Paperless Implementation as an Enabler for Efficient MRO Operations

Neal Reagor,
Director Planning and Commercial Services - EAMS
AGENDA

1. EAMS’ History
   - About EAMS
   - Delivery Trends
   - Process Flow & Paperwork
   - No Real Time Data or Status

2. What & How We Changed
   - Embraer P3E
   - Digital Non Routines
   - Task Card Process Flow
   - Digital Status and Milestones

3. What We Gained
   - Daily Production Status Report
   - Task Card Life Cycle
   - Reporting
   - On Time Performance
About EAMS

2002
First Embraer MRO for Commercial Aircraft in the United States

2006
Hangar 2
Built for the EJets (E170 – E195)

2012
Hangar 3
Operations replaces the Paint area

2013
Hangar 4
Temporary additional hangar and shop space

Embraer Aircraft Maintenance Services Inc., a wholly-owned subsidiary of Embraer since 2002. EAMS provides Aircraft and Component Maintenance as well as factory authorized training on the E-jet. EAMS has 11 aircraft maintenance bays and over 400 maintenance technicians.
Where We Were

2014 – 2016

• Struggling Delivery Performance
• 3000+ Pieces of Paper per Heavy Check
• No Real Time Visibility of Aircraft Workflow
• Lack of Data to Make Informed Decisions
Stamps, Signatures, Dates, all Handwritten on Paper.
Where We Were

Non Routine Generation Flow – **12 Steps**

- Inspector
- Generate Finding
- PC Drop Box
- PC Manual Input Into Quantum
- Non Routine Printed
- Lead Bid Drop Box
- Lead Orders Material
- Customer Approves Task card
- Approved or Unapproved Bin
- Task Card Ready to Flow and Work

Paperwork movements to multiple locations at EAMS = Lost Paperwork
Where We Were

Large Amounts of paperwork in the Hangars
Each bay would have a board of nearly 500 panels that would have to be opened and closed during the check. They were listed alpha numerically as opposed to location.
No Real Time Data

- No Live Status of Aircraft Progression
- No Real Time Task Completion Data
- No Standardized Aircraft Flow
- Aircraft Check’s Status was Manually Populated
What & How EAMS Changed

2014 - Process Improvement / Preparation

2015 – Automation / Implementation

2016 / Future – Standardized / Optimize

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How & What We Changed

Embraer P3E Steps

• Analyze Processes
• Identify Issues
• Define a Strategy
• Complete Kaizens
• Implementation
• Optimize New Process

To remove the Lav technician walked 1.8 miles in 5 Hours
How and What We Changed

Understand The Current Process

• Map Processes
• Bring in the whole team
• No Idea is a bad Idea
How and What We Changed

Paperless Non Routine Findings
- Legibility
- Date and Time Stamped Entries
- Reduced Paperwork on Floor
- Electronic Signatures
- Digital Notes

Embraer Aircraft
Maintenance Services
How and What We Changed

Control of Task Cards
- Visible Task Card Movement
- Online Customer Approvals
- Increased Accountability
- Quicker Time into Work
Pre Shift Work Assignments

- Work Ready for Technicians Pre-Shift
- Grouped into Executable Packages
- Flowed by Project Manager to Crew to Tech
How and What We Changed

Real Time Data and Maintenance Flow

- Live Aircraft Status
- Major and Minor Check Milestones
- Planned vs Actual Labor Trends
- Critical Factors Viewable by Customer
- Real Time Task Progress
- Factual Data
What We Gained

“Most of the world will make decisions by either guessing or using their gut. They will be either lucky or wrong.”
- Suhail Doshi, CEO, Mixpanel
Data to Make Informed Decisions

Real Time Data

- Check Card and Labor Hour Progress
- Overdue Milestones and Tasks
- Quality Indicators – Reopened, Rejected, and Voided Task Cards
- Non Routine Evaluation Status
- Real Time Budget Progress
- Planned vs Actual Labor Production
Data to Make Informed Decisions

As Is: Automated Reporting

- Approve Overtime
- Closed Task Card Labor
- Day Labor
- Estimated Labor Requirements
- Labor Hours by Group
- Labor by Skill
- Main Hour Report
- Overtime
- Schedule Labor
- Shift Labor
- Unaccounted Labor
- User Activity
- WO Labor Audit

Task Card

- Aircraft Awareness
- Evaluation Summary
- Major Repairs
- NR Creation
- Shop Task Cards
- Task Card Count Report
- Task Card Details
- Task Card Labor
- Task Card Milestones
- Task Card Start Days
- Task Card Zones
- Task Cards Over Estimate
- Voided Task Cards
- Work History

Work Order

- Base Maintenance Status Report
- CAB5
- Critical Factors Report
- DET Status
- Dashboards
- Engineering Forms
- Estimated Hours by Crew
- Labor Forecast
- Milestone
- N/A NGR
- Post Check
- Post Check Work
- Production Control Status Report
- Settlements
- Station Guides
- Status Report Legacy
- Status Report New
- Structural Defects
- WO Aggregates
- WO Performance
- WO Performance By Skill
- WO Process Status

