International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)

INFORMATION PAPER

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of the CAR/SAM Regional Planning and Implementation Group (GREPECAS)
Asynchronous (virtual): 9 to 25 September 2026
In person: Mexico City, Mexico, 12 to 16 October 2026

Agenda Item 3: **Review of the Results of the Analysis of Large Height Deviations (LHDs) and of the Collision Risk Model (CRM)**
3.4 Trend identification

TRENDS AND RECURRENCE OF COORDINATION FAILURES IDENTIFIED IN LHD REPORTS FROM 2023 TO 2025

(Presented by CARSAMMA)

EXECUTIVE SUMMARY

This Information Paper reviews coordination-related LHD occurrences from 2023 to 2025, identifying persistent, increasing and emerging concentrations by FIR interface and transfer point. CARSAMMA also organized common indications identified in the 2025 reports into a taxonomy, applied in **Appendix A** and defined in **Appendix B**, to support targeted State investigation and mitigation.

Strategic Objectives:	• Every Flight is Safe and Secure
References:	• ICAO Doc 9937 – Manual of Operating Procedures and Practices for Regional Monitoring Agencies in Relation to the Use of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive, Second Edition, 2019.

1. Introduction

1.1 ICAO Doc 9937 assigns regional monitoring agencies a central role in collecting and processing reports of large height deviations (LHDs). It also requires periodic review of monitoring results for recurring problems and an annual review of LHD reports to identify systematic problems that may affect the safe operation of RVSM airspace (Doc 9937, paragraphs 2.2.24, 2.5.2 and 2.5.4).

1.2 The Scrutiny Group supports this function by reviewing operational and technical information, evaluating LHD reports, and identifying adverse trends. When the group identifies a trend, it may recommend action to air traffic service providers or regulatory authorities as part of ongoing RVSM safety oversight (Doc 9937, Appendix J, paragraph 2.2).

1.3 This Information Paper examines the validated LHD records for 2023, 2024 and 2025. It identifies recurrent coordination failures by responsible FIR, directional FIR interface and transfer point, and proposes priorities for bilateral investigation and follow-up.

2. Discussion

Scope and Method

2.1 This Information Paper analyses validated coordination-related LHD occurrences recorded in 2023, 2024 and 2025. The analytical population comprises events classified under codes E1, E2, F1 and F2, totalling 561 occurrences in 2023, 528 in 2024 and 236 in 2025. The comparison is based on the coordination-related categories recorded in each annual dataset.

2.2 FIR names were standardized across the three datasets. Interfaces are presented directionally as the reporting or affected FIR followed by the FIR to which the coordination failure was attributed. Events were grouped by validated GTE code, interface, and transfer point.

2.3 The recurrence analysis uses absolute frequencies. Traffic movements and reporting completeness were not available as exposure measures. The findings therefore identify concentrations for investigation and prioritization; they do not establish occurrence rates, causal factors or individual responsibility.

2.4 For the purposes of this Information Paper, persistent recurrence means that comparable events were recorded in each of the three years; increasing trend means that the absolute count increased in each successive year; and emerging signal means a new or materially increasing concentration requiring follow-up.

Trends by FIR and FIR Interface

2.5 The number of validated coordination failures decreased across the period. Because the figures are absolute counts and reporting coverage may vary, do not interpret the decrease as improved operational performance on its own, as presented in **Table 1**.

Coordination failure population	2023	2024	2025
E1	347	292	134
E2	214	186	81
F1	0	32	20
F2	0	18	1
Total	561	528	236

Table 1 – Coordination failure population

2.6 Bogota remained the FIR to which coordination failures were most frequently attributed. At the directional interface level, Guayaquil → Bogota represented the largest recurrent concentration and involved several transfer points, supporting a review of the overall bilateral coordination process.

