Agenda Item 5: Collision risk assessment and LHD

d) Collision risk assessment: CARSAMMA, ARMA; SATMA

EUR/SAM Corridor CRM (2021)

(Prepared by SATMA)

SUMMARY

This paper presents a resume of results of 2021 EUR/SAM Corridor CRM (safety assessment).

REFERENCES

- TOR of SATMA
- Report of the Special Atlantic Coordination Meeting (ACM-S, Madrid, Spain, 23-24 June 2022).

1. Introduction

1.1 SATMA, as monitoring Agency, is committed by SAT group to conduct studies and required assessments to analyse the conditions for the safety application of RVSM/RNP10 in EUR/SAM Corridor (ACCs in the Canary Islands, Recife, Sal and Dakar).

2. CRM EUR/SAM 2021

2.1 DATA AVAILABLE

Next table indicates the months for which LHD reports were received. From these LHDs, only those affecting the four main routes were considered.

Months	Canarias UIR	SAL Oceanic UIR	Dakar Oceanic UIR	Atlántico-Recife FIR/UIR
Jan-21				
Feb-21				
Mar-21				
Apr-21				
May-21				
Jun-21				
Jul-21				
Aug-21				
Sep-21				
Oct-21				
Nov-21				
Dec-21				

KEY: Available | Not available | "No deviation" report received

Table 1.- Available data (CRM 2021)

Date	Route	Duration	Coordinated FL	Observed FL	Deviation	Cause	Category
190121	UN866	0.08333 h	FL355	FL360	500 ft	Coordination Error	E
210221	UN873	0.08333 h	FL350	FL350	0	Coordination Error	E
030721	UN873	0.08333 h	FL390	FL390	0	Coordination Error	E
121121	UN873	0.08333 h	FL390	FL370	2000 ft	Coordination Error	E

Table 2.- Large height deviations reported in the Canaries

2.2 TRAFFIC

Not all the data from the rest of the FIR/UIR was available at the end of the year. At the time of starting this study, no SAL traffic data was available, so they had to be extrapolated from the traffic data of the Canary Islands and Dakar. Neither was available traffic data from Dakar since June, so the traffic samples used to perform this analysis are the ones from 1st August 2021 to 31st August 2021. This month has been selected as it was the one with the highest number of flights from the months with all information available. The number of flights and the flight time for the complete year 2021, required for some of the calculations, have been extrapolated.

The traffic outlook for the future was strongly impacted by COVID-19, backing to pre-1990 flight levels. Because of this, the traffic forecast for the next years has been made considering three possible scenarios considering all possible risks and their relative impacts.

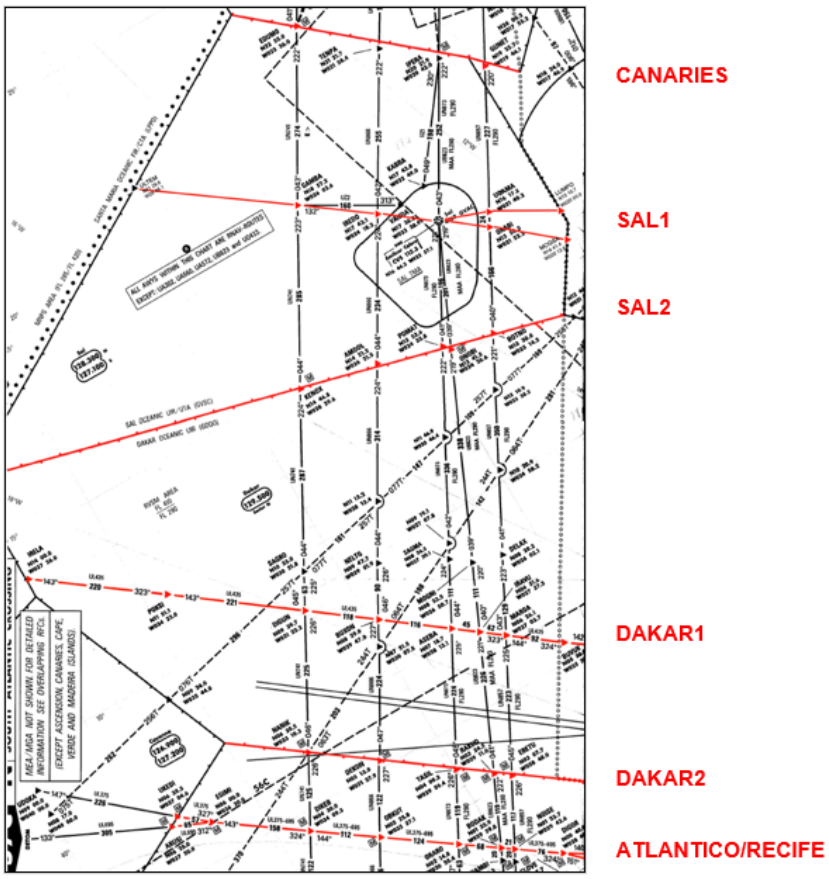
In this study the most optimistic scenario was chosen (High Scenario), in which the 2019 level is recovered in mid-2023. The next four years was calculated, assuming a traffic growth rate of 57%, 19%, 10% and 3% in 2022, 2023, 2024 and 2025 respectively.

