SIXTH MEETING OF THE FANS 1/A INTEROPERABILITY TEAM
SAT/FIT/6

(Recife, Brazil, 3 May 2011)

Agenda Item 3: Review of ADS/CPDLC programmes and implementation activities in SAT FIRS

Central FANS 1/A Reporting Agency – REPORT 2010

(Presented by SATMA)

SUMMARY

The objectives of this working paper are to present the results of CFRA activities and the FANS services monitoring made by AENA in 2010.

1. INTRODUCTION

According to SAT/FIT4/2 resolution "***SATMA (Spain) offered to discharge CFRA function pending on the finalization of CFRA***" during one year.

In accordance with this resolution, SATMA presents the results obtained from the monitoring process performed by AENA in 2010 in the EUR/SAM Corridor. Therefore, this report represents the last task carried out by SATMA in CFRA.

2. BACKGROUND

In SAT/FIT/2 Meeting the Central FANS 1/A Reporting Agency (CFRA) was created and, subsequently it was scheduled to be operative by 2010. Along with this, the Terms of Reference, Duties and Responsibilities of this agency were also defined.

Extracting from SAT/FIT/3 Appendix C, the Terms of Reference relating to the CFRA are "*To collect and disseminate operational information supporting ADS/CPDLC applications within the ATM systems, in order to promote, interaction between ATSPs, Stake Holders including Airline operators and FITs in adjacent airspaces".*

3. DISCUSSION

This report responds to commitment of SATMA to perform the CFRA activities of the EUR/SAM Corridor during 2010.

The report presents the FANS services performance and use for flights in the EUR/SAM Corridor, presenting traffic data, data link utilization, CPDLC exchange, etc., as well as a brief description of potential issues, to be further investigated and for which actions might be agreed, identified during the period of research. At the same time, it was remarkable that reports sent to each States by the communications service providers do not provide enough information to monitor the FANS services.

Regarding to this fact, SATMA emphasized during last meeting the importance of receiving required information from all States in order to start the development of its functions. Nevertheless, due to the limited availability of data, this report is only based on records from the ADS/CPDLC System of the Canarias FIR (SACCAN). Valuable information provided by ASECNA was not included in the present study, owing to the fact that it corresponded to data not confined only to the EUR/SAM Corridor area.

In order to complete the participation of SATMA in CFRA, instances of the capabilities which could be developed are presented in the following annex.

4. ACTIONS BY THE MEETING

The SAT/FIT/6 Meeting is invited to:

a) Take note of the information provided in this working paper and its annex.

b) Analyze the hosting of the Central FANS Reporting Agency (CFRA) during 2011.

ANNEX 1. ANALYSIS OF FANS SERVICES IN THE EUR/SAM CORRIDOR. CFRA REPORT 2010

1. INTRODUCTION

The present report shows data relative to the performance and use of FANS services for the year 2010, concerning aircraft flying in the EUR/SAM Corridor, area of interest for the Central FANS Reporting Agency (CFRA).

2. SCOPE

During 2010, the CFRA functions have been committed to SATMA, the South Atlantic Monitoring Agency. These duties include the production of annual reports on FANS-1/A activity within the area of interest for review by the SAT FANS-1/A Interoperability Team (FIT). AENA, on behalf of SATMA, has conducted the corresponding activities to develop the current report, which describes the FANS services performance and use in terms of traffic data, data link utilization by these aircraft, CPDLC exchange, etc., and includes a brief description of issues found during the research period.

A complete study of the entire area of the EUR/SAM Corridor could not be carried out since Sal Oceanic ADS/CPDLC System was not operative in 2010. Apart from that, relevant data have not been received from all of the concerned FIRS. The information provided by ASECNA has not been included in the present study, owing to the fact that it corresponded to data not confined only to the EUR/SAM Corridor area (i.e. it comprised a wider area beyond EUR/SAM corridor). Therefore, due to available data, in this report only records from the ADS/CPDLC System of the Canarias FIR (SACCAN) have been used, acting as representative for the entire EUR/SAM Corridor.

For Canarias data analysis, “EUR/SAM Corridor flights” are considered as those flights either overflying EDUMO, TENPA, IPERA or GUNET, or flying those RANDOM routes with NELSO and/or ROSTA as route waypoints and with exit points at the south of Canarias airspace defined by coordinates (see Figure 1). Additionally, regarding the period of time considered, except for issues presented in Section 7, only data for the last four months of 2010 have been taken into account, since such a period is considered representative of the whole year.

