Electronic Aircraft Records – Transformation to Digital Age

Facilitators

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Electronic Aircraft Records

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Paperless Aircraft Operations; IATA’s Vision
IATA’s paperless initiatives

**Passenger**
- Reservations, Ticketing, and Airport Processes

**Operations**
- MRO Service Providers, OEMs, Parts Distributors, Lessors
  - e-Records
  - e-Parts Tracking
  - e-Task Cards
  - e-Techlog
  - e-Signature

**Customer Focused**

**Aircraft Focused**

Successful IATA implementation worldwide via industry mandate

IATA is in a strong position and capable of coordinating this multi-stakeholder, complex industry effort
IATA Vision: Aircraft Maintenance Focus

To simplify maintenance operations by incorporating paperless technologies, thereby facilitating regulatory compliance and enabling new processes to reduce costs.

The Role of IATA

Define Standards

Coordinate Stakeholders

Digital Maintenance

(e.g. eLog book, eDocumentation, component Auto-ID tags, eRecords & eArchives)

Auto-ID Parts Identification

Electronic Signature
Key Stakeholders

- OEMs
- Aviation Authorities
- Airlines
- Parts suppliers
- Standards
- Technology providers
- MROs
- Lessors
- Logistic companies
Be able to track an aircraft part (eventually the aircraft) throughout its lifetime

- Agree on what information to track
  - Regulatory compliance
  - Contractual obligations
  - Protect asset value
  - Operational efficiency

- Agree on “Birth Record”
  - Cannot provide “Back-to-Birth” Record when there is no “Birth” Record...

- Independent of technology
Two-way treatment

A different approach is required to track parts
Today, every part on a new aircraft that is not tracked is a missed opportunity
Need industry commitment

Fix Date: 2020

New Aircraft

Repair - Pool

Old Aircraft

e-Tag

No e-Tag

e-Tag

e-Tag

e-parts tracking: Every part produced or overhauled after 2020 should be tracked
Focus Areas

- Auto ID technologies as enablers to track and trace parts; emphasis on RFID
- Worldwide acceptability criteria for state recognition of electronic records and electronic signatures
- Definition of the paperwork that is required to follow the aircraft and its parts from “cradle to grave”
- Transition Roadmap; how to evolve into paperless processes
RFID

- RFID technology has the potential to become a key element in improving efficiencies in Aircraft Technical Operations:
  - We have to work with it as a fact, not as a hypothesis
  - Several airlines are using RFID technology in operations today
  - OEMs are mature enough not only to use RFID technology in the process of manufacture but also deliver the product with RFID tags

Better be in a position to shape the future than being carried away…
e-signature

- Release certificates (FAA 8130-3, EASA From 1) signed and transferred electronically
- Maintenance manuals are accessed electronically
- Maintenance tasks are signed off electronically

- Revolutions of maintenance manuals, MOE, MME, CAMO are made and approved by CAA electronically
- Worldwide acceptance of e-signoff and documentation needed for aircraft and parts transfer
Electronic Documentation

- Work with ICAO on the development of criteria for the acceptance of electronic documentation worldwide
- LLP Traceability Template; first step to track parts
- Templates to simplify documentation
  - Non Incident Statement → Incident Clearance Statement
  - Airframe Maintenance Template Agreement
- e-signature and cybersecurity are key to success
Next Steps – Transition Roadmap

- Definition of birth record; list of documents that are required at delivery of a new aircraft and its parts;
- Identification of requirements operators need to document to fulfil regulatory, commercial and operational needs;
- Documentation that airlines need to transfer along with an aircraft and its parts in order to meet regulations and maximize asset value;
- Formation of an ID relationship management scheme that provides recognition of processes, records and sign-offs;
- Major stakeholders involved on the way forward: OEMs, Airlines, Lessors, MROs, Suppliers, Parts Distributors, etc.
Thank You
Geoff Pettis
Manager, Cabin Ops Support Engineering,
Delta Air Lines
Evolving Information Technology

