



SEVENTEENTH MEETING ON THE IMPROVEMENT OF AIR TRAFFIC SERVICES OVER THE SOUTH ATLANTIC (SAT17)

(Canarias, Spain, April 18-20, 2012)

**Agenda Item 4: Communications, navigation and surveillance / Air traffic management
(CNS/ATM) Systems**

4.2. RNP4 in the EURSAM corridor

FEASIBILITY OF RNP-4 IN THE EUR/SAM CORRIDOR

(Presented by SATMA)

SUMMARY

The main aim of this working paper is to present a preliminary assessment of the feasibility to implement the RNP-4 in the EUR/SAM corridor.

1. INTRODUCTION

The main aim of this working paper is to present a preliminary assessment of the feasibility to implement the **RNP-4 in the EUR/SAM corridor**.

Currently, it is provided RNP-10 that supports 50NM lateral and the 80NM (or 10 minutes) longitudinal spacing and this implementation would allow to support 30 NM lateral and the 30 NM longitudinal distance of separation minima.

2. BACKGROUND AND SCOPE

It is well known that RNP4 implementation is a target of the work programme of the IAS/SG. In this line, during last meetings there have been several working papers, references and SAT decisions related to implement RNP 4 in the EUR/SAM Corridor:

- SAT14/TF1/Decision 11 (2009-Cape Verde): That EUR/SAM Corridor States and ANSPs are Agreed on a need for a RNP4 - 30/30NM implementation strategy;
- SAT15/FIT5/Decision 3 (2010-Lisbon): That IATA and ACC units encourage Airlines to increase their level of participation in ADS-C/CPDLC operations in order to enhance safety and efficiency of operations within the SAT and specially the EUR/SAM corridor;
- Based on previous discussion, it was decided by SAT states to develop a task in accordance with the following terms (Decision SAT 16/06 -Brazil):

- *It is agreed by all EUR SAM States that consolidation of FANS1/A aircraft facilities, prior to RNP4 fleet certifications, should be a prerequisite for the implementation of RNP 4 in the area.*
- *SATMA will contact States and IATA to compile data and information required to achieve a cost/benefit study based on the following hypothesis:*
 - a) *Results in terms of time and average of FANS1/A equipped & RNP4 certified aircraft on traffic growth expected;*
 - b) *Impact of “FL, Route or Airspace” restrictions for low average of FANS1/A equipped & RNP4 certified aircraft;*
 - c) *Increase average of optimal levels per period /peak time set;*
 - d) *ATC/Pilots Work load impact;*

The cost/benefit analysis will be submitted to SAT Group for further actions”

3. DISCUSSION

In order to accomplish the SAT decisions described above, SATMA has performed several tasks to obtain the best and realistic picture to decide the next steps in the EUR/SAM Corridor.

➤ Consolidation of FAN1/A aircraft facilities

The first step performed by SATMA was to analyze the consolidation of FAN1/A in the EUR/SAM Corridor. Due to the lack of a Central FANS 1/A Reporting Agency (CFRA) in the EUR/SAM Corridor, the unique data collected by SATMA has been the reported by Aena that shows data relative to the performance and use of FANS services for the year 2011, concerning aircraft flying in the UIR Canaries from/to the EUR/SAM Corridor.

An abstract of this report is shown in the following table:

Traffic Data	2011			2010
	Mean	Maximum	Minimum	Mean
Number of connected flights	1658	1843	1482	1601
Percentage referred to total number of flights in the EUR/SAM Corridor *	59.07 %	62.7 %	54.69 %	61,37 %
Percentage referred to flights in the EUR/SAM Corridor * indicating data link and ADS capacity in the Flight Plan	94.89 %	96.66 %	93.55 %	97,99 %
Number of flights with CPDLC connection (Monthly average)	1546	1712	1410	1525

* Traffic over flying the UIR Canaries from/to the EUR/SAM Corridor

TABLE 1: Traffic data summary

The main conclusions obtained of this study are defined below:

- Approximately **60%** out of the total within the EUR/SAM Corridor * are FANS equipped flights.
- Almost every equipped flight connected to SACCAN (**95%**).
- The majority if logged-on flights exchange CPDLC information (**95%**).
- **The trend of figures is kept regarding the 2010.**

Therefore, the *prerequisite for the implementation of RNP 4*, the consolidation of FANS 1A, **has not yet been achieved** in the EUR/SAM Corridor.

