



ICAO

**SEVENTH MEETINGS OF THE SAT IMPLEMENTATION MANAGEMENT GROUP (SAT IMG/7)
AND
SAT SAFETY OVERSIGHT GROUP (SAT SOG/7)**

Dakar, 6-10 April 2026

Agenda Item 6: SAT Collision Risk Assessments (CRA)

6.a) ARMA, CARSAMMA, SATMA Activities

SATMA Activities in 2026

(Presented by SATMA)

SUMMARY	
This information paper presents the LHD data reported by the LHD Reporting Team, ARMA and CARSAMMA, which were used by SATMA as input for the development of the CRA for the EUR/SAM corridor for 2025.	
<i>Strategic Objectives</i>	<i>A – Every Flight is safe and secure.</i> <i>E – Aviation Delivers Seamless, Accessible, and Reliable Mobility for All.</i>

1 INTRODUCTION

1.1 In the ICAO context, assessments are conducted to analyse the conditions for the safe application of RVSM and RNP 10 in the EUR/SAM Corridor, covering the ACCs within the Spain/Canarias FIR, Cabo Verde/Sal Oceanic FIR and Senegal/Dakar Oceanic FIR.

- Data from the Brazil/Atlantico FIR have been excluded from the scope of this paper, as this portion of the corridor is analysed separately by CARSAMMA.
- This paper presents to SAT SOG Members and States the latest updates and developments related to Collision Risk Assessment activities in the EUR/SAM Corridor.

2 ACTIVITIES IN PROGRESS

2.1 The Lateral Height Deviation (LHD) reports received and the manner in which they have been considered in this analysis by the LHD Reporting Team were presented at the current meeting of the SAT SOG.

2.2 The Collision Risk Assessment for the EUR/SAM Corridor for the year 2024 has been reconducted, taking into account recent improvements and updated operational data.

2.3 The dualization of ATS route UN866 has been taken into consideration in the assessment.

2.4. However, the new version will include the following modifications:

- The revised scope, which was previously coordinated with ARMA, has been applied for the Collision Risk Assessment (CRA) and the associated analysis of Lateral Height Deviations (LHDs), as detailed below.:

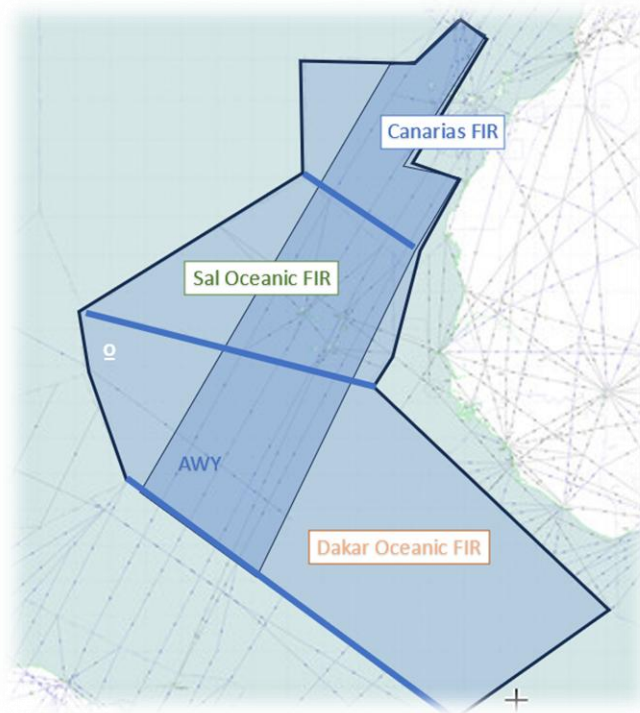


Figure 1. Scope of CRA

- Based on the revised scope, a comprehensive analysis was conducted for the EUR/SAM Corridor for the full year 2025. An extract of this analysis, focusing on the overall results, is presented below.

