The aerospace supply chain is a complex and global network of manufacturers, suppliers, distributors, regulators and customers. Image: Honeywell

Giving it currency

Supply chain challenges have never been greater for the industry, but for operators and MROs, blockchain is a technology with vast problem solving potential, as Gerrard Cowan discovers.

Supply chain security is crucial for low-fare carriers and the wider aviation sector, with implications for safety, reputation, financial well-being and sustainability.

The challenges have never been greater, but emerging technologies could offer a key advantage. For some industry players, blockchain holds particular potential.

Blockchain is best known for its use in cryptocurrencies such as Bitcoin, though experts see a wide range of applications beyond money.

It is designed to function as a decentralised and secure method of keeping, encrypting and sharing digital records of transactions, with authorised participants maintaining copies of a "ledger" that they validate and to which they can add new entries.

The "blocks" record transactions between users, and cannot be altered by unauthorised parties, giving the technology particular security advantages. As a result, there have been numerous efforts to incorporate the benefits of the technology into aviation within the low-fare sector.

For example, when JetBlue and Shell Aviation last year announced a deal to bring a supply of sustainable aviation fuel (SAF) into Los Angeles Airport, they said they would also support corporate customers through their work with Avelia – a blockchain-powered book-and-claim system that provides users with fully traceable environmental attributes of SAF.

PLAYING THEIR PART

How could blockchain help bolster supply chains? André Fischer is CEO of flydocs, an asset management solution provider within the aviation industry that is working on blockchain in a variety of ways.

Blockchain has particular applications in parts traceability, says Fischer, providing a capability to establish the authenticity and provenance of aircraft parts.

He notes that there are obvious and significant potential benefits in asset management, minimising the highest single risk to the organisation's balance sheet.

"Each part can be assigned a unique identifier that is recorded on a blockchain," Fischer tells *LARA*. "This way, maintenance traders, airlines, and regulators can easily verify the authenticity of a part by checking its history on the blockchain, reducing the risk of using counterfeit or suspect (bogus) parts whilst also providing full traceability, enabling users to completely streamline the 'back to birth' history process."

The technology is continually evolving, with its application in various industries – including aviation – quickly progressing.

"Throughout the aerospace supply chain, similar challenges exist," says Fischer. "Where there is a genuine need to securely maintain, share and often transfer a large number of records, ranging from compliance needs to the sale of an asset. Therefore, the need to verify and validate those records is important."

The aim for flydocs is to create value from aircraft maintenance data, through component and life cycle asset management and beyond.

As a subsidiary of Lufthansa Technik, the company has explored the benefits of blockchain in aviation since 2018 and is a founding member of the SITA-managed MRO Blockchain Alliance, whose members include Ramco Systems, Cathay Pacific, Willis Lease Finance Corporation and more.

Fischer says flydocs is currently working through the alliance on a partnership that will aim to utilise blockchain to provide seamless and secure proof of the life journey of aircraft parts.

This will lead to the development of a "digital passport", he says, capable of enabling a trusted and secure way of proving and maintaining the authenticity of aircraft parts.

At the time of going to press, live trials were ready to begin early in 2024.

"This will enable the very first blockchain token for components and empower asset owners and traders with the ability to provide proof of authenticity simply and securely," says Fischer.

Low-fare airlines and the wider aviation industry would benefit from such a digital passport, he argues, because it would empower users with the ability to easily and securely buy or trade parts.

"This may also solve a significant challenge faced in the industry today, in which providing a 'back to birth' [history] for a part is an absolute must, but is currently an arduous task due to the sheer amount of paperwork and auditing/verifying that comes with it."

INFORMATION ECONOMY

Major manufacturers of aircraft parts and components have embraced blockchain.

Honeywell has used the technology for several years, working to digitise aircraft records and detail the pedigree of parts.

The company integrates aircraft record generation with its digital blockchain ledger, which means customers can search and retrieve scattered data through a simple user interface, according to the company.

This decentralised database can be

Honeywell initiated its blockchain application to trace the lineage of aircraft parts. Above, company mechanics at work. Image: Honeywell

accessed by users in real time, with all users holding a copy of the database.

Vidhyashankaran Iyer, Vice President and General Manager of Honeywell Aerospace Trading, tells *LARA* the aerospace supply chain is a complex and global network of manufacturers, suppliers, distributors, regulators and customers, who need to exchange information and co-ordinate actions in a timely and efficient manner.

He says: "However, the current system is often plagued by issues such as lack of visibility, traceability, and trust, as well as vulnerability to fraud, cyberattacks, and human errors. Blockchain technology has the potential to address these challenges by providing a shared and immutable ledger of transactions, events and documents that can be accessed and verified by all the stakeholders in the supply chain."

Iyer contends that blockchain technology could help low-fare carriers reduce maintenance costs, increase aircraft availability and minimise errors in tracking parts.