2.3 LOCATION FOR RISK ASSESSMENTS

For the studied scenario, lateral and vertical collision risks are assessed. This assessment was made in six distinct locations along the Corridor, covering the four UIR. These locations are the following (See Picture 1):

- Canaries: FIR/UIR limit
- SAL1: UR-976/UA-602
- SAL2: UIR SAL Oceanic/UIR Dakar Oceanic
- Dakar1: UL-435
- Dakar2: UIR Dakar Oceanic/Atlantic FIR
- Atlantico/Recife: UL-375/UL-695

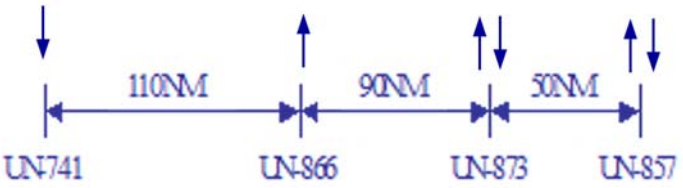
Traffic on the DCT Area, placed to the west of the current UN-741, has not been considered in the analysis..



Picture 1. Locations for Risk Assessments (2021)

2.4 LATERAL RISK

Lateral collision risk is below the $TLS = 5 \cdot 10^{-9}$ with the current traffic flow and it is estimated that, considering an annual traffic growth rate of 57%, 19%, 10% and 3% in 2022, 2023, 2024 and 2025 respectively, the TLS would be exceeded in the period under consideration in all analysed locations except Canaries and SAL1.



FIR	Lateral Collision Risk 2021	Lateral Collision Risk 2025
Canaries	$1.3514*10^{-9}$	$2.8607*10^{-9}$
SAL1	$2.0462*10^{-9}$	$4.3313*10^{-9}$
SAL2	$3.2452*10^{-9}$	$6.8693*10^{-9}$
Dakar1	$2.6516*10^{-9}$	$5.6130*10^{-9}$
Dakar2	$3.2194*10^{-9}$	$6.8148*10^{-9}$
Atlantico/Recife	$2.4476*10^{-9}$	$5.1810*10^{-9}$

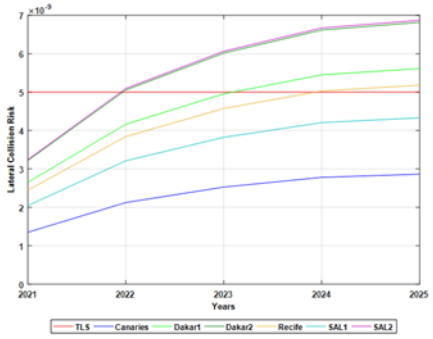


Table 3.- Lateral Risk (CRM 2021)

2.5 VERTICAL RISK

TECHNICAL VERTICAL RISK

Technical vertical risk represents the risk of a collision between aircraft on adjacent flight levels due to normal or typical height deviations of RVSM approved aircraft. It is attributable to the height-keeping errors that result from the combination of altimetry system errors (ASE) and autopilot performance in the vertical dimension.

