

IMPLEMENTATION OF DATA LINK SERVICES IN EUROPE

Recife, March, 18th 2016

- **Carlos Alves**
 - Studies and Projects Director (since 2006)
 - Grad. and Master Degree in Electrical Engineering
 - Pos Graduation Management and Leadership
 - NAV Representative on:
 - ICAO NAT SPG
 - ICAO NAT IMG
 - AAB Eurocontrol
 - AEFMP WG
 - SESAR definition Phase
 - National Frequency Manager
 - Comité GNSS Member
 - Participation on LINK 2000+ Programme
- – Email: carlos.alves@nav.pt / tel. +351 218 553 533

SUMMARY

- 1. Why data link?**
- 2. Initiatives and implementation of data link**
- 3. Reported problems**
- 4. Status of implementation**
- 5. Conclusions**



WHY DATA LINK?



WHY DATA LINK?

Evolution to support the traffic demanding



Procedural Based Control:

Control on Where We Think the Aircraft Is

- Landmark Navigation
- Radio Beacons
- Position Reports

• • •

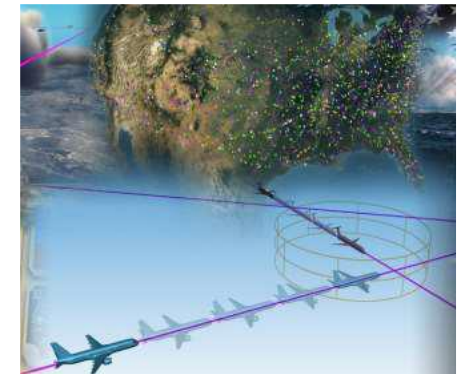


Surveillance Based Control:

Control on Where We Know the Aircraft Is

- VOR/DME
- RADAR

• • •



Trajectory Based Control:

Control on Where We Know the Aircraft Will Be*

- RNP
- ADS-B
- Data COM

• • •

EVOLUTION DATA LINK INITIATIVE

First global programme for the implementation of Data Link in Europe start in 2003 with the called “LINK 2000+ Programme (Pioneer Phase)”

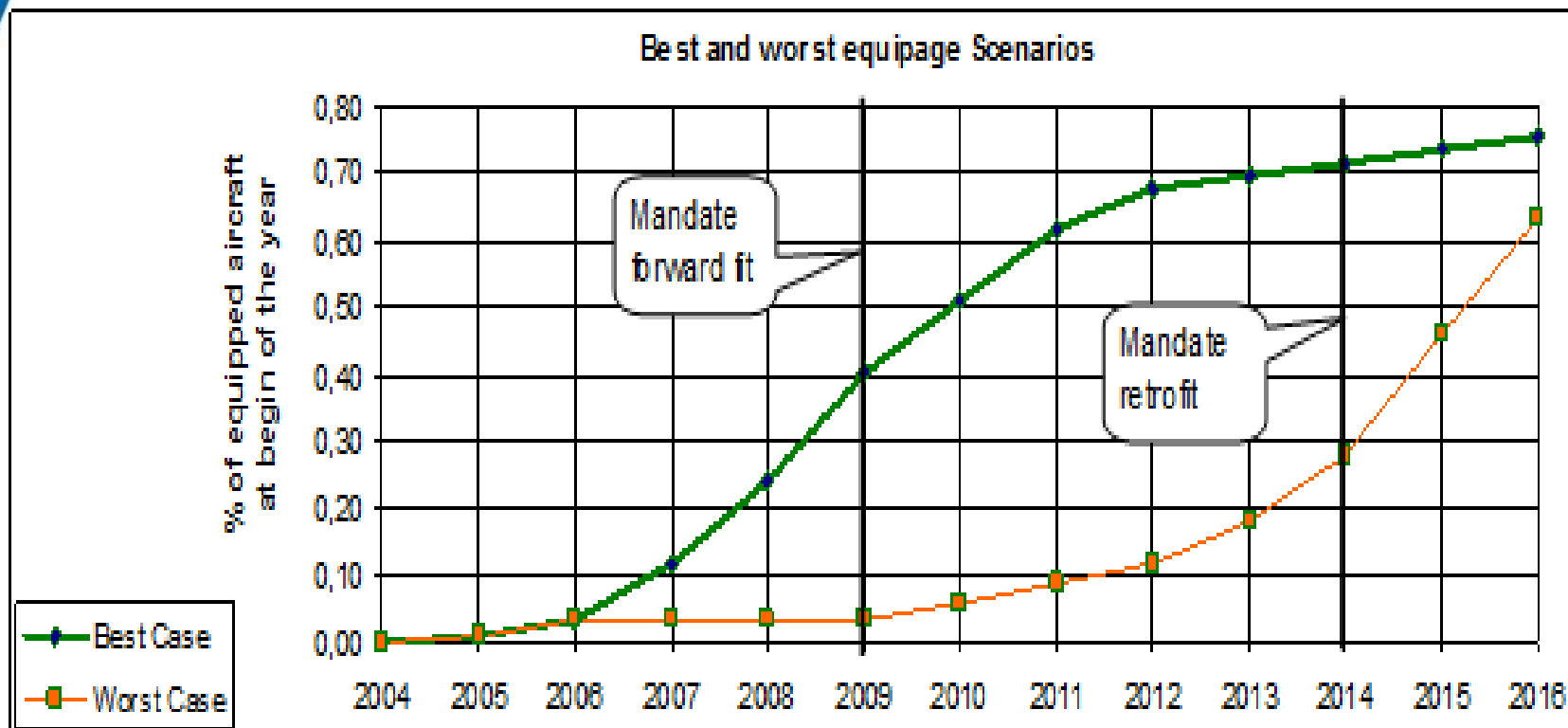
It gathered financial incentives for the airlines, as well as the directives for the implementation

Elaborated the definitions with the implementing Architecture that paved the way and serve as Guidelines for the coming implementing rules

