



23/05/2018

EUR/SAM Corridor Airspace Concept State of Art I

SAT22 agreements/Conclusion/Tasks

- EUR/SAM States : 5 minutes Reduced LSM (ICAO Doc 4444)
- UPDATE National regulations and guidance materials (ICAO Doc 4444)
- States : PBCS regulatory Framework (PBCS-National Action Plan).
- ICAO Regional Director AFI and SAM : Supporting State Letter.
- States : Local means of collecting and sharing PBCS performance data for CFRA

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EUR/SAM Corridor Airspace Concept State of Art II



Responsible team defined and tasked

- ESCIT (EUR-SAM Corridor Implementation Team) – Portugal Team leader
- Plan strongly amended during in SAT22 (PANS-ATM doc.4444)
- PBCS time-based longitudinal separation minima introduced.
- ESCIT met in several videoconferences to define milestones and schedule.

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EUR/SAM Corridor Airspace Concept SAT 22 Approved plan

Code	Project Deliverables	Responsible	Status of implementation*	Delivery date	Remarks
	5 minutes Longitudinal Separation minima based on RSP/RCP/RNP10				
EUR/SAM_1.1	Approval of Doc4444 5.4.2.9 "Longitudinal separation minima" in EUR/SAM Corridor States National Regulations	States		TBD	
EUR/SAM_1.2	RNP10/RSP180/RCP240 ANSP /Operator Requirements-Flight Plan	IATA/ANSP		TBD	Systems and fleet status regarding RSP/RCP ANSP systems update and ANSP Safety Studies (ICAO CIRCULAR 343-AN/201)
EUR/SAM_1.3	Evaluation of ADS-C/CPDLC GS Performance (RCP/RSP). Feasibility of DLink Madate	CFRA/ANSP		TBD	Evaluation of the ADS-C/CPDLC Ground Systems Performance against RCP and RSP. RCP/RSP for Operators -Fligh Plan cover
EUR/SAM_1.5	Safety Assessment Report States Implementation Hazards Log Operators requirements	SATMA/CFRA/ IATA/STATES		SAT23	
EUR/SAM_1.6	Operational Procedures	States		TBD	
EUR/SAM_1.7	Development of AIC, AIP Supplement and letter of operational agreement to support 5 minutes LSM	SATMA States/ANSP IAS Members		TBD	
EUR/SAM_1.8	Post-implementation Monitoring of the 5 minutes Longitudinal Separation under Data Link Mandate	SATMA States/ANSP IAS Members		SAT 24	

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EUR/SAM Corridor Airspace Concept

SAT 23 proposed Schedule

Code	Project Deliverables	Responsible	Delivery date	Remarks
5 minutes Longitudinal Separation minima based on RSP/RCP/RNP10				
EUR/SAM_1.3	Evaluation of Ground Systems Performance against RCP/RSP in the corridor, to determine the feasibility of Data Link Mandate	CFRA/ANSP	November 2018	Evaluation of the ADS-C/CPDLC Ground Systems against RCP/RSP. (ICAO CIRCULAR 343- Hazard Logs)
EUR/SAM_1.5	SATMA Safety Assessment (Data Definition)	SATMA/CFRA/IATA/STATES	November 2018	SATMA: 2018 Data definition/schedule for Safety Assessment
EUR/SAM_1.6	Operational Procedures	States	February 2019	General Procedures regarding .Traffic transfer procedures .FL allocation considerations
EUR/SAM_1.7	AIC EUR/SAM Corridor DL Mandate: Development of AIC, AIP Supplement and letter of operational agreement to support 5 minutes Longitudinal Separation for States involved on the implementation	SATMA States/ANSP IAS Members	February 2019	Draft for a general AIC model : Considerations to take into account for LoAs Revision of Contingency plan (if necessary)
EUR/SAM_1.8.1	PBCS implementation Safety Assessment PBCS (SLSM)Implementation in EUR/SAM	SATMA	March-May 2019	
EUR/SAM_1.8.2 enaire.es	Post-implementation Monitoring of the 5 minutes Longitudinal Separation under Data Link Mandate	States/ANSP IAS Members	SAT 25	

EUR/SAM_1.3

Evaluation of ADS-C/CPDLC Ground Systems : RCP240/RSP180

RCP specification (communication transaction time)					
RCP	240				RCP
	Controller composes and sends message	← Operational Performance (Monitored) →		Controller receives indication and confirms response	
	Communication transaction time				
99.9%	Part of 30	210		Part of 30	ET
95%	Part of 30	180		Part of 30	TT
		RCTP (Ground to Air)	PORT	RCTP (Air to Ground)	
99.9%		P(150)	60	P(150)	99.9%
95%		P(120)	60	P(120)	95%

The communication system provided to enable the application of the separation minima shall allow a controller, **within 4 minutes**, to intervene and resolve a potential conflict by contacting an aircraft using the normal means of communication.

