EASA

European Union Aviation Safety Agency

VIRTUA Project - Blockchain for airworthiness in aviation

Developing Solutions and Strategies for Integrating Blockchain in Airworthiness Management

January 2024

Funded by the European Union

* This project is funded by Horizon Europe

Workshop Speakers

Iñigo ARSUAGA
FPT SOFTWARE
Digital Transformation & Aviation
inigoae@fpt.com

Mayeul DUPUY
PwC France
Blockchain Expert
mayeul.dupuy@pwc.com

Attendants

Airworthiness and Maintenance Specialists | Aviation Executives and decision-makers
Regulatory and Compliance Officers | Lessors | Aviation Blockchain Developers

Workshop guidelines

Video recording & Transcript

The event is going to be recorded in video.
It will be available in the future through the EASA website.

The attendees will be kept anonymous unless they participate on the Q&A section.

Polls

During the workshop, some polls will be shared to you.

They will appear directly on your screen, and can also be seen in the « Polls » tab.

We invite you to respond to them to share your opinion and expertise.

Questions & answers

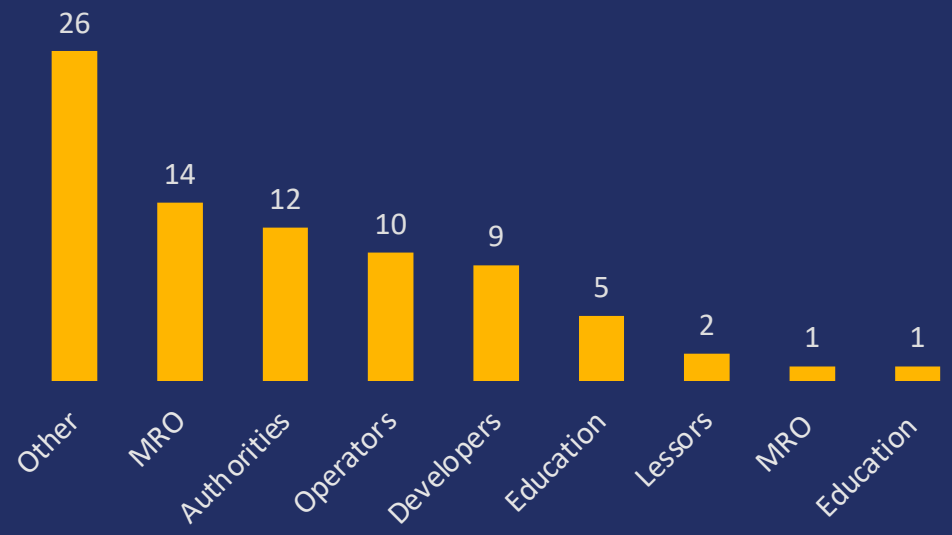
You can ask your questions directly in the « Q&A » tab of Teams.

We will do our best to respond orally or in writing.

You can also respond to other participants.

Poll #1:

Which Stakeholder group are you representing today?



VIRTUA project scope

- Use of the blockchain technologies for the management of aircraft parts throughout their lifecycle
- Some challenges we see today:
  - Parts traceability
  - SUPs and fraudulent certificates/EASA F1s
- What do we expect from this project:
  - Assessment of benefits and constrains using the blockchain technology
  - Recommendations for changes to be introduced in regulations, standards and working processes

More information:

EASA

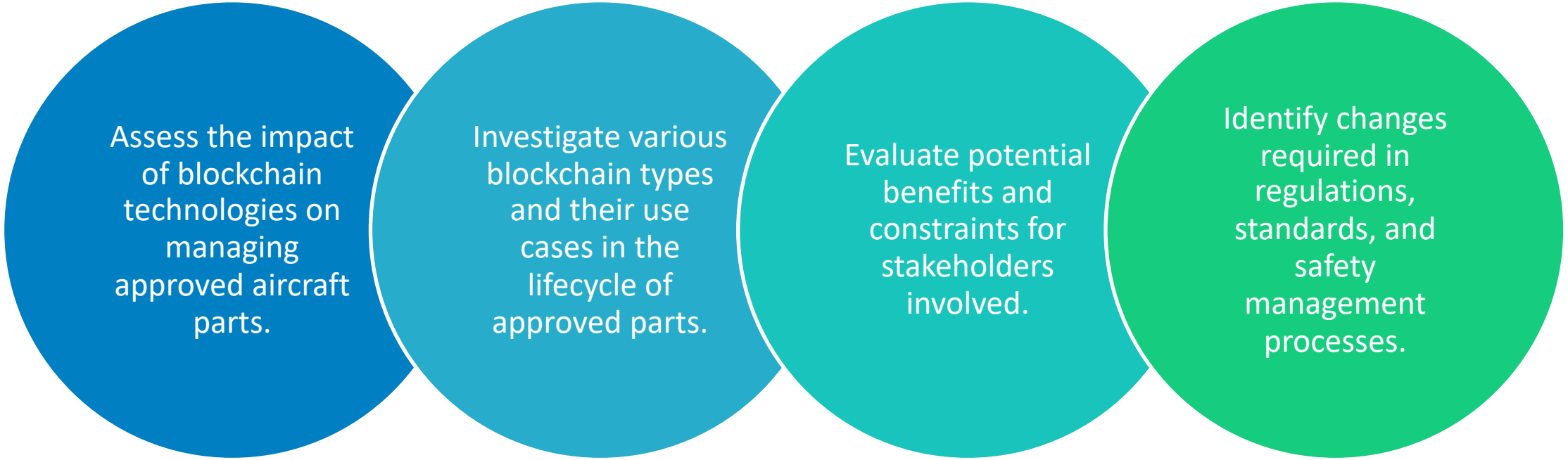
https://www.easa.europa.eu/en/research-projects/virtua-digital-transformation-case-studies-aviation-safety-standards

LinkedIn group

Blockchain for aircraft parts - Horizons Europe EASA

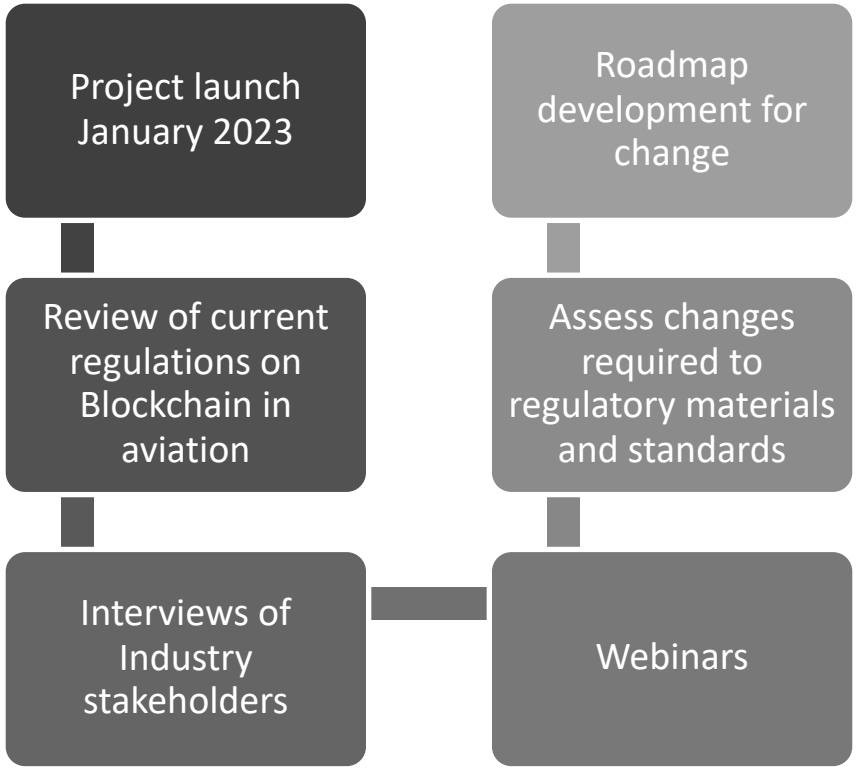
VIRTUA project partners

The VIRTUA Project objectives



Workshop #2 – Identifying opportunities

The VIRTUA Project advancement and deliverables



Current stage:

Currently we are in information gathering stage, where we want to get the complete views from aviation stakeholders. If you would like to **collaborate**, and your view to be heard we would be glad to conduct an in depth interview.

Specially, if you are from one of these stakeholders' groups:

OPERATORS | **LESSORS** | **OEMs**

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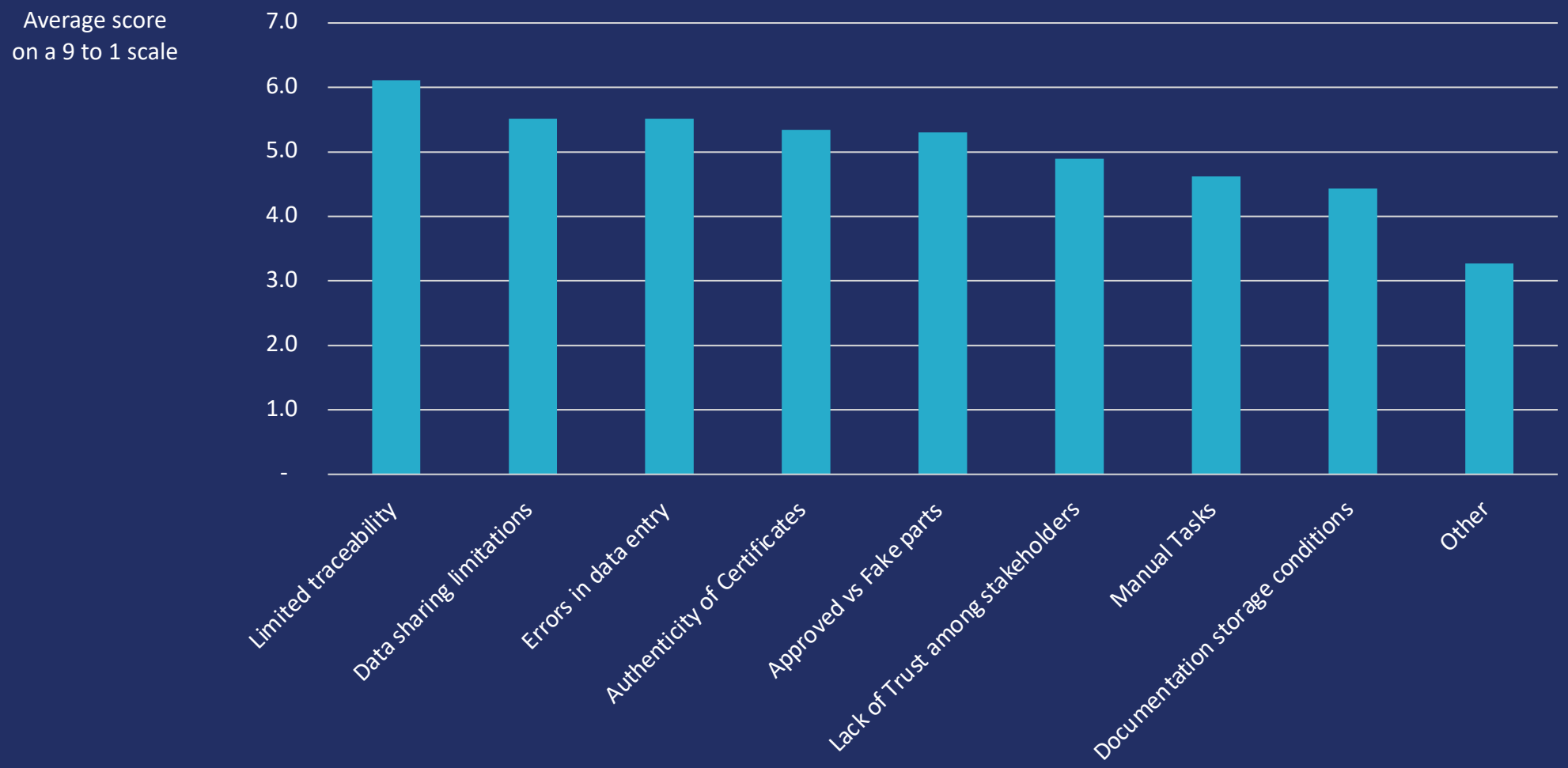
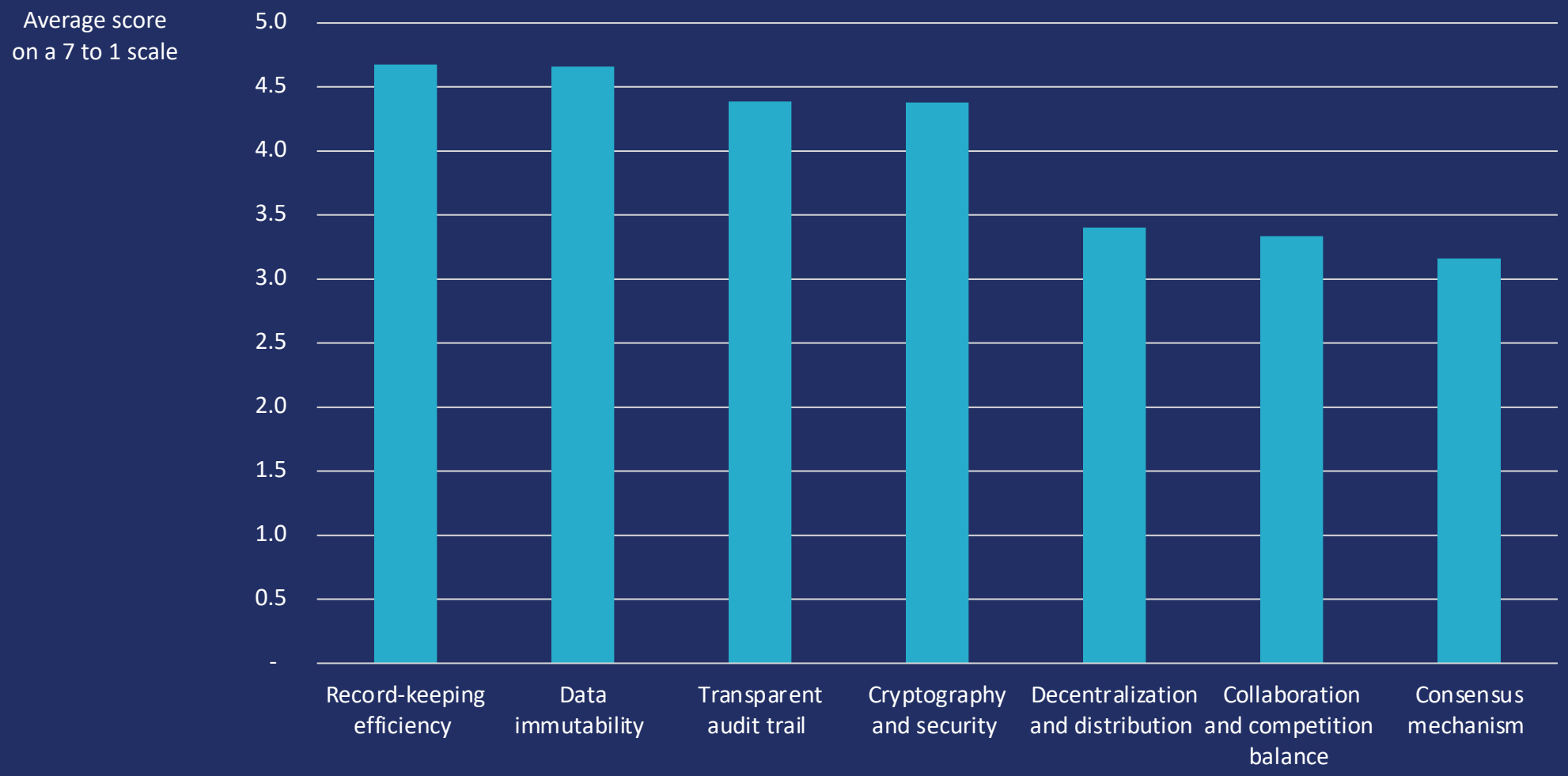
Previous workshop polls and results

What do you consider to be the most significant challenges in airworthiness parts tracking?



150 respondants

What are the essential blockchain concepts that should be prioritized for implementation in the aviation sector?