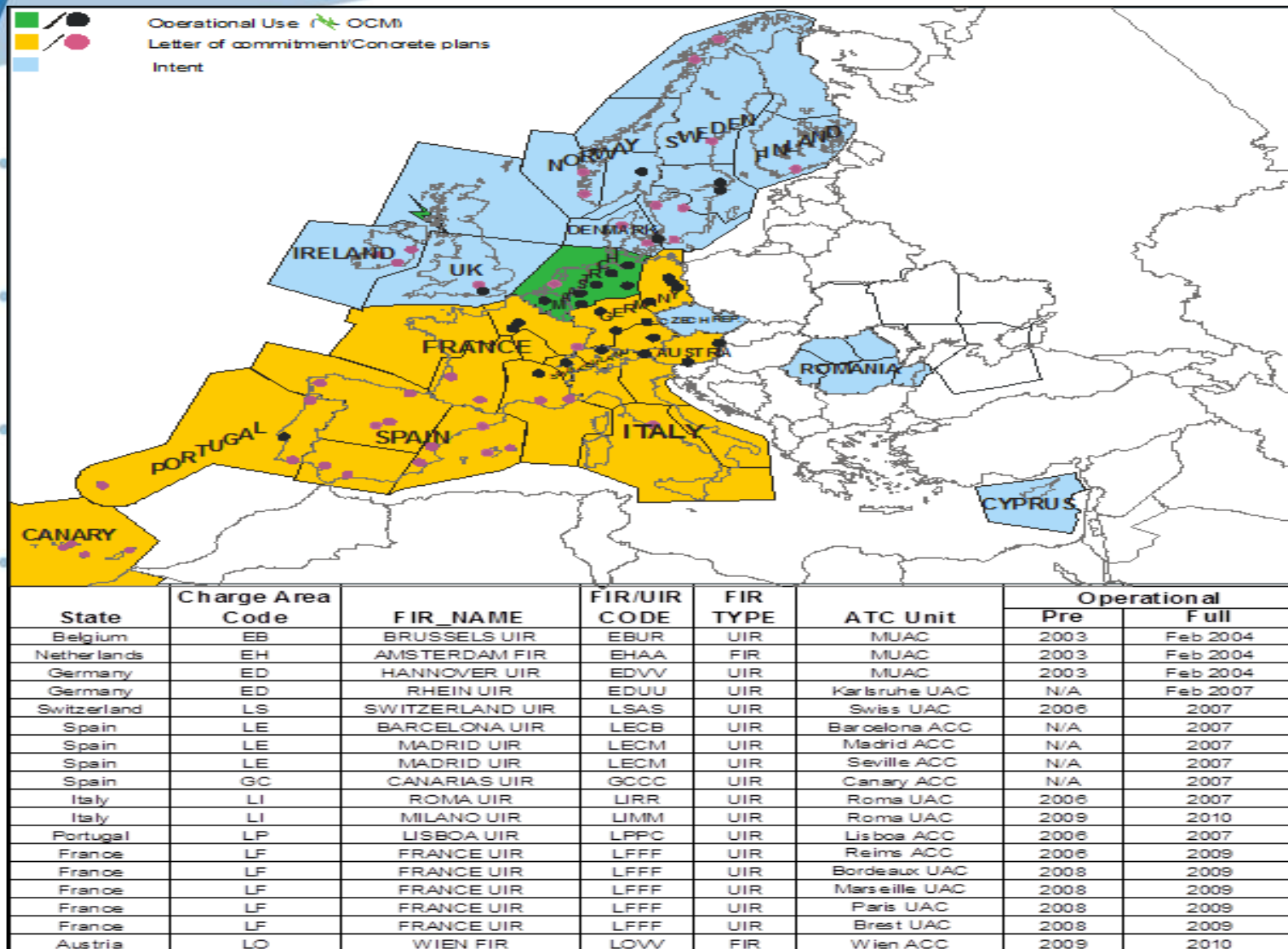
Anyway reference should be done from 2001 with DOVE and PETAL projects

% OF EQUIPPED AIRCRAFT

Link 2K / Dec. 2004



EVOLUTION DATA LINK INITIATIVE



BRIEF HISTORY OF ADOPTION PROCESS

- **30 May 2005 : Mandate from EC to ECTRL**
- **19 October 2007: Final Report by ECTRL**
- **4 Sept. 2008 : Positive Vote at SSC27 on draft IR**
- **16 January 2009 : Adoption of Regulation No 29/2009 (publication in OJ EU on 17 January)**
- **9 February 2009 : Entry into force of Regulation**

• • • • • • • • • •

COMMISSION REGULATION (EC) N.º 29/2009

To deal with the increase of traffic demand and consequente need of capacity increase without increase the number of sectors

Based on the studies performed by several entities including Eurocontrol, SESAR Programme and still taking into account the experience and work done on LINK 2000+ Programme, laying down requirements on data link services for the Single European Sky



COMMISSION REGULATION (EC) N.º 29/2009

Applies to:

- **All flights operating as General Air Traffic (GAT) in accordance with Instrument Flight Rules (IFR) above FL 285;**
- **ANSP, providing services to GAT in the airspace identified in the regulation;**
- **Flight data processing systems and associated procedures;**
- **Ground-based and airborne human machine interface systems and associated procedures;**
- **A/G communication systems and associated procedures.**

COMMISSION REGULATION (EC) N.º 29/2009

Main dates defined on the Regulation:

- **February 2013 : Start in operation in a large number of European FIR's**
- **February 2015 : Start in operation of the entire aviation and the remaining FIR's**

Investment costs:

- **831 M€, until 2020**
- **979 M€, until 2025**

• • • • • • • • • •

DEPLOYMENT CONFIGURATION

- **Configuration VDL2 (ICAO):**
 - **1 channel**
 - **Dedicated data transfer channel**
- **Current Frequency: 136.975 MHz**
- **Channel occupancy (ATN B1) \leq 40%**



IMPLEMENTATION OF REG. 29/2009

In 2008 the MUAC (Maastricht Upper Area Control Centre) identified the need for review / analysis of the so called " ATN B1 Disconnections (Provider Abort) PA".

There was no due retesting or mitigating problems, they came to be worsen the date of implementation, leading to the mandate suspension, in face to the high number of occurrences.