"Most of the use cases being discussed involve better tracking – back to birth records tracking – and identification of parts which ultimately removes data-related delays and buffer stock in the supply chain," he says.

Iyer tells *LARA* that Honeywell initiated its blockchain application to trace the lineage of aircraft parts, with the goal of streamlining

operations in the multi-billion-dollar market for used, serviceable aircraft parts.

In this sector, buyers are required to meticulously track the history of used aeroplane parts to ensure compliance with the airline or operator's quality standards.

The conventional process involves scrutinising paper documents and following up with sellers for any missing information, which can lead to inefficiencies and increased expenses.

Iyer says: "Honeywell's piloted ledger systematically records each manufacturing, repair, ownership transfer, and end-of-life event on the blockchain, presenting users with an easily navigable interface. We are working with industry partners to evaluate business models and technology to scale this further."

As well as the traceability and security advantages of blockchain, Iyer emphasises the potential boost to collaboration among various actors in the supply chain for low-fare carriers and aviation more widely, through providing a common and transparent platform for information-sharing and decision-making.

"Blockchain technology can also enable the creation of digital identities and reputations for the participants, based on their performance, quality, and reliability," he says. "This can incentivise the participants to adhere to the best ⟫⟫

practices and standards, and reward them for their contributions to the supply chain."

The benefits of blockchain are universal according to Saravanan Rajarajan, Director – Aviation Solution Consulting at Ramco Systems.

However, he says the technology is well suited to low-fare and regional airlines, as well as the wider aviation context, owing to its capability in "tracking parts from inception till scrapping and maintaining shared information on aircraft airworthiness, including maintenance and certifications".

Rajarajan also highlights the potential financial advantages, noting that blockchain "helps reduce the cost of tracking parts and the cost incidence of scrapping [parts] due to missing records".

Rajarajan says that through the MRO Blockchain Alliance, Ramco Systems is working on a proof of concept to demonstrate the use of blockchain to digitally track and record the movements and maintenance history of parts "across airlines, lessors, original equipment manufacturers (OEMs) such as engine producers, logistics suppliers, and maintenance providers".

However, there are challenges to overcome. Rajarajan points to "standardisation challenges", for instance.

He adds that for blockchain to yield real benefits, it needs a "network effect" driven by information sharing across users.

Currently, siloed blockchain networks limit this potential impact.

"Another limiting factor is whether the blockchain includes all the supply chain players such as the MROs, Tier 2 and 3 suppliers, etc," says Rajarajan.

"There is a challenge in defining the standards for the industry to adopt."

For André Fischer of flydocs, the biggest challenge confronting the increased adoption of blockchain in the aviation domain is the change management demanded in adopting the technology.

However, he points to similar challenges in the past that have been overcome – such as the move from paper records to digital.

"Those early adopters utilising blockchain technology like the 'digital passport' will be at the forefront of change and will see early benefits, but as the industry in general widens the adoption, those benefits will hugely increase."

Fischer warns that another challenge posed by blockchain is the risk of access monopolisation.

Future access to blockchain-secured data and records must be almost guaranteed, he says.

This is why flydocs has teamed up with SITA, an organisation that is largely controlled by major industry stakeholders.

VALUE ADDED

Craig Gottlieb, a managing director in Accenture's aerospace and defence industry practice, also highlights the need for network effects, noting that the value of blockchain increases with the number of participants in the chain.

"Across aviation, this would mean operators, OEMs and MROs aligning to participate in one or more ecosystems of assets and data, instantiated in a blockchain for traceability and reference," he says.

The two main challenges to overcome, then, are ensuring "the business initiative to participate", along with the maturity of the

industry's collective digital core.

"Even if fully 'unleashed' in aviation, blockchain is no panacea," Gottlieb says. "Any value that it creates will be predicated upon the desire to participate in blockchain-powered ecosystems, the ability to easily digitise and communicate operational and configuration data, and the ability to drive analytics off of the insights that blockchain can provide."

However, Gottlieb thinks there are very good use cases for blockchain around managing used serviceable material and other areas of the spare parts market.

"Going forward, new programmes can take advantage of blockchains to create initial digital records for both software and hardware to reduce the burden of ongoing configuration management and certification in a more software-defined future."

Iyer also highlights challenges around scalability, as well as regulatory challenges.

"Ensuring that blockchain solutions comply with regulations and standards is critical," he says.

Finally, he points to the need to ensure that blockchain is integrated with existing enterprise resource planning (ERP) supply chain systems, a process that can be complex and resource intensive.

"All of these are solvable," Iyer says. "As industry participants see value in use cases, investment will follow. Iteration will reduce the cost of adoption as standard business models and technologies emerge." ∎

Blockchain is well suited to low-fare and regional airlines, according to Saravanan Rajarajan, Director – Aviation Solution Consulting at Ramco Systems.
Image: Ramco Systems

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André Fischer, CEO, flydocs