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Evaluation of ADS-C/CPDLC Ground Systems : RCP240/RSP180

RSP specification (surveillance data transit time)				
RSP	180			RSP
	Time at position (RNP at +/-1 sec UTC)	Operational Performance (Monitored)		ATSU receives surveillance data
		Surveillance data transit time		
99.9%		180		OD
95%		90		DT
		Aircraft system	CSP	ATSU system
99.9%		5	170	5
95%		3	84	3

ADS-C Report Delay	Action
> 3 minutes	obtain the report as quickly as possible
> 6 minutes	take action to resolve potential conflict(s)

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RSP/RCP Performance

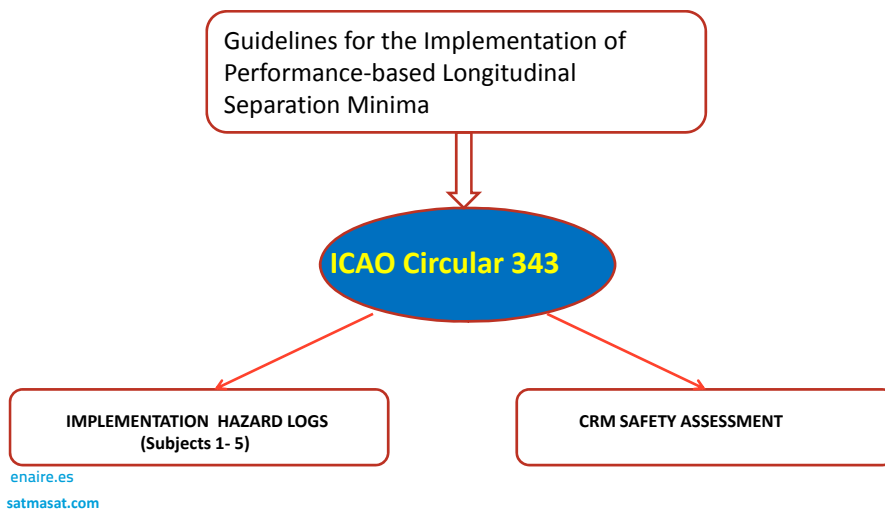


	Continuity	Availability	Integrity
RSP	If a communication transaction is not completed within the operational (ET) time value, the system is required to provide an indication to the controller for appropriate action. Success rate required 99,9%	99.9% (for safety) <u>available service</u> allows a "out of service" of 524 minutes/year	There usually is no operational visibility of communication or surveillance services that do not meet integrity requirements. Any malfunction should be adequately mitigated in safety assessment, design and implementation.
RCP	If a surveillance data report is overdue (not delivered within operational time value), the system is required to either automatically take action and/or provide an indication to the controller for appropriate action. Success rate required 99,9%	99.99% (for efficiency) <u>available service</u> allows a "out of service" of 52.4 minutes/year. (Down time due to planned maintenance is not included)	System integrity issues discovered post-implementation should be reported to the appropriate Regional/State monitoring agency and/or authorities for appropriate actions Occurrence no greater than 10-5 probability of malfunction per flight hour is required

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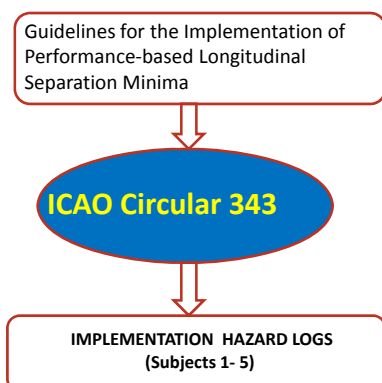
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Evaluation of ADS-C/CPDLC Ground Systems : RCP240/RSP180



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Evaluation of ADS-C/CPDLC Ground Systems : RCP240/RSP180



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Evaluation of ADS-C/CPDLC Ground Systems : RCP240/RSP180

Guidelines for the Implementation of Performance-based Longitudinal Separation Minima

ICAO Circular 343

IMPLEMENTATION HAZARD LOGS (Subjects 1- 5)