TECHNICAL ISSUE EFFECT

Provider Abort: sustained loss of ATN connectivity greater than 6 minutes leading to loss of CPDLC communication between controller and pilot. In this case, the flight crew gets an indication and has to revert to voice communications.

User Abort: it corresponds to a loss of the communication link between controller and pilot. Airborne or ground application terminates the connection.

Transmission delays: transmission delays but without exceeding the allocated timers (thus not triggering User Abort). • • • • •

AVAILABILITY LEVEL

Stated on GOLD ATN B1 network availability shall be 99,99% (0,01% ind.)

Number of provider aborts: acceptable indicator of network using availability.

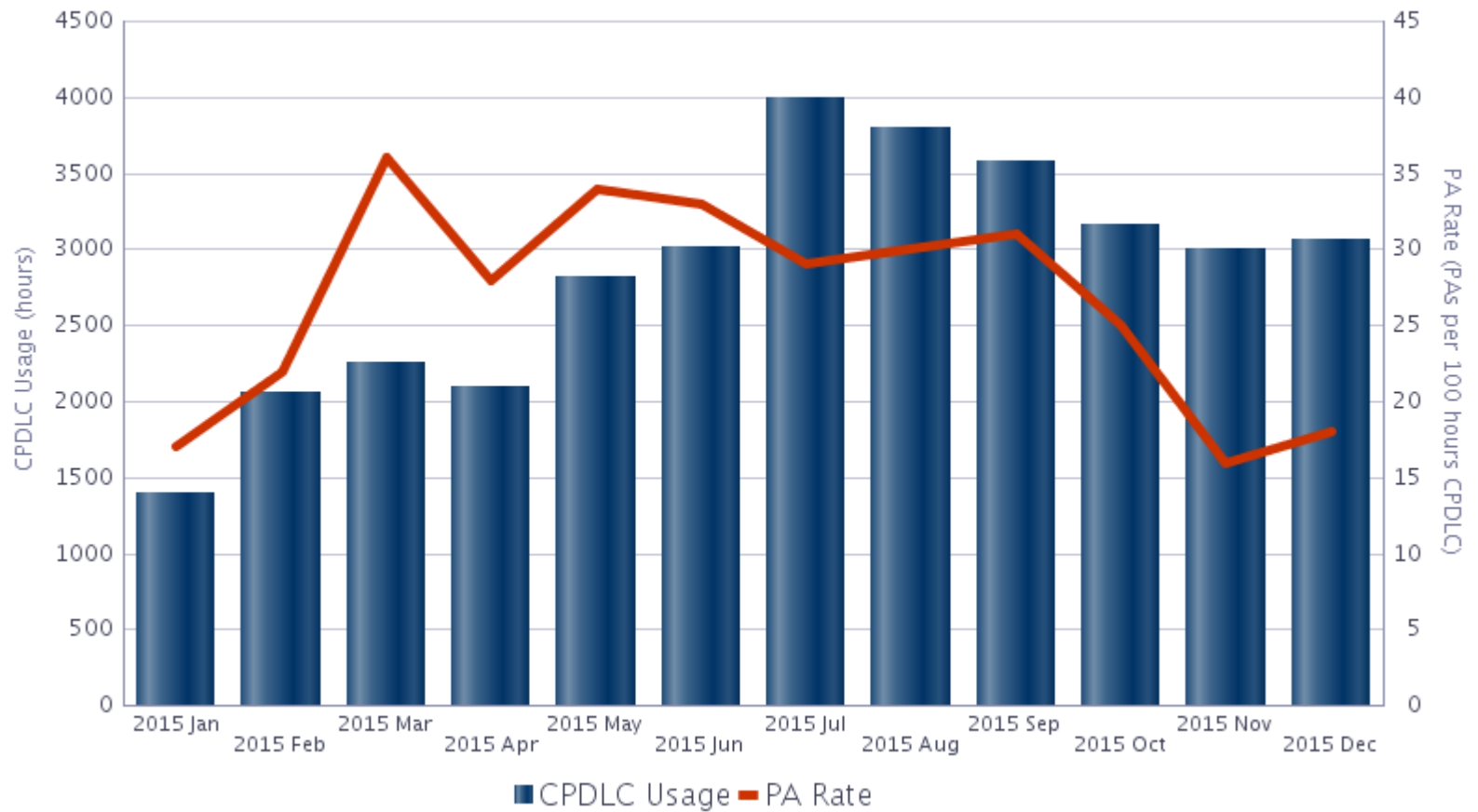
Degradation of availability shall not be worse than the ATN B1 availability, i.e. 0,01%.

