Aeronautical Telecommunications

World ATM Congress 2015
The Future ATM Generation

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Senior Expert Telecommunications
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ICAO CNS/ATM System Outline

Navigation

Communication

Surveillance

Air Traffic Management
The ATM network and CNS

Network Infrastructure
Network Infrastructure

- VHF Voice And DATA (COM)
- Transponder Code (SUR)
- Data
- Voice (Telephone)

NAVIGATION
Overview

A/G VOICE

A/G DATA

G/G VOICE

G/G DATA

EUROCONTROL
Framework

- Internet Protocol (IP)
- Air/Ground Data Links, incl. Satcom
- Air/Ground Voice forever
Drivers for COM change

- Avoid Technical Obsolescence
- Use modern telecommunication technologies

- Not Cause the Bottleneck
- Increase use of air-ground data
- Data becomes primary

![Diagram of network components: VC1, VC2, Switch, Host, X.25 Packet]
Why « networks »

Net-centric operation
The Pan European IP Network Services
Air-Ground

It is a bit freaky with this wireless technology
VHF voice “forever”

Stay tuned!

8.33 kHz below flight level 195
Radio Frequency Function
We have voice ... what is data link?

Think of this

Data link brings benefits:

- Capacity
- Safety
## Typical Data Link Flight

<table>
<thead>
<tr>
<th>Taxi</th>
<th>Take-Off</th>
<th>Departure</th>
<th>En Route</th>
<th>Approach</th>
<th>Land</th>
<th>Taxi</th>
</tr>
</thead>
<tbody>
<tr>
<td>From A/C</td>
<td>From A/C</td>
<td>From A/C</td>
<td>From A/C</td>
<td>From A/C</td>
<td>From A/C</td>
<td>From A/C</td>
</tr>
<tr>
<td>OUT</td>
<td>OFF</td>
<td>Engine Data</td>
<td>Weather Reports</td>
<td>Delay Info/ETA</td>
<td>Catering Requests</td>
<td>IN</td>
</tr>
<tr>
<td>Link Test</td>
<td>Clock Update</td>
<td></td>
<td>CM</td>
<td>Gate Requests</td>
<td>Fuel Information</td>
<td></td>
</tr>
<tr>
<td>Delay Reports</td>
<td></td>
<td></td>
<td>CPDLC (position report, requests…)</td>
<td>ETA</td>
<td>Crew Information</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Special Requests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To A/C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fault Data</td>
<td></td>
</tr>
<tr>
<td>D-TAXI, DCL, D-OTIS</td>
<td>To A/C</td>
<td>Flight Plan Update</td>
<td>Weather Reports</td>
<td>OCL</td>
<td>Ground Voice Request</td>
<td></td>
</tr>
<tr>
<td>Weight and Balance</td>
<td></td>
<td></td>
<td>CPDLC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airport Analysis</td>
<td></td>
<td></td>
<td>Weather Reports</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V-Speeds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flight-Plan, Load</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FMC</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Data Link – Human Machine Interface

Move the mouse over the track label on the controller's screen.
Data Link – Human Machine Interface

Select 290 (and click) to clear the aircraft to FL290.

Controller's screen

Aircraft interface:

ACTIVE ATC : KZAK CTL
Data Link – Human Machine Interface

Select 290 (and click) to clear the aircraft to FL290.
Data Link – Human Machine Interface

Controller's screen

Aircraft interface:

Message received and displayed in the cockpit. Choose button next to WILCO on pilot's screen.

Attention getter
Data Link – Human Machine Interface

Choose "SEND" to send the message.

Controller's screen

Aircraft interface:
Data Link – Human Machine Interface

Choose “SEND” to send the message.

Controller’s screen

Aircraft interface:

CLIMB TO FL290
Data Link – Human Machine Interface

The WILCO message is received by the ground system. The box around the Cleared Flight Level disappears from the track label.

CPDLC Dialogue Terminated. Go to the next page.
## Communication Evolves

<table>
<thead>
<tr>
<th>2018</th>
<th>MEDIUM TERM</th>
<th>2023</th>
<th>LONG TERM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data-link</strong></td>
<td>LINK 2000+</td>
<td>4D (SESAR)</td>
<td>FULL – 4D</td>
</tr>
<tr>
<td><strong>A/G Voice</strong></td>
<td>25KHz / 8.33 KHz</td>
<td>8.33 KHz</td>
<td>Digital?</td>
</tr>
<tr>
<td><strong>G/G Data</strong></td>
<td>X25</td>
<td>IPv4-v6</td>
<td></td>
</tr>
<tr>
<td><strong>G/G Voice</strong></td>
<td>MFCR2 ATS/QSIG</td>
<td>VoIP</td>
<td></td>
</tr>
<tr>
<td><strong>Messaging</strong></td>
<td>AFTN</td>
<td>CIDIN</td>
<td>AMHS (IP)</td>
</tr>
<tr>
<td><strong>Flight plan</strong></td>
<td>FMTP (IR)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Future Data links - 3 components

- Airport surface: AeroMACS
- General terrestrial: LDACS
- Satellite: Oceanic + Continental

3 New Components: Data link
Future Communications Infrastructure (FCI)

IP network (PENS – SWIM backbone)
Applications: Messaging (AMHS), Coordination and Transfer (OLDI)
Surveillance, Information Management, Voice, …

VHF voice 25 & 8,33 kHz
Data link ACARS, ATN/VDL2

New datalinks
New mobile network

Acronyms:
ACARS: Aircraft Communications Addressing and Reporting System
ATN: Aeronautical Telecommunication Network
VDL2: VHF Digital Link Mode 2
VHF: Very High Frequency

Network Manager
Airports
ATS Unit
Aeronautical Information Management (EAD)
Surveillance
Airline Ops
Challenges

Spectrum and Frequency Management

Governance
Aeronautical Telecommunications

WAC 2015

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WAC, 10 March 2015