Curacao → Barranquilla and La Paz → Cordoba showed the clearest increasing directional trends. The marked reductions observed in Panama → Bogota, Bogota → Panama and Santo Domingo → Curacao should be monitored to determine whether they reflect sustained operational improvement or changes in traffic or reporting coverage. These trends are presented in **Table 2**.

Reporting or affected FIR	FIR attributed with failure	2023	2024	2025	Assessment
Guayaquil	Bogota	24	49	26	Persistent high concentration
Panama	Bogota	36	33	2	Persistent with marked reduction
Bogota	Panama	30	21	8	Persistent with reduction
La Paz	Amazonica	21	27	8	Persistent with reduction
Santo Domingo	Curacao	28	22	3	Persistent with marked reduction
Maiquetia	Bogota	24	21	6	Persistent with reduction
Santo Domingo	Port au Prince	17	22	7	Persistent recurrence
Curacao	Barranquilla	6	9	16	Increasing trend
Curacao	Maiquetia	10	10	7	Persistent and comparatively stable
La Paz	Cordoba	6	8	11	Increasing trend
La Paz	Curitiba	3	10	6	Persistent recurrence
Guayaquil	Central America	7	2	8	Recurrent with increase in 2025
La Paz	Asuncion	4	9	7	Persistent recurrence
Port au Prince	Kingston	12	6	4	Persistent with reduction

Table 2 – Coordination failures by directional FIR interface

TRENDS BY TRANSFER POINT

2.7 The following transfer points showed the most relevant persistent, increasing, or emerging concentrations during 2023-2025. **Table 3** presents the results.

Transfer point	2023	2024	2025	Three-year assessment
PULTU	3	21	14	High recurrence since 2024
ETBOD	10	16	7	Persistent recurrence
PUBUM	9	7	16	Persistent with marked increase in 2025
KIKAS	10	17	4	Persistent with reduction
ENPUT	14	14	3	Persistent with marked reduction
RCO	12	11	6	Persistent with reduction
SIDAK	6	13	8	Persistent, below 2024
IREMI	11	11	5	Persistent with reduction
UGUPI	11	11	4	Persistent with reduction

Transfer point	2023	2024	2025	Three-year assessment
AGUJA	8	11	6	Persistent with reduction
OROSA	4	5	13	Persistent with increasing trend

Table 3 – Coordination failures by transfer point

2.8 PULTU had the highest three-year total and remained elevated in 2025. ETBOD also remained recurrent throughout the period. In 2025, however, PUBUM and OROSA showed the highest increases in concentration, with PUBUM becoming the highest point-level concentration in the dataset.

2.9 SIDAK remained persistent despite a reduction from its 2024 level. KIKAS, ENPUT, RCO, IREMI, UGUPI and AGUJA were also recorded in each year but showed lower counts in 2025. Follow-up should determine whether these reductions represent sustained improvement or changes in traffic or reporting coverage.

PRIORITIES AND FOLLOW-UP

2.10 The proposed priorities combine persistence, direction of change, and the size of the 2025 concentration. CARSAMMA identified common indications involving incorrect, missing, or late coordination; transfer-point and crossing-time discrepancies; uncoordinated flight-level changes; and automated coordination occurrences. Appendix A applies these indications to the priority interfaces and transfer points, while Appendix B defines the taxonomy codes.

2.11 The taxonomy is intended as a screening and prioritization tool to support consistent classification, targeted mitigation and effectiveness monitoring. It does not establish root cause, responsibility or accountability, which remain subject to investigation and validation by the States and air navigation service providers concerned.

3. Suggested action

3.1 The Meeting is invited to:

a) note the coordination-failure trends identified in the validated LHD data for 2023–2025;

b) validate the recurrent, increasing and emerging interfaces and transfer points identified in this Information Paper;

c) recognize the occurrence taxonomy defined in Appendix B as a screening and prioritization tool to support State investigation and targeted mitigation; and

d) agree that the GTE request the States and air navigation service providers concerned to investigate the priorities identified in Appendix A, validate the indicated mechanisms, implement appropriate mitigation measures, and report the results and evidence of effectiveness for subsequent GTE monitoring.