- Airlines (Engineering and Maintenance) are exposed to aircraft electronic information and digital processing
- Main facets of evolution are:
  - Increased “digital” demands and capabilities
  - Scalability in adoption of digital processing
  - Installation of new aircraft technology on legacy fleet
  - Real time data capture, allocation, reporting and analysis
  - Simplify parts and aircraft transferability, with 100% regulatory compliance

Key Stakeholders

- Airframers
- Suppliers
- Airlines
- Aviation Authorities (FAA, EASA, ICAO...)
- Lessors
- MRO
- Logistic/Cargo
- Technology Providers
- Standards (IATA, ATA...)
- Cargo
- SPEC2000

Background

Paperless Operation
Current

Paper Operations

• FAA requires paper records to be kept (digital cannot be original)
  - All mtc. records of entire mtc. program cycle must be kept
  - Aircraft sale/transfer results in massive amounts of paper records being reviewed and transferred
Paperless Operations

- Shift to paperless operations among all stakeholders by implementing electrical documentation in following areas;
  - e-Record (Repair History, Parts Tracking...)
  - e-Technical Publications (Manuals...)
  - e-Signatures (Task Cards, FAA8130...)

Connectivity

- Standard Template
  - Data connectivity via Wi-Fi
  - Cloud Link
# Matrix

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                   • Regulators         |
## Matrix - MRO

<table>
<thead>
<tr>
<th>Focus Area</th>
<th>Mechanics</th>
<th>Customer</th>
<th>Warehouse</th>
<th>Suppliers</th>
<th>Potential Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expendables</strong></td>
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<td></td>
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<td></td>
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<td><strong>Rotables</strong></td>
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<td><strong>e-Record: Maintenance</strong></td>
<td>• XML Mtc. Schedule and Program&lt;br&gt;• XML Component Repair Doc&lt;br&gt;• e-Part Tracking</td>
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<td>• Access to Digital tech. pub (CMM/AMM/IPC)</td>
<td></td>
<td>• Owner of original publications</td>
<td></td>
<td>• LLP Traceability Template&lt;br&gt;• Interlink Cloud&lt;br&gt;• RFID tech. providers&lt;br&gt;• Regulators</td>
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<td><strong>e-Signature</strong></td>
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Electronic Aircraft Records

Rob Saunders
Head of Engineering Cost Management & Business Improvement, Cathay Pacific
The Cost of Paper is far more than the cost of paper

Revisited - 2015
Our **Purpose**: Why we exist

Our role in the airline is to deliver safe and compliant aircraft which meet business requirements.

**Flight Schedule**

**Maintenance Program**

- Carry Out Maintenance
- Materials and Logistics
- Record Work Done and Store Records

**Carry Out Maintenance**

- **Materials and Logistics**
  - **Record Work Done and Store Records**

**Maintenance Plan**

- **Carry Out Maintenance**

**Heavy Maintenance Plan**

- **Carry Out Maintenance**

**Analysis of Records & Modify Program**

- **Analyse Records & Modify Program**

**Maintenance Projects**

- **Maintenance Projects**
  - **48,772 Maintenance Projects**
  - **373,759 tasks accomplished**

**Log Entries**

- **Log Entries**
  - **128,310 Arrivals**

**Component Certifications**

- **280,000 Component Certifications**

**Active Requirements**

- **Active Requirements**
  - **10,552 Active Requirements**

**Maintenance Program**

- **Maintenance Program**
  - **582,515 Log Entries**
  - **128,310 Arrivals**

**Our Drivers: Our internal compass**

- **Safety**
- **Compliance**
- **Delivery**
- **Value**
- **Sustainability**

Our drivers will act as our internal compass, steering our behaviors, decisions and actions. They are a set of principles and a reference point to guide all of our work.

All recorded on Paper

**Yes Really!**

- 582,515 Log Entries
- 128,310 Arrivals
- 48,772 Maintenance Projects
- 373,759 tasks accomplished
Our Purpose:
Why we exist
Our role in the airline is to deliver safe and compliant aircraft which meet business requirements.

