Data Link: The road to FCI

Iris Public Event
Salzburg, 04/02/13
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1. The current situation
   • DLS IR - Link2000+

2. Future Communications Infrastructure – SESAR Activities
   • Initial 4D
   • Full 4D

3. COM Roadmap
Agenda

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3. COM Roadmap
Current ATM Communication Means

Primary Mode: Voice
DSB-AM (25 and 8.33 KHz)

Limited Data Link:
ACARS and VDL2
Data Link: LINK2000+

Programme Objectives

- Implementing En-route CPDLC over ATN/VDL2
- Datalink Services Implementing Rule (EC Reg. 29/2009)
- Forward compatible with new services/technology

ACM – ATC Communications Management

ACL – ATC Clearances

AMC – ATC Microphone Check

Above FL285
DLS IR Key Dates

- **Aircraft Forward Fit**
  - ANSPs LINK/Core Region
    - INCENTIVES = EARLY EQUIPAGE
      - 1st Jan 2011
      - 7th Feb 2013
      - 5th Feb 2015

- **New aircraft conform**
  - ANSPs All of EU

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FCI: Basic Assumptions on Future Ops Concept

Future ATM concept introduces new (demanding in data exchanges) ATM services.

Data will be the primary mode of future operations (voice only for emergency).

Previous analyses demonstrated that no single technology meets all requirements across all operational flight domains.

FCI will be a system of systems integrating existing sub networks (VDL) as well as new sub networks.
Operating Concept Evolution

- **Initial Data Link En-Route**
- **Initial 4D Trajectories & Airport Services**
- **Enhanced AOC & MAPS, MET**
- **Full Air-Ground SWIM TBD**

** ATS Services**

**Info Services**
How to unlock the benefits

- Initial 4D TM
- Full 4D TM
What is I-4D?

- Share and synchronise airborne and ground trajectory.
- “Flying to Time constraints” to optimize sequences as defined by the ATC.
i4D: The Validation Steps

- **2010**: Initial developments air + ground
- **2011**: Flight Trial
- **2012**: i4D Step A
  - Flight Trial
  - Non- & Coupled simulations
  - Ground systems 2nd generation (Step A outputs)
- **2013**: i4D Step B
  - Non-Coupled simulations
  - Flight Trial
  - Non- & Coupled simulations
  - Ground systems 3rd generation
  - Airborne systems 2nd generation
- **2014**: i4D Step C
  - Non- & Coupled simulations
Step A: Flight Test and Simulations (P9.1)

- i4D real Flight Trial
- Feb 2012
- RTA + datalink tested
- MUAC and NORACON coupled (with Airbus cockpit) and non-coupled simulations with mixed traffic
Step A: Key Conclusions

Technically and operationally, flight trial was successful and provided valuable results.
- Aircraft met the time constraints.
- New data link techniques worked well.

• **Airborne data availability on the ground is essential.**
  - 4D Trajectory (Extended ADS-C) can be the foundation for the future air-ground synchronisation.

**Good cooperation between all partners and systems, a solid basis for going forward.**
- Coupled and non-coupled mixed mode validations are an essential part to provide the “full assessment”.
- More I-4D validations planned up till end 2013 (under P4.3) and early 2014 (under P5.6.1) to validate more in detail.
- Validation of Interoperability-Ground → Flight Object.
Future i-4D steps scope

Step B
Refinement of the HMI to reduce the number of inputs.
Refinement of parameters for EPP event tolerances.
Indication of expected speed change to the controller prior to issuing a CTA.
Refinement of the discrepancy indicator (ground versus air).
Refinement of the simulator – more realistic 4D profiles using the 4D Predictor from Airbus
Creation of procedures to control in a mixed mode environment.

Step C
Solutions to issues found during Step B
Further refinement of HMI
Increased automation in the 4D trajectory negotiations between air and ground.
Enhanced prototypes of a tools, e.g. speed assessments.
Assessment of the use of the downlinked EPP in additional tools, e.g. workload and conflict detection/display.
Improvements to avionics and updated air-ground ICD.
I-4D: the way ahead

Proposal under discussion to split I-4D into:

• Flying to Time for flow management and arrival sequencing.
• Downlink of airborne trajectory via ADS-C (Extended Projected Profile - EPP) and enhanced CPDLC.
• Proposal impacting Traffic Synchronisation (SPC 4.1), I-4D+CTA (OFA 4.1.5) and Trajectory Management Framework (OFA 3.1.1).

Merge of IOP with TMF, implicitly also merging IOP+i4D.

Current Pilot Common Project approach (compatible with above considerations) envisage deployment for 2018-2020 (at least the data link parts).
What about Full 4D?
Operational Needs and the Datacom services

Initial 4D Trajectory Operations synchronises the flight plan or Reference Business Mission Trajectory between air and ground and supports the use of a time constraint to synchronise dense en-route and terminal traffic flows whilst allowing the aircraft to fly its profile in the most optimal way to meet that constraint.

Reduce routine tasks and voice communication

Enable Initial 4D Trajectory Ops + additional services

Full 4D Business / Mission Trajectory

CPDLC:
ACL: ATC Clearance and Information service
AMC: ATC Microphone Check service
Supported by:
• DLIC: Data Link Communications Initiation
• ACM: ATC Communications Management

(European Datacom Mandate)

CPDLC:
DCL: Departure Clearance
D-TAXI: Data Link Taxi Service
D-OTIS: Data Link Operational Terminal Information Service
Additional CPDLC services supporting i4D
Plus
• Enhanced position reporting providing future waypoints with time in seconds supported by ADS-C EPP (Extended Projected Profile)

(Current scope of WG78/SC214)

Advanced ATM Services to be defined (Part of the work of SESAR in Europe)
+ Taking a fresh view of the requirements from a stakeholder needs perspective.
A two way synchronised iterative process is normally required
However, future operational requirements are not easily translated into clear technical requirements for technology development.

Therefore, technology is asked to provide: flexibility, scalability, and margins.
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Future COM Infrastructure

Legacy Systems

- Multilink Concept
- Airport surface: C band
- General terrestrial: L Band
- Satellite: Oceanic + Continental
Multiple ongoing activities:

- Industrial
  - ESA Iris project
  - ANTARES
  - THAUMAS/PRECURSOR
  - IRIDIUM Next

- Standardisation
  - ICAO ACP (SSB group)
  - NEXUS (proposal to ICAO for SARPs update)

- SESAR
  - P15.2.6
Way Ahead

Deployment considerations

The business case and consideration of the business model are at the heart of the way forward.

Vision is also critical (especially for SATCOM)
Q?

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