



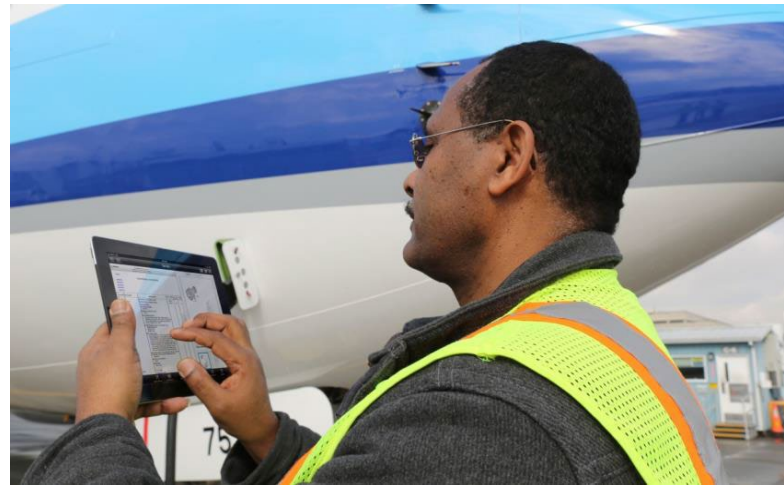
# Improving Maintenance Efficiency through Electronic Work Package

Jun 2022, Ken Jones



# The problem

- The more things change, the more they stay the same



- Operators have made great strides performing their own maintenance using paperless processes.
- But outsourced maintenance, not so much



## The problem (cont'd)

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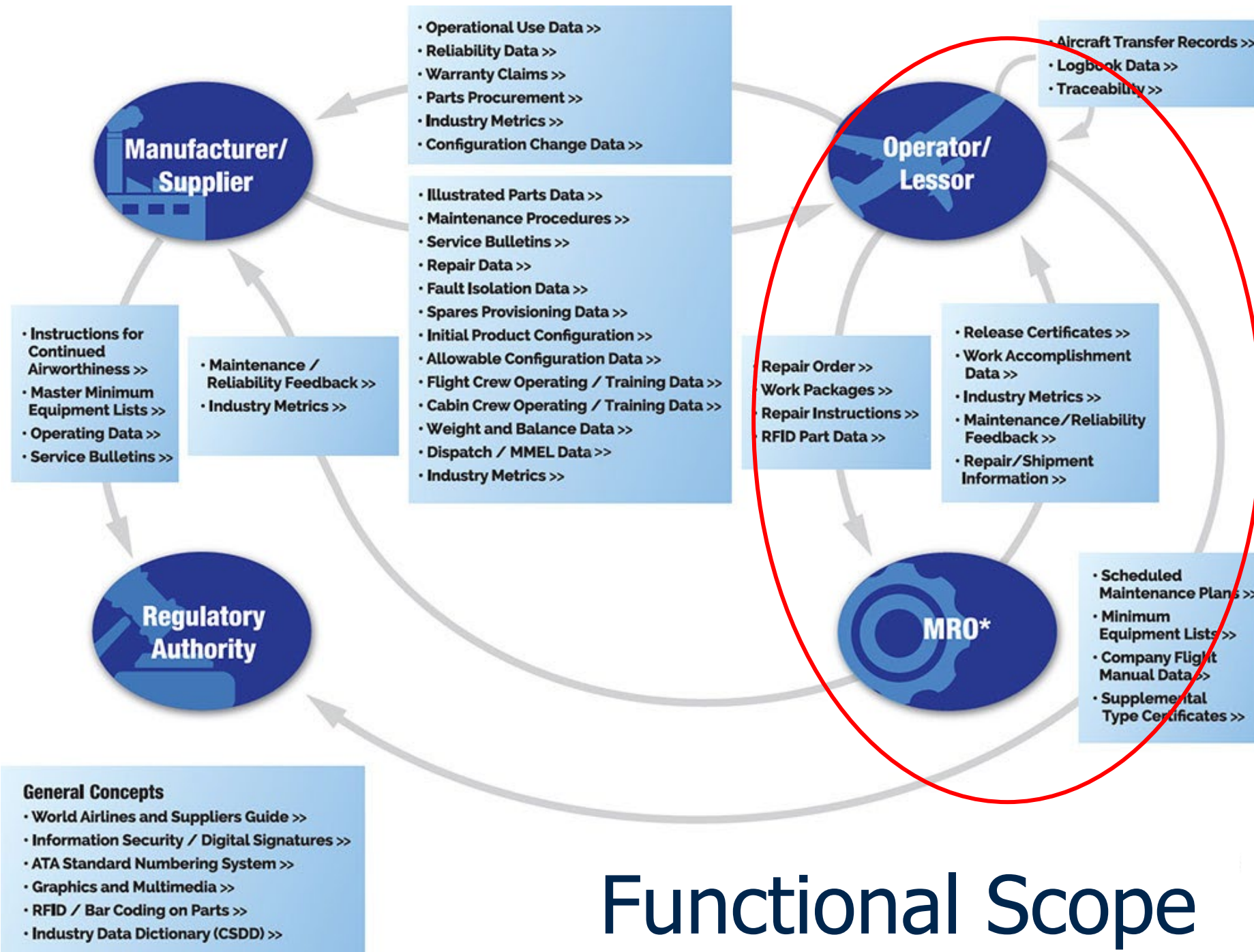
- MRO personnel enter data into airline M&E IT system?
  - Managing passwords, personnel, access
- Converting my digital data to PDFs or a hybrid:
  - Excel spreadsheet with Work Orders referencing “Paper task cards” which must get signed off.
- MRO Receives PDF’s and spreadsheets and enters data into their M&E execution system, possibly even performs maintenance electronically, then signs off paper task cards and scans and returns to Operator
- Operator enters accomplishment information into their M&E IT system to reset maintenance counters, etc. Sends findings to reliability group.