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Subject 1 — Filing of incorrect FPL information	
Hazard	Loss of separation.
Unsafe event (cause)	An ineligible aircraft receives a clearance for one of the performance based separation minimum because equipment and/or capability were incorrectly filed in the FPL or incorrect flight information transmitted from an adjacent ATC unit.
Analysis	<p>The safety analysis used for determining the longitudinal separation standards was based on the assumption that the concerned aircraft and crew had and was operating the required on-board ADS-C and CPDLC equipment. If the equipment is filed in the FPL but not available or not used by the flight crew then the controller could apply inappropriate separation.</p> <p>Aircraft operators are required to correctly file the on-board navigation equipment that is serviceable and usable by the crew. It is important that aircrew also use the equipment that is filed. It may, for example, lead to loss of separation if CPDLC capability is filed in the flight plan but then subsequently not used by the pilot.</p> <p>ATC reads the navigation and equipment designators from the FPL and then plans for and applies separation accordingly. ATC normally does not question the data in the FPL and trusts that the filed data is correct. It is important that aircraft operators and aircrew understand the importance of filing correct data in the FPL and the adverse impact that incorrectly filing this information can have on airspace risk.</p> <p>It is also the responsibility of ATC to correct flight plan data that is found to be incorrect and subsequently pass corrected data in coordination messages to the next facility. For example if CPDLC is found to be inoperative in an aircraft that has filed CPDLC capability then that information must be passed to the next ATC unit.</p>
SASP global controls and/or mitigations	<p>a) Establishment of ongoing system performance monitoring as defined in the <i>Manual on Monitoring the Application of Performance-Based Horizontal Separation Minima</i> (Doc 10063).</p> <p>b) PANS-ATM providing guidance for completing the FPL form.</p> <p>c) <i>Performance-based Communication and Surveillance Manual</i> (Doc 9869), <i>Global Operational Data Link Manual</i> (Doc 10037) providing guidance to aircraft operators.</p>
Regional and local controls and/or mitigators required	Monitoring of airspace in accordance with <i>Manual on Monitoring the Application of Performance-based Horizontal Separation Minima</i> (Doc10063) guidelines.

EUR/SAM_1.3

Evaluation of ADS-C/CPDLC Ground Systems : RCP240/RSP180

Guidelines for the Implementation of Performance-based Longitudinal Separation Minima

ICAO Circular 343

IMPLEMENTATION HAZARD LOGS (Subjects 1- 5)

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Subject 2 — Failure of ADS-C and/or CPDLC transfer	
Hazard	Loss of separation.
Unsafe event (cause)	The receiving ANSP is unable to establish an ADS-C or CPDLC connection with one or both aircraft.
Analysis	<p>ADS-C and CPDLC services are intended to be seamless as connected aircraft move across flight information region (FIR) boundaries. However, experience has shown that, due to any one of a number of ground or airborne system problems or errors, the transfer of ADS-C and/or CPDLC connections may not occur.</p> <p>Examples of transfer failure include cases in which:</p> <ol style="list-style-type: none"> the transferring ANSP fails to nominate the receiving ANSP as the Next Data Authority (NDA) for CPDLC; failure in the forwarding of the CPDLC connection to the receiving ANSP; inappropriate termination of the ADS-C connection by the flight crew when crossing the FIR boundary, and unintentional ADS-C disconnects due to or the ground system is unable to re-establish a lost ADS-C connection. <p>When this occurs, ATC is expected to request the flight crew to follow procedures for re-establishment of the AFN Logon or CPDLC connection.</p> <p>If attempts to restore connectivity are unsuccessful, ATC is expected to apply an alternate form of separation between the aircraft pairs involved.</p>
SASP global controls and/or mitigations	Establishment of recommended data link procedures as defined in the <i>Global Operational Data Link (GOLD) Manual</i> (Doc 10037).
Regional and local controls and/or mitigations required	A. Apply an alternate form of separation. B. Comply with guidelines provided in the <i>Global Operational Data Link (GOLD) Manual</i> (Doc 10037).

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Evaluation of ADS-C/CPDLC Ground Systems : RCP240/RSP180

Guidelines for the Implementation of Performance-based Longitudinal Separation Minima

ICAO Circular 343

IMPLEMENTATION HAZARD LOGS (Subjects 1- 5)