FIR	Technical Collision Risk 2021	Technical Collision Risk 2025
Canaries	$1.4153*10^{-14}$	$2.9959*10^{-14}$
SAL1	$8.6874*10^{-15}$	$1.8389*10^{-14}$
SAL2	$1.1904*10^{-14}$	$2.5197*10^{-14}$
Dakar1	$8.4062*10^{-15}$	$1.7794*10^{-14}$
Dakar2	$1.2185*10^{-14}$	$2.5793*10^{-14}$
Atlantico/ Recife	$1.2871*10^{-14}$	$2.7246*10^{-14}$

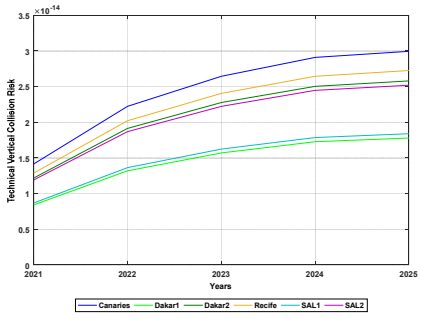


Table 4.- Technical vertical risk (CRM 2021)

It can be seen that, the estimates of the technical vertical risk are below the technical TLS even in 2025 in all the locations, and similar to the values obtained in the last year assessment .

TOTAL VERTICAL RISK

After an analysis of the deviation reports, it can be concluded that all of the registered deviations are due to errors in coordination between adjacent ATC units, resulting in either no notification of the transfer or in transfer at an unexpected flight level.

FIR	Overall vertical Collision Risk 2021	Overall vertical Collision Risk 2025
Canaries	$2.9636*10^{-8}$	$6.2732*10^{-8}$
SAL1	$8.7105*10^{-15}$	$1.8438*10^{-14}$
SAL2	$1.1904*10^{-14}$	$2.5197*10^{-14}$
Dakar1	$1.0929*10^{-8}$	$2.3134*10^{-8}$
Dakar2	$1.2658*10^{-8}$	$2.6794*10^{-8}$
Atlantico /Recife	$1.2871*10^{-14}$	$2.7246*10^{-14}$

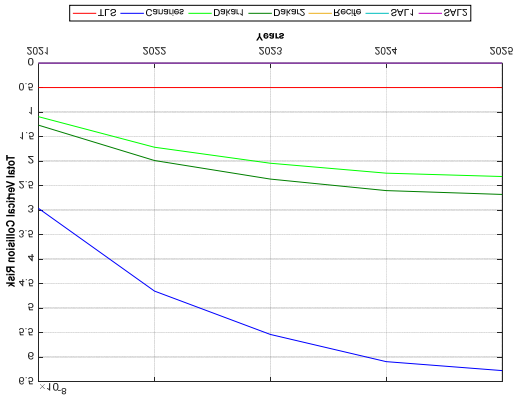


Table 5.- Total vertical risk (CRM 2021)

The total vertical risk calculated using the deviations reported by the States is lower than the TLS in all locations except in Canaries and Dakar.

It was remarked that all the received deviations had been due to coordination errors between ATC units and not related to RVSM operations. In the same way, it was also explained that the deviation reports indicated that there was not any traffic in conflict. That is also the case of this study.

The same problem, the collision risk being higher than the TLS if coordination errors are taken into account, was already identified in the previous safety assessments and the corresponding conclusions were presented. Nevertheless, it is also advisable to insist on the need of implementing adequate corrective actions to reduce operational errors in the Corridor.

3. Action by the Meeting

The meeting is invited to:

a) note the information provided; and

b) open the debate to CRM methodology and results, if needed.

— END —