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APPENDIX A
DETAILED RECURRENCE EVIDENCE TAXONOMY AND MITIGATION FRAMEWORK

This appendix provides the analytical basis for the priorities proposed in the working paper. It links the three-year recurrence evidence to the failure mechanisms indicated in the 2025 reports and to targeted mitigation and effectiveness measures for consideration by the States concerned.

A1 TRENDS BY FIR INTERFACE

A1.1 Bogota remained the FIR most frequently attributed with a coordination failure, with 114 events in 2023, 122 in 2024 and 41 in 2025. Several FIRs showed lower absolute counts in 2025. Curacao–Barranquilla and La Paz–Cordoba, however, increased across the period and require closer review at interface level.

Reporting or affected FIR	FIR attributed with failure	2023	2024	2025	Assessment
Guayaquil	Bogota	24	49	26	Persistent high concentration
Curacao	Barranquilla	6	9	16	Increasing trend
La Paz	Cordoba	6	8	11	Increasing trend
Santo Domingo	Port-au-Prince	17	22	7	Persistent recurrence
La Paz	Curitiba	3	10	6	Persistent recurrence
Panama	Bogota	36	33	2	Marked reduction
Santo Domingo	Curacao	28	22	3	Marked reduction

Table A-1 — Trends by directional FIR interface

Note: Direction is presented as reporting/affected FIR → FIR attributed with failure. Directional interface results should be interpreted separately from transfer-point results, since occurrences at the same bilateral interface may be reported in different directions.

A1.2 The Guayaquil–Bogota interface had the largest three-year total, with 99 coordination failures. Its 2025 count remained material despite the reduction from 2024. The Curacao–Barranquilla interface increased from 6 events in 2023 to 9 in 2024 and 16 in 2025, while La Paz–Cordoba increased from 6 to 8 and then 11 events.

A1.3 The reductions observed in the Panama–Bogota and Santo Domingo–Curacao interfaces require effectiveness verification. The available data do not establish whether the reductions resulted from corrective action, changes in operations or changes in reporting coverage.

A2 TRENDS BY TRANSFER POINT

A2.1 Table A-2 presents the transfer points with the most relevant persistent or increasing concentrations during 2023-2025.

Transfer point	2023	2024	2025	Three-year assessment
PULTU	3	21	14	High recurrence since 2024

Transfer point	2023	2024	2025	Three-year assessment
ETBOD	10	16	7	Persistent recurrence
PUBUM	9	7	16	Persistent with marked increase in 2025
KIKAS	10	17	4	Persistent with reduction
ENPUT	14	14	3	Persistent with marked reduction
RCO	12	11	6	Persistent with reduction
SIDAK	6	13	8	Persistent, below 2024
IREMI	11	11	5	Persistent with reduction
UGUPI	11	11	4	Persistent with reduction
AGUJA	8	11	6	Persistent with reduction
OROSA	4	5	13	Persistent with increasing trend

Table A-2 – Trends by transfer points

A2.2 PULTU had the highest three-year total and remained elevated in 2025. PUBUM and OROSA showed the strongest increases in the final year of the review period, while ETBOD and SIDAK remained persistent despite lower counts than in 2024.

A2.3 KIKAS, ENPUT, RCO, IREMI, UGUPI and AGUJA remained recurrent but showed lower absolute counts in 2025. Their recurrence should continue to be monitored to determine whether the observed reduction is sustained.

A3 TAXONOMY-BASED REVIEW OF THE 2025 OCCURRENCES

A3.1 The validated GTE code defines the coordination-related LHD population. Additional taxonomy fields were derived from the occurrence narratives to identify more specific indications of the coordination barrier involved. These fields serve different analytical purposes and should not be treated as mutually exclusive classifications.