On the other hand, it is import to highlight the lack of the CFRA involve that there are not global data and monitoring of FANS 1/A in the EUR/SAM Corridor.

➤ **FANS1/A equipped & RNP4 certified aircraft**

In addition, SATMA has contacted with states, IATA and airlines to compile data and information required to know the current status of FANS1/A equipped and RNP4 certification aircraft.

Airlines	Operating the following FANS1/A aircraft	Aircraft in the EUR/SAM Corridor	% TOTAL
KLM	A330-200 (12) A330-300 (4) * in 2012 B777-200 (17) B777-300 (5)	- - Yes Yes	1,3%
AFR	All aircraft are RNP4/FANS certified and french CAA (DGAC) will deliver to AFR the approval to fly RNP4 routes in early 2012	All	14,69%
DLH	B747-400 (30) FANS 1 and RNP /4/10 B747-8 (17) FANS 1 A and RNP 1/4/10 from 2012 A330s (15) FANS A+ and RNP 1/4/10 A340-600s (24) FANS A+ and RNP 1/4/10 19 of 26 A340-300 are FANS A and RNP 1/4/10	Yes - - Yes Yes	2,2 % (1 % exc)
IBE	All aircraft are RNP10/FANS certified. The most of them are equipped RNP4 but not certified.	Yes	14,25%
LPE	B767-300 Not RNP4 certificated.	Yes	-
IWD	A330-300 (2) FANS 1/A A330-200 (1) FANS 1/A from 2012	Yes	0,2 % (0,05 % exc)

TABLE 2: Equipped and certified aircraft summary

In addition, next figure shows for the most significant airlines registered in Canarias (SACCAN-CANARIAS ADS/CPDLC System) their percentages of FANS-1/A connections referred to the total number of connected flights for the whole time of study.

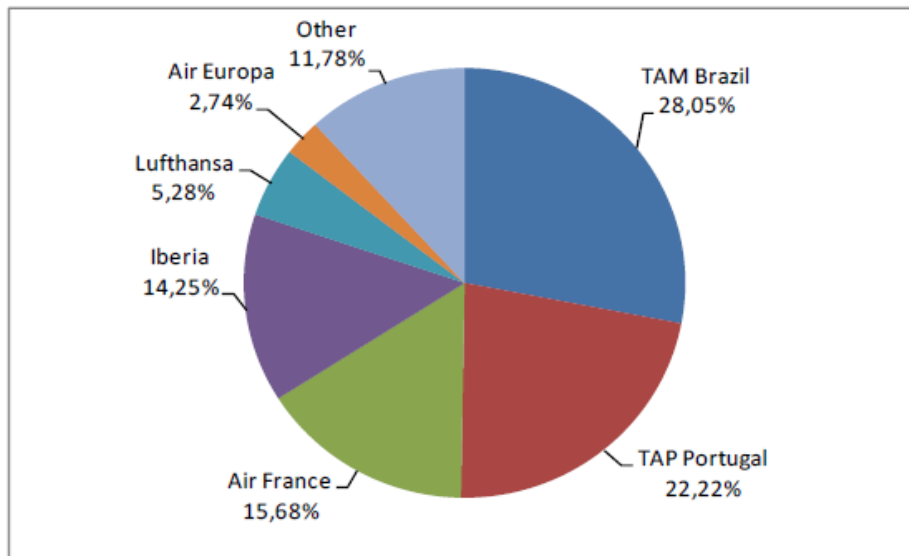


FIGURE 1: Average percentage of most significant airlines

Although the presented sample does not include all airlines in the corridor, the lacks of Acceptable Means of Compliance (AMC) to certificated RNP4 as well as the **uselessness** for EUR/SAM Corridor (currently there are not benefits operatives) and other areas (e.g. nowadays in North Atlantic it is not required) confirm that **the evolution of this certification will be slow and progressive during several years.**