129 respondants

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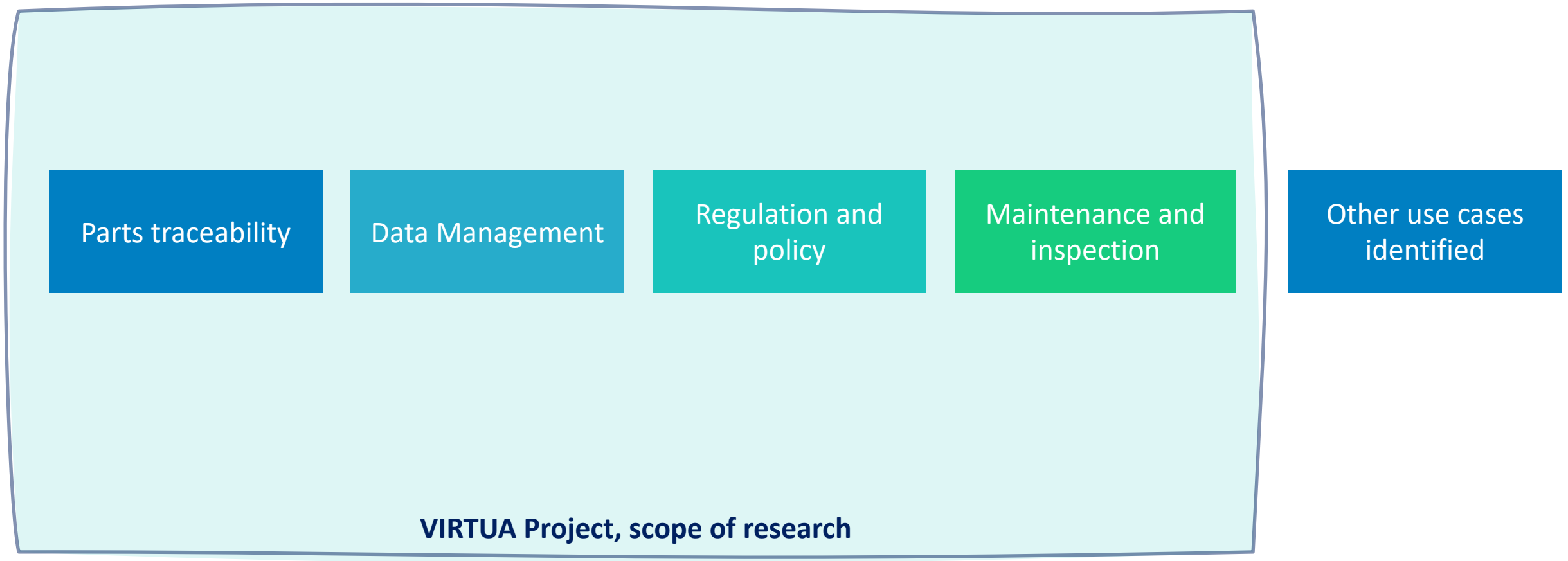
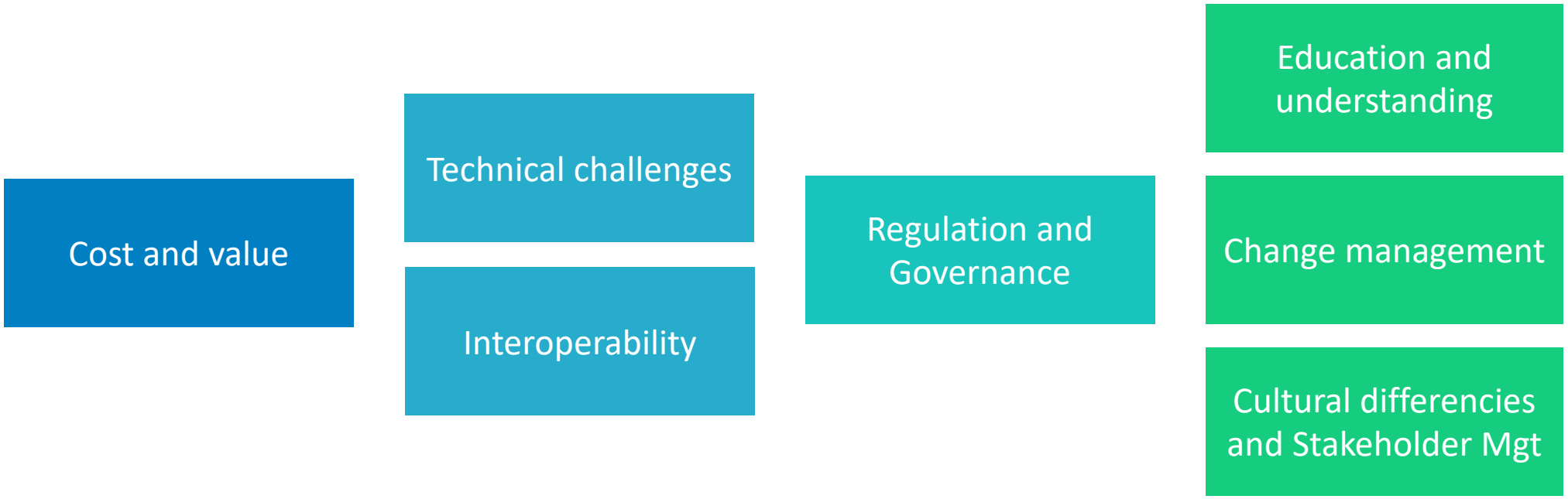
Insights from interviews

Key blockchain-based use cases identified by stakeholders in the industry



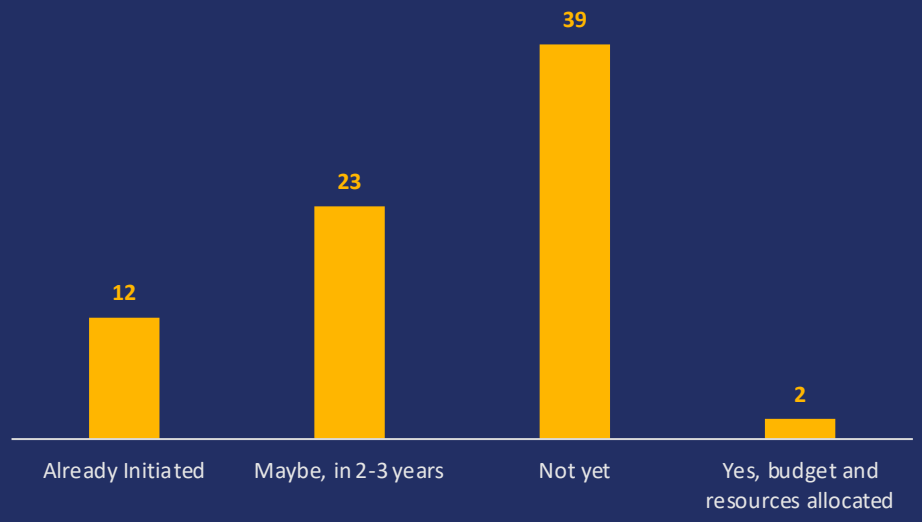
Despite recognizing Blockchain's potential, the aeronautics industry faces challenges in its implementation



The industry is open to change and there is optimism that Blockchain could coexist with current solutions, eventually becoming fully digital if proven effective.

Poll #2:

Have you considered starting a Blockchain powered project?



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Projects presentations

Jalux + Block.Aero

How a Global Startup & Japanese Multinational Corporation Implemented Blockchain Solutions for Aviation Material Management and Supply-Chain

Daher + GoodsID

Track the history of an aircraft from delivery to the present, add trust, add value, save time and propose direct access to a range of services related to the aircraft.

KLM + SkyThread

KLM E&M pioneering with SkyThread for frictionless data sharing across the aviation ecosystem, starting with the 787 community

Aviation Supply-Chain Management - Jalux

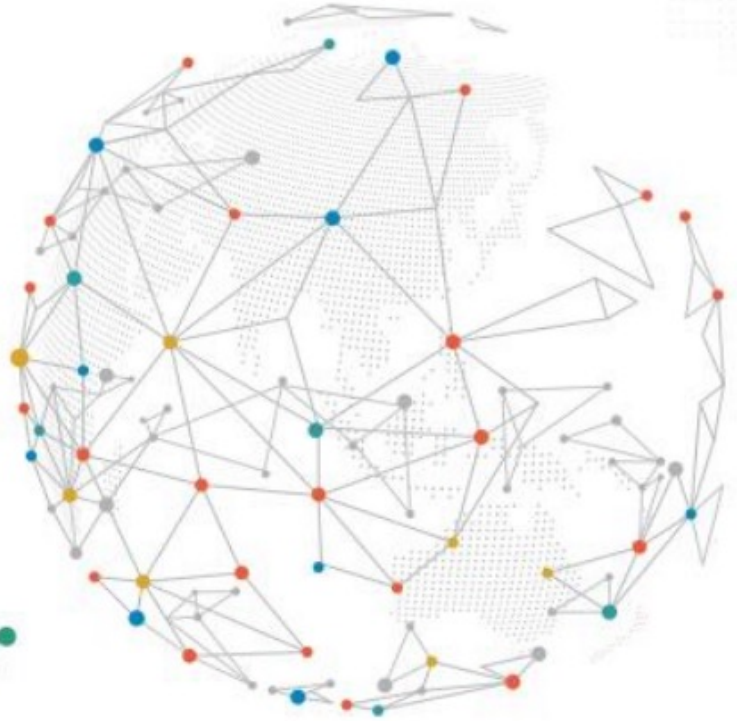
How a Global Startup & Japanese Multinational Corporation Implemented Blockchain Solutions for Aviation Material Management and Supply-Chain

Daichi SAKATA
Jalux
Assistant Manager

Todd SIENA
Block Aero Technologies
Founder & CEO

Jalux

Corporate Profile



Shareholders

SJ Future Holdings Corporation (48.14%)

Sojitz Corporation (22.22%)

Japan Airlines Co., Ltd. (21.56%)

Japan Airport Terminal Co., Ltd. (8.08%)

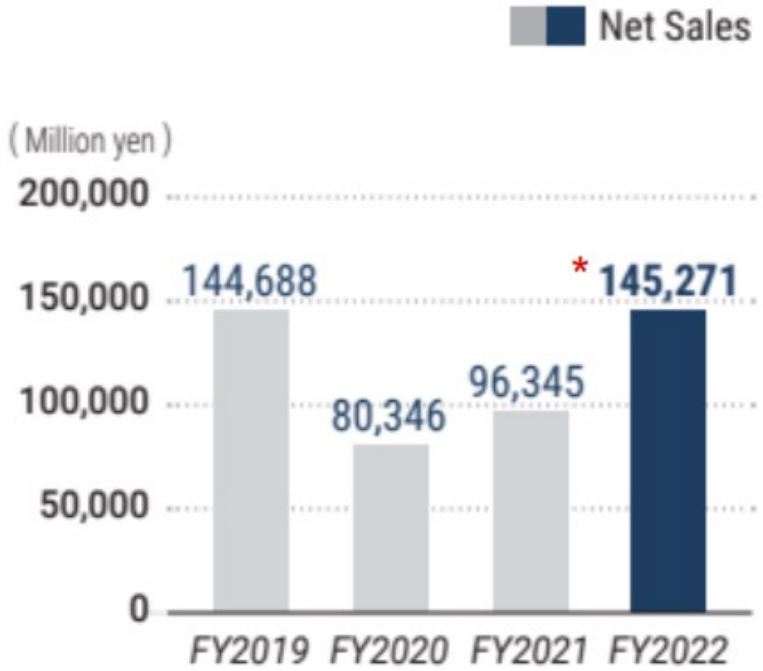
Corporate Profile

- **Established in 1962**
- **Capital Stock : JPY2,558 millions (March 2023)**

- **Net Sales**
  JPY 145,271 millions (March 2023)
  51% Sales Growth from FY2022

- **Employee Headcount**
  Japan 1,905 incl. 1483 at consolidated subsidiaries
  Year-on-Year Growth up 12% from FY2022

- **Quality Approvals**
  JALUX : AS/EN9120
  JALUX Americas : ASA-100
  TRACE CERTIFIED



*approx. USD 1 billion in 2024 USD

Coverage of the Complete Aerospace Value Chain

Jalux

Manufacturer

- Raw Material/Parts/Chemical/Tooling
- VMI (Vendor Management Inventory)
- Financial Solution
- Logistic Support

Operator

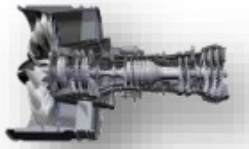
- Asset Management
- Engine Leasing
- Engine Part out
- Parts/Chemical/GSE

- Financial Solution
- Logistic Support
- PBL (Performance Based Logistics)

Jalux

MRO

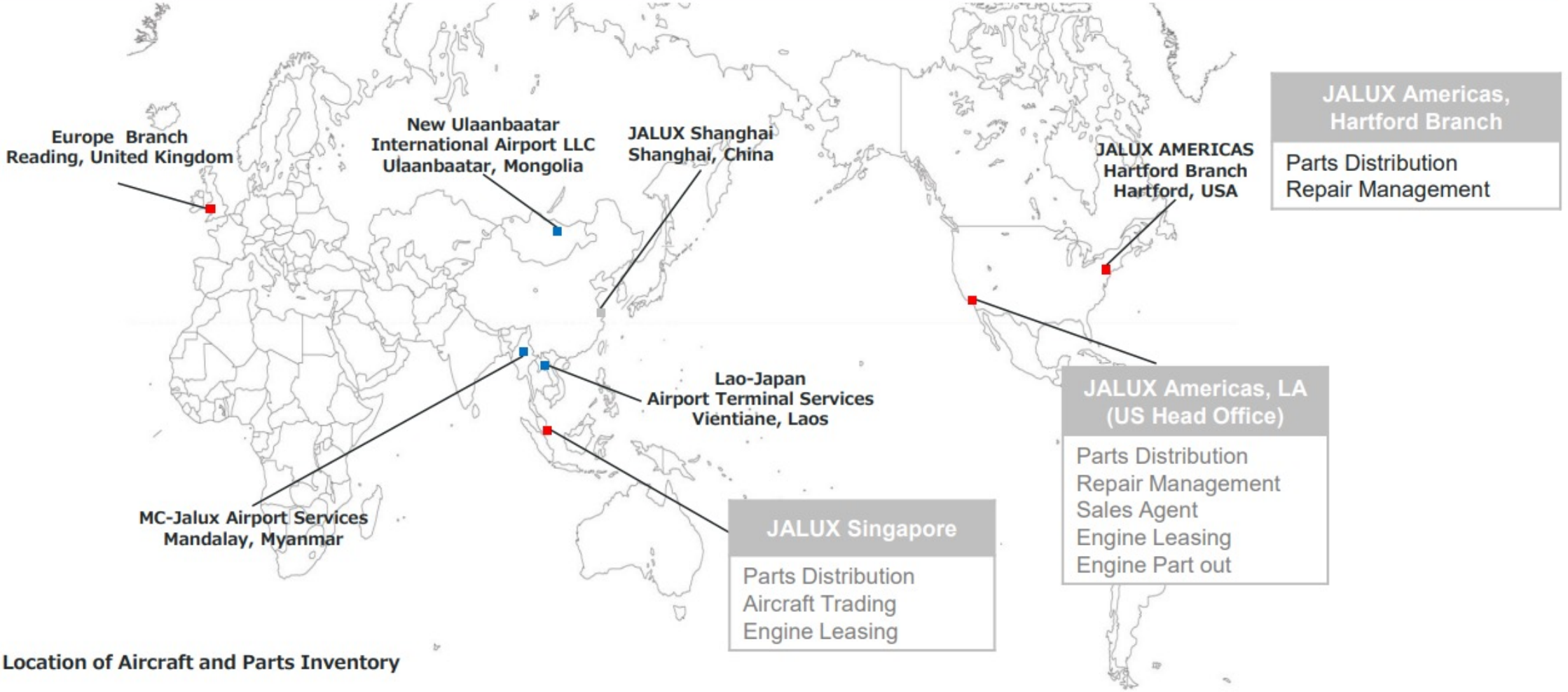
- Parts/Chemical/Tooling
- Financial Solution
- Logistic Support

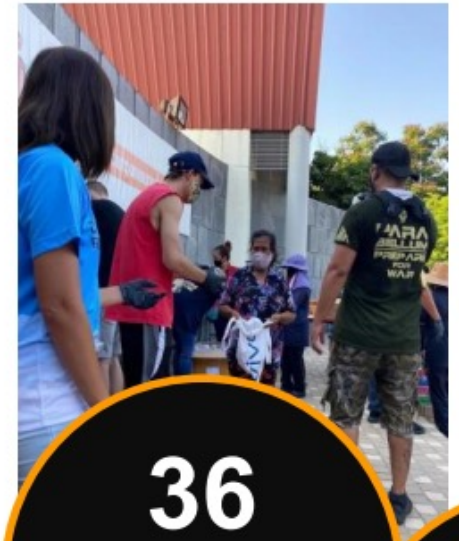


Airport

- Airport Development
- Terminal / Tenant operation

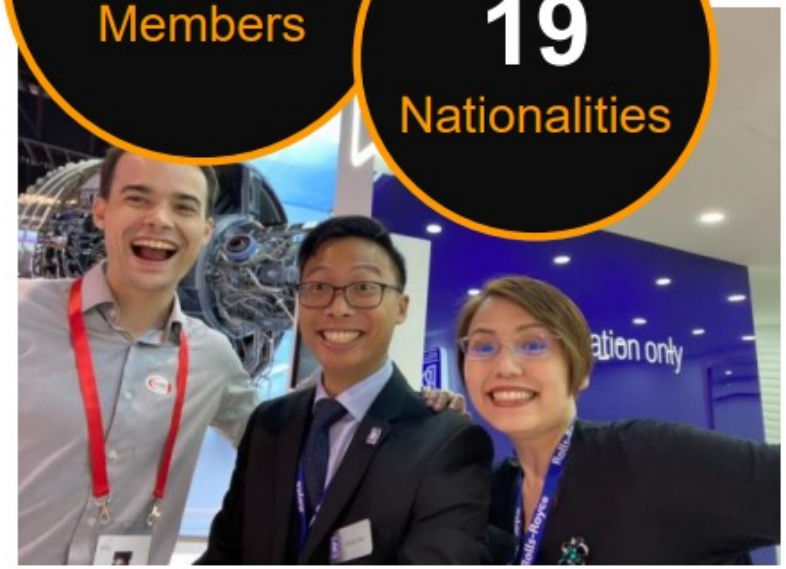
Worldwide Network





36
Team Members

19
Nationalities



Block.Aero

Our Mission and Values

Block.Aero

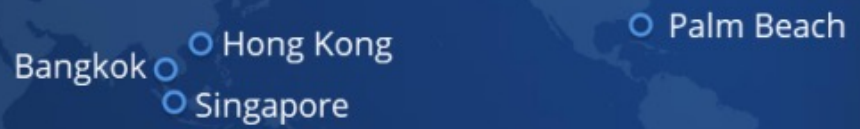
Safety › Efficiency › Collaboration

Leading Digital Transformation with Aviation Blockchain

Block Aero is committed to supporting UN SDGs

United Nations Global Compact

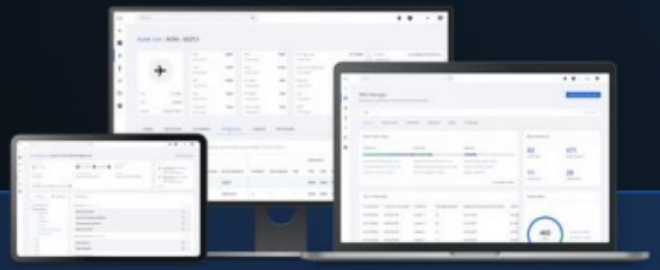
Global Locations



Jalux is Using Block Aero Aviation Blockchain Platform

Interoperable, aviation asset management platform with web enabled portals and applications.