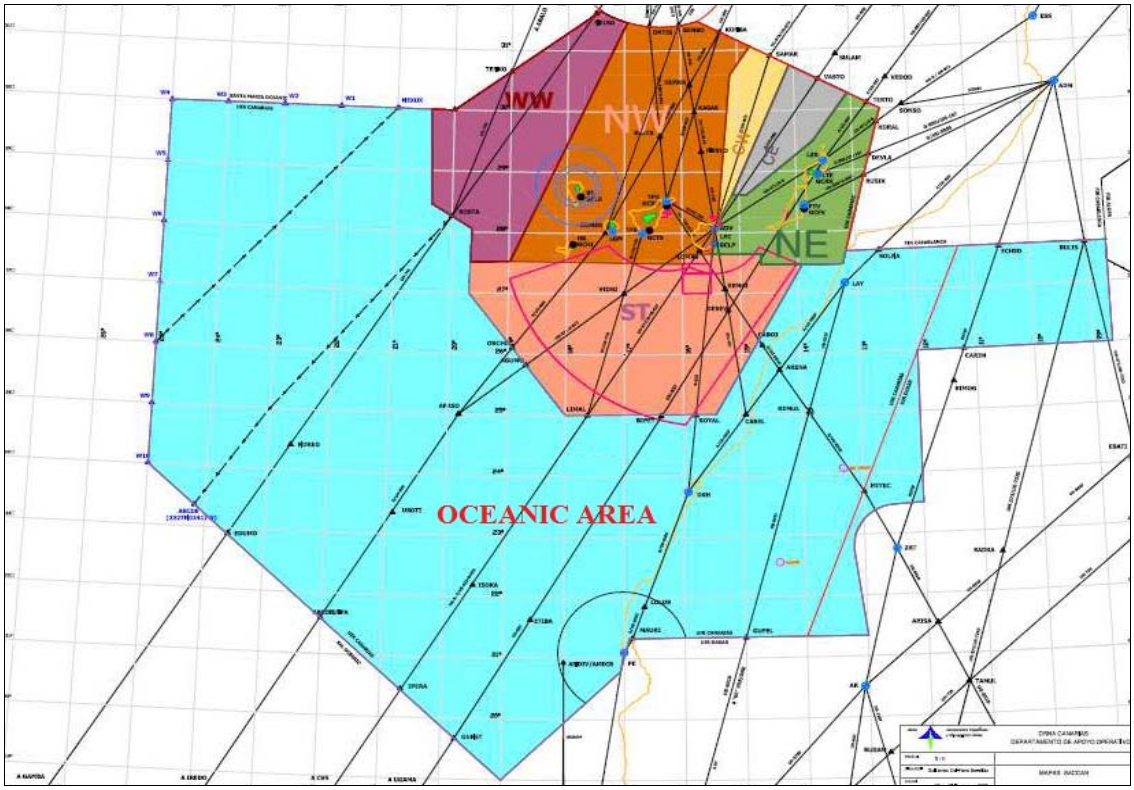

FIGURE 1
Oceanic Canary airspace

3. TRAFFIC ANALYSIS

This section presents data of traffic flying in the EUR/SAM corridor and making use of FANS1/A services.

Table 1 shows a summary of the analyzed traffic in the EUR/SAM Corridor, from September to December 2010.

Traffic data				
	Dec 2010	**Nov 2010**	**Oct 2010**	**Sept 2010**
Number of connected flights	**1548**	**1605**	**1672**	**1582**
Percentage referred to total number of flights in the EUR/SAM Corridor	58,70%	62,65%	62,93%	61,29%
Percentage referred to flights in the EUR/SAM Corridor indicating data link and ADS capacity in the Flight Plan	96,51%	99,14%	99,23%	97,11%
Number of flights with CPDLC connection	1489	1539	1571	1503
Number of different aircraft (aircraft registration) connecting to SACCAN	229	207	215	223

TABLE 1
Traffic data summary

As can be inferred from the table above, approximately 60% out of the total flights within the EUR/SAM Corridor are FANS equipped flights, having connected nearly all of them (96-99%). Also, the vast majority of logged-on flights connect to CPDLC application (between 94% and 96% of the logged-on flights). Finally, the number of aircraft (i.e. number of different aircraft registrations) flying over the EUR/SAM Corridor and making use of FANS services is about 200-230 on a monthly basis.

The following table (Table 2) shows the percentage of connected flights for the most significant airlines. As it is shown, airlines with higher number of connections in the EUR/SAM Corridor are TAM Brazil (around 29%) and TAP Portugal (approximately 23%), comprising more than 50% out of the total connected flights between the two of them. The next ones, Air France and Iberia, are about 15% each. These four airlines (TAM Brazil, TAP Portugal, Air France and Iberia) comprise about 80% of the total number of connected flights.

Adding Lufthansa and Air Europa to the previous four ones, percentage increases up to about 90%.

Airline	% referred to connected flights				
	Dec 2010	Nov 2010	Oct 2010	Sept 2010	Type of airplane [Average]
TAM Brazil	28,42%	28,91%	29,10%	29,27%	63,83% A330 23,72% B777 12,45% A340
TAP Portugal	22,74%	22,74%	22,90%	23,20%	100% A330
Air France	16,28%	16,26%	15,44%	14,60%	65,20% B777 18,64% B747 15,85% A330 0,30% A340
Iberia	13,24%	14,14%	14,97%	12,58%	100% A340
Lufthansa	5,23%	4,05%	4,65%	5,82%	73,10% B747 26,90% A340
Air Europa	4,59%	4,86%	3,58%	2,59%	100% A330

TABLE 2
Most significant airlines data

In the previous table, the percentage of different types of connected aircraft from these airlines (averaged along the four months) is also represented: all connected aircraft are Airbus A330, Airbus A340, Boeing B747 or Boeing B777. These airlines and aircraft percentages are also shown in 0 and FIGURE 3.