180 aircraft in 2013
- 10,500 Active MRs
- 49,000 Work Packages
- 373,000 Tasks
- 128,000 transits
- 582,500 Log Entries
- 280,000 Component certs

33,000,000 paper records and growing

Paper in Aviation Maintenance

A bit of a Challenge
Paper in Commercial Aviation

A highly optimised, hugely inefficient industry of people, pens and paper held together by silos of automation

But - somehow - it works
Works? – well, not really

- Package produced and printed in duplicate
- Additional AMM printed by MRO – every time!
- Plan produced manually by MRO (as a gantt chart)
  - Work cards manually reviewed each day (team of planners)
    - 3 meetings – Plan updated manually and reprinted
  - MRO system tracks tasks cards closed (but not stages)
  - Separate shortage reports produced – meetings each day
  - NRCs raised in MRO system – defects entered but action is written.
    - fed back to airline days / weeks later
- Paper tally sheet to track cards – cards added / removed manually
- Part changes logs produced in Excel for later feedback (compliance?)
- Paper work card reconciliation and data entry
In fact – it’s a bit broken.

- Airline system updated after a/c back in service (config. models)
- Paper records passed to Airline after scanning for MRO 145 requirements
- Airline scans records again for indexes and stores in controlled store
- Data extracted and fed into separate NRI system
- NRIs and Part records (inc C+E) correlated with originating AMS task
  - Very difficult or not happening
- Level 1,2,3 corrosion findings fed into corrosion data base - separately
- EO accomplishment fed back to separate AD db - manually

All of these issues are retrospectively corrected – as a continuous Process of Normality – and some are not!
High Level hangar plan is generated by applying Task Requirements to Fleet and Facility constraints. This is based on projected fleet utilisation (BOP).

Manage production plan
- Track critical path
- Track task ‘clock stops’
- Track shortages
- Track budget NRCs
- Electronic sign off of tasks

Increased A/C Utilisation

Reduced $ / ATK

Cost Management

- Reliability
- Check Escalations
- Float Calculations
- Technical Records
- Part Change
- Compliance

Budget Forecast
Actuals Reconciliation

Rolling Forecast generated from actual plan – monthly changes generated

Material Requirements generated from Tail specific Bill of Materials

BM Hangar Plan

Library of standard checks with resource requirements

Check Templates

Maintenance Requirements (inc. AMS)
**E2P - P2E**

Electronic .....to.... Paper.... To.... Electronic

Tech Docs Management System

Records Management System

E through E

Maintenance Requirements

Hangar Execution

Check Execution

E-signature avoids paper and the need to produce and scan a document.
Paper to Data
Records Management

20 Scanners for a year

On line indexed records
Paper to Data e-Enabled

New Web Interface Defect Analysis & Planning

Closed Loop Line Maintenance Planning
Paper to Data
Future State

Our Purpose: Why we exist
Our role in the airline business is to support and enhance the overall passenger and customer experience. We must maintain an unwavering focus on safety, compliance and meeting the airline’s exacting business standards. We work to ensure the proper operation, and to raise the industry’s overall reputation.

Our Ambition: What motivates us
For Engineering to be recognised by the airline, industry, partners and regulators as a world leader. The way we do things

Our Priorities: What we are focusing on
Effective processes
Efficient procedures
Engaged people

Our Drivers: Our internal compass
Safety
Compliance
Delivery
Value
Sustainability

Our Mission: What we at Engineering do...be a world leader
We must maintain an unwavering focus on safety, compliance and meeting the airline’s exacting business standards. We must maintain an unwavering focus on safety, compliance and meeting the airline’s exacting business standards.

Check Execution

Planned Maintenance

Tech / Cabin Log

History
Benefits?

• Check Control and efficiency improvements
  • BM OTP
  • BM reduced check length
  • On line Shortage management
  • On line part changes
    • Reduced component TRT
    • Data entry accuracy
      • Reduced CX TR effort
  • On Line Task clearance
    • No paper to:
      • Collect, Ship, Store, Retireve
      • Reduced MRO effort
        • No paper reconciliation checks
Benefits?