One is the maximum number of provider per each 100 hours of service

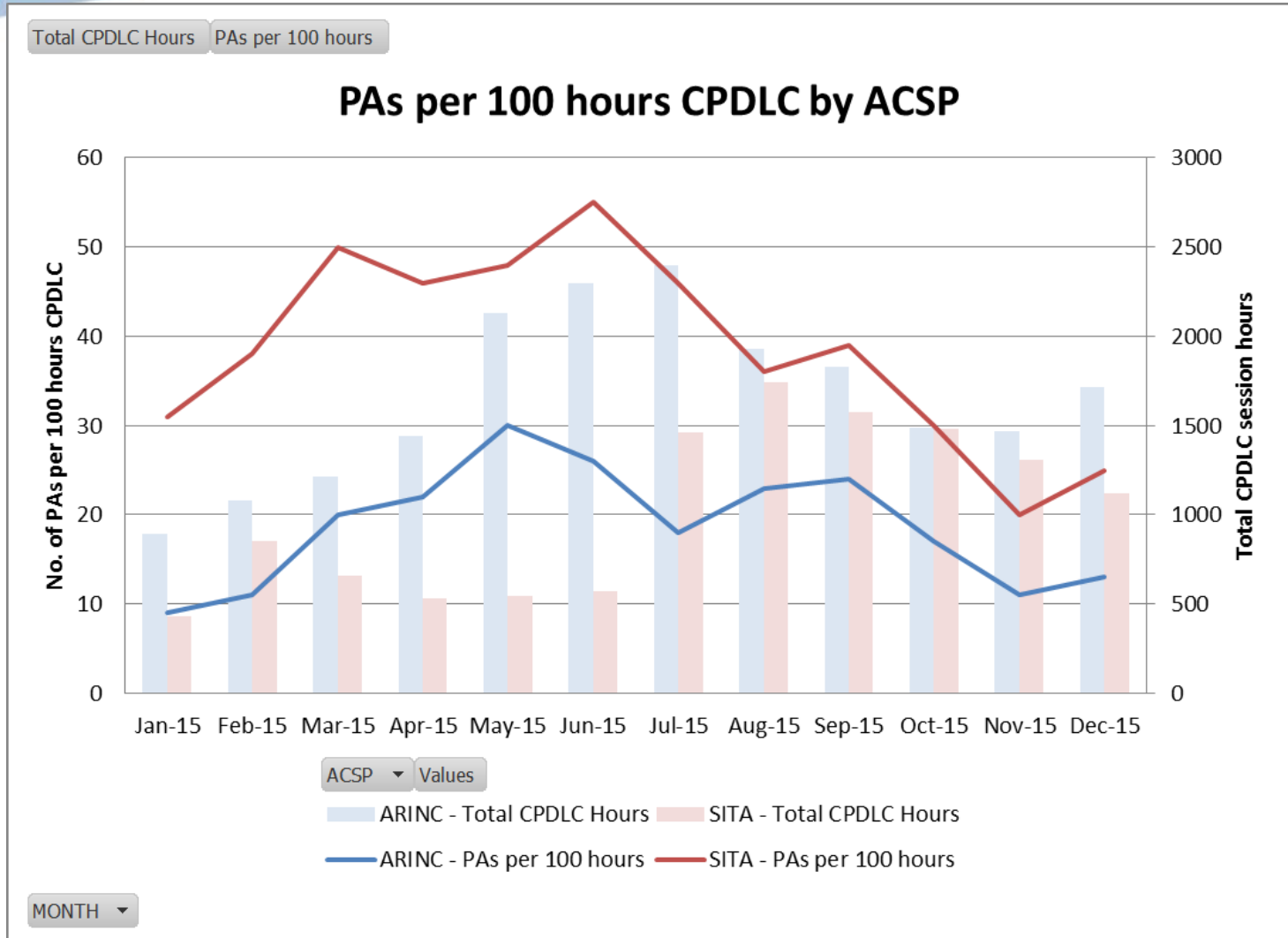
The average PA measured during 1º to 3º quarter of 2013 was 34 PAs per 100 hours, with some peaks higher during the summer.

PROVIDER ABORT RATE

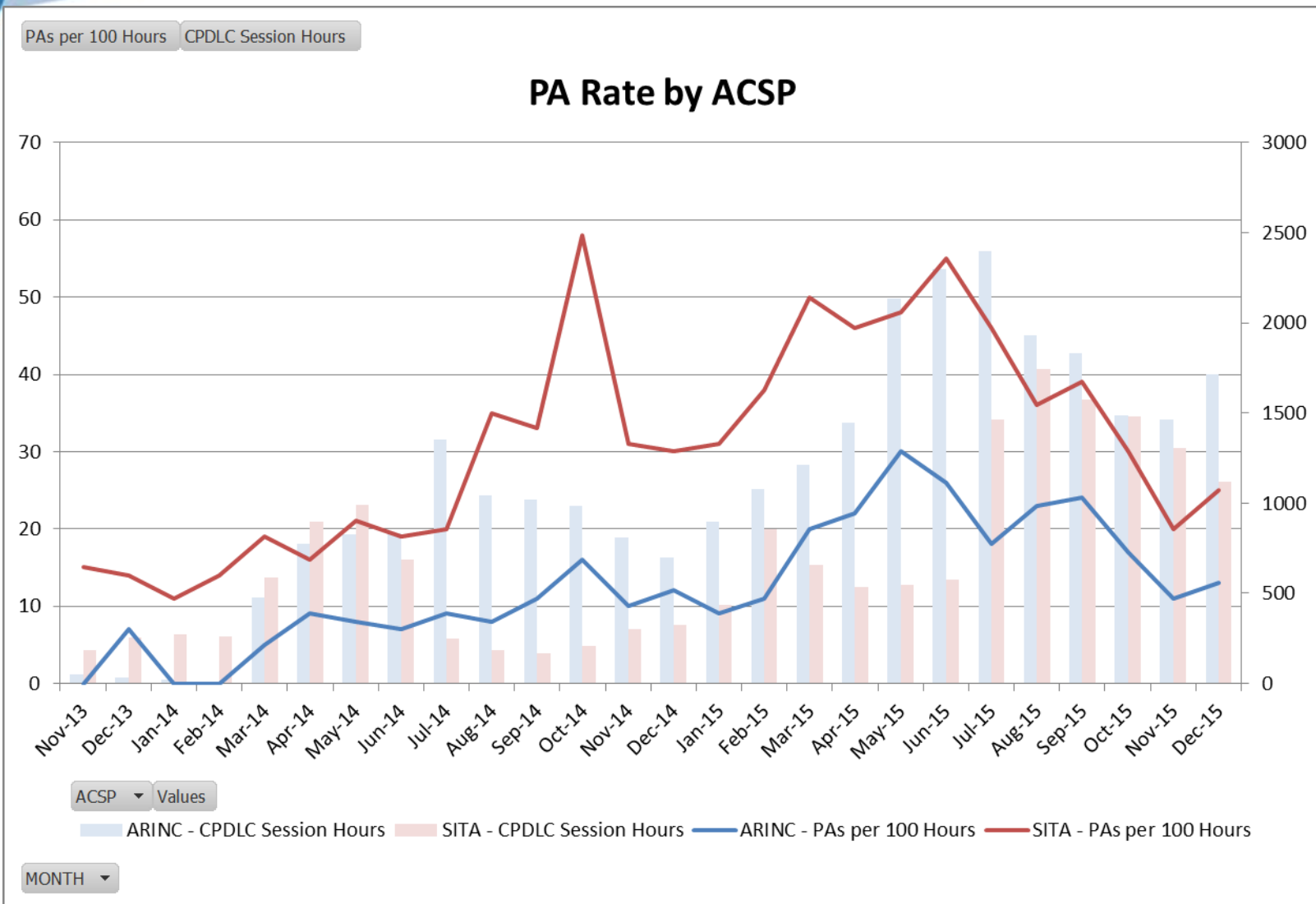
Provider Aborts per 100 hours CPDLC



PA Rate by ACSP



A 3 YEAR PERSPECTIVE



FIRST EASA REPORT

Simultaneously with the suspension of the service by some operators European Commission facing all them decided to address it to EASA requiring a deep analysis to identify possible causes, with the suspicion that origin can be several instead of only one.