Addresses pain points across the value chain with private permissioned blockchain databases that are replicated between organization to organization peers as shared / common / distributed ledgers for efficient data exchange, tracking of asset status, and facilitating compliance monitoring and auditing.



Multiple Types of Network Participants Engaging – MROs, distributors, regulators, operators, and OEMs at different TRL on Block Aero Platform

Digital Asset Manager

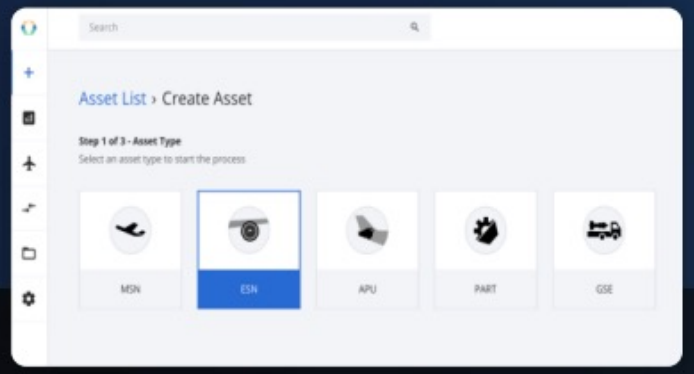
includes Transaction Workflows • Documents • Certificates • IoT Logistics & more

MRO Manager	Airport Manager	Procurement Manager	Sustainability Manager	Lease Manager
In-Production, Expanding Scope	*Aniticipated, SDG Alignment*	*Implementation In-Progress, Q2 Go Live*	*Aniticipated, SDG Alignment*	*Anticipated*

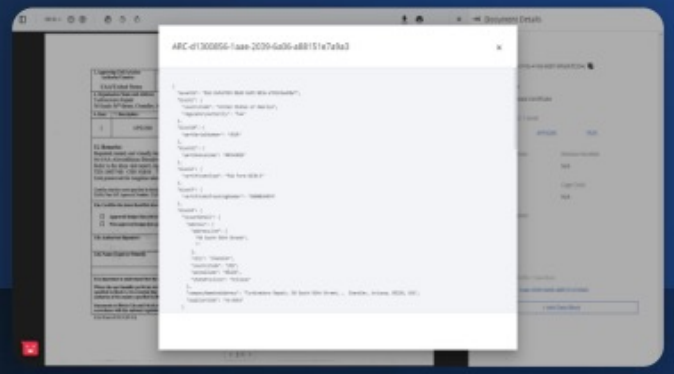
How it Works

- Easily create on-chain *digital twin* asset profiles of your aircraft, engines, and parts
- Build best in class asset pedigrees by attaching *data blocks* and immutable certificates
- Unlock the power of accessible data for your organization with transactions as *digital threads*

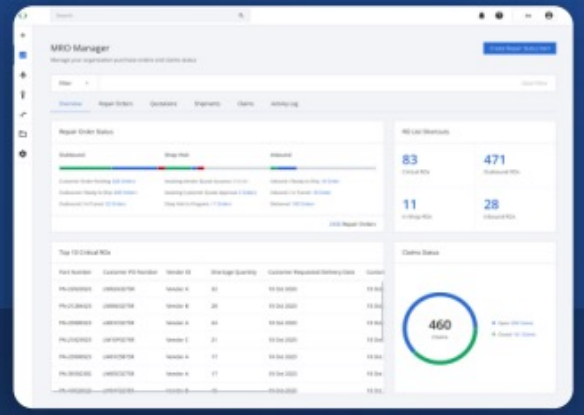
Create Assets



Attach Data Blocks



Manage Transactions



Our Japan Ecosystem Scale Snapshot on Block Aero Aviation Blockchain Network

Jalux Block.Aero

Datasets

160,162

Data Blocks

Immutable records of standardized data, documents, and certificates

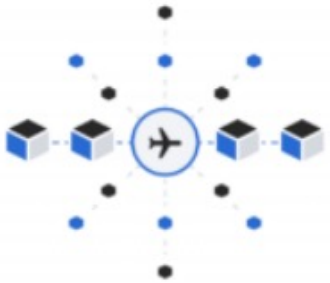
Assets

130,565

Blockchain Aviation Assets

Digital Passports for your aircraft, engines, and parts

Transactions



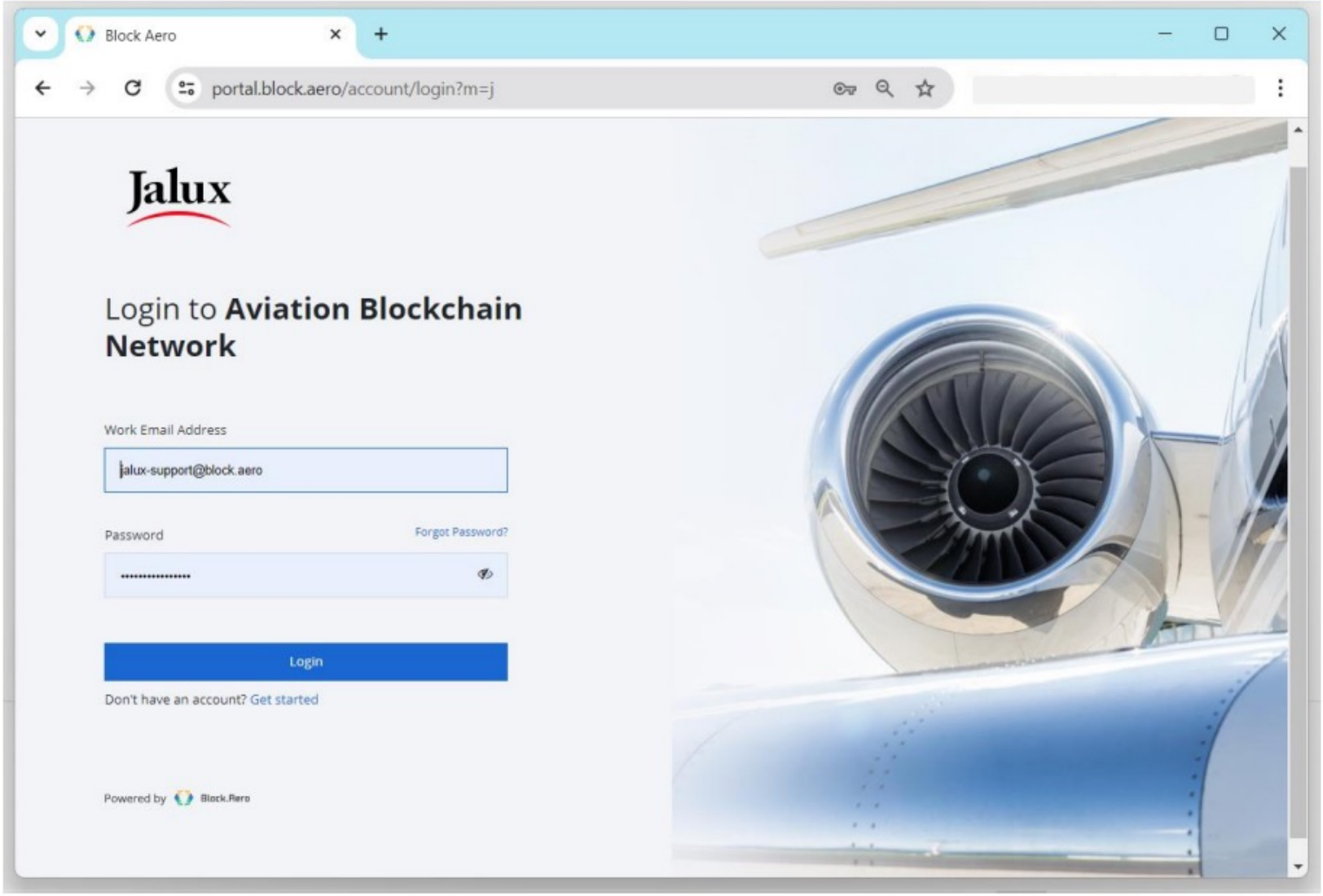
11,933

Digital Threads

Streamlined workflows for your aerospace transactions

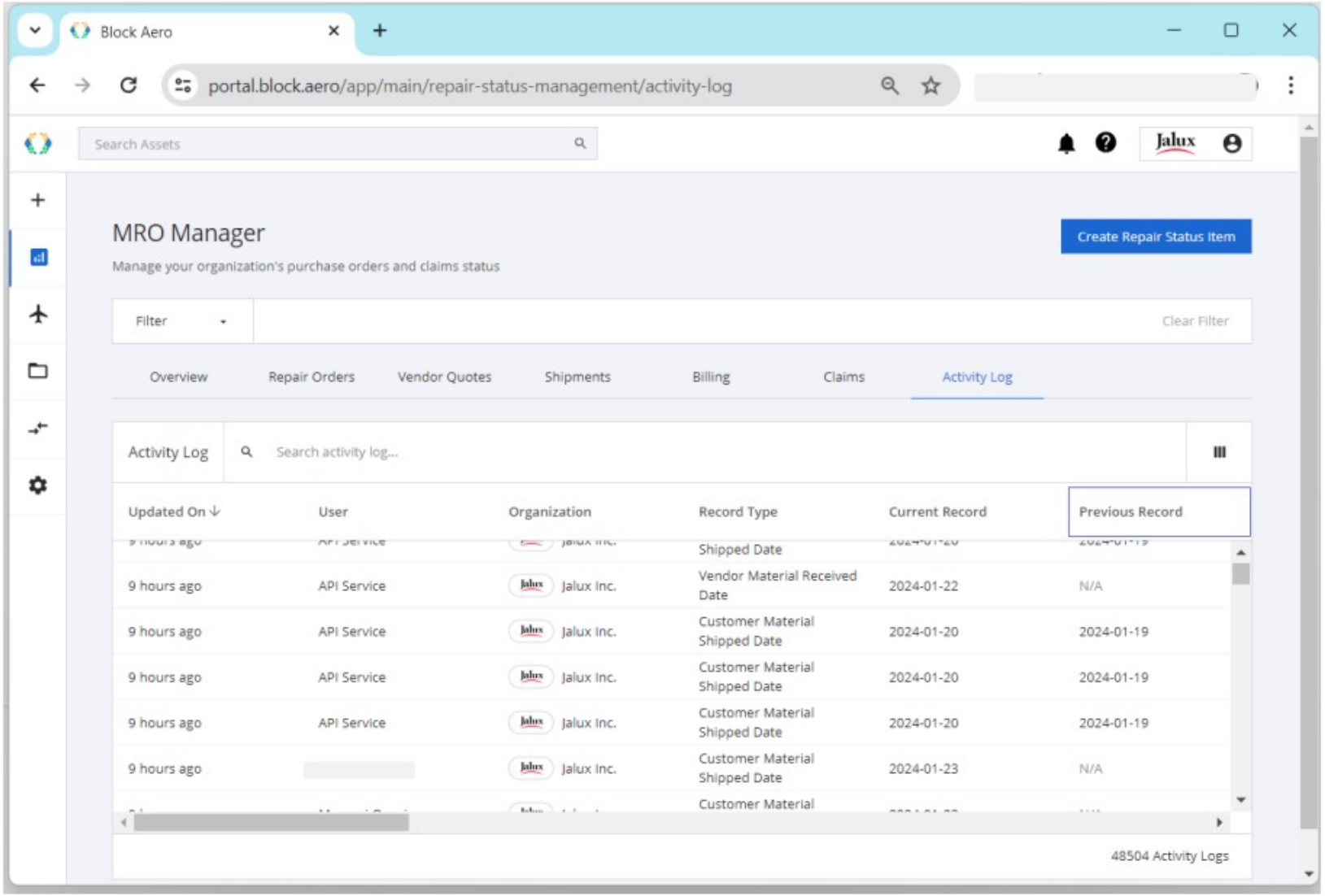
Last Updated: 2023-Oct-03

Our users log in to their accounts through the web portal and access Block Aero every day



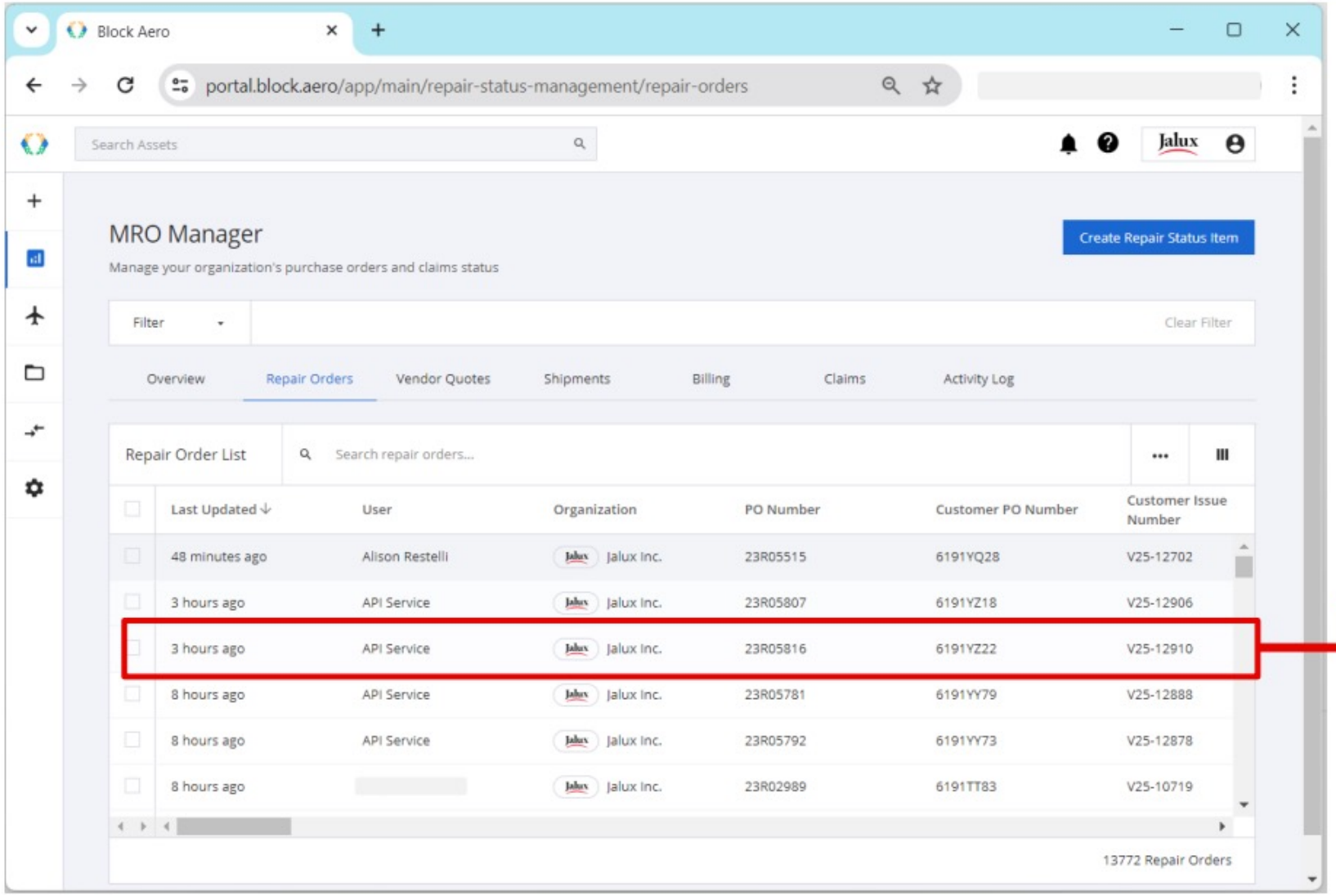
- Jalux administrates our own users and their access to the data being managed on Block Aero platform.
- Jalux is redistributing accounts to key partners in the local ecosystem.

