Aviation RFID in Perspective
A little of the past, a lot of the future

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Industry Credentials

• 17 years at United Airlines TechOps
• 20 years consulting in aviation
• Primary architect and author of ATA Spec2000 Chapter 9 standards
  – Barcode part marking
  – RFID part marking
  – Cradle-to-Grave Traceability
  – Barcode/RFID shipping label standard
What Problem is Aviation Solving?

1. Data is being entered by hand poorly, and then stored in databases forever – bad decisions continue to be made for years based on that data.

2. We need more data but it is too hard to collect, so we do without it (or someone makes an ‘analytical guess’).

3. Our data lasts for decades due to safety and regulatory requirements – because our airplanes do!

Good data is like having lots of clean water – if you have it, you can make coffee, tea, lemonade or drink it straight! And we need that with aviation data.
Aviation’s Solution?

- **Automatic data collection** — RFID and/or barcodes
  - Must keep fat fingers, poor eyesight, and poor writing out of the data process

- **Use intelligent data for entering into our systems**

- **Use Transparent Data Collection®**
  - Gather data at the source in digital form and transmit it in digital form so it doesn’t get changed
Why Use RFID/Barcode?

To Avoid Errors!

Errors follow the Iceberg Principle

If this is what you’re seeing ...

This is what you’re not seeing! (and these errors will hurt you!)
Ever seen characters like this?

What’s your interpretation?

Is this a problem in your company?
A little History…

- 15 years ago aviation couldn’t presume network connectivity from anywhere
  - We need to fix airplanes out on the tarmac, or in huge hangars, and everywhere around the world – not exactly a controlled environment…
  - WiFi standards were just solidifying but not available in airplane locations
  - 3G cellular was not ubiquitous
  - We couldn’t read a generic RFID tag, connect to a database and understand what the part is we’re holding in our hand – we needed data on the part itself
  - The process had to work anywhere around the world because we all need the same Birth Record data on the part.

- This RFID system design still gives us the freedom and flexibility to do our job wherever it needs to be done.
How does Aviation do it better?

• We give every part a social security number (SSN)
  – Really, only the important serialized parts (OEM does)
  – But concept can be applied to every part you want to track, whether the OEM has tagged it or not

• The SSN provides a cradle-to-grave ID for that item so that every one in the supply chain calls it the same thing. This Traceability aspect is key in our industry.
SSN for Parts

Your company’s unique CAGE Code

+ Your unique Serial Number for the part

Example: CAGE: 3RVP8   Serial #: ABC123-1
SSN: 3RVP8ABC123-1

This is the part’s identity cradle-to-grave
And the same method the DoD uses in IUID
Intelligent Data

What’s this Number?

263265930

Part Number?
Serial Number?
Employee Number?
Location?
Order Number?
SSN without the dashes?

Does the computer know? How??

This is a NAKED number with no intelligence whatsoever!
Spec2000 uses Intelligent Data

Example of an Intelligent Number – same whether barcode or RFID

Spec2000 Serial Number showing the Text Element Identifier (TEI)

<--- SER | space | 263265930

TEI
4 characters

Serial Number
1→30 characters

Simple, plain text, WYSIWYG, easy for people - easy for computers

= XML data
Birth Record Data

• Spec2000 defines Birth Record data:
  – CAGE Code (CAG or MFR or SPL)
  – Unique Serial # (SER)
  – Original Part # (PNO)
  – Date of Mfgr (DMF)

Key data that every participant across supply chain wants to know
Beyond Birth Record data

• In aviation, also need to know the **Current Part #** (PNR) which is always needed to install or repair a part

• Using RFID, this data is found in the memory beyond the Birth Record data in either a single or dual record tag

• The Spec2000 standard allows lots of flexibility to add additional data your business thinks is important.

• Spec2000 mandates a minimum amount of key data, but allows much more.
Spec2000 RFID User Memory Standards

RFID tag structure – EPC standards-based (not proprietary)

EPC Class 1 Gen2 = ISO 18000-6c

Aviation also uses

User Memory

Tag ID

EPC / UII
Unique Item Identifier

Reserved

SSN

Low-mem Tag
(e.g., 512 to 2000 bits)

MFR
SER
PNO
DMF

Birth Record Data

Additional data here
Spec2000 RFID User Memory Standards

15 years ago this seemed like a good idea.... Too complicated!