EASA REPORT - POTENTIAL CAUSES

- Problems in the airborne equipment implementation
- Problems in the ground equipment Implementation.
- Interoperability aspects
- CPDLC fragmented coverage
- VHF Ground Stations Coverage holes
- Degradation of data-link performances
- Inappropriate management of multiple connections.
- AOC traffic
- ACARS - VDL Mode 2 conflicts.
- Other potential causes

Four conclusions:

- VDL2 over one single frequency has already reached its capacity limits. Therefore, multi-frequency deployment in Europe is a “must” as of today;
- A 4 frequencies implementation is a minimum requirement to support VDL2 deployment until 2025 in high density area;



VDL Mode 2 SJU study (June 2014 –July 2015)

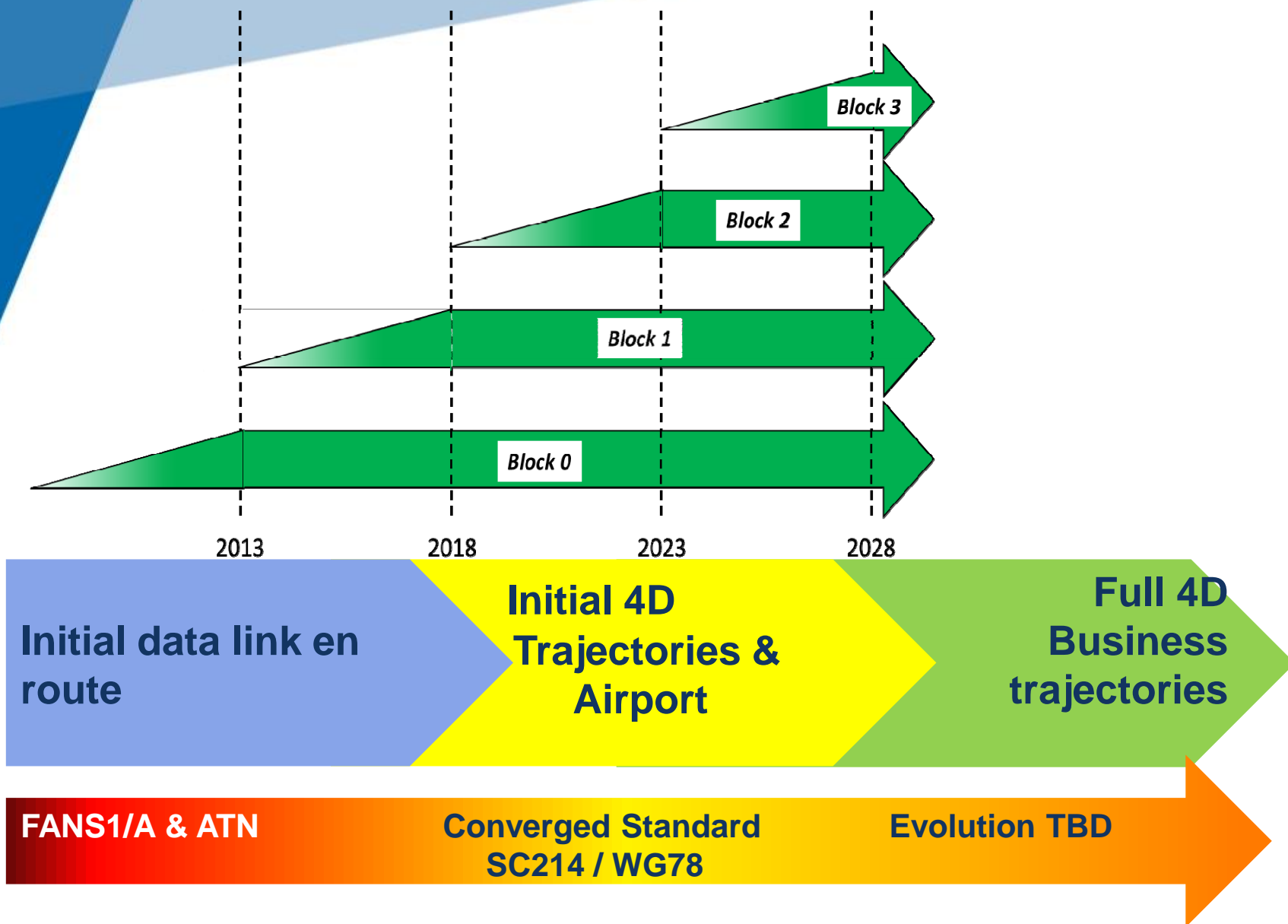
- Further optimization options under investigation may extend the viability of VDL2 over 4 frequencies beyond 2025 in high density area;
- It is highly recommended to anticipate the evolution of the European datalink infrastructure in the ATM Master Plan and to prioritize the development of the next generation datalink technology within SESAR.



REGULATION CHANGES

- **Commission Implementing Regulation (EU) 2015/310**
 - **Service Providers: February, 5th, 2018**
 - **Operators: February, 5th, 2020**

OVERALL ROADMAP



SJU PROJECT ELSA

Demanded by EC SESAR JU launched a second study, to address the EASA recommendations 1 to 6.