Over Estimate:

Evaluation Summary:

Labor Plan:

Evaluation Summary:

Embraer Aircraft Maintenance Services
Data to Make Informed Decisions

Task Card Life Cycle Analysis
- Data to Improve the Execution of Task Cards
- Identify Bottlenecks
- Increase Mechanic Hands On Time
- Decrease Overall Check Turn Time One Task at a Time
## Data to Make Informed Decisions

### Instant Reporting
- Available to All Departments Based on Needs
- Other Example of Data Trends
  - Rework Trends
  - Work Stoppages
  - Incorrectly Classified Findings
  - Audit and Tally Data
  - Support Shop Resource Utilization

### Manage Ad Hoc Reports

<table>
<thead>
<tr>
<th>Report Name</th>
<th>Report Description</th>
<th>Report Area</th>
<th>Predefined</th>
</tr>
</thead>
<tbody>
<tr>
<td>109 ER/ER</td>
<td>For control tower measurements</td>
<td>Core Task Card</td>
<td>No</td>
</tr>
<tr>
<td>109 INTERIORS REPORT 2</td>
<td>MATERIAL PROBLEMS</td>
<td>Core Material</td>
<td>No</td>
</tr>
<tr>
<td>109 INTERIORS REPORT 3</td>
<td>MILESTONE REPORT</td>
<td>Milestone Reporting Area</td>
<td>No</td>
</tr>
<tr>
<td>109 INTERIORS REPORT 4</td>
<td>BUDGET NUMBERS</td>
<td>Core Task Card</td>
<td>No</td>
</tr>
<tr>
<td>109 INTERIORS REPORT 5</td>
<td>AC ON SITE</td>
<td>Core Bill of Work/Work Order</td>
<td>No</td>
</tr>
<tr>
<td>109 BIT - Task Card Missing quantity Seq</td>
<td>Work order specific - Task Card Missing quantity Seq EXCLUDING 109 rack items</td>
<td>Core Task Card</td>
<td>No</td>
</tr>
<tr>
<td>109 BCF ONLY - Task Card Missing quantity Seq</td>
<td>Work order specific - Task Card Missing quantity Seq ONLY FOR 109 rack items</td>
<td>Core Task Card</td>
<td>No</td>
</tr>
<tr>
<td>442 Kalson WiP Data</td>
<td>for kalzen results tracking</td>
<td>Core Task Card ViPES</td>
<td>No</td>
</tr>
<tr>
<td>AEROTEAMS PAYROLL</td>
<td>Production Labor</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>AVIONICS 444 REPORT 1</td>
<td>USER ACCOUNT INFO</td>
<td>User Info</td>
<td>No</td>
</tr>
<tr>
<td>AVIONICS 444 REPORT 2</td>
<td>MATERIAL PROBLEMS</td>
<td>Core Material</td>
<td>No</td>
</tr>
<tr>
<td>AVIONICS 444 REPORT 3</td>
<td>MILESTONE REPORT</td>
<td>Milestone Reporting Area</td>
<td>No</td>
</tr>
<tr>
<td>AVIONICS 444 REPORT 5</td>
<td>BUDGET NUMBERS</td>
<td>Core Task Card</td>
<td>No</td>
</tr>
<tr>
<td>AVIONICS 444 REPORT 6</td>
<td>AC ON SITE</td>
<td>Core Bill of Work/Work Order</td>
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<tr>
<td>Active Rework / Warranty</td>
<td>Reports rework task card types for all open work orders</td>
<td>Core Task Card</td>
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<tr>
<td>Applied Hours by Month</td>
<td>Applied Hours Transfer</td>
<td>Production Labor</td>
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<tr>
<td>Area Group Report</td>
<td>Report to detail employee to assigned location</td>
<td>User Info</td>
<td>No</td>
</tr>
<tr>
<td>Audit 2 Report</td>
<td>Core Task Card</td>
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<td></td>
</tr>
<tr>
<td>Commercial Invoice Report</td>
<td>Reports A/C Completed and Ready for Invoice</td>
<td>Core Bill of Work/Work Order</td>
<td>No</td>
</tr>
<tr>
<td>Commercial Work Order Data Report</td>
<td>W/O Data Set</td>
<td>Core Bill of Work/Work Order</td>
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</tr>
<tr>
<td>Compass All Run</td>
<td>Pulls quantum and Empower sequence numbers</td>
<td>Core Task Card</td>
<td>No</td>
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<tr>
<td>Compass NR Over 25 Hours</td>
<td>Pulls info for Compass tally</td>
<td>Core Task Card</td>
<td>No</td>
</tr>
</tbody>
</table>
Paperless operations increases technician Efficiency, which enables increases in Quality and Employee Safety.
Results

Going Paperless Summary

- **Increase Data**
  - The ability to make quick and accurate business decisions based on factual, real time data.

- **Better, More Defined Process**
  - Process inside the system will be defined with little to no work arounds.

- **Increased Accountability**
  - The defined process will point out new and previously unknown bottlenecks.

![EAMS – On Time Delivery Performance](image)