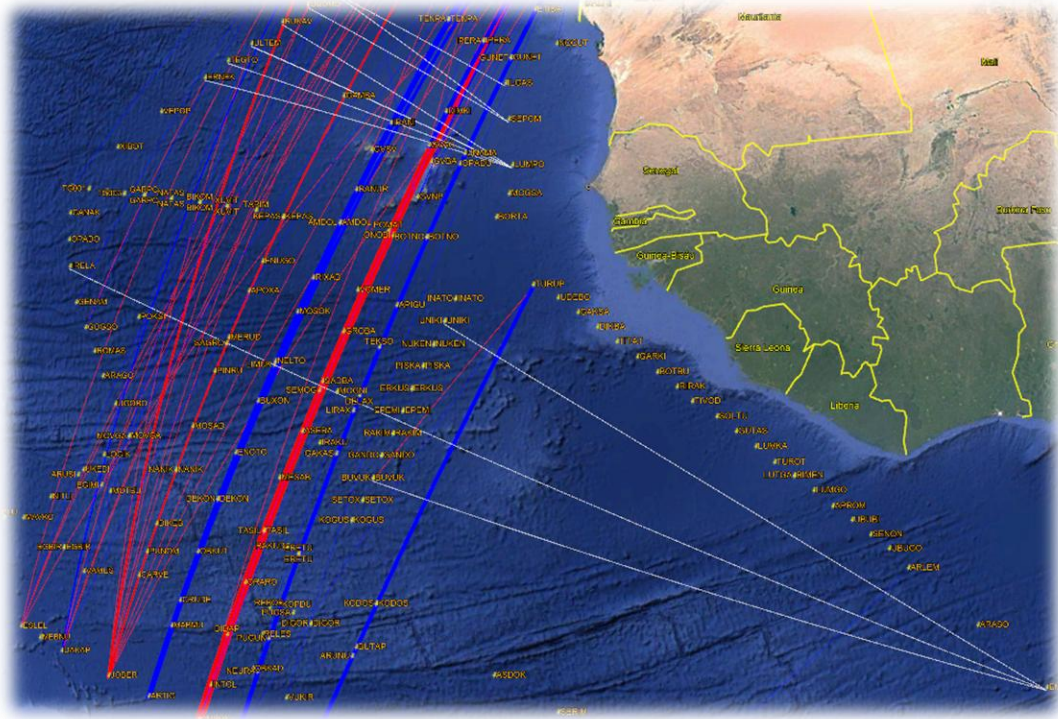


Figure 2. Main flows

- SATMA has already provided to SAT States in previous SOG meetings regarding data and usage of SLOP procedures to be included in the methodology of Collision Risk Assessment (EUR/SAM Corridor). The assumption is that obtained SLOP Data in Canarias FIR will be assumed for the rest of the EUR/SAM Corridor. Next table shows the SLOP Data per analyzed year. Although the distribution is similar, the total figures using SLOP is higher in 2025.

	Centerline	1-Mile Right Offset	2-Mile Right Offset
2023	60.6%	27.3%	12.1%
2024	60.3%	27.9%	11.9%
2025	53.8%	34.4%	11.8%