**Started in February 2015 and final report mid-2016.
The project objective and scope includes work to be undertaken in three specific areas:**



SJU PROJECT ELSA

➤ First

Collection and analysis of data from avionics and ground-systems to determine the levels of RF interference and VDL2 channel occupancy as well as identifying issues affecting the end-to-end performance of the VDL2 Datalink;



SJU PROJECT ELSA

➤ Second

Modelling and analysis of the options for multi-frequency VDL2 deployment, in particular the options for channel use, frequency assignment, network topology and network management;

➤ Third

RF-level modelling of the VDL2 channel in support of both ATN and AOC communications in parallel consulted stakeholders on the required next steps to review the Regulation.



INITIAL VDL MULTI-FREQUENCY DEPLOYMENT

VDL Multi Frequency:

- FMG, working on a plan of VDL frequency allocations, to be synchronized with ELSA final recommendations when available
- Very recently (2016) agreement: ARINC would release 136,725 MHz while SITA would release 136,750 MHz in the VDL band.



CURRENT MULTIFREQUENCY SITA EMPLOYMENT

EUROPE – VDL FREQUENCY COVERAGE

MAXIMUM COVERAGE AT 30 000 FEET
ON-LINE VDL ARE IN RED, PLANNED ARE IN BLUE



EUROPE – VDL SECOND FREQUENCY COVERAGE

ON-LINE VDL ARE IN RED, PLANNED ARE IN BLUE



DATA LINK REPORT STATUS (Dec. 2015)

- **15th November 2012: Voice read back was removed at MUAC and DFS**
 - **13th December 2012: Geneva ACC CPDLC operational**
 - **10th January 2013: Zurich ACC CPDLC operational**
 - **10th January 2013: Zurich ACC CPDLC operational**
 - **10th Oct 2013: NATS using CPDLC operationally at Scottish and London UIRs**
- • • • • • • • • •

DATA LINK REPORT STATUS (Dec. 2015)

- 5th May 2014 NAV Portugal are now supporting LOGON via DLIC using ATN
- 24th June 2014 The IAA are now supporting CPDLC via ATN
- 17th Oct 2014 Austrocontrol are now using CPDLC via ATN operationally.

• • • • • • • • • •

DATA LINK REPORT STATUS (Dec. 2015)

- **2nd April 2015 Naviar are now supporting CPDLC operationally**
- **16th April 2015 LFV are now supporting CPDLC operationally**
- **22nd Oct 2015 DSNA have introduced a CPDLC initial operating capability**
- **24th November 2015 HungaroControl have introduced CPDLC.**

• • • • • • • • • •

DATA LINK Status Report (Dec. 2015)

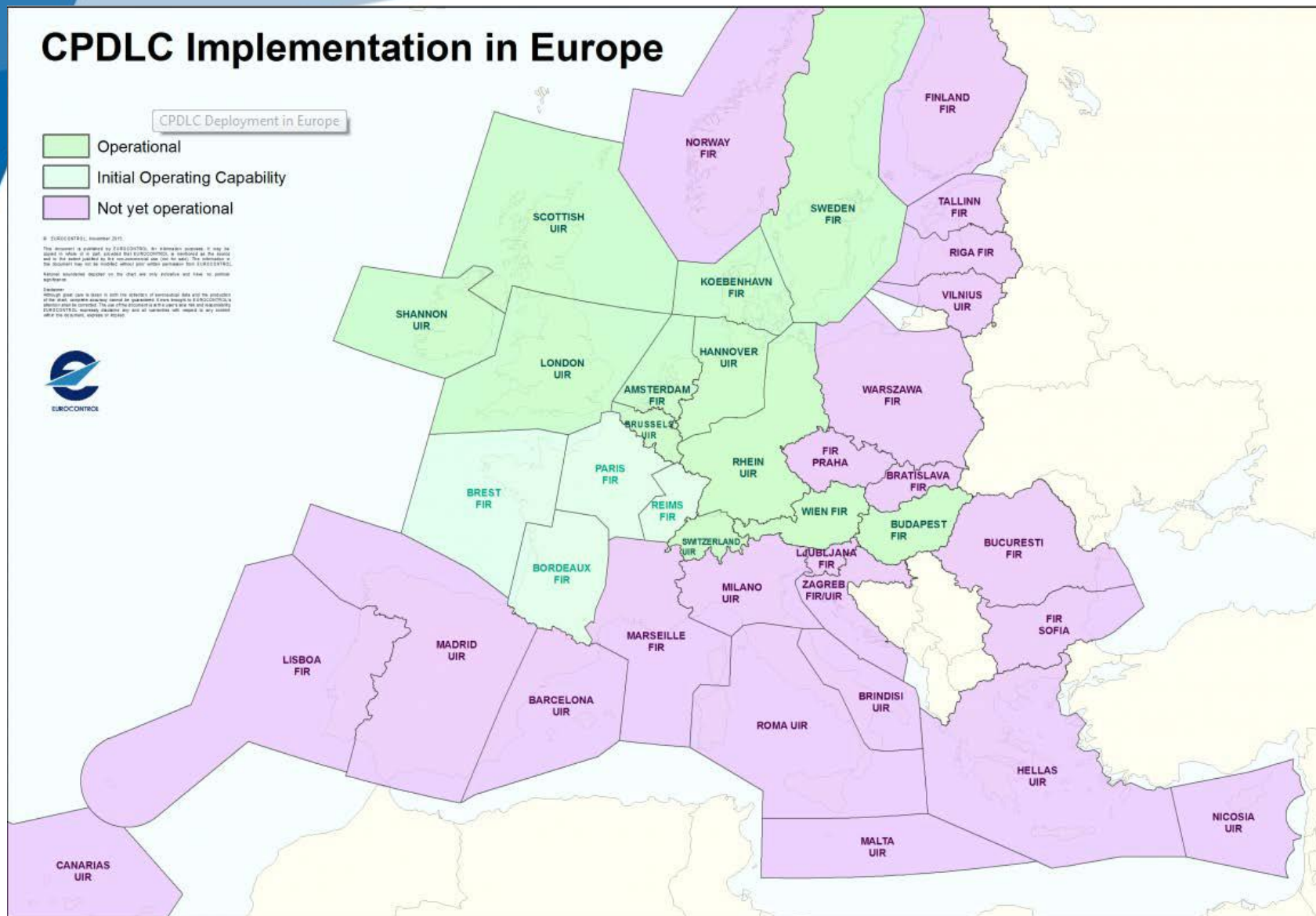
CPDLC Implementation in Europe

- CPDLC Deployment in Europe
- Operational
 - Initial Operating Capability
 - Not yet operational

© EUROCONTROL, November 2015

This document is provided by EUROCONTROL, an international organisation, it may be subject to change. It is not intended for legal purposes. It is intended for the internal use of the member states and is not intended to be used for any other purpose. The information in this document may not be further disseminated without written permission from EUROCONTROL.