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Subject 3 — Surveillance and/or Communication failure	
Hazard	Loss of Separation.
Unsafe event (cause)	Failure within the data link system and/or supporting subnetworks.
Analysis	<p>Performance-based longitudinal separations rely upon end to end connectivity of data link systems and subnetworks to ensure that required messages and information are sent, received and processed between the airborne equipment, communication service provider (CSP) networks and air traffic service unit (ATSU) ground system. Failure of individual components of the overall data link system can result in a necessary condition for separation application to not be available.</p> <p>Examples of communication and surveillance system components that can fail individually include:</p> <ul style="list-style-type: none"> a) air navigation service provider (ANSP) gateway failure; b) CSP network failure; and c) ground-earth station (GES) failure.
SASP global controls and/or mitigations	Establishment of recommended data link procedures as defined in the <i>Global Operational Data Link (GOLD) Manual</i> (Doc 10037) and the <i>Performance-based Communication and Surveillance (PBCS) Manual</i> (Doc 9869).
Regional and local controls and/or mitigations required	<ul style="list-style-type: none"> a) Apply an alternate form of separation. b) Ensure redundancy of equipment, lines, power supply, etc. c) Comply with guidelines provided in the <i>Global Operational Data Link Document (GOLD) Manual</i> (Doc 10037), the <i>Performance-based Communication and Surveillance (PBCS) Manual</i> (Doc 9869) and the <i>Satellite Voice Operations Manual</i> (Doc 10038).

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Evaluation of ADS-C/CPDLC Ground Systems : RCP240/RSP180

Guidelines for the Implementation of Performance-based Longitudinal Separation Minima

ICAO Circular 343

IMPLEMENTATION HAZARD LOGS (Subjects 1- 5)

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Subject 4 — Ground system failure	
Hazard	Loss of Separation.
Unsafe event (cause)	Failure of the (ANSP) flight data processing system (FDPS).
Analysis	<p>Performance-based longitudinal separations rely on ground system automation to process ADS-C reports to both calculate the distance between aircraft pairs and provide ATC alerts when the distance is in danger of falling below the minimum. Failure of FDPS hardware/software components or unavailability of power supply would negate this function and compromise the conditions for application of the separation.</p>
SASP global controls and/or mitigations	None.
Regional and local controls and/or mitigations required	<ul style="list-style-type: none"> a) Where able, transition remaining pairs to other form of separation that is not data link dependent. b) Ensure redundancy of equipment, lines, power supply, etc. c) Suspend further use of the performance-based separation minima.

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Evaluation of ADS-C/CPDLC Ground Systems : RCP240/RSP180

Guidelines for the Implementation of Performance-based Longitudinal Separation Minima

ICAO Circular 343

IMPLEMENTATION HAZARD LOGS
(Subjects 1- 5)

Subject 5 — GNSS system failure

Hazard

Loss of separation.

Unsafe event (cause)

GNSS failure affecting multiple aircraft or a failure of individual GNSS receivers.

Analysis

Performance-based longitudinal separation rely on data link communications which have a requirement to be accurate to within one second of UTC. On most aircraft equipped with ADS-C and CPDLC, this accuracy is provided via the GNSS time source.

GNSS outages are detected by RAIM equipment. For individual GNSS receivers, the pilot shall advise ATC of failure.

SASP global controls and/or mitigations

PANS-ATM (Doc 4444), 5.2.2 Degraded Aircraft Performance

Regional and local controls and/or mitigations required

- Make RAIM prediction a standard operation and suspend application of the performance-based separation minima in case of predicted RAIM outage.
- Where able, transition remaining pairs to separation that is not reliant on GNSS.
- Suspend further use of the performance-based separation minima.

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Evaluation of ADS-C/CPDLC Ground Systems : RCP240/RSP180

Guidelines for the Implementation of Performance-based Longitudinal Separation Minima

ICAO Circular 343

IMPLEMENTATION HAZARD LOGS (Subjects 1- 5)

If analysed deeply, despite of PBCS, all Harzards Logs established in Circular 343 (Annex 1) are items that must have been necessary verified (FHA) before any ADS/CPDLC implementation.

FANS has been used in EUR/SAM corridor for years as a surveillance tool (add more years of trials and tests), so States and operators in the area are already experienced in ADS-CPDLC functions and services.

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Evaluation of ADS-C/CPDLC Ground Systems : RCP240/RSP180

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ENAIRE (CANARIAS ACC) CONFIGURATION FOR RSP

Coordenadas Geodésicas			
Latitud	Or.	Longitud	Or.
312000.000	N	0262000.000	W
310506.000	N	0201523.000	W
322429.000	N	0180059.000	W
315154.000	N	0163406.000	W
280046.000	N	0175214.000	W
264219.940	N	0150258.400	W
274000.000	N	0123543.000	W
263129.500	N	0113507.600	W
275000.000	N	0082500.000	W
255000.000	N	0082500.000	W

Demora máxima para aceptar reportes ADS-C: segundos Número de periodos con ausencia para CNL Pista ADS-C:

Umbral de FOM para Aviso por "FOM bajo": Umbral para Aviso "Discrepancia en Posición": millas náuticas

CFRA Canarias FANS 2017 analysis :

- With regard to downlink messages delay, on average 95% of the calculated delays are usually not greater than 60 seconds whilst 99% of calculated delays are usually well below 180 seconds.