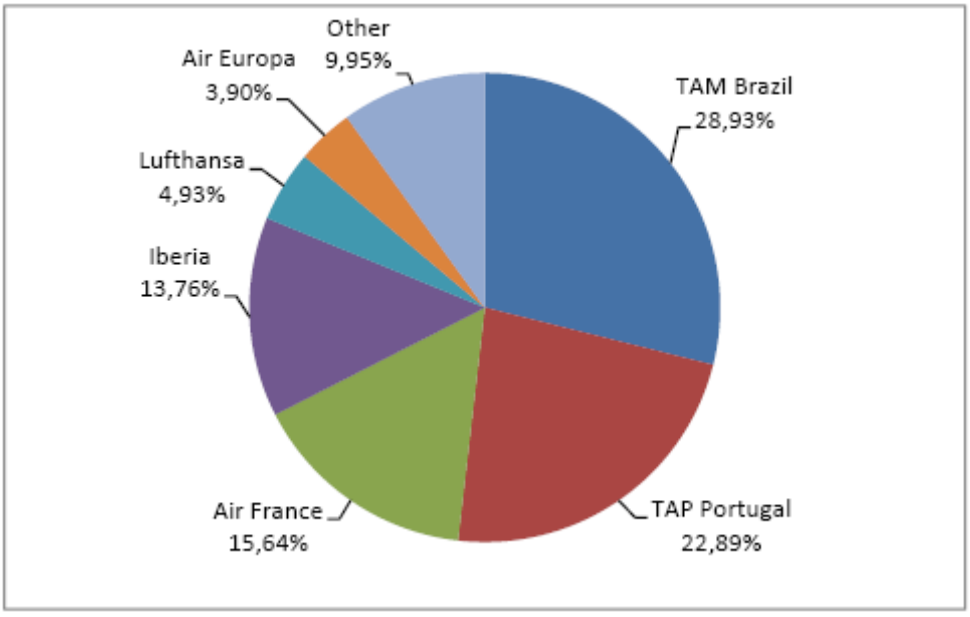

FIGURE 2
Average percentage of the most significant airlines

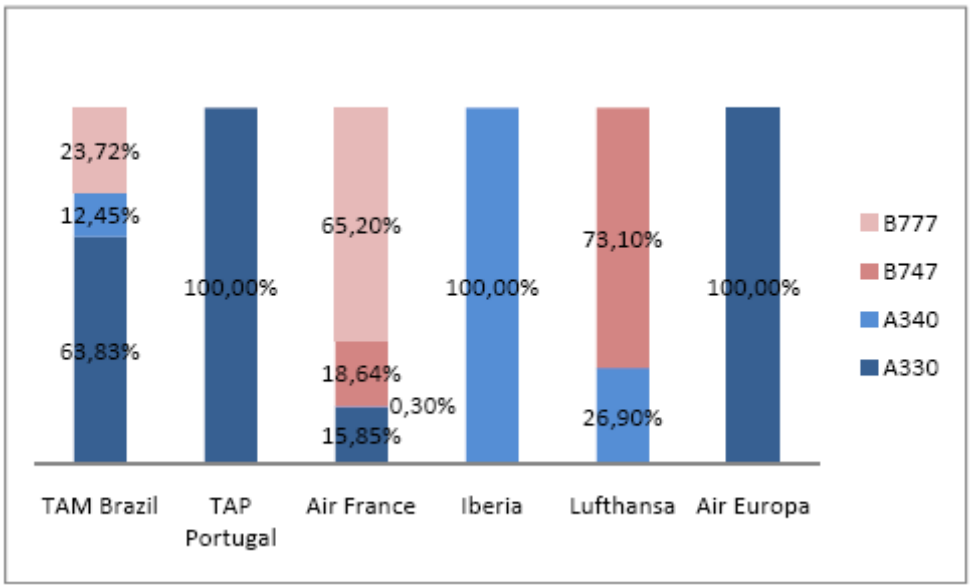

FIGURE 3
Different types of connected aircraft for the most significant airlines

In addition, next figure illustrates the total percentage of each principal type of aircraft flying in the EUR/SAM Corridor.