# What we are are trying to do

- End-to-end electronic maintenance records
- Allow each entity to use “their own system”
- Collect information electronically to allow better intelligence analysis
- More quickly identify issues (or non-issues) to modify maintenance program intervals
- Facilitate digital sign offs

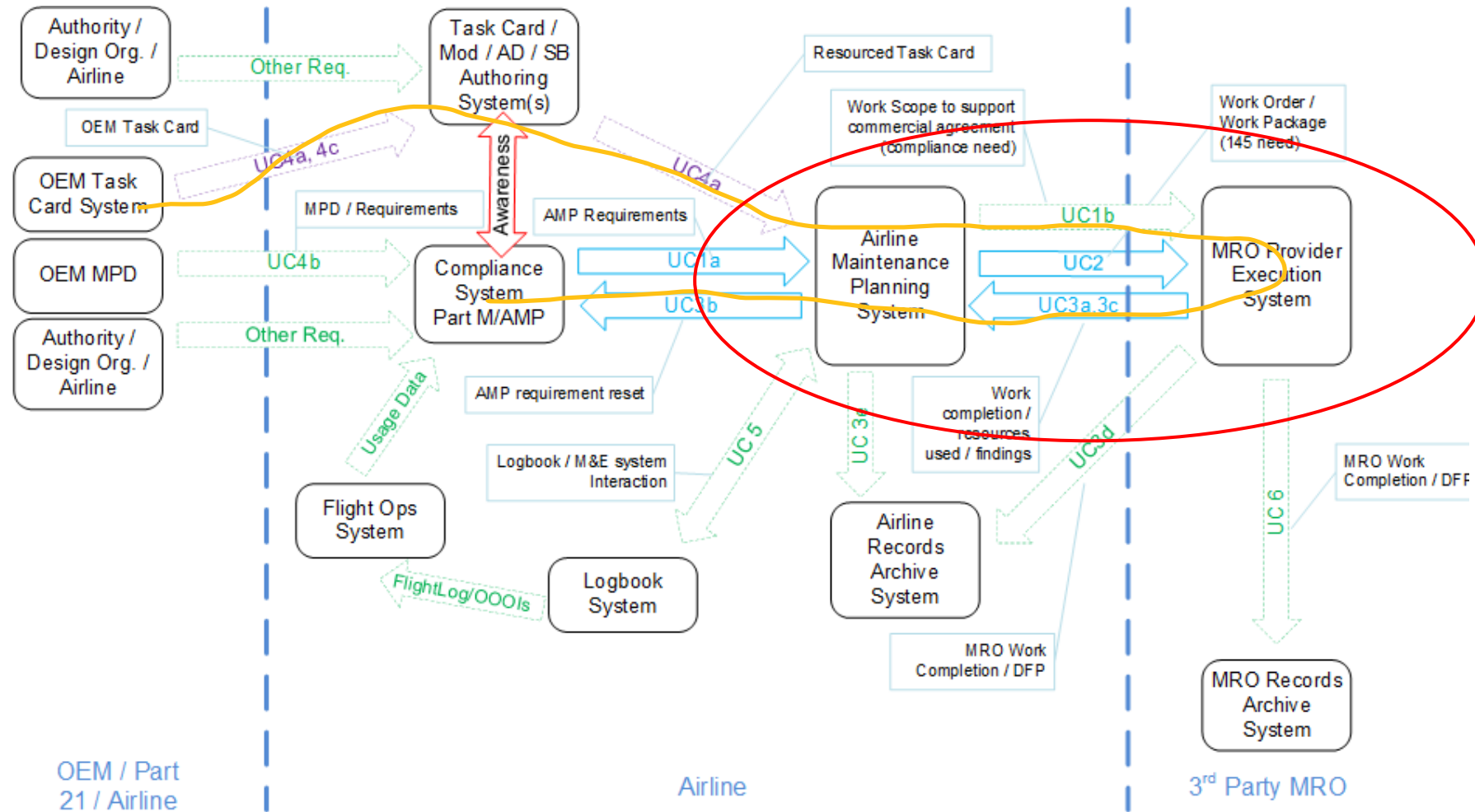




# Functional Scope



# The "Golden Thread"





# The Work Package

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- Work Package Header
  - Status (ForQuote, Estimated, Committed, ForExecution, Revised, Completed)
  - When the aircraft is expected / actually received / Hours / Cycles, etc.
  - Estimated Labor Hours / Estimated Elapsed Time / Location
  - Reference to AMP, AMM revisions
- Contains a complete set of Work Orders to be accomplished
  - Routine / Scheduled Maintenance Tasks
  - Open Logbook items
  - “One Offs” (A.D.’s, S.B’s, etc which aren’t yet part of the maintenance program)
  - Carry over Non-Routines
  - Modifications



# Approach 1 – Transactional (Preferred)

- Work Package Commitment
- Add W.O to Work Package
- Remove or Defer W.O. from Work Package
- Request Approval / Provide Approval
- Request Removal / Deferral from Work Package
- Add Findings
- Work Action Completions
- Substitute Work Orders
- Status Report
- Release to Service







## Approach 2 (less preferred)

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### ■ The “Big Bag”

- Provide Work Package at beginning of the maintenance visit
- Provide modified Work Package at an interim time, if applicable
- Receipt of Completed Work Package at end of visit

### ■ Advantages

- Easier to develop initially

### ■ Disadvantages

- MRO needs to identify changes
- - or – Changes to the package need to be made manually





## Other Features

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- Reference electronic or paper Logbook items
- Reference Resources Expected
- Reference Resources Used
- Part Number Replacement Details
- Reference “Users” (maintenance tech, inspectors, planners, etc.)
- Asset Details
  - Aircraft serial number, tail number, hours, cycles data)
  - Other asset details (engines, APUs, Landing Gears, etc.)
- Unique Reference ID's



# Other Features

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- Feedback requested
  - Measurements, tests performed or test results, etc.
- Fully developed Findings structure to support reliability analysis
  - Enumerated details
  - Detailed Structural Location details
  - Detailed description of findings (sizes, corrosion types, etc.)
- Signoffs requested (task vs. step signoff / inspection signoff's, etc.)
- Digital Signatures / Signature Statements
- Release to Service



# Proof of Concept (POC)

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- Initial Work Package with 8 Work Orders of different types
- Some with findings which required approval
- Extra requirements added by Operator, causing:
- Request by MRO to remove other Work Orders to make time
- Closeout of Logbook items
- Deferrals
- Interim Status Report
- Final status report