Table 1.- SLOP distributions

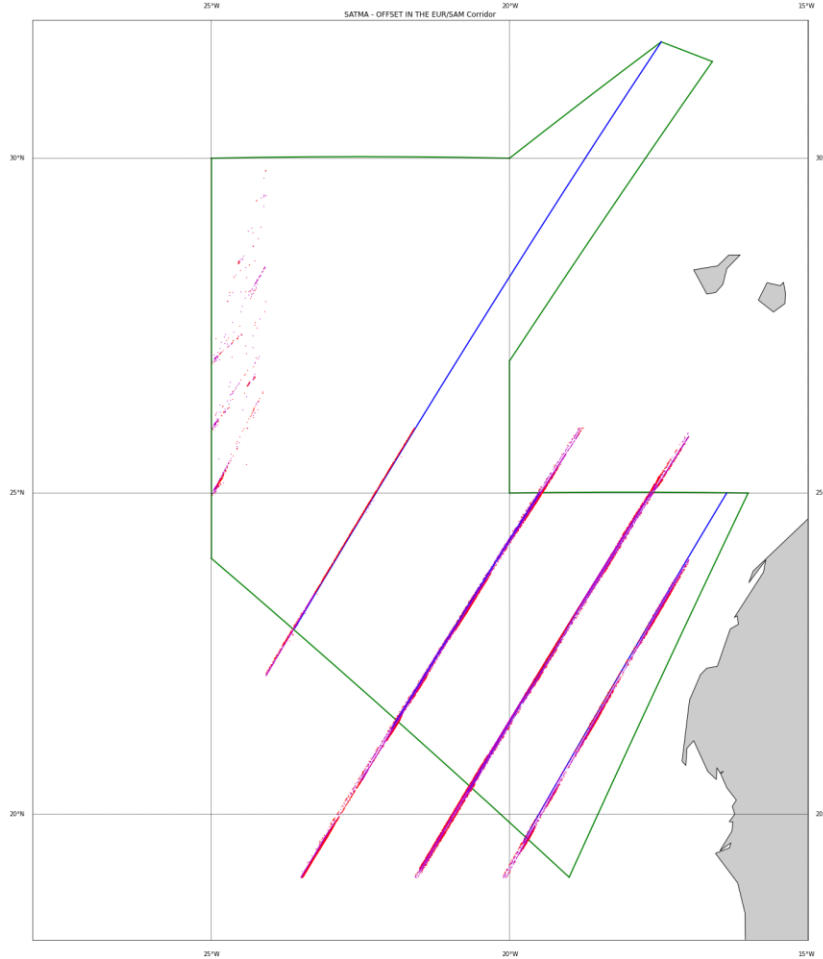


Figure 1. Strategic Lateral Offset Procedure (SLOP) Assumed for the CRA

- The CRA methodology has been updated in accordance with:
 - The **total vertical risk** is defined as the sum of the technical risk and the operational risks. It is assumed that the same type of collision risk model is applicable to the different risk components. N means **Number** of fatal accidents per flight hour due to loss of planned vertical (az) separation.

$$N_{az}^{total} = N_{az}^{tech} + N_{az}^{wl} + N_{az}^{cl/d}$$

- For example, the vertical collision risk associated with an incorrect flight level assignment is given by:

$$N_{az}^{wl} = P_y(0) \cdot \frac{\lambda_x}{S_x} \cdot \left\{ P_z^{wl}(S_z)_{same} E_{z_{same}} \cdot \left[\frac{|\Delta \bar{v}|}{2 \cdot \lambda_x} + \frac{|\bar{y}|}{2 \cdot \lambda_y} + \frac{|\bar{z}|}{2 \cdot \lambda_z} \right] + P_z^{wl}(S_z)_{opp} E_{z_{opp}} \cdot \left[\frac{2 \cdot |\bar{v}|}{2 \cdot \lambda_x} + \frac{|\bar{y}|}{2 \cdot \lambda_y} + \frac{|\bar{z}|}{2 \cdot \lambda_z} \right] \right\} \\ + \frac{P_z(0) \times t^{wl}}{T} \cdot \sum_1^n P_h(\theta_i) \cdot E_z(\theta_i) \cdot \left\{ \frac{v_{rel}(\theta_i)}{\frac{\pi \lambda_h}{2}} + \frac{|\bar{z}|}{2 \cdot \lambda_z} \right\}$$

- The final term, which applies to all technical risk components, is evaluated at airway crossing points and does not take into account crossings executed tactically.