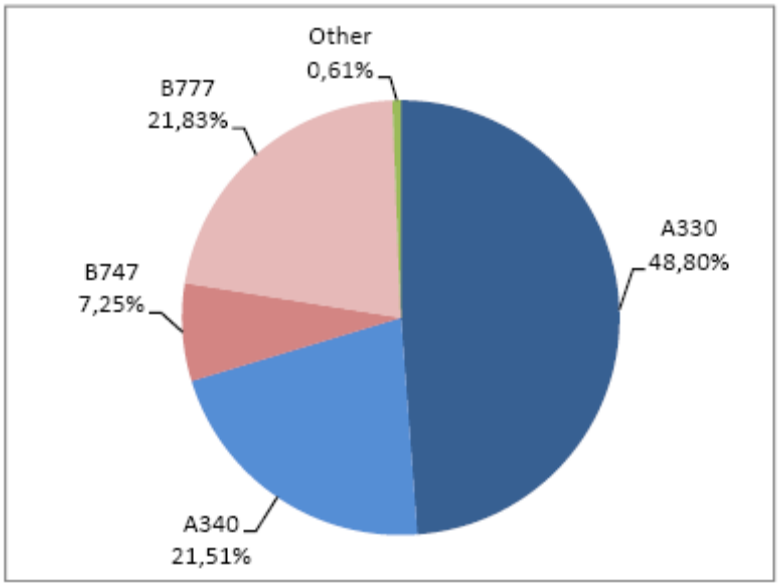

FIGURE 4
Total percentage of different types of connected aircraft

4. COMMUNICATIONS NETWORK PERFORMANCE

The following subsections present the communications network performance, showing the data links media used, as well as the message delay percentages obtained for the months under study.

4.1 DATA LINK MEDIA

The percentage utilization value per data link media used for air-to-ground (i.e. downlink) communications is depicted in Table 3. It shows that the satellite link is primarily used (around 70% of the times), maintaining similar values over the four months.

Data link media	Percentage of utilization				
	Average	**Dec 2010**	**Nov 2010**	**Oct 2010**	**Sept 2010**
Satellite Link	69,89%	70,79%	69,78%	69,23%	69,77%
VHF Link	30,11%	29,21%	30,22%	30,77%	30,23%

TABLE 3
Percentage of data link utilization (September 2010 to December 2010)

4.2 AIR -TO - GROUND MESSAGE DELAYS

Percentage data for downlink messages delays is shown in Table 4, providing indication of the time elapsed in surveillance (ADS) and communications (CPDLC) messages delivery. This table presents delay values for which 95% and 99% of air-to-ground transit times (calculated from message time stamp and message reception time in SACCAN) remain below, grouped by message type (‘AFN Log-On’ messages, ADS reports and CPDLC messages in an individual approach, as well as all messages altogether) and data link media (VHF, Satellite and Satellite+VHF). As it is seen in Table 4, 95% of calculated times are not greater than 60 seconds (except for AFN Log-On messages in December 2010, when corresponding 95% figure was 61,417 seconds) whilst 99% of calculated delays are well below 120 seconds. Figures are not constant for the four analyzed months but, generally speaking, there are not major differences from mean values in each case. As expected, data largely depend on data link media, being satellite delays greater than VHF delays.

Parameter	Dec 2010	Nov 2010	Oct 2010	Sept 2010
AFN Log-On				
95% VHF delay	29,654 s.	25,408 s.	28,075 s.	26,324 s.
95% SAT delay	61,417 s.	54,106 s.	46,909 s.	55,324 s.
95% ALL delay	50,890 s.	43,562 s.	39,445 s.	46,683 s.
99% VHF delay	68,150 s.	53,512 s.	50,916 s.	53,912 s.
99% SAT delay	106,144 s.	92,884 s.	92,448 s.	110,280 s.
99% ALL delay	99,812 s.	87,492 s.	83,929 s.	97,404 s.
ADS reports				
95% VHF delay	27,945 s.	27,108 s.	26,624 s.	25,709 s.
95% SAT delay	56,282 s.	52,698 s.	54,725 s.	52,256 s.
95% ALL delay	45,340 s.	43,660 s.	43,656 s.	44,596 s.
99% VHF delay	65,800 s.	59,254 s.	65,361 s.	60,689 s.
99% SAT delay	107,602 s.	104,650 s.	102,336 s.	102,931 s.
99% ALL delay	101,089 s.	98,588 s.	98,618 s.	97,135 s.
CPDLC AT				
95% VHF delay	31,842 s.	26,004 s.	28,471 s.	30,470 s.
95% SAT delay	36,410 s.	35,584 s.	32,189 s.	35,022 s.
95% ALL delay	34,632 s.	32,695 s.	31,964 s.	34,804 s.
99% VHF delay	67,632 s.	81,829 s.	82,538 s.	75,948 s.
99% SAT delay	78,360 s.	93,432 s.	80,044 s.	90,064 s.
99% ALL delay	75,876 s.	91,928 s.	80,044 s.	89,782 s.
AFN Log-On, ADS reports and CPDLC AT				
95% VHF delay	28,386 s.	26,660 s.	26,920 s.	26,173 s.
95% SAT delay	53,768 s.	50,443 s.	49,530 s.	50,604 s.
95% ALL delay	45,120 s.	42,743 s.	41,734 s.	43,788 s.
99% VHF delay	67,224 s.	59,254 s.	62,596 s.	64,272 s.
99% SAT delay	105,714 s.	102,432 s.	100,528 s.	102,356 s.
99% ALL delay	99,729 s.	97,270 s.	97,028 s.	96,631 s.

