Disruption for MRO in Aviation Industry

Dr. Albert Tan
Agenda

• Spending of Maintenance and Repair Operations (MRO) for Aviation industry
• Technology Disruption for Aviation
• Introduction to Blockchain
• How can Blockchain improves MRO process for Aviation industry?
• Barriers in adopting Blockchain
Technology Disruption for the Aviation Industry

Blockchain
• MRO for tracking spare parts
• Airway bills and related documentation

Artificial Intelligence and Big Data
• Route planning
• Revenue management

Internet of Things
• Monitoring of components in the aircraft
• Boarding pass and cargo tracking
Global MRO spend in 2016 was valued at $67.6B, excluding overhead. This represented around 9.5% of airlines operational costs.

Engine and components remain the highest cost segments with respectively 39% and 22% of maintenance costs.

Source: IATA Report, 2016
Current Process for Aircraft Spare Parts management

- Repair services
- Customer services
- Component control
- Maintenance, Repair and Overhaul provider
- Logistics
- Aircraft operator

Maintenance location decision

Commercial charging decision

Dispatch notification of serviceable component

Replenishment order

Record component in ERP

Record component in ERP

Multiple systems and databases

Notification to MRO provider
What is Blockchain?

Blockchain is a system comprised of..

• Transactions
• Immutable ledgers
• Decentralized peers
• Encryption processes
• Consensus mechanisms
• Optional Smart Contracts
Transactions

- As with enterprise transactions today, Blockchain is a historical archive of decisions and actions taken.
- Proof of history, provides provenance.

<table>
<thead>
<tr>
<th>Notable transaction use cases</th>
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<tbody>
<tr>
<td>Land registration – Replacing requirements for research of Deeds (Sweden Land Registration)</td>
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<tr>
<td>Personal Identification – Replacement of Birth/Death certificates, Driver’s Licenses, Social Security Cards (Estonia)</td>
</tr>
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<td>Transportation – Bills of Lading, tracking, Certificates of Origin, International Forms (Maersk/IBM)</td>
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<td>Banking – Document storage, increased back office efficiencies (UBS, Russia’s Sberbank)</td>
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<tr>
<td>Manufacturing – Cradle to grave documentation for any assembly or sub assembly</td>
</tr>
<tr>
<td>Food distribution – Providing location, lot, harvest date Supermarkets can pin point problematic food (Walmart)</td>
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<td>Audits – Due to the decentralized and immutable nature of Blockchain, audits will fundamentally change.</td>
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Immutable

• As with existing databases, Blockchain retains data via transactions

• The difference is that once written to the chain, the blocks can be changed, but it is extremely difficult to do so. Requiring rework on all subsequent blocks and consensus of each.

• The transaction is, immutable, or un-editable

• In DBA terms, Blockchains are Write and Read only

• Like a ledger written in ink, an error would be be be resolved with another entry
Decentralized Peers

• Rather than the centralized “Hub and Spoke” type of network, Blockchain is a decentralized peer to peer network. Where each NODE has a copy of the ledger.

Legacy Network
Centralized DB

Blockchain Network
Distributed Ledgers
Encryption

• Standard encryption practices
• All blocks are encrypted
• Some Blockchains are public, some are private
  • Public Blockchains are still encrypted, but are viewable to the public, e.g. https://www.blocktrail.com/BTC
  • Private Blockchains employ user rights for visibility, e.g.
    • Customer – Writes and views all data
    • Auditors – View all transactions
    • Supplier A – Writes and views Partner A data
    • Supplier B – Writes and views Partner B data
Consensus

- Ensures that the next block in a blockchain is the one and only version of the truth
- Many Consensus mechanisms, each with pros and cons

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<thead>
<tr>
<th>Consensus Mechanism</th>
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<tr>
<td>Proof of Work</td>
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<tr>
<td>Proof of State</td>
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<tr>
<td>Proof of Elapsed Time</td>
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<tr>
<td>Proof of Activity</td>
</tr>
<tr>
<td>Proof of Burn</td>
</tr>
<tr>
<td>Proof of Capacity</td>
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<tr>
<td>Proof of Importance</td>
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<tr>
<td>And others....</td>
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</tbody>
</table>
Smart Contracts

- Computer code
- Provides business logic layer prior to block submission

<table>
<thead>
<tr>
<th>Blockchain</th>
<th>Smart Contracts?</th>
<th>Language</th>
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<tbody>
<tr>
<td>Bitcoin</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Ethereum</td>
<td>Yes</td>
<td>Solidity</td>
</tr>
<tr>
<td>Hyperledger</td>
<td>Yes</td>
<td>Various</td>
</tr>
<tr>
<td>Others</td>
<td>Depends</td>
<td>Depends</td>
</tr>
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Ethereum supports Solidity, while Hyperledger supports various languages including GoLang, C++, etc., depending on the implementation.
A Blockchain aircraft spare part ecosystem
Future Process for Aircraft Spare Parts management using Blockchain
How can Smart Contract works in Logistics?

1. Supply chain contract and its conditions written as code into a blockchain

2. Contract is part of the blockchain and distributed across the network

3. Contracted parties perform contract obligations

4. Contract executes itself the moment conditions are met

Source: DHL
Future usage of Blockchain in Aviation Industry

Blockchain For Aviation
8 POSSIBLE USE CASES

- Maintenance Transperency
- Streamlining Digital Travel Systems
- Flight Records Systems Security
- Reducing Overbooking
- Airline Alliance Revenue Sharing
- Streamlined Frequent Flyer Programs
- Multi-Tier Oversight
- Tokenized Ticketing
Steps to Implement Blockchain

1. STRATEGY
Set the vision for how blockchain can support the business challenges or opportunities.

2. DEVELOP & PLAN
Define the specific business areas for blockchain value. Develop the plan to execute PoC(s) on high value areas and opportunities.

3. PROOF OF CONCEPT
Controlled learning of blockchain technology with focus on a select use case. Incorporate learnings from PoC phase into pilot.

4. PILOT
Continued learning on the blockchain-based use case. Complete high level assessment, blueprint and roadmap to transition.

5. SCALE
End-to-end implementation of a blockchain-based solution for targeted business challenges, aligned to strategy.

6. EXPAND & MANAGE
Expand the platform to additional business units and deploy ongoing improvements.

Source: Accenture Consulting
Summary

• Technologies are disrupting the Aviation industry
• Blockchain is a potential solution for solving challenges faced in the Aviation industry
• We need more standardizations of data and processes to increase adoptions for cargo tracking and safety of passengers
Questions and Answers

Dr. Albert Tan
albtan@mit.edu