Take into account that airlines should have to certificate each aircraft and its crew that operate in the EUR/SAM Corridor to not obtain any operational benefits. To have an idea of this process, next table shows the Airworthiness and Operational Approval Matrix required:

Operational Approval Process (PBN Vol II, Part B/C, Paragraph X.3.2.2)	Evidence of Aircraft Eligibility	Assessment of the on-board navigation system for the following functional requirements	Assessment of the Operating Procedures for the navigation system(s) to be used	Control of those procedures through acceptable entries in the Operations Manual(s)	Identification of flight crew, flight dispatchers and maintenance personnel knowledge and training	Where required, control of navigation database process
RNP 4	(PBN Vol II, Part C, Paragraph 1.3.3) FAA Order 8400.33 FAA AC 20-130A FAA AC 20-138A <ul style="list-style-type: none"> Aircraft fitted with GNSS only as an approved long range navigation system for oceanic and remote airspace operations must meet the technical requirements specified in paragraph 1.3.3. Appropriate standards are FAA Technical Standard Orders (TSO) C129a or C146(), and EASA Technical Standard Orders (ETSO) C129a or C146() Multi-Sensor Systems Integrating GNSS with integrity provided by RAIM. Multi-sensor systems incorporating GPS with RAIM and FDE that are approved under FAA AC20-130A 	(PBN Vol II, Part C, Paragraph 1.3.3.2) Functional requirements <ul style="list-style-type: none"> display of navigation data; track to fix (TF); direct to fix (DF); direct—to function; course to fix (CF); parallel offset; fly-by transition criteria; user interface displays; flight planning path selection; flight planning fix sequencing; user defined course to fix; path steering; alerting requirements; navigation data base access; WGS 84 geodetic reference system, and automatic radio position updating. 	(PBN Vol II, Part C, Paragraph 1.3.4) Pre-flight planning <ul style="list-style-type: none"> The onboard navigation data must be current and include appropriate procedures Review contingency procedures for the event that aircraft can no longer navigate to its RNP 4 capability Enroute <ul style="list-style-type: none"> At least two LRNSs must be operational at the entry point to RNP 4 airspace Advise ATC of any deterioration or failure of the navigation equipment that falls below the required level 	(PBN Vol II, Part C, Paragraph 1.3.4) General Operating Procedures <ul style="list-style-type: none"> Cross-checking procedures must be in place to identify navigation errors Use a lateral deviation indicator, flight director or autopilot in lateral deviation mode on RNP 4 routes Pilots may use a navigation map display with equivalent functionality to a lateral deviation indicator MEL update 	(PBN Vol II, Part C, Paragraph 1.3.5) Pilot training Operators must ensure that flight crews are trained and have appropriate knowledge of topics contained in the PBN Navigation Specification, the limits of their RNP 4 navigation capabilities, the effects of updating and RNP 4 contingency procedures	(PBN Vol II, Part C, Paragraph 1.3.6) The navigation database should be obtained from a supplier that complies with RTCA DO-200A/EUROCAE ED 76. LoA issued by the CAA of the State of Registry demonstrates compliance with this requirement.

TABLE 3: Operational Approval Matrix for aircraft

➤ **Impact of “FL, Route or Airspace”**

Once defined the area to apply this change, except for specific aircraft to be defined, **only** aircraft which are RNP-4 approved will be authorized to operate within the same.

At the same time, each Air Navigation Services Provides must be in compliance with:

▪ **NAVAID INFRASTRUCTURE CONSIDERATIONS**

RNP 4 does not require any ground-based navaid infrastructure. Nevertheless, GNSS is the primary navigation sensor to support RNP-4, either as a stand-alone navigation system or as part of a multi-sensor system.