TABLE 4
Delay parameters (September 2010 to December 2010)

5. AUTOMATIC DEPENDENT SURVEILLANCE

5.1 ADS CONTRACT REQUESTS

In the Canaries FIR, initial ADS contracts are automatically set with every logged-on aircraft. These initial contracts consist of a 15 minute periodic contract, requesting the transmission of earth reference and predicted route groups with every periodic report, and an event contract including waypoint change and lateral deviation events, the latter with a 5 nautical miles threshold. Though initial contracts may be modified, it is seldom done. Event contracts including vertical rate change or altitude range events are punctually established. At times, demand contracts are also requested.

5.2 FIGURE OF MERIT (FOM) ANALYSIS

This subsection presents the Figure of Merit parameter (FOM) analysis from ADS messages transmitted by A/Cs and received by SACCAN. FOM is a parameter included in every ADS report that provides information about how precise the notified A/C position is and, therefore, of the quality of the ADS surveillance data.

Accumulative percentage values corresponding to FOM figures received for each of the four months under study are indicated in Table 5.

FOM	Dec 2010	Nov 2010	Oct 2010	Sept 2010
FOM = 7 (Error < 0,05 NM)	3,10%	1,50%	1,69%	1,14%
FOM ≥ 6 (Error < 0,25 NM)	100,00%	100,00%	100,00%	100,00%
FOM ≥ 5 (Error < 1 NM)	100,00%	100,00%	100,00%	100,00%
FOM ≥ 4 (Error < 4 NM)	100,00%	100,00%	100,00%	100,00%
FOM ≥ 3 (Error < 8 NM)	100,00%	100,00%	100,00%	100,00%
FOM ≥ 2 (Error < 15 NM)	100,00%	100,00%	100,00%	100,00%
FOM ≥ 1 (Error < 30 NM)	100,00%	100,00%	100,00%	100,00%
FOM ≥ 0	100,00%	100,00%	100,00%	100,00%

TABLE 5
FOM values from received ADS reports (accumulative values)

Note to Table 5: In November 2010, a FOM = 4 message (which corresponds to 0,0044% of the total number of reports) and another message with FOM = 1 were received. Their percentages have been deemed insignificant and consequently not considered. In the same way, a FOM = 4 message was received in December 2010 (0,0044% of the full amount) which has not been considered as well.

As can be seen on the table above, 100% (see *Note* to Table 5) of ADS messages received on ground reported a FOM value equal to 6 or 7, meaning that the position error is always estimated as being either lower than 0.25NM or even lower than 0.05 NM, with a probability of 95%.

6. CONTROLLER - PILOT DATA COMMUNICATIONS

In areas of Canarias airspace where appropriate VHF coverage does not exist, CPDLC (controller - pilot data link communications) is used as a communication means between ATCos and suitable trained flight crews of FANS equipped aircraft.

This section provides a snapshot of CPDLC utilization by pilots and controllers, indicating the CPDLC message elements interchanged, as well as presenting the uplink and downlink percentage use per element types.

Table 6 and Table 7 show the percentage of the vast majority of transmitted uplink and downlink CPDLC message elements with respect to the total of transmitted elements (the message elements presented are those that have been utilized more than once at least in one month or, in other words, a minimum of 0,05% in any month).

UL message element	**Percentage referred to total**			
	Dec 2010	**Nov 2010**	**Oct 2010**	**Sept 2010**
[freetext] (both UM169 and UM170)	53,77%	54,51%	49,14%	48,97%
CONTACT [icaounitname] [frequency]	9,85%	9,23%	12,65%	10,52%
SQUAWK [beaconcode]	9,77%	10,40%	8,95%	10,37%
REPORT LEVEL [altitude]	7,02%	6,26%	6,44%	6,76%
CLIMB TO AND MAINTAIN [altitude]	5,45%	5,02%	5,39%	4,79%
MAINTAIN [altitude]	3,31%	2,09%	2,54%	2,61%
REPORT PASSING [position]	2,22%	2,31%	2,14%	3,52%
ERROR [errorInformation]	1,78%	1,87%	2,31%	2,27%
END SERVICE	1,61%	3,99%	3,05%	1,36%
ROGER	1,33%	0,48%	1,42%	1,24%
PROCEED DIRECT TO [position]	0,93%	1,61%	2,48%	3,55%
RADAR CONTACT [position]	0,77%	0,15%	0,27%	0,36%
REQUEST POSITION REPORT	0,48%	0,07%	0,85%	0,94%
AT [position] CONTACT [icaounitname] [frequency]	0,36%	0,37%	0,61%	0,15%
CONFIRM ALTITUDE	0,28%	0,29%	0,17%	0,42%
RADAR SERVICES TERMINATED	0,24%	0,18%	0,07%	0,21%

UL message element	Percentage referred to total			
	Dec 2010	Nov 2010	Oct 2010	Sept 2010
STANDBY	0,16%	0,04%	0,17%	0,27%
MONITOR [icaounitname] [frequency]	0,16%	0,18%	0,71%	0,36%
DESCEND TO AND MAINTAIN [altitude]	0,12%	0,22%	0,07%	-
CRUISE CLIMB TO [altitude]	0,12%	0,07%	-	0,06%
UNABLE	0,04%	0,07%	0,03%	0,09%
AFFIRM	0,04%		0,03%	0,24%
CLEARED TO DEVIATE UP TO [distanceoffset] [direction] OF ROUTE	0,04%		0,20%	0,12%
REPORT BACK ON ROUTE	0,04%	0,04%	-	0,18%
CONFIRM SPEED	-	0,44%	0,27%	0,21%
AT [position] PROCEED DIRECT TO [position]	-	-	-	0,24%