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Evaluation of ADS-C/CPDLC Ground Systems : RCP240/RSP180



Guidelines for the Implementation of Performance-based Longitudinal Separation Minima

ICAO Circular 343

CRM SAFETY ASSESSMENT

CONSIDERATIONS

There is a **requirement** for a region or State to undertake an implementation **safety assessment**. In principle, this comprises two parts :

•**Safety assessment for navigation performance**

•**Hazard assessment.**

Only the hazard assessment needs to be performed for any local implementation, since the **safety assessment for the navigation performance under the various navigation specifications is valid for any implementation.**

The hazard analysis is to identify hazards and related mitigation measures that are specific to the local situation.

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EUR/SAM_1.5**SATMA Safety Assessment (Data)****SATMA (Monitoring Agency)**

- Perform **Safety Assessment** , based on CRM
- Data and information to be provided by States when demanded.
- As no real/available data related to 5 Separation minima in the corridor SATMA will estimate the more conservative hypothesis for a suitable implementation.
- At that time, States collaboration providing FANS data and equipment performances in a periodical base will be a requisite

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Data required defined/deliver by November 2018

EUR/SAM_1.6

EUR/SAM_1.7

Operational Procedures (5mts LSM)



- New scenario for ATCs.
- **FL shared by PBCS/no PBCS aircraft**
- To be defined:
 - AIC models
 - Letters of agreements models
 - Traffic transfer between collaterals
 - Flight level occupancy considerations
 - Contingency Plan revision (if necessary)
 - Longitudinal Separation Deviation Reports (Monitoring)
 - Others

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An **“Operational Procedures Task Force”** proposed.

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Flight Plan Addins (ICAO Doc10063)



PBC approval	RCP 240	Mandate	Flight Plan -Field 10 ^a - P2 for CPDLC RCP240
PBS approval	RSP 180	Mandate	Flight Plan-Field 18 -SUR/RSP 180
PBN approval	RNP	Mandate	Flight Plan -Field 10 ^a (R) and Field 18 RNAV

Aircraft PBCS (RCP240/RSP180) certification* should be issued by States Regulators and sent to responsible RMA for registration.



*Certification is global and unique, as RMAs will maintain and share a global Database of registered certifications.

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INITIAL WORK PROGRAMME FOR THE ESCIT TEAM

WORK PROGRAMME		
TASK No.	SUBJECT	TARGET DATE
1.	<p>Elaborate :</p> <ul style="list-style-type: none"> • Draft for a general AIC model • Considerations to take into account for LoAs • Revision/Reedition of Contingency plan (if necessary) <p>General Procedures regarding</p> <ul style="list-style-type: none"> • Traffic transfer procedures between collaterals • Flight level allocane considerations • ADS Contracts 	February 2019
<p><i>Note: The SAT FIT should submit its meeting reports and proposals to the SAT Working Group.</i></p>		
<ul style="list-style-type: none"> • COMPOSITION • <ul style="list-style-type: none"> ○ <i>ESCIT group.</i> ○ Team Leader: Portugal 		
<ul style="list-style-type: none"> • WORKING ARRANGEMENTS: THE GROUP SHOULD COMPLETE ITS WORK AND SUBMIT ITS PROPOSALS TO THE SAT AND SHOULD WORK THROUGH ELECTRONIC CORRESPONDENCE PRIOR TO MEETINGS. 		

EUR/SAM_1.8.1**EUR/SAM_1.8.2****Implementation PBCS (5mts LSM)**

EUR/SAM_1.8.1	PBCS implementation Safety Assessment	SATMA	March-May 2019
	<u>GO/NO GO DECISION</u>		SAT 24
	PBCS (5LSM) Implementation in EUR/SAM		June 2019
EUR/SAM_1.8.2	Post-implementation Monitoring of the 5 minutes Longitudinal Separation	States/ANSP IAS Members	SAT 25

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EUR/SAM Corridor Airspace Concept**Schedule**

Project Deliverables	Delivery date
5 minutes Longitudinal Separation minima based on RSP/RCP/RNP10	
RCP/RSP Systems Performance (ICAO CIRCULAR 343- Hazard Logs)	November 2018
SATMA Safety Assessment (Data)	November 2018
Operational Procedures (Task force)	February 2019
PBCS implementation Safety Assessment	March-May 2019
GO/NO GO PBCS(5LSM)Implementatio in EUR/SAM	SAT 24
Post-implementation Safety Assessment	SAT 25

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