▪ **COMMUNICATION CONSIDERATIONS**

According with annex 11 the Communications requirements are: Direct controller-pilot voice communications or controller-pilot data link communications (CPDLC),

▪ **SURVEILLANCE CONSIDERATIONS**

According with annex 11 the surveillance requirements are: An **ADS system** in which an event contract must be set that includes a lateral deviation event report whenever a deviation from track centre line greater than 9.3 km (5 NM) occurs. Note that (Prior to implementation, a system verification of sufficient duration and integrity shall be performed). The separation minima to be applied, it will affect to the ADS-C periodic reporting interval.

The next table is summed up the requirements for the Air Navigation Service Provider (ANSP):

NAV	COM	SUR
Based on GNSS.	Direct controller-pilot voice communications or CPDLC	ADS C in accordance with determinate specifications

TABLE 4: Requirements for ANSP

In this regard, the status of implementation of ADS-C/CPDLC ground systems in the EUR/SAM corridor is fully operational.

Nevertheless, as it has been indicated before, aircraft equipage is not complete (around 60%). On the other hand, in accordance with the report provided by CFRA in 2010 and the report on FANS services in Canarias airspace of the EUR/SAM Corridor during 2011 provided by AENA, there are several operative issues, such as the following ones, that should be addressed:

- ☐ Problems with A/C Log-On due to diverse causes;
- ☐ Flight Plans with incorrect aircraft registration;
- ☐ Reception of Not Current Data Authority.

It is recommended to review the full report with all the operative issues as well as the technical ones.

4. CONCLUSIONS

Due to the current capabilities of aircraft that overfly the EUR/SAM corridor as well as the ATS service provided, SATMA suggest that previous to implement the RNP 4 it will be necessary to address some of the following options:

- To guarantee harmonized ADS/CPDLC procedures as well as to implement an adequate monitor and report on ADS/CPDLC. Both tasks are considered like part of duties and responsibilities of CFRA. Therefore, SATMA suggests **to promote a real implementation of Central FANS 1/A Reporting Agency CFRA.**
- According with the Regional Supplementary Procedures (DOC 7030), for flights in the EUR/SAM corridor (Canarias (southern sector), Dakar Oceanic, Recife and Sal Oceanic FIRs), a longitudinal separation minimum of 93 km (**50 NM**) derived by RNAV may be applied between RNAV-equipped aircraft approved to RNP 10 or better, in accordance with the provisions of the PANS-ATM, 5.4.2.6. In this line, for aircraft cruising, climbing or descending on the same track, the following separation minima may be used:

Separation minima	RNP type	Maximum ADS-C periodic reporting interval
93 km (50 NM)	10	27 minutes
	4	32 minutes
55.5 km (30 NM)	4	14 minutes

TABLE 5: Separation minima – RNP Type

The indicated periodic reporting intervals are specific to the use of ADS-C and are derived from performed safety assessments. As a result, these intervals may differ from those required for use with other procedural RNAV longitudinal separation minima.

Obviously the aircraft certification is yet achieved. Nevertheless, the requirements in the ATC System are different to apply the mentioned reduction for ANSP.

Likewise, these improvements only could be applied between aircraft with defined minimum navigation performance specifications. Hence, **it could be defined a specific area to apply this improvement (50/50 NM based on RNP10) and so to encourage the consolidation of FANS/1A.**

- **To encourage**, in accordance with Conclusion SAT16/09, **“South-Atlantic Interoperability Initiative”** to support the SAIRE and any other initiative to improve energy efficiency and lower aircraft noise. The group is invited to analyze the Information Paper **“SATISFIED”** (**SAT** Improved u**S**e of **F**light cor**I**dor for Emissions re**D**uction).

5. ACTIONS BY THE MEETING

The SAT17 Meeting is invited to:

- a) Take note of the information provided in this working paper.
- b) To determine next steps.