• Data Analysis
  • Check stats
    • What went wrong – fix next time
  • NRI feedback – structured and directly into database
• Materials consumption
• Critical path analysis – post check
• manhours/elapsed time records
• Generate projected costs and Materials needs
Barriers to Introducing Paperless Maintenance

- Buy in from Regulatory Agencies
  - Many regulations are law - Many countries

- Lessors and Finance companies driving the need for Paper
  - Driven by the regulators

- Availability of structured data from OEMs and repairers

- Few Data Standards

- Maturity of systems and technology to support changes to the processes
  - Ability to meet of Mechanics and Engineers mindset

- Cost of introducing technology and process changes across industry

- Lack of understanding or vision for ‘back office, not so trendy’ functions

- Tendency for airlines to accept incremental improvement of Siloed processes that should be redundant
Business Benefits – Records Management System

- No physical storage required for maintenance records
- Savings in Aircraft Lease Fees on redelivery processes
- Fast access to information
- Efficiency improvements in Tech Records section
- Improve security with the electronic information
- Rapid access for investigations

- Improve the Maintenance Program based on Data Analysis
Paperless Objectives

Mission: To influence Airlines, MROs and Suppliers and Regulators (the Industry) to introduce business changes that enables the removal of paper records in aircraft maintenance.

Enable CX to reduce Cost / ATK and increase revenue
- Eliminate process inefficiencies
- Improve cost avoidance (Lease Returns, Inventory, paper Management)
- Reduce in service disruption

Introduce Industry Standards
- Influence the Industry to introduce standards (birth record requirements, lease returns requirements)
- Drive priorities for OEMs to deliver paperless
- Drive to set up centralised repair/part history data for all Operators/MROs
- Create awareness in the industry

Ensure Sustainability & Usability
- Exploit new generation aircraft capabilities
- Leverage on Technology and tightly manage systems and organisational integration – ie avoid the siloed covert developments
- Account for technological growth opportunities – ie data volumes, band width, improved world wide access, mobile devices etc.
Lease Return Vicious Circle

- CX Component Acceptance Data Standard – 7335 out of 14152 acceptance requirements are Lease return driven

Alignment required to come up with ONE standard
## ENG Data Management Benefit Realization

<table>
<thead>
<tr>
<th>Description</th>
<th>Pre-DM Project (2012)</th>
<th>Post-DM Project (As of 2015)</th>
<th>HKD (m)</th>
<th>Man days</th>
</tr>
</thead>
<tbody>
<tr>
<td>CX Risk Registry</td>
<td>No.5 on company risk register</td>
<td>Removed from risk registry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENG Risk Registry</td>
<td>No.1 on Eng risk register</td>
<td>Removed from risk registry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance/AD task overrun risks</td>
<td>80 (Over 50% of which are data related)</td>
<td>Zero AD compliance errors as a result of data integrity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Integrity Index</td>
<td>98% (2% = Red Traffic Light)</td>
<td>99.6% (Green Traffic Light)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Component cost spending of lease return aircraft</td>
<td>ECC estimated 1m cost of component replacements per a/c</td>
<td>Actual reduction of 3.1M per aircraft (4 a/c in 2014 = 12.4M avoided)</td>
<td>12.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Note: in combination with Flydocs implementation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved RO Proforma</td>
<td>Unstructured Repair Order work scope causing uncontrolled cost. (Value unknown)</td>
<td>Introduced in 2014. Part of 3M saving per year realised on similar ROS</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Issue Return AD</td>
<td>20% RO capture incorrect Part No. / Serial No. or inaccurate component hours/cycles (compliance). Corrected manually.</td>
<td>Data correction reduction - 30 man days per month. //Avoid incorrect works cope carried out – over-maintenance or out-of-compliance risk, part of 2M saving per year.</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>Duplicated item serial</td>
<td>Manual surveillance and correction</td>
<td>Avoid 180 corrupted events per month being corrected. Saving of 30 man days per month. Reducing of premature removal or out-of-compliance, savings reflected above.</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Part Change</td>
<td>Manual data entry – effort and prone to errors</td>
<td>Saving of 410 man days</td>
<td></td>
<td>410</td>
</tr>
<tr>
<td>CADS &amp; I/W per Asset Type (not yet delivered)</td>
<td>Configuration Standards currently manually managed</td>
<td>Saving of 220 man days (Phase 2 planned 2015)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Tangible Benefits</strong></td>
<td></td>
<td></td>
<td>17.4</td>
<td>470</td>
</tr>
</tbody>
</table>
Results

