HERMES™ Ground Data Link System Overview
Why Data Link and ACARS?
Why Data Link?

• With Data Link the aircraft becomes integrated with the airline’s information infrastructure.

• Used properly, Data Link will:
  – Enable enhanced workflows leading to operational efficiency and reduced costs
  – Provide flight crew, ground staff, and ground systems with real-time information for better decision making leading to better management of traffic irregularities
  – Make the airplane less reliant on local ground support (e.g. line stations)
  – Improve safety (read-back errors, frequency congestion, workload)
  – Improve passenger satisfaction (passenger services)

• Improves safety while enabling on time performance and reducing costs
Why ACARS?

• Cost savings:
  – Reduction in crew duty time
  – Extension of on-wing time
  – Block time reduction

• Study shows a reduction in operating costs of $2.0M per year based on these factors alone!
  – Assumptions:
    • 14 Aircraft
    • 3,600 FH per year per aircraft
    • Average trip time of 1.25 FH
    • Costs of avionics equipage included

• To fully realise these benefits, Data Link must be integrated with ground operations – people, processes and applications
### Typical ACARS Flight Leg

<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><strong>From A/C</strong></td>
<td><strong>To A/C</strong></td>
<td><strong>From A/C</strong></td>
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</tr>
<tr>
<td>OUT</td>
<td>PDC, and ATIS</td>
<td>OFF</td>
<td>Engine Data</td>
<td>Position Reports</td>
<td>Provisioning</td>
<td>ON</td>
</tr>
<tr>
<td>Link Test</td>
<td>Weight and Balance</td>
<td>Engine Data</td>
<td>Weather Reports</td>
<td>Gate Requests</td>
<td>ETA</td>
<td>Crew Information</td>
</tr>
<tr>
<td>Clock Update</td>
<td>Airport Analysis</td>
<td>Delay Info/ETA</td>
<td>Special Requests</td>
<td>Engine Information</td>
<td>Engine Information</td>
<td>Fault Data from CMC</td>
</tr>
<tr>
<td>Delay Reports</td>
<td>V-Speeds</td>
<td>Voice Request</td>
<td>Maintenance Reports</td>
<td>Maintenance Reports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flight-Plan, Loaf FMC</td>
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</tr>
</tbody>
</table>

### Events:
- **Taxi**
  - From A/C OUT
  - Link Test
  - Clock Update
  - Delay Reports
- **Take-Off**
  - From A/C OFF
  - Engine Data
- **Departure**
  - From A/C
  - Flight Plan Update
  - Weather Reports
- **En Route**
  - From A/C
  - Position Reports
  - Weather Reports
  - Delay Info/ETA
  - Voice Request
  - Engine Information
  - Maintenance Reports
- **Approach**
  - From A/C
  - Provisioning
  - Gate Requests
  - ETA
  - Special Requests
  - Engine Information
  - Maintenance Reports
- **Land**
  - From A/C ON
  - Fuel Information
  - Crew Information
  - Fault Data from CMC
- **Taxi**
  - From A/C IN
  - Fuel Information
  - Crew Information
  - Fault Data from CMC

**Note:**
- **PDC:** Performance Display Computer
- **ATIS:** Automatic Terminal Information Service
- **CMC:** Central Maintenance Computer
- **V-Speeds:** Various Speeds
- **FMC:** Flight Management Computer
Rockwell Collins support total solutions

- Airline Operational Control (AOC) Database design
  - Usability and message formats
- Data Link Service Provider (DSP) Selection in real time
  - Cost, coverage, performance, message content
- Security
- Automation
  - To provide reliability, automation must be a goal
- Which Applications?
  - Flight times, freetext, ACMS are common as “phase 1”
- Data flow analysis
  - How/when is data created, transferred, consumed
  - Who needs it, and when
- Workflow analysis
  - What are the business processes involved in generating the data, how can these be optimised with data link
Ground System Issues

• “Legacy” Ground systems
  – Existing ground systems must be used to remain cost-effective
  – A new ground system is a legacy system waiting to happen

• Middleware standards
  – These are not a “silver bullet”, but can make things easier
    – XML

• Data “quality”
  – How can this be measured, what can be done about it?
  – Any manual step will introduce errors

• Flight crew acceptance
  – “It’s like this, we’re going to give you more work to do and pay you less.” “What do you mean you’re not happy?!”