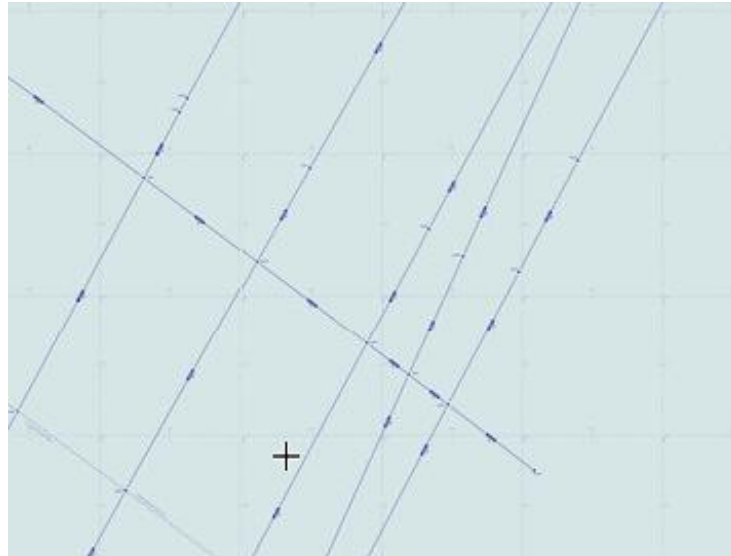


Figure 2. Considered crossings in the CRA

- The total lateral risk comprises the technical risk and the operational risks. However, in the absence of PBCS implementation, lateral risk is assumed to be limited to the technical component only. Nevertheless, the methodology is ready to implement operational risk based on LLE/LLD.

$$N_{ay}^{total} = N_{ay}^{tech} + N_{ay}^{TC} + N_{ay}^{IT}$$

- SATMA intends to initiate the calculation of the Altimetry System Error (ASE) using ADS-B data provided by ENAIRE within the Canarias FIR, limited to traffic operating along the EUR/SAM Corridor. The initial dataset has already been obtained. This activity is being coordinated with the Federal Aviation Administration (FAA) in the context of **the SAT RMA Harmonization/Standardization Project Team**. Once this activity is finalized, several parameters of the Collision Risk Assessment (CRA) will be updated. Consequently, the CRA figures for 2025 should be considered provisional.

2025			
EUR/SAM Corridor*	Vertical Collision Risk Estimation (Naz)		
	TOTAL	Tech	Ope
Naz (SLOP)	1.36E-10	1.26E-14	1.36E-10
Naz (Not SLOP)	3.10E-10	4.35E-14	3.10E-10
Target Level of Safety (TLS)	5.00E-09	2.50E-09	5.00E-09

* See scope of this analysis

Table 2.- Naz for 2025

2025			
EUR/SAM Corridor*	Lateral Collision Risk Estimation (Nay)		
	TOTAL	Tech	Ope
Nay (SLOP)	2.26E-10	2.26E-10	
Nay (Not SLOP)	2.14E-10	2.14E-10	
Target Level of Safety (TLS)	5.00E-09	2.50E-09	5.00E-09

* See scope of this analysis

Table 3.- Naz for 2025

- As a follow-up to SOG-07, the forthcoming SATMA Working Paper on Collision Risk Assessment will incorporate a defined set of Safety Key Performance Indicators (KPIs), as outlined below.

sKPI	Description	2025	2024
SAT.SK1.01	Number of accidents	0	0
SAT.SP1.02a	Number of LHD events divided by number of flight hours flown in the COVERED SAT AREA	7.82E-05	8.91E-05
SAT.SP1.02b	Overall time of LHDs at unprotected flight level divided by total duration of flights in minutes	8.28E-04	1.01E-03
SAT.SP1.03a	Number of Lateral deviations divided by number of flight hours flown in the COVERED SAT AREA	0	0
SAT.SP1.03b	Overall time of lateral deviations on an unprotected profile divided by total duration of flights in minutes	0	0
SAT.SK1.04	Number of losses of separation events divided by number of flight hours flown in the COVERED SAT AREA	0	0
SAT.SK1.05a	Number of coordination errors divided by number of flight hours flown in the COVERED SAT AREA	5.06E-05	7.86E-05
SAT.SK1.05b	Overall time of coordination errors spent at unprotected profile divided by total duration of flights in minutes	4.97E-02	5.66E-02
SAT.SK1.06a	Collision Risk Estimate (CRE) in the vertical dimension	1.36E-10	1.57E-09
SAT.SK1.06b	Collision Risk Estimate (CRE) in the lateral dimension	2.26E-10	4.19E-10

Table 4.- SKPI EUR/SAM Corridor

3 Action by the meeting

3.1 The meeting is invited to note the information provided.

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