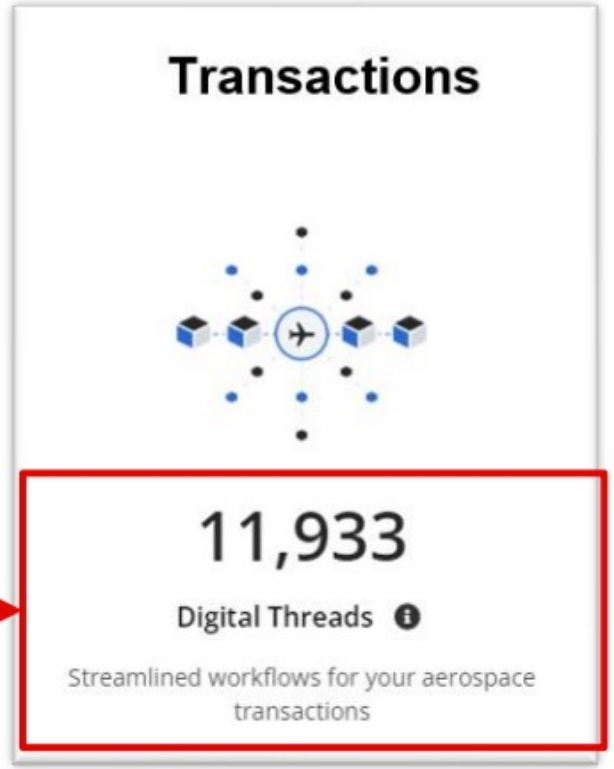
The ledger is accessed and updated 24/7 by both humans (Jalux & Customers) and machines (API services).



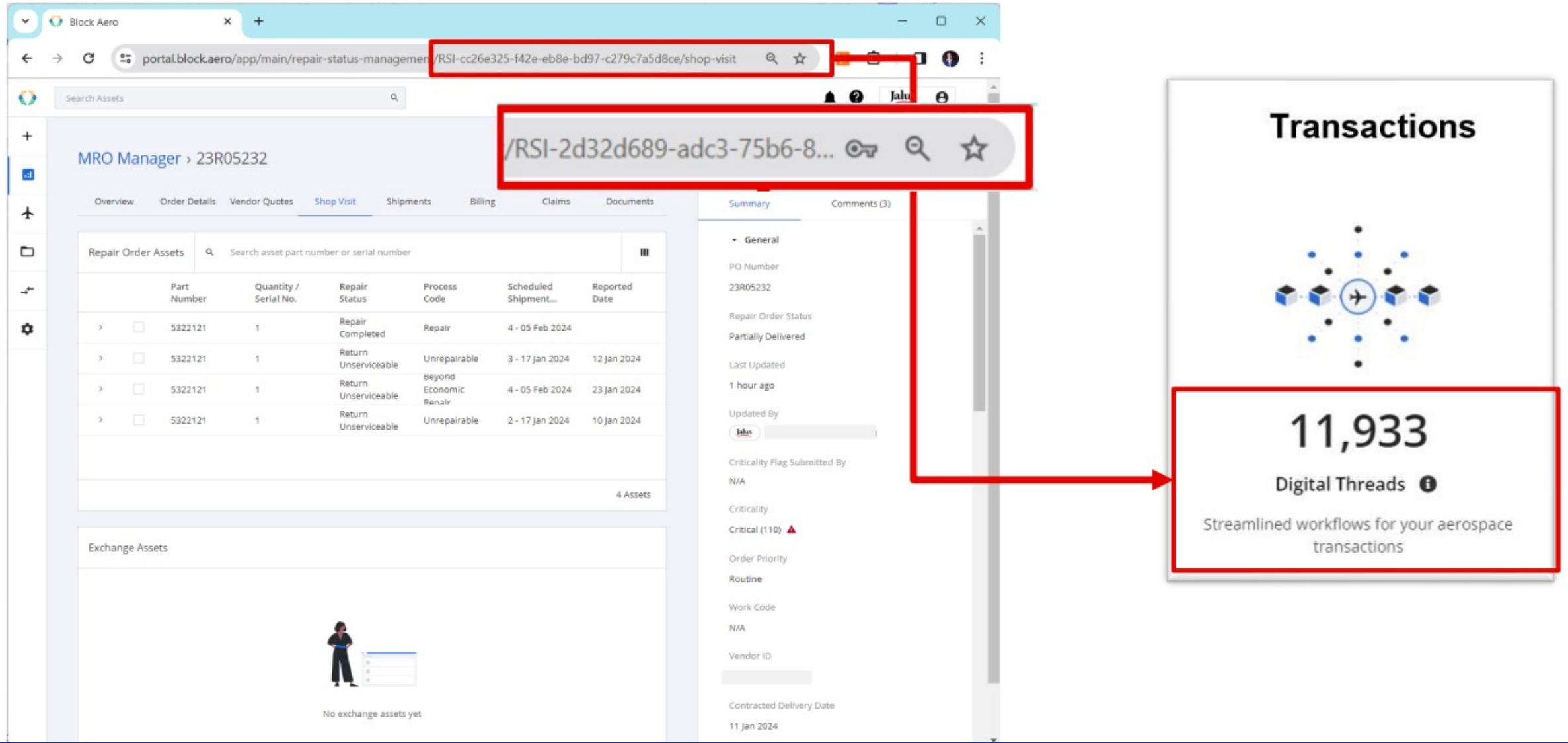
- Simple user experience for our employees and our customers to learn/train.
- Easy to monitor transaction status, as well as propose, accept, and reconcile asset repair orders – high volume!
- Tracks key data points and facilitates document access in the MRO workflow with Block Aero blockchain records aka *Data Blocks in Digital Threads*.

Each row in this table is an order transaction powered by blockchain records that manage data in the workflow

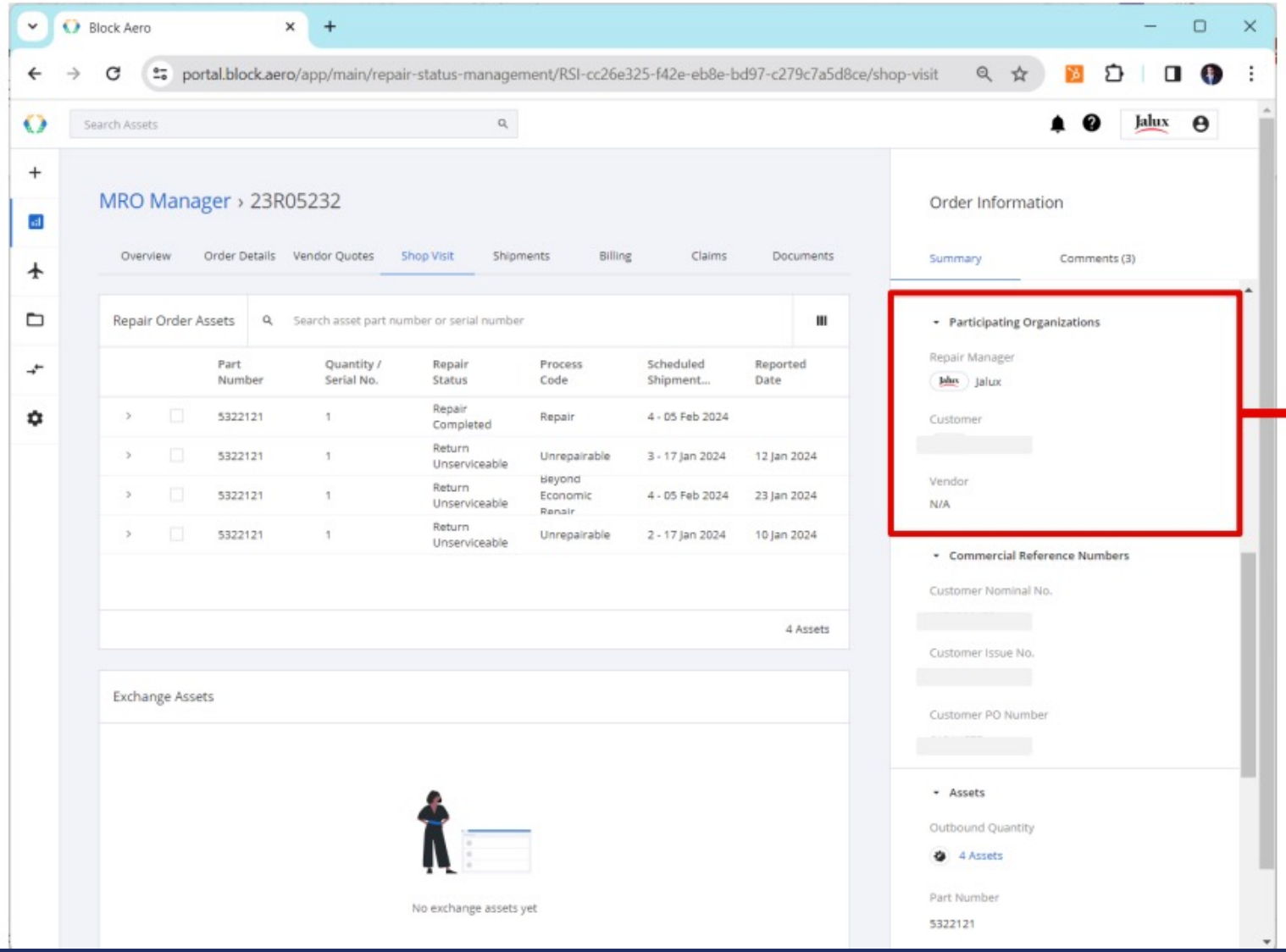


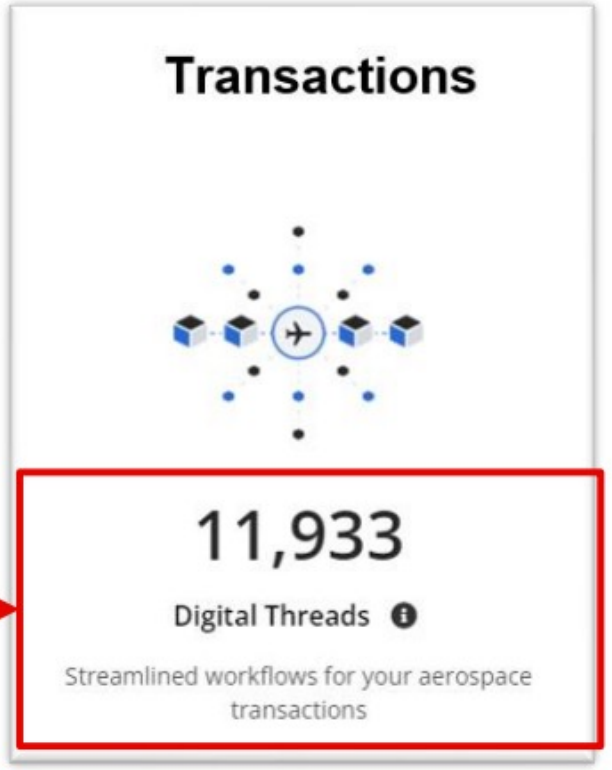


RSI and similar blockchain records facilitate standardization and sharing of data in MRO Manager



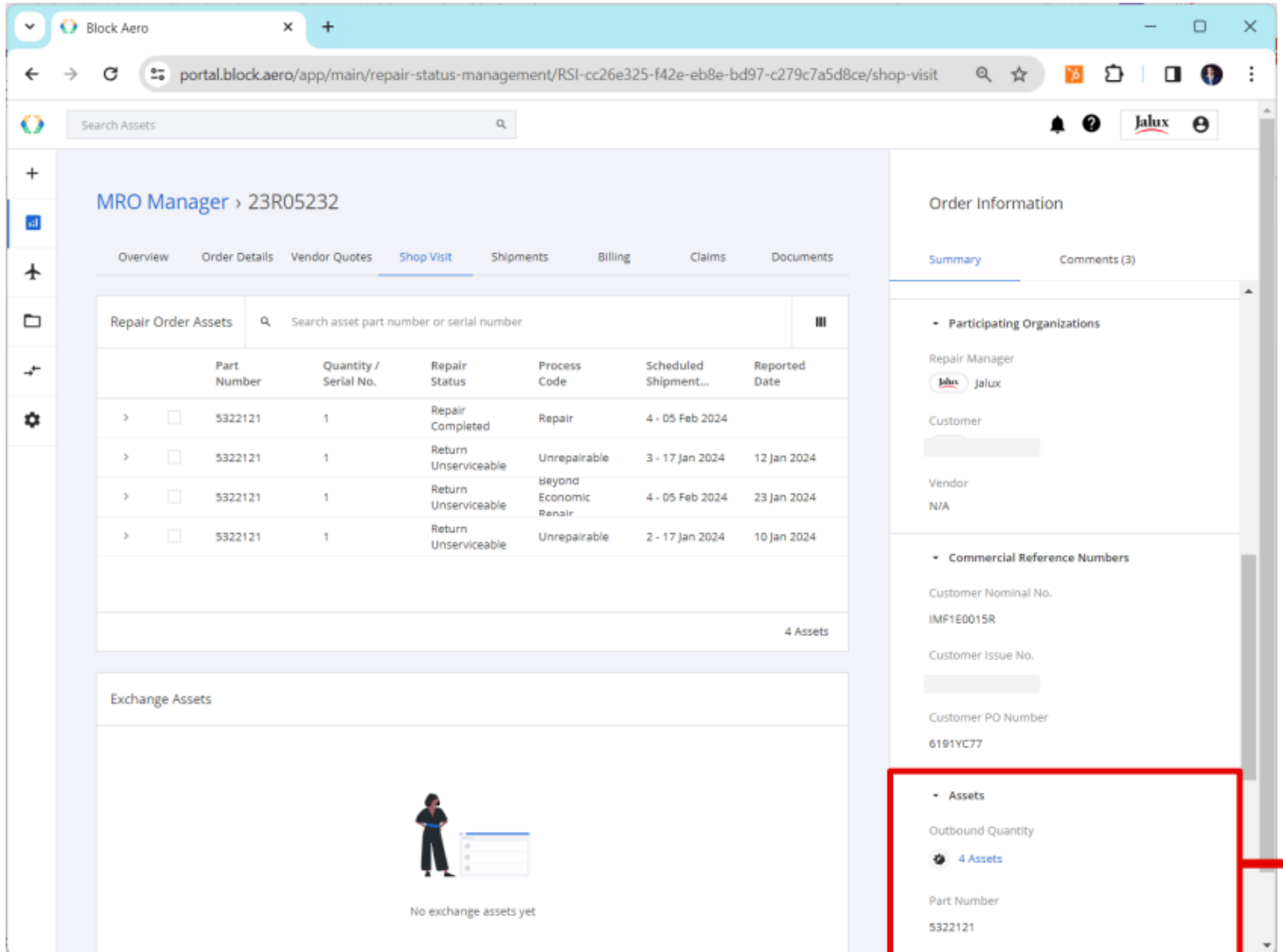
Organizations' blockchain IDs can be assigned ORG roles that control read and write permissions to records

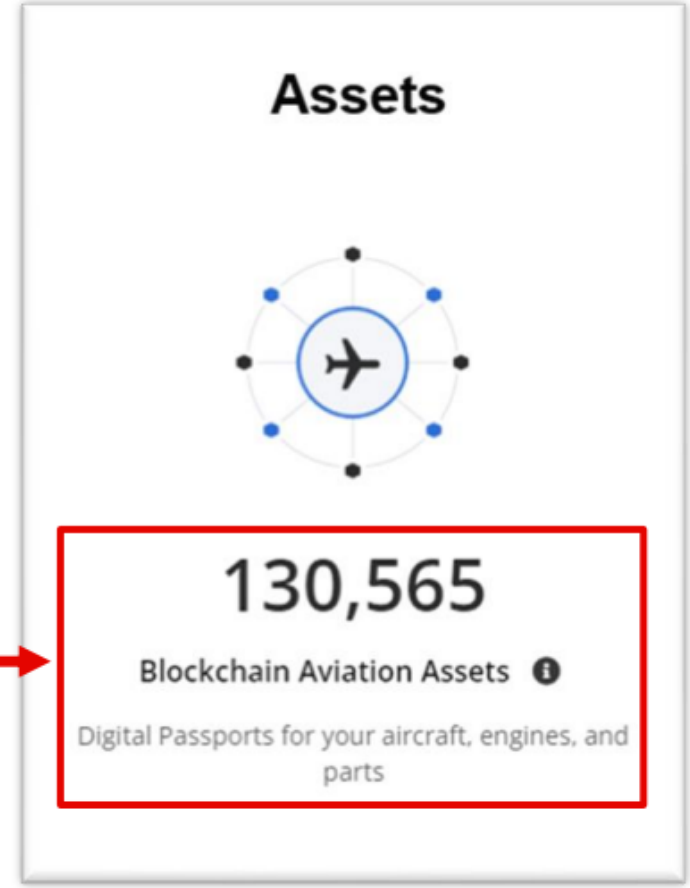




Every digital thread feeds data to related aviation assets and builds an asset-linked repository of immutable records