• Initialisation is key
  – An automatic initialisation improves data quality and helps flight crew acceptance
Common Misconceptions

- My ground operations software can “talk” ACARS ..... 
- I must design my AOC database around my ground software ..... 
- I must design my ground software around my AOC database ..... 
- I don’t operate a mixed fleet ..... 
- Flight times are easy .....
What is HERMES

HERMES - Brand Name for a Family of Software Products and Services

“HERMES” - The Greek Messenger of the Gods. Also the God of Riches, Trade and Good Fortune

HERMES is an advanced “Windows 2000” PC Based System

The HERMES System provides a data communications vehicle connecting people and computers in aircraft to people and computers on the ground
Integrating ACARS

“Data Link - connecting people and computers in aircraft to people and computers on the ground to lower cost and improve efficiency”

- Flight Times
- Crew Management
- Flight Plan (FMC)
- Weight & Balance, Takeoff Data Calculation
- Engine Performance / Trending
- Weather Information & Observations
- Fuel Information
- Re-Dispatch Avoiding Fuel Stop
- Position Reports and ETA Updates
- Gate Information & Aircraft Provisions
- Aircraft Fault Data
- Air-to-Air Messages
- Pre Departure Clearance
- Digital ATIS
- Oceanic Clearance
- CPDLC
HERMES in Operation

HERMES Server
- Routing
- Formatting
- Delivery Control
- Send/Receive
  - Transaction Mgt
  - Configuration Mgt

HERMES Operator Console (Client)

HERMES Mapper (Clients)

HERMES Messenger (Clients)

ACARS Data Link Service Provider

Broad band connectivity

Existing and future IT infrastructure

- Administration
  - Crew Scheduling
  - Reservation System

- Maintenance
  - Performance Monitoring / Trending
  - Maintenance Scheduling

- Flight Operations
  - Dispatch and following
  - Flight Planning
  - Global Communication
  - Wx

- Ground Operations
  - Load Sheet Calculation
  - Departure control
Key Benefits

- Instant global communication – improved safety.
- Reduced costs with increased efficiency and capability through
  - Integration of A/C into operators IT infrastructure
  - Single Point Link
    - Isolate Internal IT Systems from ACARS
    - Ready for the future (Migration into the ATN and beyond)
  - Flexible, user configurable interface to existing systems
- Reduced turnaround times through automation, preventative and proactive maintenance
- Standard protocols are built into HERMES
- Full local control for immediate changes
- Security inbuilt
- Minimise and manage message costs
Key Features

- Automated Messaging Service for Air/Ground communication
  - Wx, A/C movement, Load sheet, Engine Monitoring, Flight Plan delivery etc
  - Isolate IT Systems from transmission media
- Isolate IT Systems from transmission media
- Sophisticated channel management
- Security
  - Authentication of source
  - Firewall
  - Encryption
  - Data integrity
- Integration of ACARS with TCP/IP & industry standard protocols
  - TCP/IP, APPC SNA, MQ Series, FTP, SMTP, DCOM etc.
  - HERMES Application Program Interface (HAPI)
- Powerful message routing features
- Message translation, both protocols and formats
- Message logging and analysis
- Multi Airline support
- Supports CPDLC and CDM
Key Features

• Status Information and Fault Isolation
  – Message Delivery Analysis
  – Message Assurance
  – Retry Logic
  – Service Provider (SVC) Failure Messages
  – OOOI Analysis
  – Deaf, Dumb and Mad Aircraft Detection
  – Administrator Event Messages

• Easy to Deploy and Use
  – Intuitive Email style and Mapper applications
  – Easy to Use With Minimum Training