EUROCONTROL does not take any responsibility for the accuracy of the information provided in this document. The use of the information in this document is at the user's sole risk and responsibility. EUROCONTROL, however, does not accept any liability for any damage caused by the use of the information provided in this document.



DATA LINK Status Report (Dec. 2015)

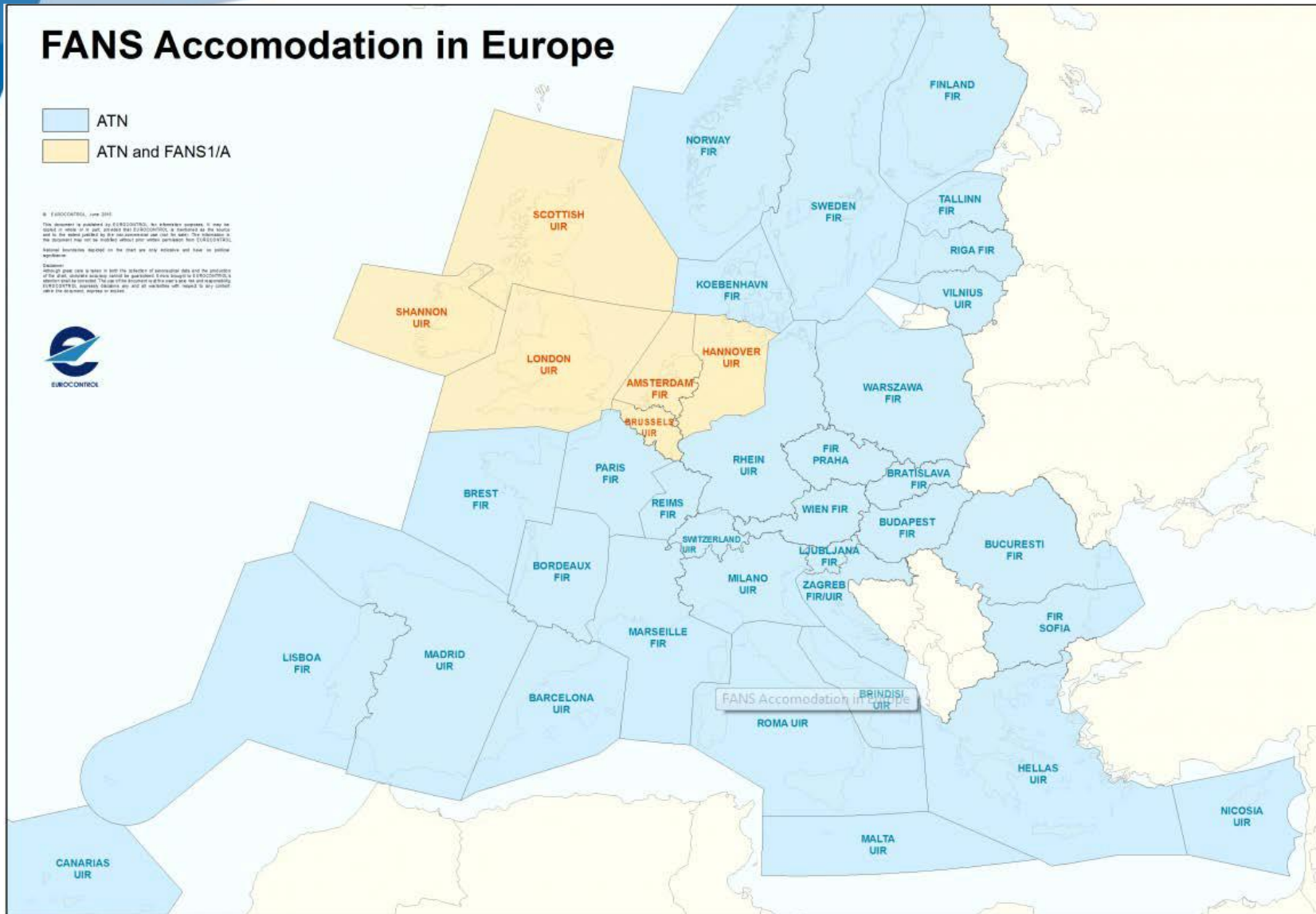
FANS Accomodation in Europe

- ATN
- ATN and FANS1/A

© EUROCONTROL, June 2015

This document is published by EUROCONTROL, but it does not represent the views of any of the member states. It is intended to be used as a reference only and does not constitute a contract. The document may not be modified without prior written permission from EUROCONTROL.

Responsible for the data: EUROCONTROL. The data is provided for information only and does not constitute a contract. The document may not be modified without prior written permission from EUROCONTROL.