Jalux Block.Aero

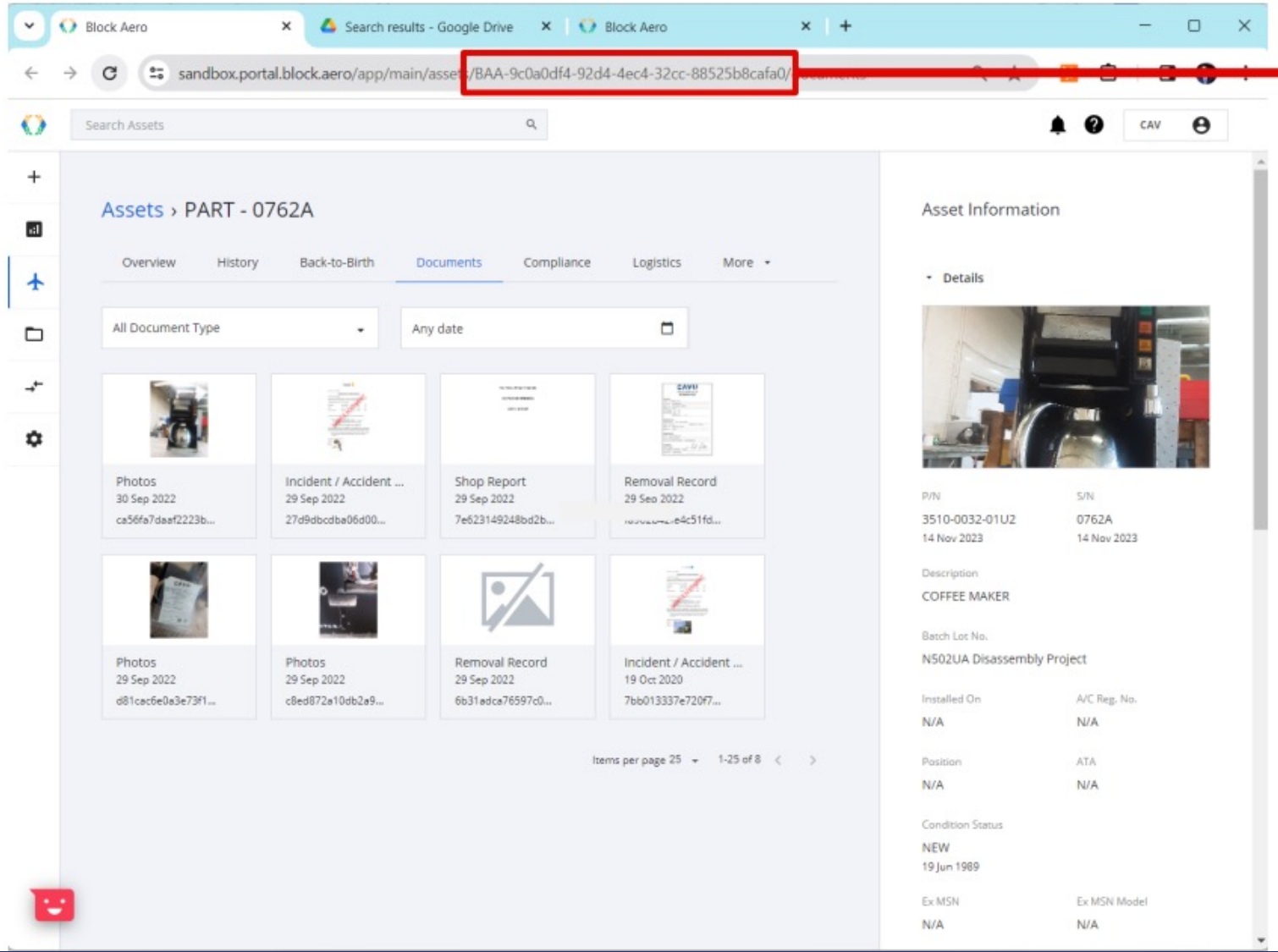


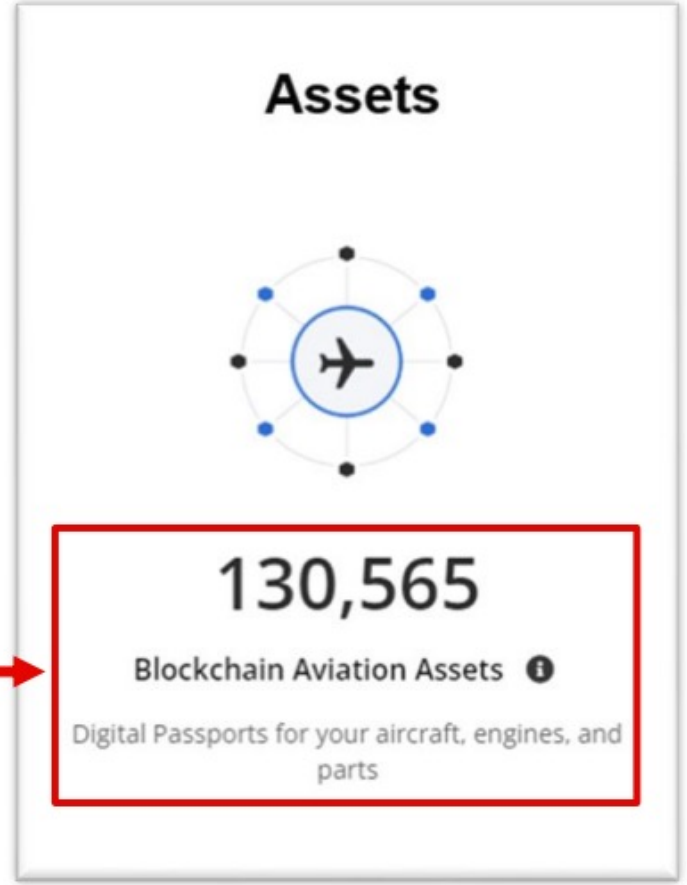


Each blockchain aviation asset (BAA) has a Digital Passport to secure back-to-birth events, records, and documentation

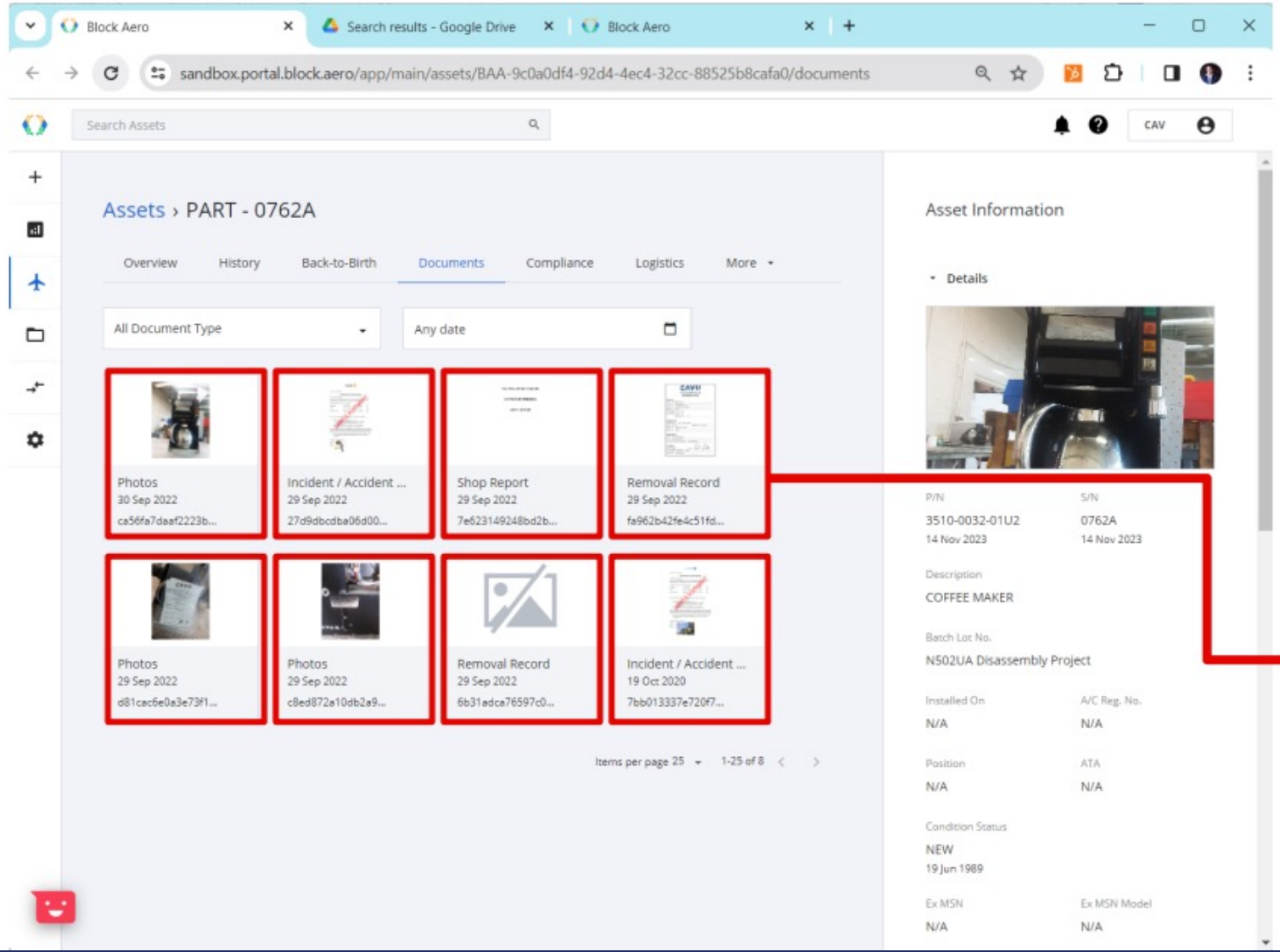
Jalux

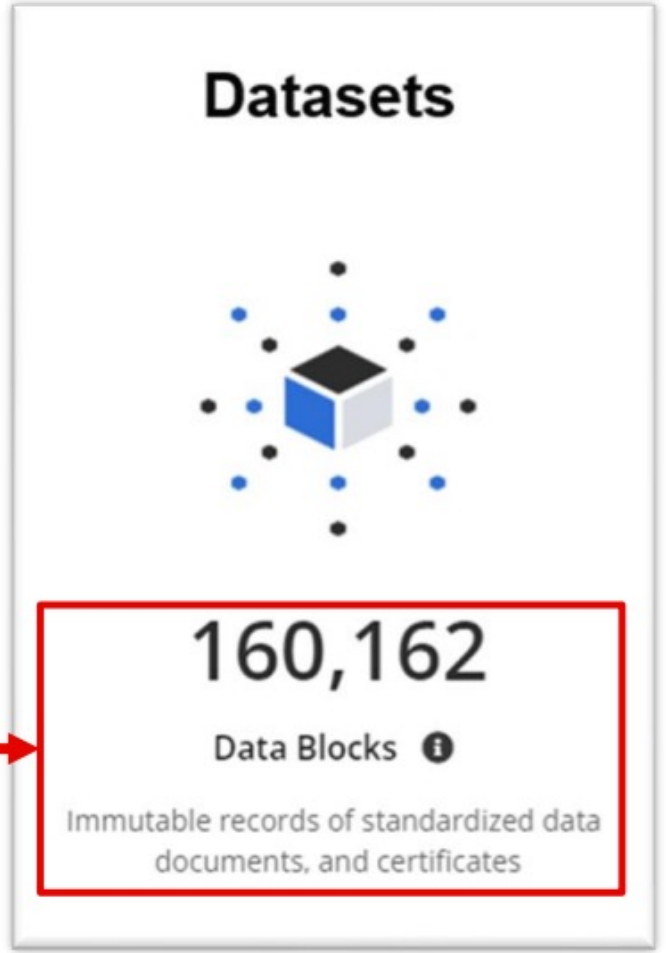
Block.Aero





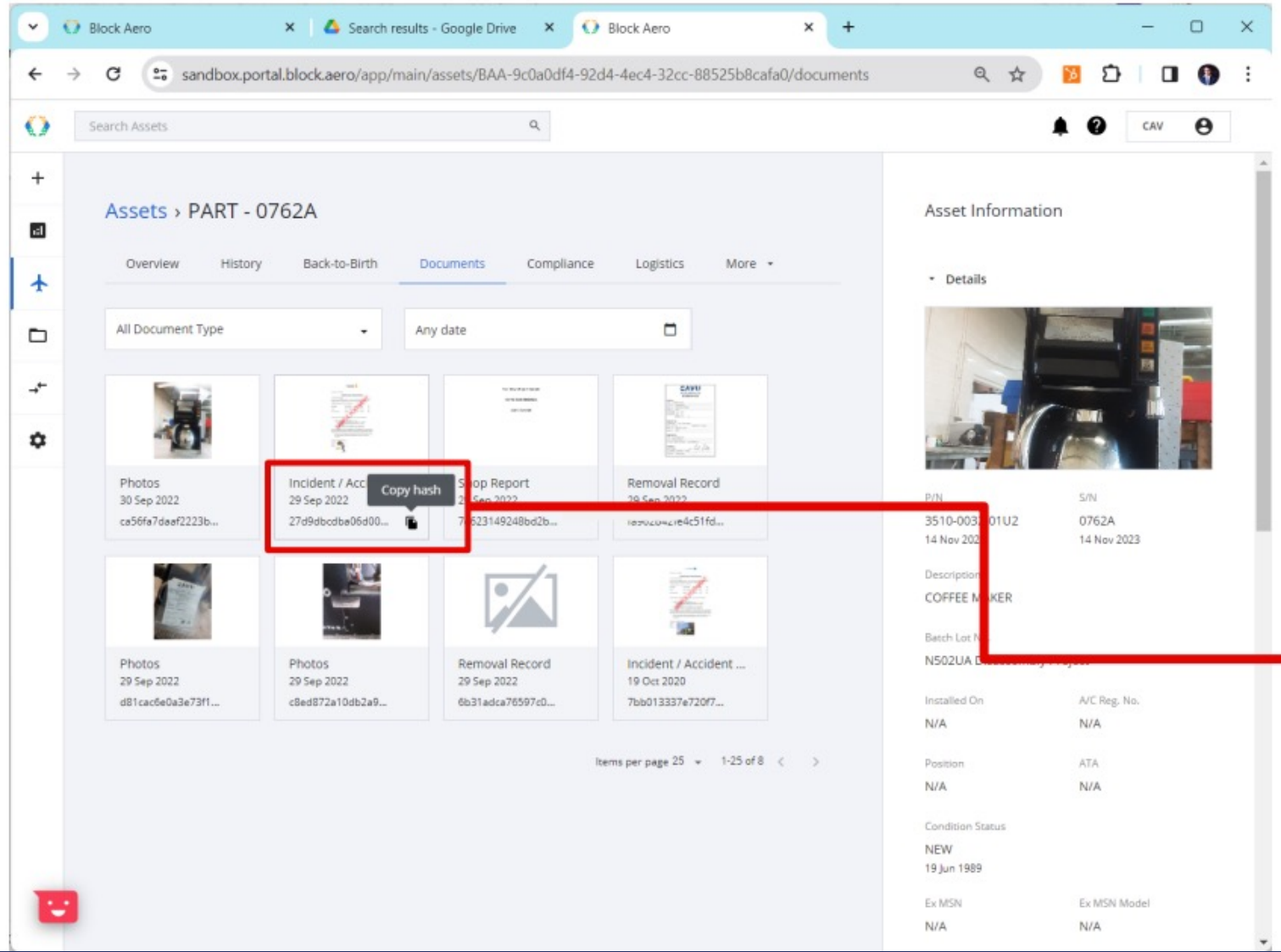
Organizations' blockchain IDs can be assigned ORG roles that control read and write permissions to assets as well

