



# Fully Digital Maintenance – Dream or Reality

Ken Jones, October 2025



# The problem

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



**KLM AIRCRAFT MAINTENANCE LOG PAGE**

Flight no: 449  
A/C Reg: AMS  
A/C Type: A332  
Subject: EQUIPM. / FURN.

Also REF to DDL M981. IFE SWS RESET. HIL HELP.  
ITEM TRF To AMS IAW MEL 25-70-70-01 B)  
CAT D. FOUND ALL D3E85 X WIRED 100025  
EN ROUTE DEFERRED DEFECT  
Name: [Redacted] Date: 102110  
Auth. no. [Redacted]

Remote Control for IFE  
ST 22 A controls ST 22B  
VICE VERSA  
Also R/C ST 16 F  
IFE ST 16G and vice  
VERSA

OVERDUE

ETOPS NEI/201150  
Relief MEL Chapter 110 no.  
25-70-70-01 B)  
On call  
E1 E2 E3 E4 APU  
Name: [Redacted] Date: 102110  
Auth. no. [Redacted]

- 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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- Does airline allow third party MRO personnel access to airline system?
  - Managing passwords, personnel, access. More likely for line maintenance than heavy maintenance. But even outsourced line maintenance can be a challenge.
- For heavy maintenance, PDFs, Excel or similar are lowest common denominator
  - Excel spreadsheet with Work Orders referencing “Paper task cards” (PDFs) which must get printed and signed off.
- Returned records as signed off task cards, work orders, etc. converted to PDF, with some kind of tally sheet.
- Operator then enters accomplishment information into their M&E IT system to reset maintenance counters, etc. Sends findings to reliability group.