A3.2 The taxonomy review uses the occurrence-taxonomy codes defined in Appendix B. Some taxonomy codes have the same designation as the validated GTE codes used to define the coordination-related LHD population. A single occurrence may contain more than one taxonomy indication; consequently, the taxonomy totals may exceed the number of distinct events.

A3.3 The taxonomy provides preliminary evidence to support prioritization and State investigation. It does not independently establish contributing factors, system failure, root cause or accountability.

FIR interface	2025 events	E1	E2	F1	E4	E5	E6	E8
Guayaquil–Bogota	26	17	3	6	—	—	—	—
Curacao–Barranquilla	16	14	2	—	—	1	—	4
La Paz–Cordoba	11	10	1	—	—	—	1	—

Table A-3 — Taxonomy indications by priority FIR interface

Transfer point	2025 events	E1	E2	E3	E4	E5	E6	E10	F1	F2
PULTU	14	11	1	—	—	—	—	—	2	—
ETBOD	7	1	1	—	1	1	3	—	—	—
PUBUM	16	11	4	—	—	—	1	—	—	—
KIKAS	4	2	2	—	—	—	—	—	—	—
ENPUT	3	1	2	—	—	—	—	—	—	—
RCO	6	3	3	2	—	—	1	—	3	—
SIDAK	8	1	3	—	—	—	4	—	—	—
IREMI	5	2	—	—	—	—	1	—	2	—
UGUPI	4	1	1	1	—	—	1	—	—	—
AGUJA	6	3	3	—	—	—	—	—	—	—
OROSA	13	9	3	—	1	—	—	—	—	—

Table A-4 — Taxonomy indications by priority transfer point

NOTE: All codes shown in this table are occurrence-taxonomy codes, as defined in **Appendix B**. Some taxonomy codes have the same designation as the validated GTE codes used to define the coordination-related LHD population. The taxonomy values represent indications derived from the available occurrence information and are not mutually exclusive.

A3.4 Some records contain a general coordination code together with a more specific mechanism code, such as E6/E1. Consequently, code totals may exceed the number of occurrences. The additional codes should be read as overlapping indications rather than mutually exclusive categories.

A3.3 The current taxonomy field also presents a data-quality limitation. Of the 236 coordination events, 191, or 80.9 per cent, reproduce the validated GTE code exactly; 233, or 98.7 per cent, contain that code; and only 42, or 17.8 per cent, include an additional mechanism code. The field therefore provides useful preliminary evidence but is not yet a fully independent causal classification.

A3.5 Particular care is required when distinguishing E1 from F1. Several narratives explicitly mention AIDC but are classified as E1, although the working taxonomy associates E1 with cases not involving automated transfer. This may reflect a distinction between the existence of an AIDC message and the effective operational use or processing of that message. The States concerned should verify the classification using system logs and local operational records.

A3.6 The matrix links the priority interfaces and transfer points identified in the 2025 review to proposed State follow-up and suggested indicators for monitoring mitigation effectiveness.

Priority	Interface or point	Taxonomy indications	Proposed State follow-up	Suggested effectiveness indicator
High	Guayaquil-Bogota and PULTU	Predominantly E1/F1 indications	Review applicable automated and voice coordination records and flight-level revision procedures	Recurrence by mechanism in subsequent review periods
High	Curacao-Barranquilla bilateral interface and OROSA	Predominantly E1, with indications of pre-TCP coordination discrepancies	Review coordination revisions, responsibility limits and authorization of level changes before the TCP	Recurrence by mechanism and interface
High	La Paz-Cordoba bilateral interface and PUBUM	Predominantly E1/E2 indications, with additional timing-related indications	Review the bilateral coordination process, transfer completion and revised-level coordination	E1 and E2 recurrence by interface direction
High	ETBOD	E1/E2 validated codes with additional E4/E5/E6 indications	Review re-estimate procedures and timely coordination requirements	Recurrence of E2, E4, E5 and E6 indications
Medium	SIDAK	E1/E2 validated codes with early-crossing indications	Review estimate revisions and confirmation of coordination before the TCP	Recurrence by mechanism in subsequent review periods
Monitor	KIKAS, ENPUT, UGUPI, IREMI and AGUJA	Mixed recurrent indications	Maintain point-level monitoring and validate the indicated mechanisms locally	Point- and mechanism-specific recurrence
Monitor	RCO	E1/F1 validated codes and automated-transfer indications	Review automated coordination messages, operational records and applicable fallback procedures	Recurrence of F1 and documented coordination discrepancies