• Remote system configuration

• Future proof
  – Enables interoperability across POA (Plain Old ACARS), VDL, ATN and emerging broadband technologies in a mixed fleet scenario.
HERMES Messenger – Send Message
HERMES Mapper
HERMES Mapper - Diversion
HERMES Administrator
HERMES Operator Console
HERMES Customers

Aeroflot
Air Algerie
Air Europe
Air Mauritius
Alaska Airlines
America West Airlines
British Midland
China Southern Air
Egypt Air
El Al Israel Airlines
Emirates
Eurocontrol

Far Eastern Air Transport
Gulf Air
Hainan Airlines
Institute of Information Industry
Kuwait Airways
Royal Air Maroc
Scandinavian Airline Systems
Saudi Aramco
Southwest Airlines
US Air Force Air Mobility Command
Volare Airlines

29 systems
Market leadership
Partnership

- Partnership is key
- Understanding and Commitment essential
- RC must maintain an
  - Intimate knowledge of requirements evolution
  - Operational drivers as well as “functions”
  - Open Communication

“We don’t know what we don’t know”

User forums
Workshops
Collaborative Dev.
System Support

- Rockwell Collins Provides Comprehensive Support Options
  - Consultancy, Advice and Training
  - Integration Services
  - Functional Enhancements
    - Product Developments
    - Customer Specific Developments
  - Remote Access Services (RAS) Support
  - 24x7 Emergency Support
- Post Design Services (PDS) Standard Contract
- Support Tailored to Each Customers Needs
How do we justify Data Link?
How do we justify Data Link?

Why Should we do Data Link?  
*Because everybody is doing it*

We should use / not use Data Link  
*Because………*

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### Benefits Study

- What data is exchange between Aircraft and Ground today? How?
- Identify Current Process
- Data Flow:
  - What
  - When
  - How
  - Triggers
- Current Costs
- Costs of Implementation
- Potential Costs Savings
- Cost Benefit Analysis

### Report

- Drivers for Data Link
- Financial Justifications
- Recommend Solution Architecture
- Implementation Plans
- Support Requirements
- Industry Trends and Future Proof Solutions
Future Data Links
Future Data Links

• VDL Mode II
  – Available today
  – Supported by HERMES today
  – ARINC 620 still used as interface to Datalink Service Provider (AOA)
  – Cost differentiation
• VDL Mode III, IV
  – Will be supported by HERMES as deployed
• ATN
  – GACS interface supported today
• Gatelink
  – HERMES operates as an I²S Ground System as part of the AFIS system
  – Data is passed to and from the aircraft using secure email
• Broadband Satellite
  – Increasingly cost-effective solutions available
  – HERMES supports today, via a variety of communications options, including SMTP, X.400, HTTP
Broadband revolution

• What is coming?
  – VDL II – 31 kb/s – Operational
  – Gatelink, 10 Mb/s – Available
  – Inmarsat, 64kb/s – 2002
  – Inmarsat, 432 kb/s - 2004
  – KU band, Mb/s – 2003-5

• A new problem for ground integration;
  – High data rates
  – New applications
  – Interoperability;
    • POA ↔ VDL II
    • POA ↔ Wide band
  – Mixed fleet equipage
• Interoperability will be key.

ACARS and Broadband equipage

- Number of A/C equipped
- Time

- Broadband equipped A/C
- ACARS equipped A/C
Summary
Summary

• Sophisticated avionics and communications are available, but to obtain resultant business process enhancements and cost benefit, an aircraft operator also needs a complimentary ground solution.

• The Rockwell Collins Ground Data Link provides an aircraft operator with increased operational capability with improved efficiency.

• HERMES can be used on its own, or integrated with other ground systems for maximum benefit.

• Rockwell Collins provides an end-to-end, integrated Aviation Information Management solution for aircraft operators both large and small.

• HERMES enables an integrated system.
HERMES Ground Data Link Solution

More than Message Management.....
<table>
<thead>
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<th>Graham Jones</th>
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