TABLE 6
Uplink message elements transmitted

DL message element	Percentage referred to total			
	Dec 2010	Nov 2010	Oct 2010	Sept 2010
ROGER	33,58%	35,10%	31,68%	34,38%
WILCO	23,92%	23,51%	28,41%	27,90%
POSITION REPORT [positionreport]	11,89%	10,63%	11,02%	8,89%
[freetext] (both DM67 and DM68)	9,18%	9,61%	9,41%	8,45%
LEVEL [altitude]	5,17%	5,15%	5,20%	5,49%
DEVIATING [distanceoffset] [direction] OF ROUTE	4,66%	4,10%	3,95%	2,88%
REQUEST [altitude]	3,39%	3,54%	3,47%	3,51%
REQUEST CLIMB TO [altitude]	1,95%	1,76%	1,60%	1,51%
DUE TO AIRCRAFT PERFORMANCE	1,06%	0,83%	1,13%	1,12%
PASSING [position]	0,99%	1,08%	0,92%	1,76%
STANDBY	0,75%	0,52%	0,56%	0,85%
REQUEST CRUISE CLIMB TO [altitude]	0,65%	0,59%	0,50%	0,44%
NOT CURRENT DATA AUTHORITY	0,45%	0,59%	-	-
REQUEST DIRECT TO [position]	0,41%	0,55%	0,39%	0,44%

DL message element	Percentage referred to total			
	Dec 2010	**Nov 2010**	**Oct 2010**	**Sept 2010**
UNABLE	0,31%	0,06%	0,06%	0,14%
PRESENT ALTITUDE [altitude]	0,27%	0,15%	0,15%	0,36%
ERROR [errorInformation]	0,27%	0,18%	0,27%	0,30%
AT [position] REQUEST CLIMB TO [altitude]	0,24%	0,03%	0,30%	0,11%
REQUEST WEATHER DEVIATION UP TO [distanceoffset] [direction] OF ROUTE	0,24%	0,92%	0,30%	0,41%
REQUEST VOICE CONTACT	0,14%	0,09%	0,06%	0,05%
WHEN CAN WE EXPECT HIGHER ALTITUDE	0,10%	0,03%	-	0,05%
DUE TO WEATHER	0,10%	0,40%	0,15%	0,25%
AT [position] REQUEST DESCENT TO [altitude]	0,07%	-	-	-
REQUEST [speed]	0,03%	0,06%	-	0,16%
PRESENT SPEED [speed]	-	0,34%	0,24%	0,16%
REQUEST DESCENT TO [altitude]	-	0,06%	-	0,03%
REQUEST OFFSET [distanceoffset] [direction] OF ROUTE	-	0,03%	0,03%	0,05%
CLIMBING TO [altitude]	-	-	0,06%	0,03%
REQUEST [routeclearance]	-	-	-	0,08%
WHEN CAN WE EXPECT CRUISE CLIMB TO [altitude]	-	-	-	0,05%

TABLE 7
Downlink message elements transmitted

The most frequent uplink message element is the “freetext”, by far the most used. For downlink elements, the most common ones are the responses “ROGER” and “WILCO”; the “Position Report” and “freetext” elements are also usually transmitted though not as often as the other ones. As far as “ROGER” message element use is concerned, it is to be noticed that ROGER is required as a response to an uplink freetext, except for those cases in which the freetext message is included in a CPDLC message also comprising a message element requiring a WILCO/UNABLE response.

As can be seen in Table 7, other frequent downlink message elements are “DEVIATING [distanceoffset] [direction] OF ROUTE” (increasing each month, it is over 4,5% in December), “REQUEST [altitude]” (approximately 3,5% every month) and “REQUEST CLIMB TO [altitude]” (increasing each month too, and reaching roughly 2% in December).

As a result, tables of total percentage per types of message elements are shown below (Table 8 and Table 9).

Type	Dec 2010	Nov 2010	Oct 2010	Sept 2010
Responses / Acknowledgements	1,57%	0,59%	1,66%	1,88%
Vertical clearances	9,00%	7,40%	8,00%	7,46%
Crossing constraints	0,04%	0,04%	0,00%	0,00%
Lateral offsets	0,00%	0,00%	0,00%	0,00%
Route modifications	0,97%	1,61%	2,68%	3,94%
Speed Changes	0,00%	0,07%	0,00%	0,03%
Contact / Monitor / Surveillance requests	20,15%	20,18%	22,92%	21,41%
Report / Confirmation requests	10,09%	9,41%	9,90%	12,07%
Negotiation requests	0,00%	0,00%	0,00%	0,00%
Air Traffic advisories	1,01%	0,33%	0,34%	0,58%
System management messages	3,39%	5,86%	5,36%	3,64%
Additional messages	53,77%	54,51%	49,14%	49,00%
TOTAL MESSAGE ELEMENTS	**2477**	**2730**	**2949**	**3298**