Table A-5 – Priority Mitigation and Effectiveness Matrix

NOTE: The taxonomy codes represent indications identified from the available LHD information and do not establish contributing factors, system failure, root cause or accountability. Effectiveness indicators should be interpreted considering traffic levels and reporting coverage, where available.

A4 LINKED MITIGATION AND EFFECTIVENESS FRAMEWORK

A4.1 The taxonomy can make mitigation more consistent and targeted by linking the recurrent location to the specific operational barrier indicated in the reports. It does not replace State investigation; rather, it identifies where the investigation and supporting evidence should be focused.

A4.2 For each priority interface, the States concerned should report: the mechanism validated through local investigation; the operational or technical barrier that failed; the corrective action and responsible organization; the implementation date; and the quantitative or documentary evidence to be used for effectiveness monitoring.

A4.3 Generic responses such as briefing personnel should be supplemented by verifiable measures. Depending on the mechanism, evidence may include AIDC or AMHS logs, changes to letters of agreement, alert parameters, contingency test results, samples of transfer records, training records and recurrence indicators for the affected interface or point.

A4.4 This approach supports just culture because it directs attention to operational barriers, procedures, systems and interface design rather than using the regional dataset to assign individual blame.

APPENDIX B
ENGLISH TRANSLATION OF THE OCCURRENCE TAXONOMY

This appendix provides the English translation of the working taxonomy used to classify the occurrence mechanisms discussed in Appendix A. The wording has been standardized for operational clarity while preserving the meaning of the source taxonomy. TCP means transfer of control point.

Code	Occurrence mechanism
E1	Repeated incorrect coordination in which no automated transfer system was used.
E2	Repeated absence of coordination in which no automated transfer system was used.
E3	Coordination was completed, but the aircraft contacted the receiving unit at a point or fix different from the coordinated point or fix, and no revised coordination was made.
E4	Coordination was completed late, less than three minutes before the TCP, or the pilot contacted the receiving unit very close to the TCP without the required prior coordination.
E5	The aircraft crossed the TCP while still climbing or descending, although it had been coordinated to cross the TCP in level flight.
E6	The aircraft was coordinated to cross the TCP at a specified time but crossed the TCP more than three minutes earlier, without a revised estimate.
E7	The aircraft contacted the ACC of the accepting FIR only after crossing the TCP and entering the adjacent FIR.
E8	The ACC of the accepting FIR climbed or descended the aircraft before the TCP, while the aircraft was still operating within the transferring FIR, without coordinating the change.
E9	The ACC of the accepting FIR incorrectly read back the coordinated level, fix or time, and the ATCO of the transferring ACC did not detect the error.
E10	The ACC of the accepting FIR requested transfer at a level, point or fix different from that originally coordinated, but the transferring ACC did not comply with the request.
E11	The ACC of the transferring FIR coordinated the wrong aircraft and did not detect the error.
F1	Repeated incorrect coordination in which an automated transfer system was used.
F2	Repeated absence of coordination despite the use of an automated transfer system; the expected automated coordination was not completed.
F3	Coordination was not completed despite attempts through all available means. The aircraft contacted the adjacent FIR before coordination had been completed.
J/K	An occurrence involving a TCAS resolution advisory, with correct or incorrect action by the pilot.

Table B-1 - Occurrence Taxonomy

NOTE: The taxonomy identifies the mechanism indicated by the report and supports screening and prioritization. It does not, by itself, establish contributing factors, root cause or individual accountability.

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