PLANNED DEPLOYMENTS REPORT (Dec. 2015)

- **ENAIRE (Spain) plans to introduce CPDLC until the Dec 2017**
 - **Madrid, Canarias, Barcelona DLIC + ACM + AMC + ACL**
- **DSNA (France) plans to introduce CPDLC IOC until May 2016**
 - **Paris, Reims and Marseille DLIC + ACM + AMC**
- **NAV Portugal Plan to introduce ATN CPDLC End 2019**
 - **Lisbon FIR. ACM. + AMC+ ACL**

PLANNED DEPLOYMENTS REPORT (Dec. 2015)

Unofficially, for the following ANSP's would be:

- **Croatia Control plans to introduce CPDLC until the End of 2016**
- **Bulgaria Air Traffic Services Authority (BULATSA) plans to introduce CPDLC until the End of 2016**
- **ENAV (Italy) plans to introduce CPDLC in Brindisi and Rome until the End of 2016**
- **ANS-CR (Czech Republic) plans to introduce CPDLC until the End of 2016**

PARTNERSHIP MODEL SITA - ANSP

SITA



- SITA outsources the provision of its A/G communication service (AOC, ATC) to the ANSP
- SITA contributes to the ANSP costs for operating the A/G infrastructure
- The ANSP deploys A/G datalink communication infrastructure
- The ANSP owns and operates the infrastructure and develops its know-how
- The ANSP receives a revenue that is directly linked to the volume of AOC traffic

PARTNERSHIP NAV PORTUGAL - SITA

Coverage over continental area and Islands (Açores and Madeira):

Continental:

- **Airports of Lisboa, Porto, Faro**
- **Radio stations de Montejunto, Fóia**

Madeira:

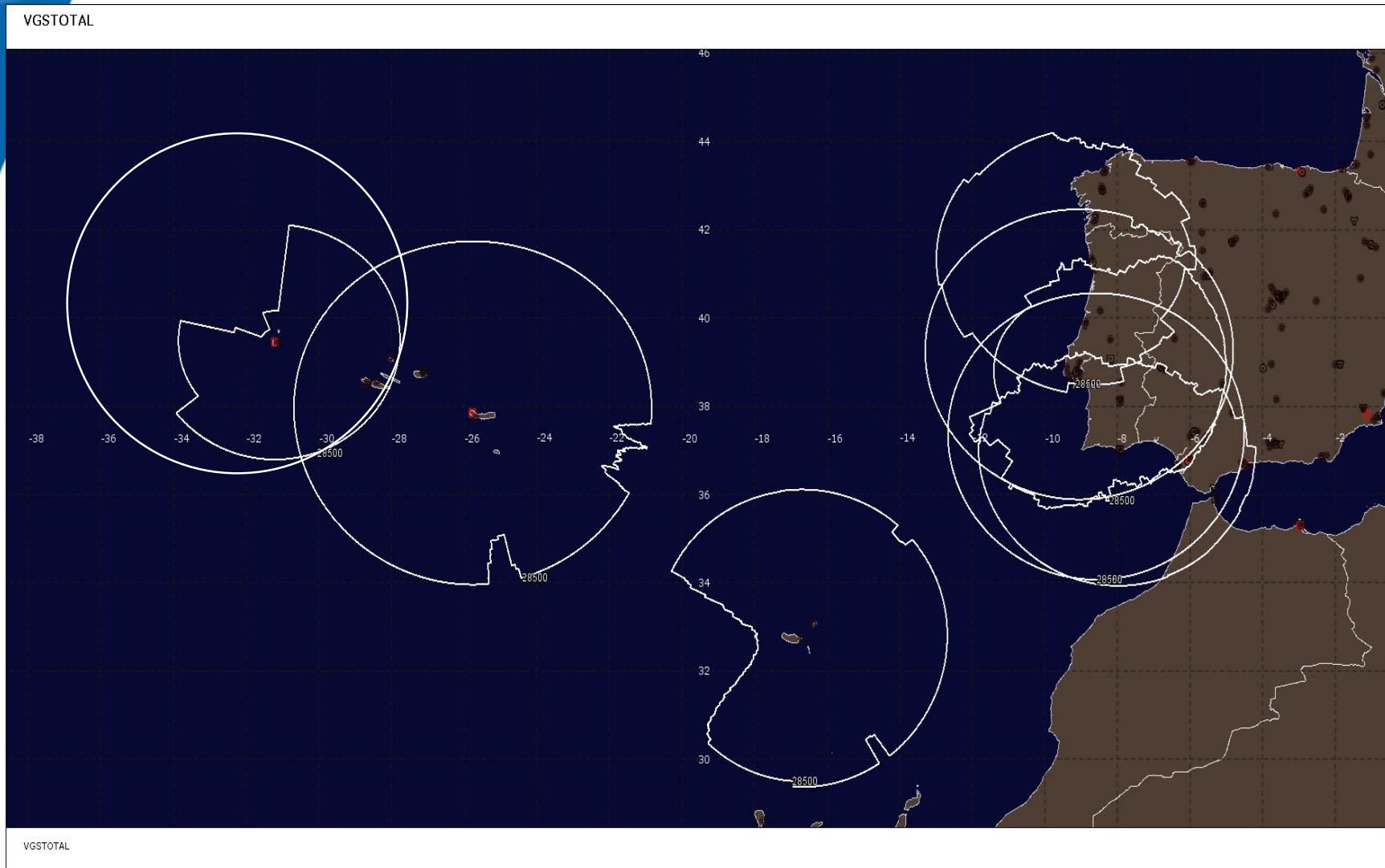
- **Funchal (Pta S. Lourenço)**

Açores:

- **Airport of Ponta Delgada**
- **Flores**



PORTUGAL: VGS COVERAGE FL 285



CONCLUSIONS

Datalink is required:

- **Increase capacity and safety**
- **Pave the way for the future trajectory management**

Features were observed

- **Analysis are on-going (cf. EC / SJU/ ELSA)**
 - **Much better performances are observed**
 - ✓ **Multifrequency deployment**
 - ✓ **Upgrades**
- • • • • • • • • •

CONCLUSIONS

Next Steps

- **SJU/ELSA outcome**
 - ✓ **Launch EASA RMT on DLS regulatory revision.**

- **Need for more rationalization**
 - ✓ **EAGDCS centralised service initiative by EUROCONTROL and ANSPs**

- **SESAR developments (Trajectory management + Technology)**



CONCLUSIONS

Next Steps

- **Communication Infrastructure Strategy
(Discussion, Workshop, New technologies)**
- **Performance Monitoring**
- **Rationalisation and multifrequency deployment**
- **New datalink: RPAS, studies on going**
- **Data link is already the present, is the future and it
worths**

• • • • • • • • • •



Thank you!