# POC (Continued)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
<b>Top Level IDs</b>																		
Work Package	ID_WP1															<b>Status</b>		
Aircraft	ID_ANZ_AC1							<b>Committed</b>		<b>Completed</b>		<b>Cancelled/Rejected</b>		<b>Deferred</b>		<b>Findings?</b>		
<b>WO</b>	<b>Task</b>	<b>Step</b>	<b>MLR (Resources)</b>	<b>Description</b>	<b>Example Includes</b>	<b>Seq</b>	<b>Date</b>	<b>Seq</b>	<b>Date</b>	<b>Seq</b>	<b>Date</b>	<b>Seq</b>	<b>Date</b>	<b>Seq</b>	<b>Find WO</b>	<b>Date</b>	<b>Seq</b>	
		ID_TASK6_STEP2																
ID_WO11				Add plexiglass face cover to attendant seats		Seq2	2017-05-10						Seq5d	2017-05-10				
	ID_TASK5			Remove														
		ID_TASK5_STEP1																
		ID_TASK5_STEP2																
	ID_TASK6			Install														
		ID_TASK6_STEP1																
		ID_TASK6_STEP2																
ID_WO12				Replace some cabin windows		Seq3	2017-05-11					Seq3a	2017-05-11					
ID_FWO4				Corrosion on incorrectly installed seat belt.	Not in scope of a normal task, so found while performing not included.	Seq11a	2017-05-25	Seq13	2017-05-25									
ID_FWO5				Corrosion on incorrectly installed seat belt.	same as above	Seq11a	2017-05-25	Seq13	2017-05-25									



# POC (Continued)

```
</mewg:MessageHeader>
<mewg:WorkPackageTransactions>
  <mewg:AddFinding timeStamp="2017-05-15T10:00:00Z">
    <mewg:ID source="MROIT">ID_TR8_AddFinding_FW01</mewg:ID>
    <mewg:AssetID source="ANZSAP">ID_ANZ_AC1</mewg:AssetID>
    <mewg:ApprovalRequested>false</mewg:ApprovalRequested>
    <mewg:WorkPackageID source="ANZSAP">ID_WP1</mewg:WorkPackageID>
    <mewg:Finding>
      <mewg:WorkOrder originDateTime="2017-05-15T10:00:00Z">
        <mewg:ID>ID_FW01</mewg:ID>
        <mewg:WorkOrderHeader>
          <mewg:ATA_Num>517811</mewg:ATA_Num>
        </mewg:WorkOrderHeader>
        <mewg:WorkOrderStatus>Open</mewg:WorkOrderStatus>
        <mewg:RoutineOrNonRoutineIndicator>NonRoutine</mewg:RoutineOrNonRoutineIndicator>
        <mewg:TypeOfWorkOrder>Finding</mewg:TypeOfWorkOrder>
        <mewg:FoundWhilePerforming>
          <mewg:WorkOrderRef>ID_W07</mewg:WorkOrderRef>
        </mewg:FoundWhilePerforming>
        <mewg:Finding>
          <mewg:FindingsDescription>FOUND OIL STAINS ON SEVERAL THERMAL BLANKETS ON 2R T/R REV
mewg:FindingsDescription>
          <mewg:FindingsTypeCode>DT</mewg:FindingsTypeCode>
          <mewg:InWorkScope>>true</mewg:InWorkScope>

```

Grid Schema WSDL XBRL Authentic Browser  
orkPackage.xsd Seq8a\_WorkActionCompletion\_W07andFW01.xml Seq8\_AddFindingFW01FromW07.xml



## Note on eLogbook

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- Allows detailed recording of all maintenance faults / logs by flight crew (or cabin crew)
- Identifies closing actions by maintenance personnel
- Full structure to handle deferrals / MELs and deferral time limits
- Reference to individual flights with flight details
- Optional service log & fuel log (structured recording of service and fuel details)
- Electronic signatures and release to service



# Next Steps

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- Task Sub-team to hold workshop to develop a “fully executable” digital task structure
  - Reuse task data from OEM / Operator in S1000D format
  - Add resources expected, resources used
  - Add measurements
  - Add findings, actions taken
  - Detailed signatures of tasks, steps, inspections
  - Allows record to be fully digital and be the “Clean Fingerprint”





# Summary

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- Fully tagged XML Work Package Transaction process
- Big opportunity to improve turnaround / reduce administrative time
- Opportunity to better track status of maintenance
- Easier to maintain records, and pull data back into system for:
  - Reliability analysis
  - Update of maintenance program with updated counters
  - Facilitated record keeping
  - Easier support for distributed ledger transactions



# Questions

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