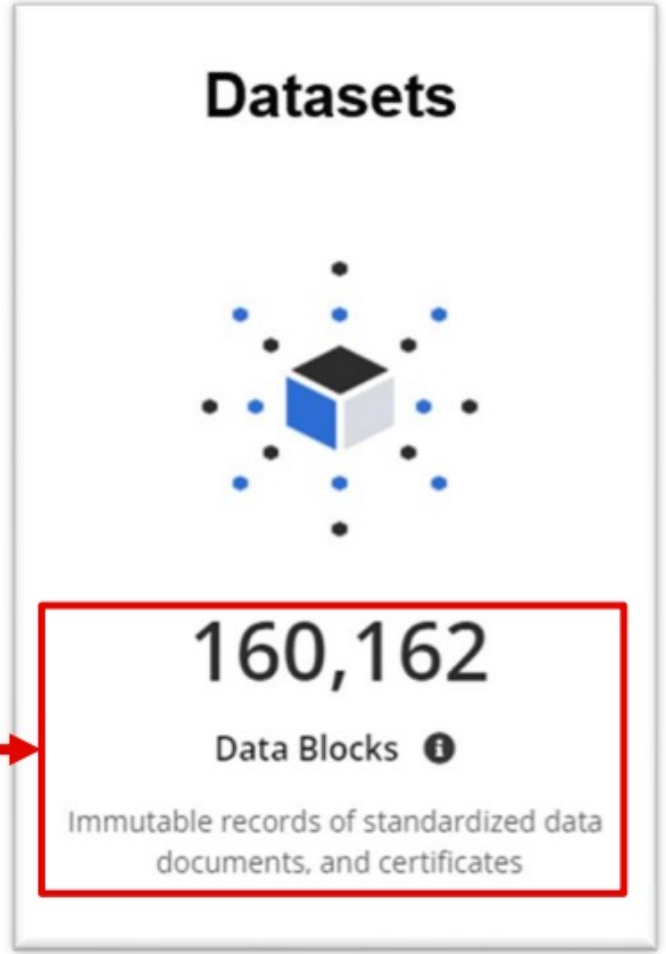




Every document and record assigned to an asset has a hash value that can help validate the data integrity which helps our asset management business in compliance

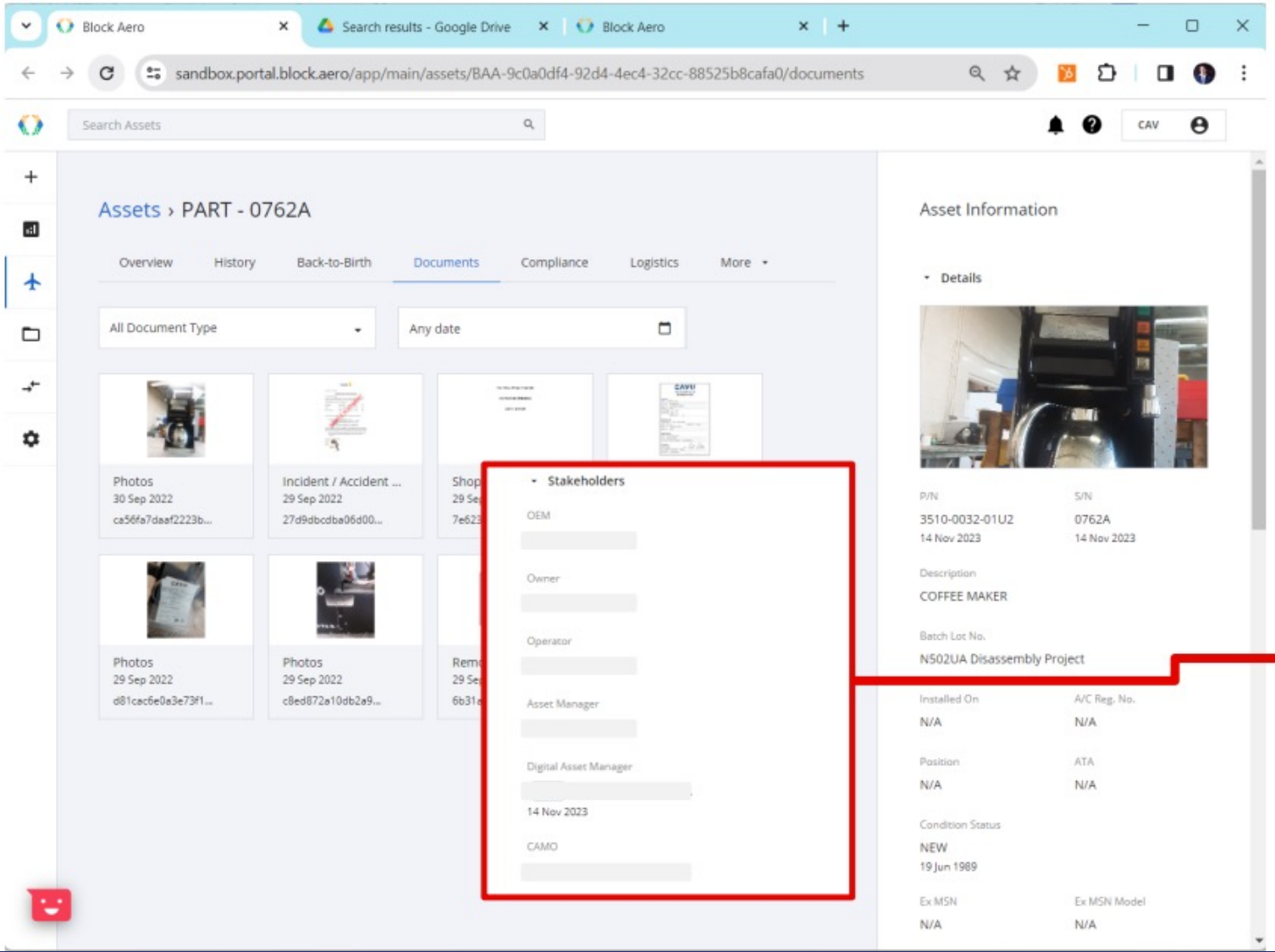
Jalux Block.Aero

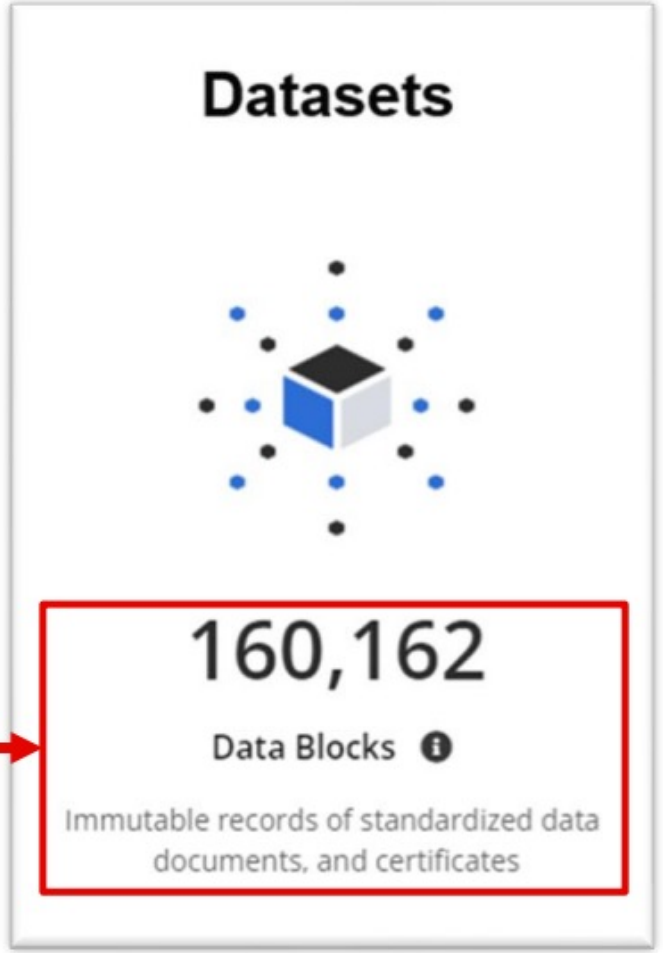




Organizations' blockchain IDs can be assigned ORG roles (e.g. Owner, Operator, etc.) to control read and write permissions to assets

Jalux Block.Aero





Production Implementation of Block Aero at Enteprise Scale

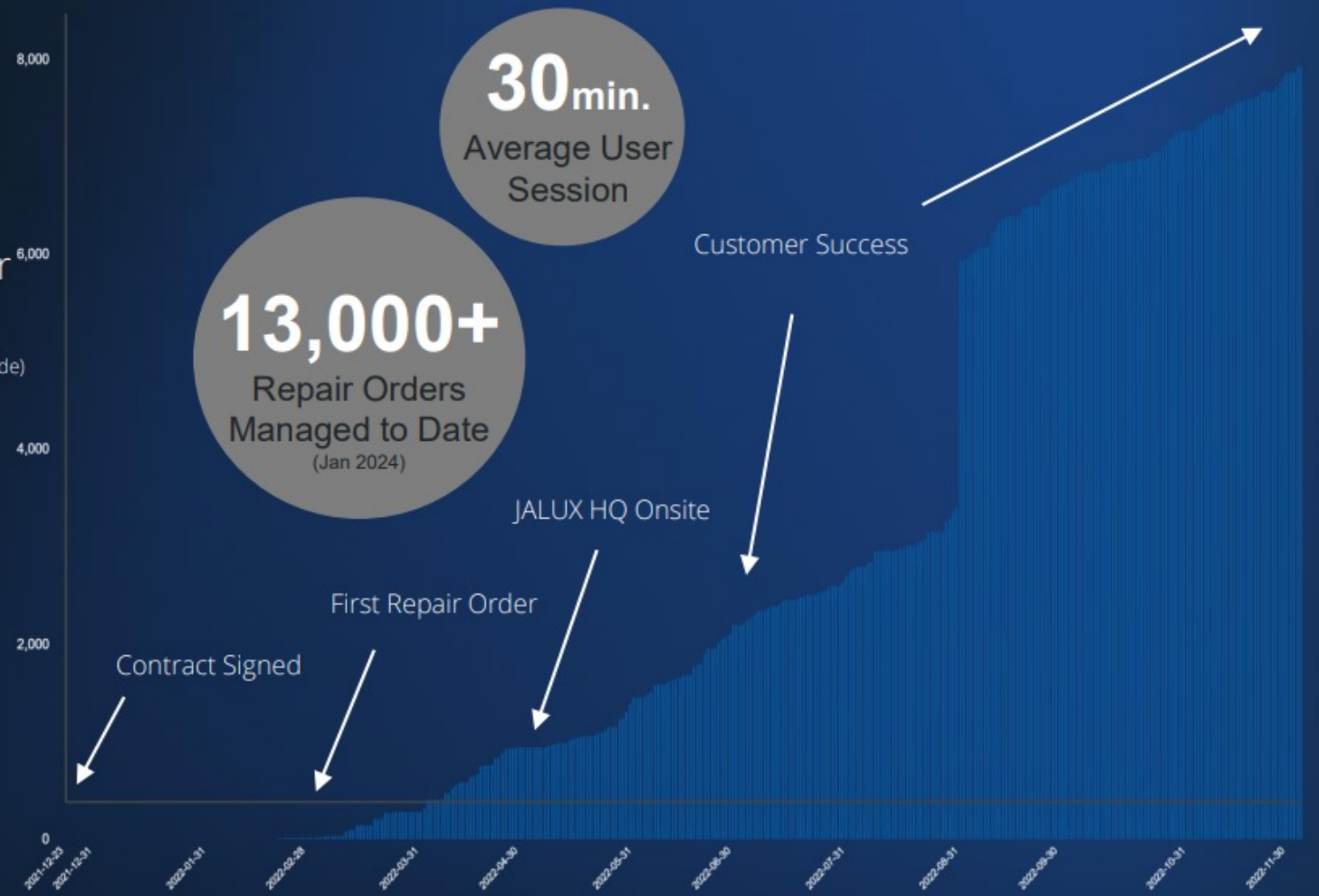
Jalux

Digital Asset Manager + MRO Manager

Users:	25+ Enterprise Users
Total Transactions:	13,753 orders
Typical Tx Value:	~$10,000 USD per repair order
Total Tx Volume:	Over $100M USD (Rough Order of Magnitude)

Over 150,000 Blockchain Aviation Assets (Digital Assets) Created

JALUX Repair Order Transactions Managed on Block Aero Platform over Time



Why JALUX Selected Block Aero

[*Corporate Culture*]

"Challenge & Change"

We regard changes in the environment
as good business chances,
and will challenge daringly on our own initiative
and continue to change to better ourselves.

[*Corporate Philosophy*]

"Contributing to Tomorrow"

Your partner in creating happiness and bringing a bright future to people, society and the environment.

- **Alignment of Company Mission, Vision,** and **Values**
- **Data Integrity and Quality** is important and required for our Quality Management System (QMS)
- **Business Value Creation** for Internal Efficiency and External Positive Customer Experience

Why a Blockchain-based Solution?

Block.Aero Jalux

1. By encrypting and decentralizing all data, tampering becomes difficult, and **integrity of records is ensured**.

2. Standardizing all data makes it **easier to share status of assets and transactions** across different organizations

   Using a common distributed ledger makes **data maintenance easier and can reduce operational costs** versus relying on multiple, separated databases.

3. **Policies and rules are systematized** and can help implement standard rules for handling data in the aviation industry.

Thank you for your attention

Any questions?

Daichi SAKATA
Jalux
Assistant Manager

Todd SIENA
Block Aero Technologies
Founder & CEO

Digital Aircraft Maintenance Certificate - Daher

Track the history of an aircraft from delivery to the present, add trust, add value, save time and propose direct access to a range of services related to the aircraft.

Gabriel RAFFOUR
Daher
Head of Innovation Program

Sébastien COURADET
Daher
Responsible for entry into service for new products

Cody ST. HILAIRE
GoodsID
Aerospace & Defense VP

A Digital Unfalsifiable Aircraft Maintenance Certificate

A simple, user-friendly solution which allows the aircraft manufacturer / CAMO to issue a digital certificate for their aircraft, register the maintenance certificate in the blockchain, and transfer it to their customers

- All of the **key data** related to the aircraft are registered and time stamped in the blockchain
  - Manufacturer
  - Aircraft Model
  - Serial Numbers
  - Registration
  - Initial Certificate of Airworthiness
  - Operational Validity
  - Additional User Selected Documents

- Thanks to blockchain technology, this digital certificate is **unique**, **tamper-proof**, **unfalsifiable**, **immutable** and **unhackable**

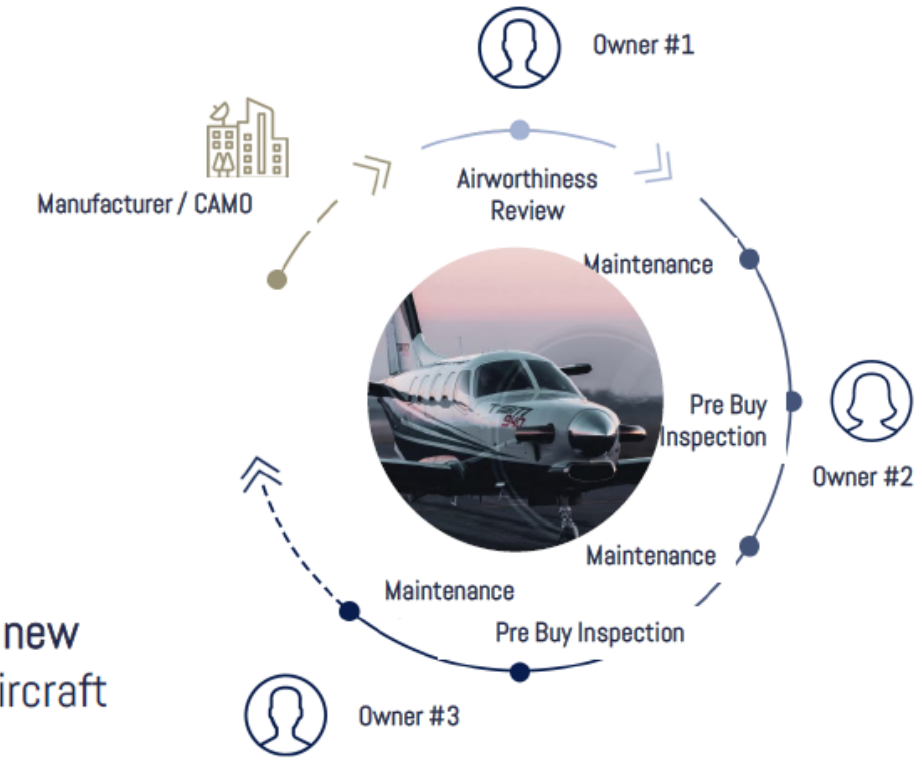
A Dynamic Maintenance Record

Track the history of an aircraft from delivery to the present

- Register within the certificate the **scheduled maintenance work** and **specific events** during the lifetime of the aircraft:
  - Scheduled maintenance
  - Airworthiness review
  - Pre-buy inspection
  - Transfer of ownership
  - Change of registration

- Register and regularly **update the flight hours**

- **Transfer** the digital maintenance certificate **to the new owner of the aircraft** in the event of a sale of the aircraft
  - Total and **full respect of the anonymity** of the aircraft's owner
  - Ownership transfers are registered on an **anonymous basis**