TABLE 8
Uplink message element type

Type	Dec 2010	Nov 2010	Oct 2010	Sept 2010
Responses	58,57%	59,20%	60,72%	63,26%
Vertical requests	6,31%	5,98%	5,88%	5,60%
Lateral offsets requests	4,66%	4,13%	3,98%	2,94%
Speed requests	0,03%	0,06%	0,00%	0,16%
Voice contact requests	0,17%	0,09%	0,06%	0,05%
Route modification requests	0,65%	1,51%	0,71%	0,99%
Reports	18,40%	17,38%	17,64%	16,74%
Negotiation requests	0,10%	0,03%	0,03%	0,11%
Emergency messages	0,00%	0,00%	0,00%	0,00%
System management messages	0,72%	0,77%	0,27%	0,30%
Additional messages	10,38%	10,85%	10,72%	9,85%
TOTAL MESSAGE ELEMENTS	**2918**	**3245**	**3368**	**3645**

TABLE 9
Downlink message element type

Note to Table 9: element "DEVIATING [distance offset] [direction] OF ROUTE" (DM80) is considered in group "Lateral offsets requests", instead of being part of the "Reports" group.

7. POTENTIAL PROBLEMS IDENTIFIED

This section presents a brief summary of those issues identified during data analysis of A/C connected to SACCAN (Canarias ACC) during 2010 and that should be further analyzed by the relevant stakeholders. Though issues have been detected through SACCAN records analysis, they are considered of generic nature. The different issues are presented in a totally anonymous manner; therefore, no company, aircraft type, etc. are mentioned in any way.

Issues have been allocated to the following categories: operational (operative), technical and related to interoperability. However, it must be taken into account that, as only a basic analysis on these issues has been carried out, such a classification should be considered as preliminary.

7.1 OPERATIVE ISSUES

The following subsections list identified aspects which, in principle, only deal with the operation of FANS services, subdivided in two categories: "Air side" (i.e. those which probably deal with flight crew actions) and "Ground side" (i.e. those which probably deal with ATSPs).

7.1.1 "Air side" issues

- Log-On received from aircraft that are not flying towards Canarias airspace. Different situations have been observed:
  - A/C Log-On received from aircraft that do not overfly Canarias airspace (i.e. during flight Canarias airspace is never overflown).
  - A/C Log-On received after A/Cs has left Canarias airspace. Furthermore, they did not connect to SACCAN during Canarias airspace overflight.

  A/C position analysis show that two of these Log-On´s are received before the concerned aircraft enters another airspace where ADS/CPDLC are operational.

- A/C Log-On received when A/Cs are flying far away from Canarias airspace (two three hours before estimated time of entering Canarias airspace), prior to enter an airspace where ADS/CPDLC is operational. Afterwards, ADS and CPDLC applications are disconnected. Subsequently, aircraft log on again to SACCAN 30 minutes at most before entering Canarias airspace.

- A/C Log-On with incorrect flight identification: It is detected that some aircraft Log-On to SACCAN with incorrect flight identification. The following situations have been identified so far:

  - A/C that Log-On with a two-letters company code in the Flight Identification instead of the expected three-letters code, as contained in the flight plan (i.e. "AAnnnn" instead of "AAAnnnn").
  - A/C Log-On with an erroneous Flight Number.

    Among these situations, it is to be noticed a case in which the erroneous Flight Number coincided with the Flight Number of another aircraft that, in turn, unsuccessfully tried to Log-On with its own correct Flight Number, because the first one was still connected to SACCAN. ADS/CPDLC disconnection of the first flight occurred quite beyond Canarias UIR boundary and after flight plan for the second flight was activated.

  - A/C Log-On with duplicated company code in the Flight Identification part of the message (i.e. Flight identification notified in the Log-On is "ABCABCnnnn", where "ABC" is the correct company code).

- Reception of character-oriented applications messages (i.e. applications other than AFN, ADS, CPDLC or "ACARS Free Text" messages) from A/C, such as "Request Oceanic Clearance" (Oceanic Clearance application) or "Request ATIS Report" (ATIS application). This situation occurs in a monthly basis.

- Aircraft with No ADS Capacity declared in their Flight Plan have been detected connecting to SACCAN (Spanish AIC 8/09 requests this information).

7.1.2 "Ground side" issues

- Flight Plans with incorrect aircraft registration (i.e. it does not match the one notified in the A/C Log-On) or without any aircraft registration are found in ground flight plan database.

- In some situations a CPDLC downlink message "Not Current Data Authority" (NDA) has been received as the reply to an uplink CPDLC message. An analysis of received NDA showed that NDA were received while the aircraft was already flying over Canarias airspace or just before entering it. These situations may have occurred because the previous data authority did not send the CPDLC message "END SERVICE" on time.

- Sending of ACARS Free Text messages by controllers; in the considered months (September to December 2010), always to FANS equipped aircraft and with CPDLC link active and connected.

