the information provided by the shadow-mode system and no aircraft was given instructions based on it. The purpose of the demonstration was to show potential for the implementation of the Integrated Runway Sequence Function, and gain feedback from Air Traffic Controllers and other stakeholders.

A national safety process was followed to ensure that the set-up for the shadow-mode system and trials followed the internal guidelines.

A Safety Analysis has been performed for the concept itself in the SESAR 2020 Wave 1 Solution 02.08. This analysis provided assurance that the Safety Requirements for the V3 phase are sufficient to reach the Safety Objectives and related Safety Criteria (SAC). The Safety Analysis produced safety requirements, safety objectives and safety criteria related to the generic solution. For a future implementation this needs to be considered for the specific operational environment, and the requirements have to be completed by performing a Preliminary System Safety Assessment (PSSA) in the specific operational environment.

2.1 VLD Objectives, Justification and Scope

Please see “SESAR 2020 VLD3 SORT DEMO Report – Part I” [1], sections A.1.1 and A.1.2.

2.2 Scope of the VLD Safety Assessment

The suitability of the Solution for deployment are addressed in Solution 02.08 Safety assessment and was therefore not focused on during the VLD-03-004 safety assessment [9]. ATCOs did confirm that the level of safety during demonstrations reached the same level as during earlier V3 validations. The Safety Analysis produced safety requirements, safety objectives and safety criteria related to the generic solution.

The VLD safety assessment address the impact on Safety of the performance of the VLD in itself, although the details of it will not be presented in this document (performed and documented locally). Demonstration was performed with shadow-mode technique in a room that is different from the operations room and no Air Traffic Controller was asked to act on the information provided by the shadow-mode system and no aircraft could be given instructions based on it.

A national safety process was performed to ensure that the set-up for the shadow-mode system and trials follows the internal guidelines.

3 VLD safety argument and assurance activities

A national safety process was performed to ensure that the set-up for the shadow-mode system and trials follows the internal guidelines.

Regarding START/STOP criteria/procedures the following has so far been identified that may affect if the VLD can be performed/continue to be performed:

- The TWR Supervisor and ATCC Supervisor may at any time communicate that it is not suitable to perform the VLD (because of incident etc.)
- Staffing levels – if reduced number of operational staff is available it may not be applicable to perform the VLD as it might affect traffic numbers
- Equipment – if degraded mode is in place for any equipment it may affect the input to the VLD and/or the applicability of performing a VLD

PJ.02-08 - Concept 1&2 - Integrated Runway Sequence for full traffic Optimization on Single and Multiple Runway Airports		
Pre -Existing Hazards	ATM Related Accident Type	Applicable Safety Criteria
Hp#1 "Situation in which the intended 4D trajectories of two or more aircraft are in conflict during interception & final approach"	Mid-Air Collision (MAC) during interception & final approach	SAC#1
Hp#2 "Situation leading to wake vortex encounter"	Wake Turbulence-induced Accident (WTA) on Final Approach (WAKE FAP)	SAC#4
Hp#3 "Situation leading to collision with another aircraft or a ground vehicle on RWY"	Collision on the runway (RWY Col)	SAC#2
Hp#4 "Situation leading to collision with an obstacle, ground vehicle, another aircraft"	Collision on the taxiway (TWY)	SAC#3
Hp#5 "Low runway-surface friction"	Low friction on the runway with impact on runway occupancy time	SAC#4

Table 1: Summary of Pre-Existing Hazards for all Solutions in VLD

Pre-Existing Hazards was not applicable in shadow mode demo with live traffic, no online interaction during VLD-03-004.

PJ.02-08 - Concept 1&2 - Integrated Runway Sequence for full traffic Optimization on Single and Multiple Runway Airports	
SAC#1	With the use of Integrated RWY Sequence integrated sequence, the number of planned tactical conflicts shall not increase
SAC#2	With the use of Integrated RWY Sequence integrated sequence, the number of imminent runway incursions shall not increase.
SAC#3	With the use of Integrated RWY Sequence integrated sequence, the number of planned taxiway conflicts shall not increase.
SAC#4	With the use of Integrated RWY Sequence integrated sequence, the number of separation minima infringements shall not increase.

Table 2: Summary of Relevant SACs for the Solutions

4 VLD safety Results

4.1 Suitability of the SESAR solution(s) for deployment

The suitability of the Solution for deployment are addressed in Solution 02.08 Safety assessment and was therefore not focused on during the VLD-03-004 safety assessment [8]. ATCOs did confirm that the level of safety during demonstrations reached the same level as during earlier V3 validations. The Safety Analysis produced safety requirements, safety objectives and safety criteria related to the generic solution.

4.2 Safety impact on current operations when performing the VLD

National safety procedures has been followed to ensure that the set-up for the shadow-mode system and trials follows the internal guidelines.

Regarding START/STOP criteria/procedures during the demonstration with live traffic the following was identified that could affect if the VLD could be performed/continued:

- The TWR Supervisor and ATCC Supervisor could at any time communicate that it is not suitable to perform the VLD (because of incident etc.)
- Staffing levels – if reduced number of operational staff was available it could not be applicable to perform the VLD as it might affect traffic numbers
- Equipment – if degraded mode was in place for any equipment it could affect the input to the VLD and/or the applicability of performing a VLD

None of the topics listed above did occur or affected the demonstration.

Pre-Existing Hazards, see table 1, was not applicable in shadow mode demo with live traffic, not online during VLD-03-004.

5 Acronyms and Terminology

Term	Definition
ATCC	Air Traffic Control Centre
ATCO	Air Traffic Controller
CO	COntidential
DEMO	DEMOstration
FAP	Final Approach
HP	Human Performance
IR	Industrial Research
MAC	Mid-Air Collision
PSSA	Preliminary System Safety Assessment
RWY	RunWaY
SAC	Safety Assessment Criteria
SAR	Safety Assessment Report
SESAR	Single European Sky ATM Research Programme
SORT	Safely Optimised Runway Throughput
TWR	ToWeR
TWY	Taxi WaY
VLD	Very Large Demonstrator
WP	Work Package
WTA	Wake Turbulence-induced Accident
IRSF	Integrated Runway Sequence Function

Table 3 : Acronyms and terminology

6 References

Safety

- [1] SESAR2020 VLD3-W2- SORT D1.1 DEMO Plan Part I, Edition 00.03.00, issued as D1.1.04, 10 February 2023.
- [2] SESAR2020 VLD3-W2- SORT D1.1 DEMO Plan Part II Safety Assessment Plan – WP5-Edition 00.03.00, issued as D1.1.04, 10 February 2023.
- [3] SESAR Safety Reference Material - latest edition accessible in STELLAR Program Library.
- [4] Guidance to Apply SESAR Safety Reference Material - latest edition accessible in STELLAR Program Library.
- [5] STELLAR Slideboard, Safety part (complementary guidance)
- [6] (EU) No 2017/373 laying down common requirements for service providers and the oversight in air traffic management/air navigation services and other air traffic management network functions, repealing Regulation (EC) No 482/2008, Implementing Regulations (EU) No 1034/2011 and (EU) No 1035/2011 and amending Regulation (EU) No 677/2011 (and associated AMC and GM).
- [7] SESAR P16.01.04, Final Guidance Material to Execute Proof of Concept, Ed00.04.00, August 2015.
- [8] SESAR Solution 02-08 SPR/INTEROP-OSED for V3 - Part V - Performance Assessment Report (PAR), edition: 00.04.00, 31 January 2020.
- [9] SESAR Solution 02-08 SPR/INTEROP-OSED for V3 - Part II - Safety Assessment Report (SAR).

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