An Enriched And Comprehensive Maintenance Record

Documenting the scheduled reviews of the aircraft

- Possibility **to register** within the certificate **the mandatory documents** of the aircraft :
  - Certificate of Registration
  - Initial Certificate of Airworthiness
  - Pre-buy inspection Report
  - Airworthiness Review Certificate
  - Certificates of Release to Service
  - Any additional documents

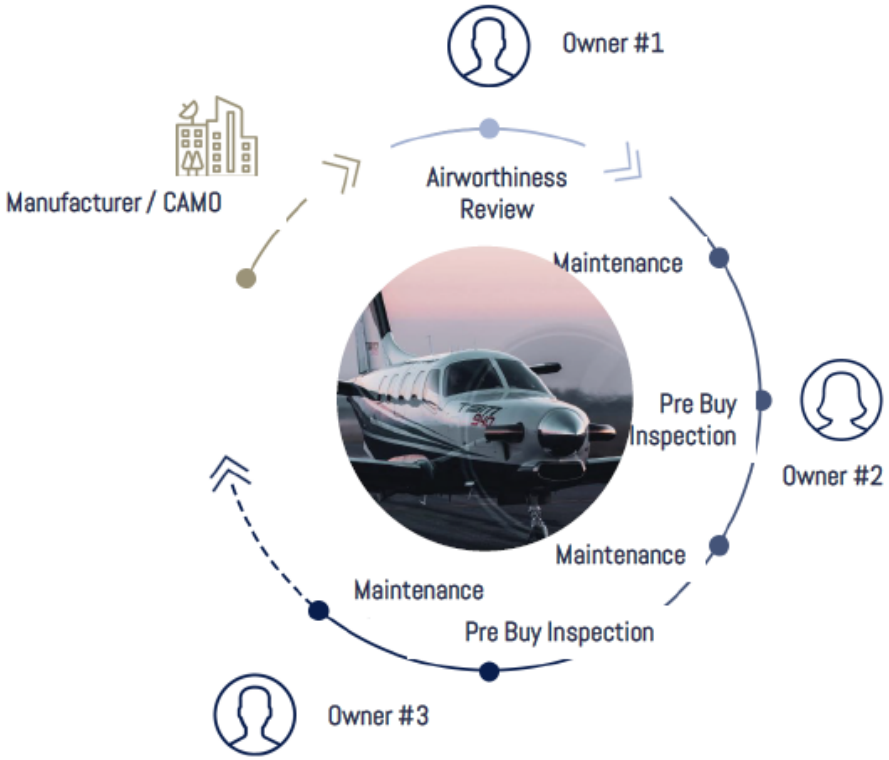
STANDARD AIRWORTHINESS CERTIFICATE

N2631A	PIPER PA-22-135	22-903	NORMAL

NONE

08-10-95	MARION W. WILLIAMS	SW-FSDO-OKC

FAA Form 8100-2



- These **documents** are registered in the blockchain : continuous, compliant and unfalsified history of the aircraft

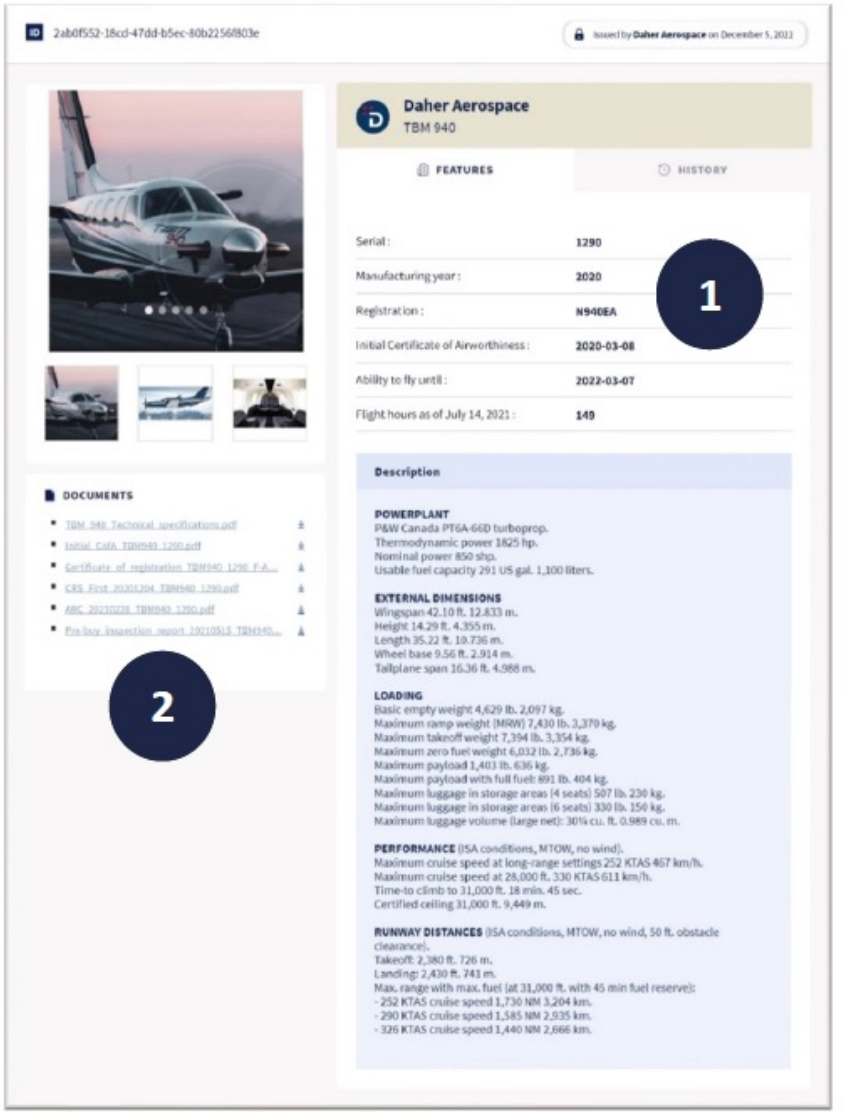
A User-Friendly Aircraft Certificate - Features

1. Product specifications

2. Possibility to add regulatory documents

DOCUMENTS

- TBM_940_Technical_specifications.pdf
- APRS_First_20200630_TBM940_1290.pdf
- CEN_20201227_TBM940_1290.pdf
- Pre-buy_inspection_report_20210214_TBM94…
- Certificate_of_registration_TBM940_1290_F-A…
- Initial_CofA_TBM940_1290.pdf



A User-Friendly Aircraft Certificate - History

3. Scheduled maintenance and events registered in the blockchain

Pre-buy inspection — May 13, 2021

Inspection date (YYYY-MM-DD)	2021-05-13
Flight hours	127
Attached document	Inspection_report_20210513_T...
Registered on (YYYY-MM-DD)	2021-05-14
By	Daher CAMO

See transaction details

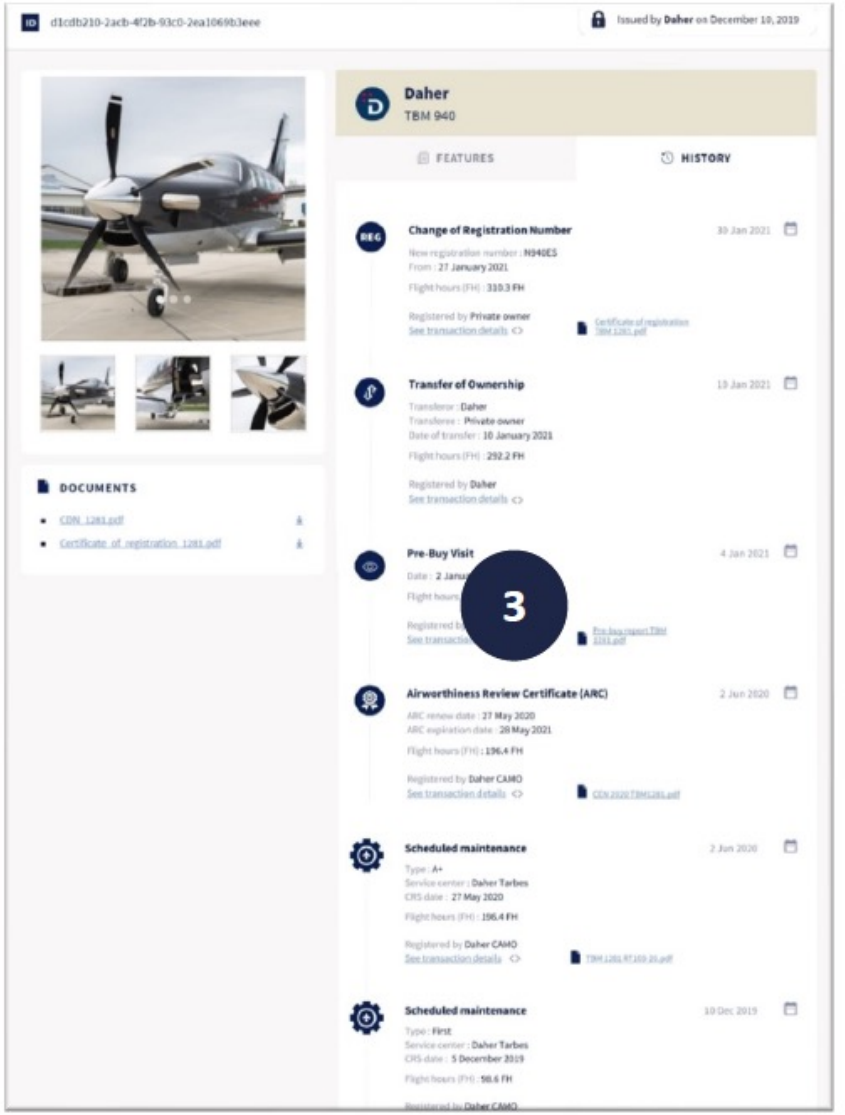
Airworthiness review — February 28, 2021

ARC date of issue (YYYY-MM-DD)	2021-02-28
ARC expiration date (YYYY-MM-DD)	2022-03-07
Flight hours	98
Attached document	ARC_20210228_TBM940_1290.pdf
Registered on (YYYY-MM-DD)	2021-03-03
By	Daher CAMO

See transaction details

Scheduled maintenance — December 4, 2020

Type	First
Service center	Daher Tarbes
Certificate of Release to Service date (V...	2020-12-04
Flight hours	72
Attached document	CRS_First_20201204_TBM940_...



Benefits Of The Maintenance Certificate For The Aircraft's Owner

ADD TRUST ▶ A **digital, certified, tamper-proof, and unfalsifiable service record book** for the aircraft

SAVE TIME ▶ A digital maintenance certificate **makes resale easier by adding trust** to the product by recording its history

ADD VALUE ▶ A digital maintenance certificate which **increases the value of the aircraft** in the event of a resale vs an aircraft without a digital certificate

MORE SERVICES ▶ **Direct access** to a **range of services related to the aircraft,** potentially offered by the issuer or affiliated third parties (aircraft manufacturer / CAMO) and included in the certificate : maintenance, insurance, parts tracking etc...

Benefits Of The Maintenance Certificate For The Certificate Issuer (Aircraft Manufacturer / CAMO)

INCREASE SECURITY ▶ Add **transparency**, **trust** and **security** to the aircraft for the owners' benefit

BETTER TRACKING ▶ **Follow** their aircraft during the entire product life and on the secondary market

ADDITIONAL BUSINESS ▶ « **Connect** » the future **owner** of the aircraft in case of the resale of the aircraft (the maintenance certificate is transferable to the new owner) so that the issuer can offer dedicated services to the new owner of the certificate

ADD SERVICES ▶ Offer **dedicated services** related to the aircraft (maintenance, insurance, secondary marketplace…)

Add Value And Trust During The Resale of the Aircraft

1. The aircraft maintenance certificate has been **updated throughout the life of the aircraft** (including pre-buy inspections and reports)

2. The owner (seller) of the aircraft **can show the certified unfalsifiable service record book** of the aircraft to the new potential buyer **with one simple click "Share the Certificate"**

3. The potential buyer is sent a link for **direct access to the entire history of the aircraft** and to its regulatory documents

4. Once the sale is completed, **the seller transfers the aircraft maintenance certificate** to the new owner of the aircraft

Thank you for your attention

Any questions?

Gabriel RAFFOUR
Daher
Head of Innovation Program

Sébastien COURADET
Daher
Responsible for entry into service for new products

Cody ST. HILAIRE
GoodsID
Aerospace & Defense VP

Component Services in Age of Blockchain - KLM E&M

KLM E&M pioneering with SkyThread for frictionless data sharing across the aviation ecosystem, starting with the 787 community

Paolo MONTI
KLM E&M Big Data
Project Lead
Component Blockchain

Joerg GARSKE
SkyThread
Head of Business
Development Europe

AGENDA

- **Air France Industries – KLM Engineering & Maintenance**
- **The challenge of reliable data availability and integrity within aviation ecosystem**
- **Blockchain as a technical viable solution**
- **AFI KLM E&M and SkyThread for Parts**
- **Value for all ecosystem players**

WE ARE AFI KLM E&M

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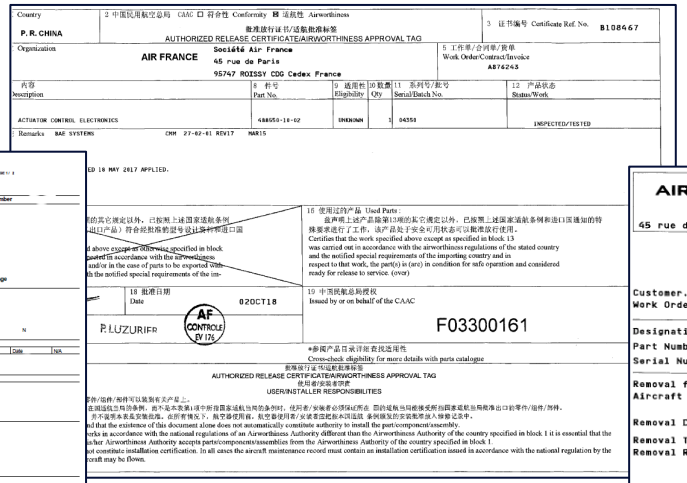
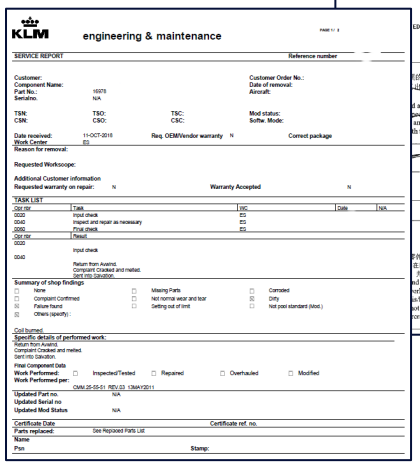
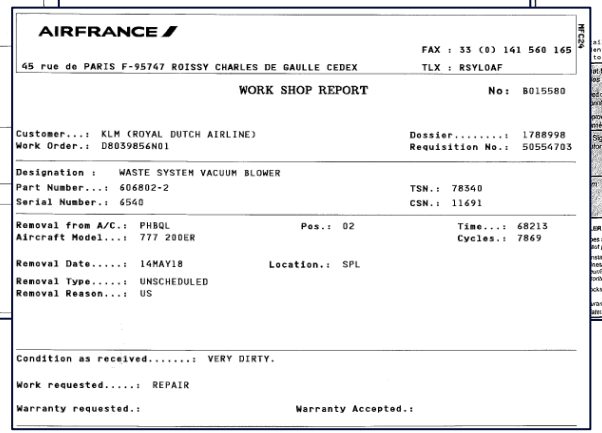
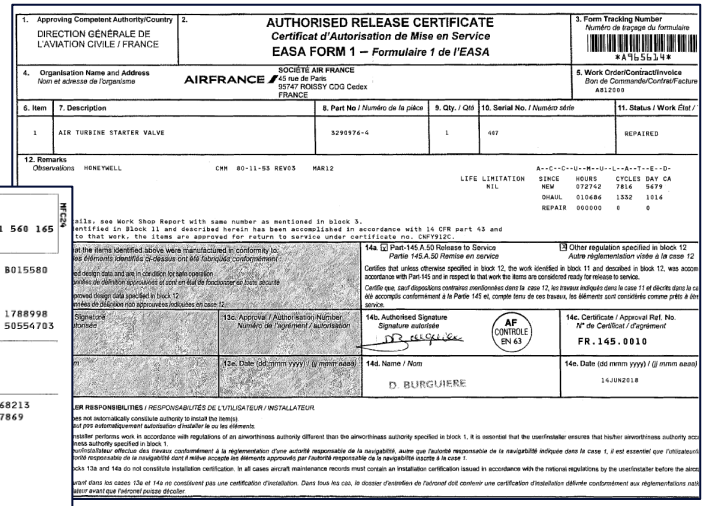
CHALLENGES IN AVIATION DATA