Aircraft Acquisition and Disposal Process
- Last 10 lease returns – on time, on budget.
- Last 5 aircraft returned using electronic records

Before
- 4 to 6 months elapsed time
- 15 – 24 man months of records preparation

After
- 3 months elapsed time (planable)
- 9 man months of effort

- Aircraft acquisition process now accounts for disposal process
Electronic Aircraft Records

Doug Walker
Vice-President & Head of Technical Americas, AerCap
Moving to a Paperless Environment

PRESENTED BY: DOUG WALKER, TECHNICAL VICE PRESIDENT, HEAD OF THE AMERICA’S

APRIL 2015
Introduction

Why now is what we asked ourselves in 2012

Is this now past due?

Greater than 40% of the global fleet is now leased with hundreds of aircraft transferring between airlines each year. Proper maintenance and supporting documentation that meets lease or sale contract guidelines will continue to be a major undertaking for Lessors and airlines alike.

Retention and transition of paper historical maintenance documents remains a barrier to efficiency for lessors, airlines, parts traders and MROs. Electronic records offer a vastly improved level of record keeping accountability and security, in addition to the obvious environmental and cost reduction benefits.

It’s time to evolve
Real or artificial challenges facing the industry in the adoption of a Paperless Environment:

**Authorities**

Need for additional regulatory guidance material, other than FAA, (world wide acceptance)

**Lessors**

Need to establish a standard for electronic records (folder structure) Communicate acceptability

**Airlines**

Fear of the new/comfort with the old (if it’s not broken don’t fix it mentality)
Benefits

Reduced printing & storage costs
Drastically decreases cost of printing and storing paper
Approx. 11,000 pages per aircraft per year

Reduced audit time and presence
Reduces the need for Lessor’s consultants to be onsite for mid-term audits and the return process.
30 days and growing

Reduced onsite audit time
Reduces the time aviation authorities need to be on site performing audits

Minimized hosting & escorting
Minimizes hosting and escorting next airline customers and consultants, office space and distractions

Reduce potential aircraft return delays
Reduces the potentially for delayed returns and associated exposure to continued lease payments

Benefits from Paperless Environment for Airlines

Improved access and update of records
On line masters can be updated in real time with instant access to researchers

Increased efficiency in record research
Search and filter capabilities which paper does not offer.

Reduced disputed & misfiled records
Reduces disputes and cost caused by misfiled or lost records

Remote due diligence research
Enables airline to conduct due diligence remotely prior to accepting aircraft saving travel cost and stress
Benefits

Increased efficiency in record retrieval
Reduces time to locate and search for critical records

Reduce potential aircraft delays
Ability to respond quickly to the next airline’s questions reducing records disputes

Remote due diligence research
Enables airlines to conduct records due diligence remotely prior to accepting aircraft, allowing the prior airline to focus

Benefits from Paperless Environment for Lessors

Reduced onsite consultation costs
Reduces costs for consultants to be onsite during audits and returns

Eliminate risk of records loss
Eliminates risks of catastrophic loss of paper records, to include hostage taking
Lessors and Airlines develop an acceptable industry standard through joint cooperation with IATA and other industry organizations.

Users agree on a pre-approved list of 3rd party and/or internal document management systems, the goal being ease of documentation transferability.

Obtain industry-wide acceptance of digital documents as originals.
Thank you