7.2 TECHNICAL OR INTEROPERABILITY ISSUES

This subsection presents those issues that may entail some technical aspects or that concern the interaction of aircraft and ground systems. As former subsection, they are subdivided in categories: general (issues related to the global process), ADS (those ones regarding the ADS functionality), and CPDLC (those ones concerning CPDLC).

7.2.1 General issues

- An aircraft remained ADS connected after landing (out of Canarias FIR), still sending reports when on ground. Because of that, the aircraft continued registered in the ground system and when the aircraft took off again (new flight), the system associated the aircraft ADS information with the previous FID. Finally, the aircraft disconnected at the new destination. The aircraft did not overfly Canarias airspace in any of the two flights.

- A highly delayed Log-On received after the aircraft has left Canarias airspace and finalized its connection to SACCAN. The reception of this delayed Log-On message leads to a new registration of the A/C in the ground system, while the aircraft is actually flying in an airspace where ADS/CPDLC are not operational. The position included in this Log-On corresponded to the beginning of its crossing of Canarias airspace.

- Some AFN and CPDLC downlink messages are received including an issuing time stamp completely incoherent with ground clock: message time stamp is older than the time of reception. Due to the fact that some affected messages are CPDLC "Position Report" messages, in which "timeatpositioncurrent" field seems coherent with ground clock but not with message time stamp, it is therefore deducted that some kind of synchronism error may have occurred in the onboard equipment.

- Duplicated uplink and downlink messages are being probably sent by the Datalink Service Provider (DSP), causing apparently a 1% of the downlink messages received on ground to be duplicated downlink messages. In the same way, some of the received downlink messages seem to be the consequence of a duplicated uplink message received on board.

7.2.2 ADS issues

- While an A/C was airborne, invalid altitude information was sent for waypoint NW+1 in several Predicted Route groups; at times, invalid information about ETA at next waypoint (NW) was also sent; additionally, invalid altitude values for next waypoint (NW) were seldom detected and two "ETA at next waypoint" with a value of "0" were also received.

- Disconnection messages with no reason included are received from an aircraft (bits that define the reason are not present in the message). Afterwards, an ADS disconnection message with a defined reason code (0, meaning Reason not specified) is received from the same aircraft.

- *Altitude Range* event messages are received from some aircraft though no *Altitude Range* event contract have been requested to them from ground system.

7.2.3 CPDLC issues

- Incorrect CPDLC messages received:

  - A CPDLC message is received, containing an initial CPDLC message element (DM48) with illogical data and erroneous characters.

  - CPDLC messages with more data than those indicated in the header of the message (header notifies the containment of a single CPDLC element, but after it more data are present). Even more, the first CPDLC message element seems to include incoherent data.

  - A CPDLC message received, which lacked essential information: specifically, the message received had not enough bits to constitute even the message element number.

- After sending a CPDLC Disconnect Request to some aircraft (after that, SACCAN considers the aircraft is CPDLC disconnected), it is detected that they continue sending downlink messages which correspond to the CPDLC application. The analysis has concluded that all these situations correspond to B747-400 aircraft, which ignore uplink CPDLC Disconnect Request messages. It is an already known and documented behavior.

- A/Cs that do not accept CPDLC connection request messages after receiving an uplink CPDLC disconnect request message. The A/C rejects the CPDLC connection by sending a downlink disconnect request message (without any CPDLC message element) instead of a connection confirm message.

- "Insufficient Message Storage Capacity" error messages are received from B747-400 A/C due to uplink CPDLC Freetext messages containing a text string superior to 80 characters. B747-400 A/Cs do not accept text length over 80 characters, so they answer with a CPDLC Error message. It is an already known and documented behavior.

8. ACRONYMS

ACARS	*Aircraft Communication Addressing and Reporting System*
ACC	*Area Control Centre*
ADS	*Automatic Dependent Surveillance*
ADS-C	*Automatic Dependent Surveillance – Contract*
AENA	*Aeropuertos Españoles y Navegación Aérea*
AFN	ATS *Facilities Notification*
ASECNA	*Agence pour la Sécurité de la Navigation Aérienne en Afrique et Madagascar*
ATSP	*Air Traffic Service Provider*
ATS	*Air Traffic Services*
CFRA	*Central FANS Reporting Agency*
CPDLC	*Controller to Pilot Data Link Communications*
DL	*Downlink*
DSP	*Datalink Service Provider*
ETA	*Estimated Time of Arrival*
EUR	*Europe*
FANS	*Future Air Navigation System*
FID	*Flight Identification*
FIR	*Flight Information Region*
FIT	*FANS-1/A Interoperability Team*
FOM	*Figure of Merit*
NM	*Nautical Mile*
NW	*Next Waypoint*
SACCAN	*Sistema ADS/CPDLC en el FIR Canarias (ADS/CPDLC System in the Canarias FIR)*
SAM	*South America*
SAT	*Satellite*
SATMA	*South Atlantic Monitoring Agency*
UL	*Uplink*
UIR	*Upper Information Region*
VHF	*Very High Frequency*