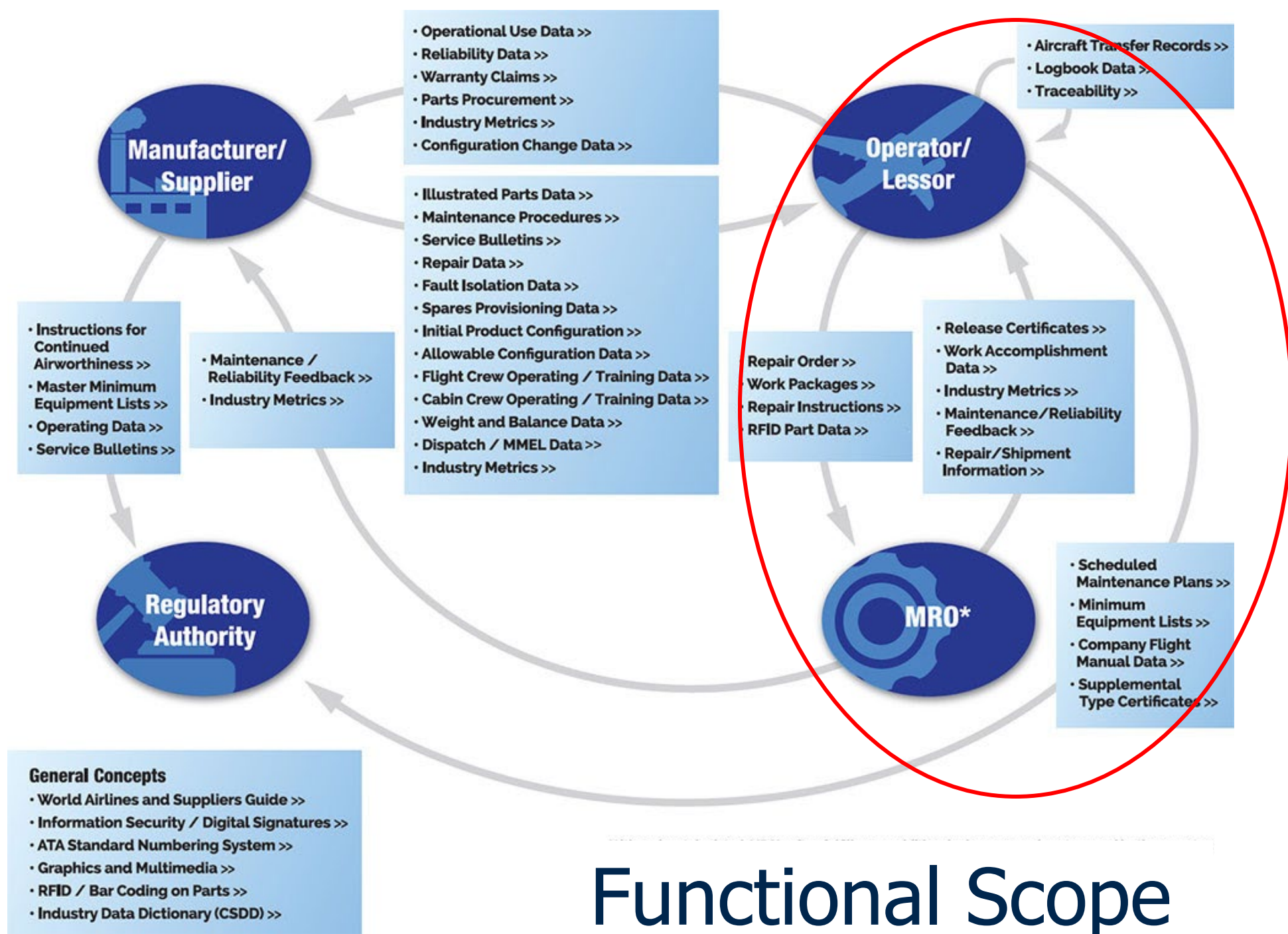




# What we are are trying to do

- Facilitate end-to-end digital maintenance & subsequent electronic records
- Allow each entity to “**use their own system**” rather than force use of a specific proprietary solution.
- Collect information electronically to allow better intelligence & reliability analysis
- More quickly identify issues to modify maintenance program intervals
- Facilitate digital sign-offs





# Functional Scope







# Definitions

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## ■ Work Order (WO)

- Defines work to be accomplished. Contains one or more task representing a logical group of instructions for maintenance. WO defines “what”, Task defines “how”.

## ■ Task

- A collection of assignable (to a mechanic/technician) & tracked work steps.. May be OEM, Operator or MRO authored. Can also include individual steps that need to be signed off.

## ■ Work Package

- An “executable” grouping of work orders with referenced and/or “contained” tasks (task cards) comprising a single check. May also include other sources of work requirements such as modifications, AD’s, SB’s, open Logbook items

## ■ Work Scope

- A set of regulatory approved maintenance requirements from an operator AMP but can also include non-AMP items, grouped for the purpose of estimating, quotation, etc.



# Definitions

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## ■ Maintenance Log

- “Defect”, “squawk”, technical fault, or airworthiness issue, typically identified by flight crew (or sometimes cabin crew), which is described and must be addressed by maintenance.

## ■ Maintenance Action

- One or more actions to rectify or defer the maintenance log.

## ■ Maintenance Release

- A release by maintenance indicating that an aircraft is airworthy and ready to fly.

## ■ Flight Log

- A set of data identifying details of an individual flight such as scheduled times, locations, actual OOOI times, purpose of flight, any irregularities, et.c





# The Spec 2000 Electronic Logbook

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- Spec 2000 Chapter 17 - e-Logbook
- An XML Data Model for business content
  - Flight Log
  - Maintenance Log, Full support for MEL's, Deferrals
  - Maintenance Action / Part Replacement / Task
  - Fuel Log / Service Log
  - Maintenance Release
  - Maintenance Log Resource
- A set of XML messages for exchanging Logbook Data with Maintenance Systems



# The Spec 2000 Electronic Logbook

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- Focus on Common Language
  - Definitions, field descriptions
  - XML standard (non-proprietary) with cryptographic time stamps
  - Common language to support Spec 2000 Chapter 11 Reliability Data exchange and Spec 2000 Chapter 18 Work Package
- Software system providers focus on presentation, UI, features, but core data definitions facilitates data exchange between systems
- Specification identifies typical use cases and what fields and “records” should be used.
- Airlines should expect their suppliers to implement & should include standards compliance in any RFPs/RFQs



# The Spec 2000 Electronic Work Package

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- Spec 2000 Work Package – Chapter 18
- 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, carry over “non-routines”
  - “One Offs” (A.D.’s, S.B’s, etc which aren’t yet part of the maintenance program)
  - Modifications





# Transactions Supported

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- 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 (WO's)
- Work Action Completions
- Substitute Work Orders
- Status Report
- Release to Service





## Other Features

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- Reference electronic or paper Logbook items / Full interoperability with Spec 2000 Electronic Logbook standard
- 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)

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</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:WorkOrder>
    </mewg:Finding>
    <mewg:FindingsDescription>FOUND OIL STAINS ON SEVERAL THERMAL BLANKETS ON 2R T/R REV
  </mewg:AddFinding>
</mewg:WorkPackageTransactions>
</mewg:MessageHeader>
```





# Next Steps

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- Task Sub-team to hold workshop to develop a “fully executable” digital task structure 2026? ([Need your participation!](#))
  - 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”



# RFID – another e-Maintenance option

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- Spec 2000 RFID facilitates new use cases, particularly in line maintenance
  - life vest presence checks
  - expiry date checks of various emergency equipment
  - Ability to check data on a limited number of embedded time controlled parts (e.g. emergency slide assemblies)
- Both RFID and bar-coding improve accuracy and increase speed of reading of part number and serial number for nearly all maintenance actions



# Summary

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- Fully tagged XML e-Logbook standard
- Fully tagged XML Work Package Transaction standard
- 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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