Standard:
EPC Class 1 Gen2
= ISO 18000-6c

User Memory

Tag ID

EPC / UII
Unique Item Identifier

Reserved

Low-mem Tag
e.g., 512-bit
MFR
SER
PNO
EXP

ToC Header Area

Part History3
Part History2
Part History1
Birth Record
Current Data
Comments

Write’n’Lock Area

Rewritable Area

High-mem Tag
e.g., 4 KB → 64 KB

MFR + SER=SSN

No-mem Tag
e.g., 96-bit

15 years ago this seemed like a good idea.... Too complicated!
Aviation RFID Solutions

On-Aircraft

New Parts
(typically OEMs)
- Low-Memory tags
  - Life Vest
  - Oxygen Generator
  - Portable Oxygen
  - Medical Kits
  - Any Life Limited item

Legacy Parts
(typically airlines)
- Low-Memory tags

On-Ground

- Tool Tracking
- Wheels
- Galley Carts
- Parts Tracking
- Inventory Tracking
- Cargo
- Baggage
- Other
On-Aircraft Solutions

- Adult Life Vests
- Infant Life Vests
- Crew Life Vests
- Oxygen Generators
- Crash Axe
- Wheelchair
- Wheelchair storage strap
- Seatbelt Extension
- Portable Oxygen Bottles
- Supplemental Oxygen Bottle
- Halon Fire Extinguisher
- Water Fire Extinguisher
- Radio Beacon / Emergency Locator Transmitters (ELTs)
- Medical kits
- First Aid Kit
- Automated external defibrillators (AEDs)
- Enhanced Emergency Medical Kit (EEMKs)
- Flashlights
- Megaphone
- Polar Gear
- Slide/Raft Inflation Assembly
- Portable Breathing Equipment / Smoke Hood (PBEs)
- Equipment Furnishing Manual
- Demo Equipment Pouch
- Baby Bassinet
- Slide/Raft Assembly
- Slide/Raft Lighting System Battery
- Survival Kit
- EPAS Battery
- Smoke Detector Battery
- Required Paperwork
- Tamper Seals on Vest Containers
- Tamper Seals on Lav Components
- Tamper Seals on Secure Panels
- Tamper Seals on Galley Carts
- Galley Carts
- Seat Covers (cleaning cycle count)
- Anything else you need to track
On-Ground Solutions

Tool Check-out/Check-in
Calibrated Tool Tracking/Prevent Check-out
Mechanic Clock-in/Clock-out
Wheel Tracking/Consumption
Flame Cabinet Chemicals
Stockroom Life Limited Parts
Stockroom Inventory
Stockroom Check-out
Transfer to other Stockroom
Expense Bin Automated Refurbishment
FIFO Tracking
Geiger counter mode to find parts

Seat Cover Cleaning Cycle tracking
Rebuild of Slides/Raft and Subcomponents
Galley Cart Tracking
ULD Tracking
Cargo Tracking
GSE Tracking / Location
Vehicle Tracking / Location
Parking Lot Access
Security Gate Access
Employee Access to Buildings or Specific Rooms
Delivery Tracking – Receiving to Delivery Point
WIP Tracking – Work in Process
Just about anything else you want to track...
Aviation RFID Providers

- Aerospace Software Developments
- EAM
- Brady
- Tego

Note: Not all providers offer a full suite of on-aircraft and on-ground solutions
How good is the technology?

B767-300 installed life vest check – cockpit, F/A seats, First, Economy, Spares

254 installed vests in 35 seconds! All present and none going to expire.
Benefits

• From previous slide: speed, labor savings, data accuracy
• Accurate forecasting of material needs
• Material cost savings are significant also:

Oxygen Generator, 15 year Lifetime

>15% ON SHELF

70% useful life ON AIRCRAFT

>15% REPLACE

With RFID data, we can stretch the green time to more than 90%
Spec2000 is continuing to Evolve

• Airlines and suppliers are developing new application and uses for RFID data, like
  – ELP (Embedded Life Parts) – allows OEMs and Airlines to track and replace subcomponent parts embedded in a slide/raft without removing the slide from the plane
    • BIG savings in time, cost and safety not having to de-install a slide
  – RFID shipping labels from OEM to Airline
    • Find that one box you are looking for to address the AOG
  – New filter bits so the readers can find the parts they want faster
  – Location Tags to define fixed locations like an aircraft or a delivery drop point

• And we are still hoping for the DoD to get interested in RFID Part Marking!
  – Got any ideas?
Connect with me for any questions:

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And thanks for your time!
THANK YOU