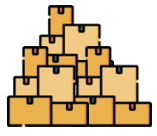
LIMITED HISTORY, VISIBILITY, AND TRUST











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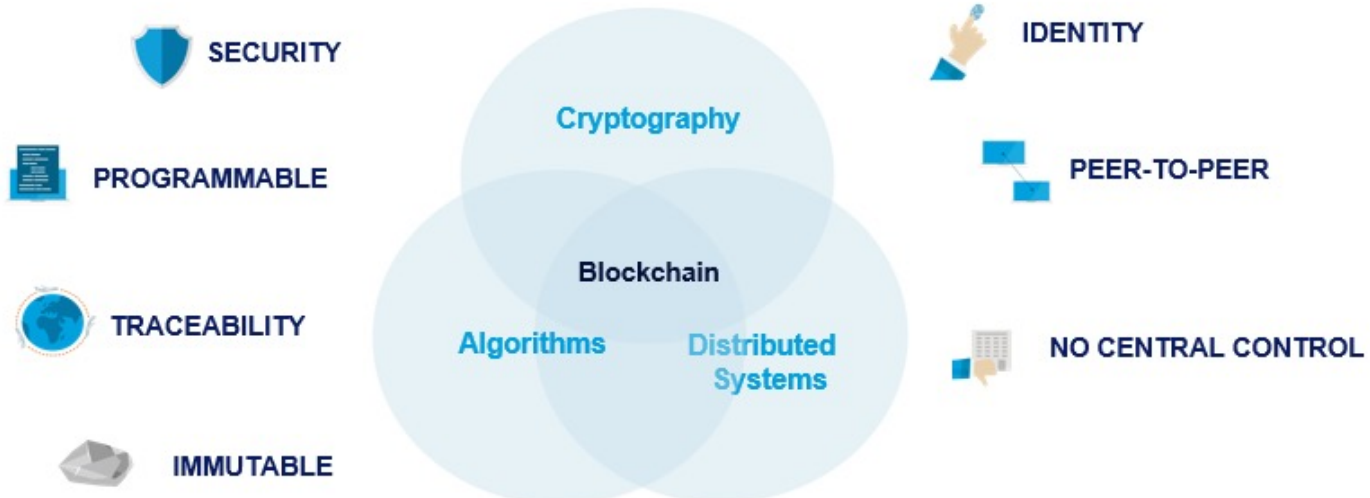
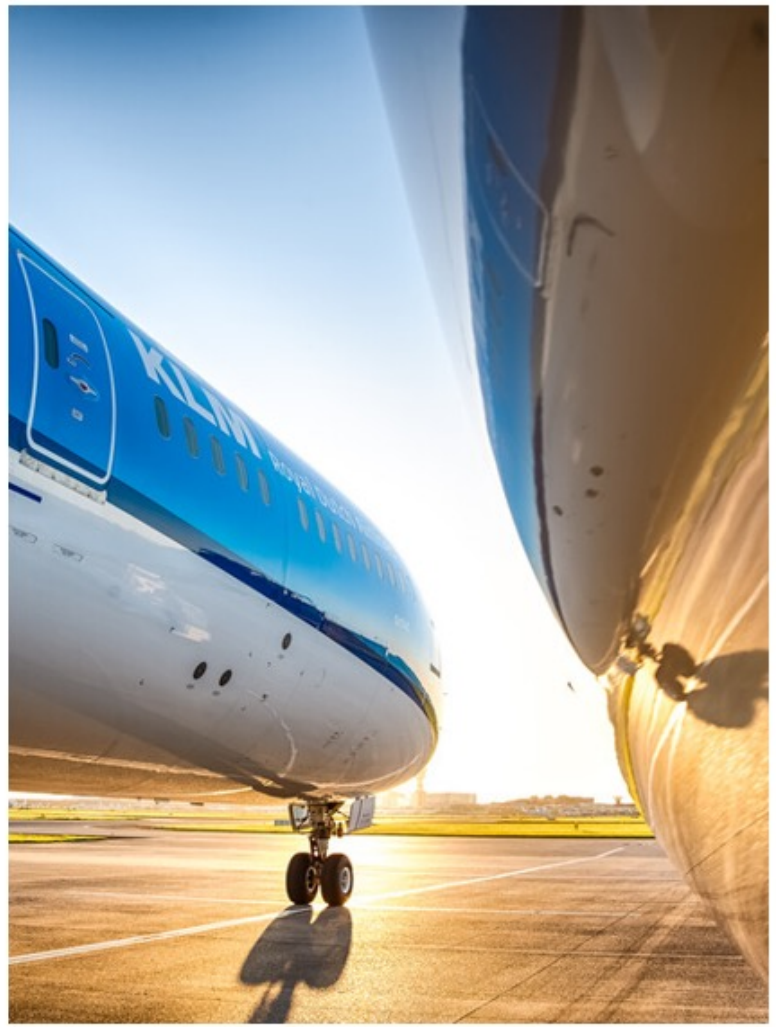
A GLOBAL COMPONENTS LIFECYCLE REGISTER

OUR ASPIRATION

Create a **global single shared** data register for events and configuration status of aircraft components through their lifecycle to create **trust and transparency** in the aviation ecosystem; leveraging blockchain technology to ensure data access, integrity and security





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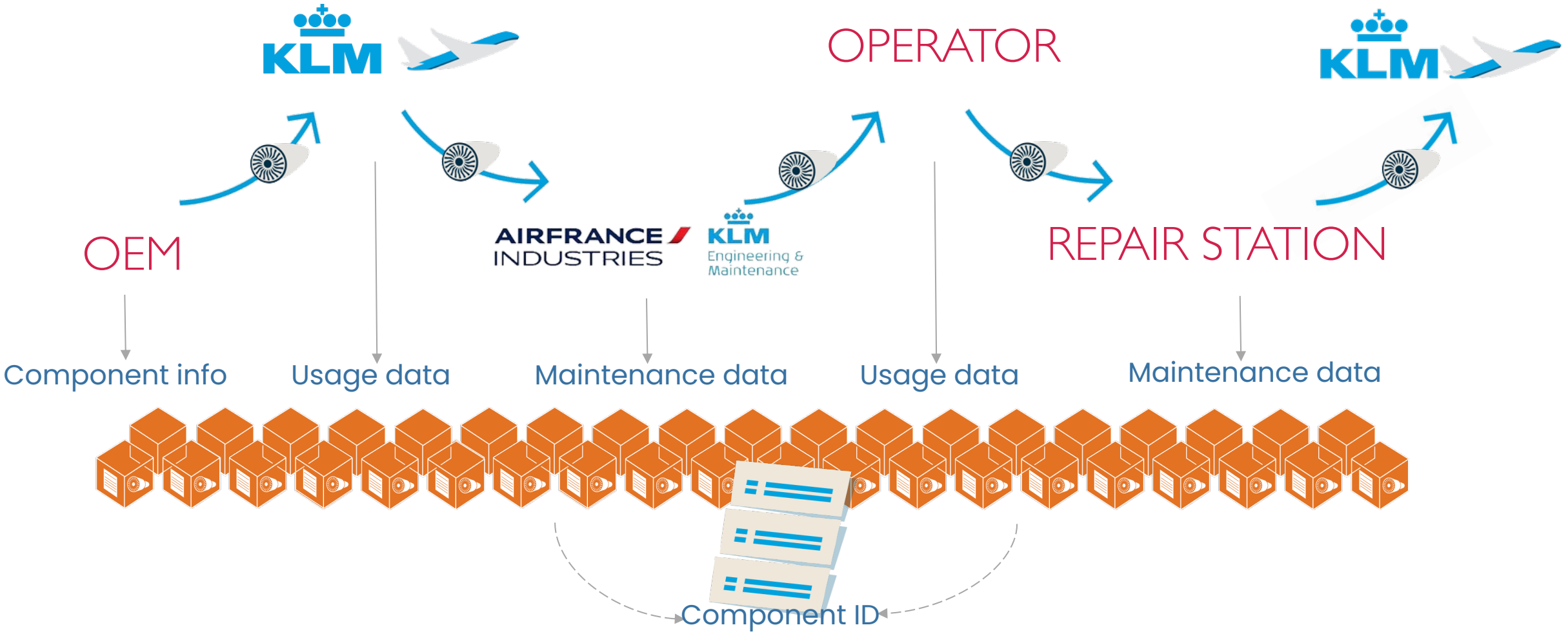
THE BLOCKCHAIN BASE CONCEPT EXPLAINED

HOW DOES IT WORK?



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THREE CONDITIONS FOR SUCCESS

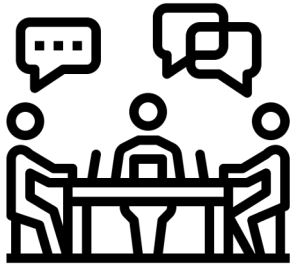
AFI KLM E&M 2018 INDEPENDENT PROOF-OF-CONCEPT FINDINGS

Ecosystem

Effort must be **common** to avoid point solutions

Trust

Independent and **Neutral** service provider



Joint Rulemaking

Consortium government needed

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AFI KLM E&M – SKYTHREAD PARTNERSHIP

SKYTHREAD FOR PARTS FOR OUR 787 COMPONENT POOL PRODUCT

- Independent, **neutral**, service provider, leveraging a combination of aviation industry & IT expertise
- SkyThread for Parts introduces a Software-as-a-Service (SaaS) data sharing network delivering **value to all stakeholders** in aviation industry.

Digital Thread

Powered by Blockchain Secured & Distributed

Backed by an Independent Industry Consortium (IDCA)

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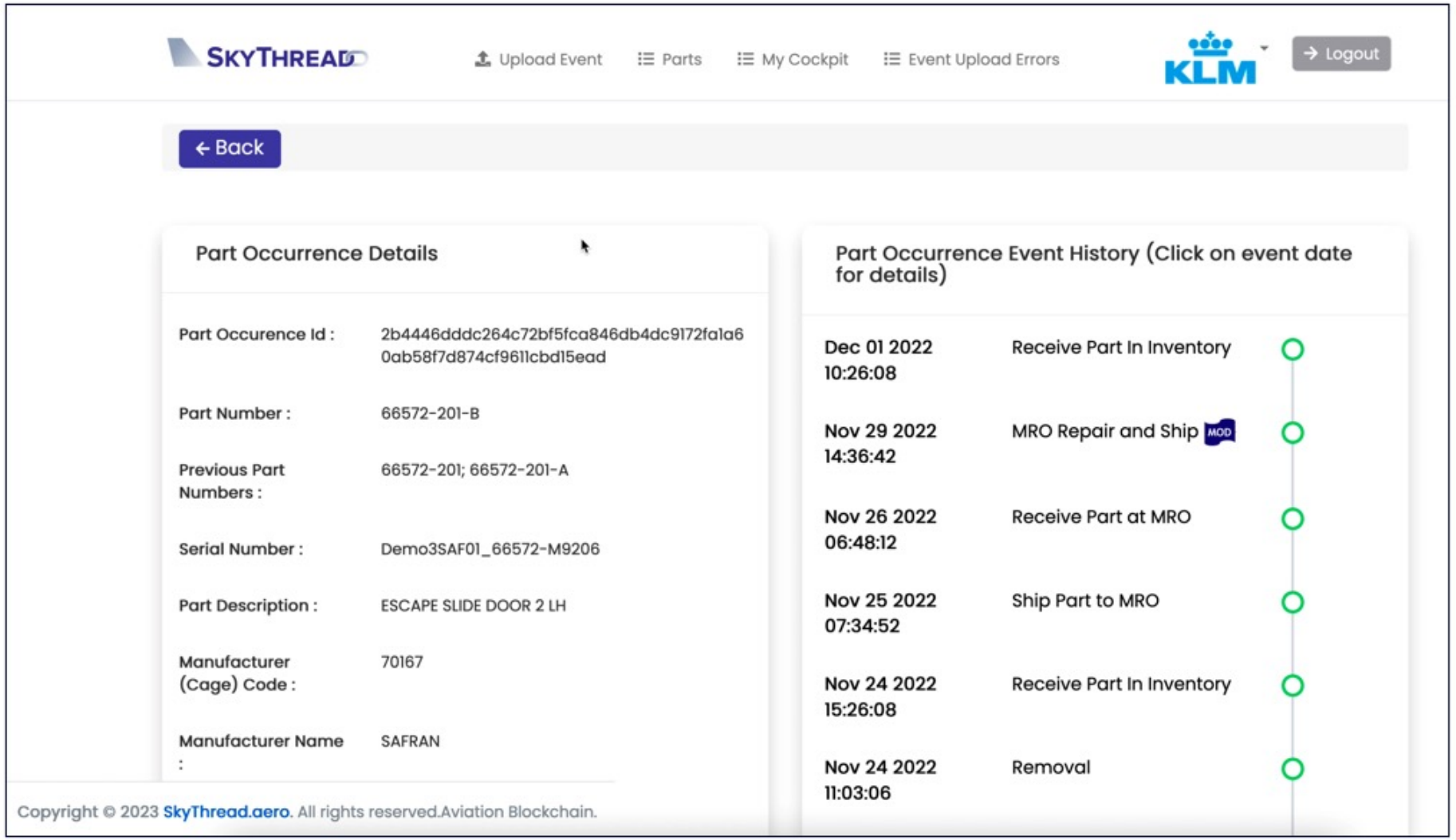
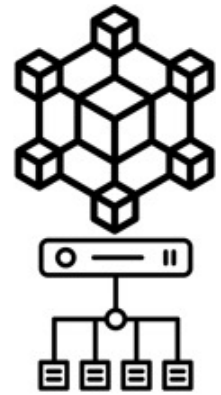
SKYTHREAD FOR PARTS AT KLM E&M

LIFECYCLE EVENT FLOW AND PART HISTORY INTERFACE





Starting Feb 2024

1M+ Events

(part birth, install/removal...)

and Service Reports

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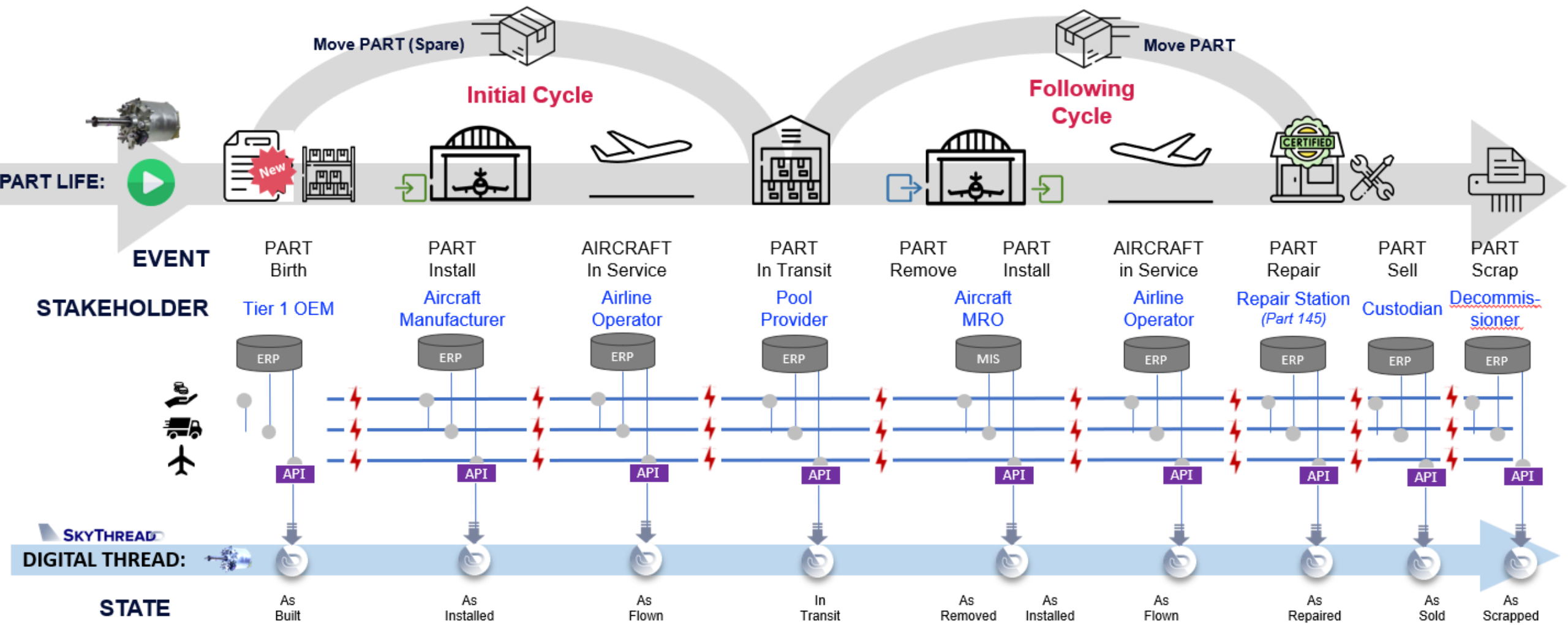
SkyThread for Parts DIGITAL THREAD

RECORDING OF EVENTS INFO FROM DIFFERENT PLAYERS IN A SINGLE THREAD



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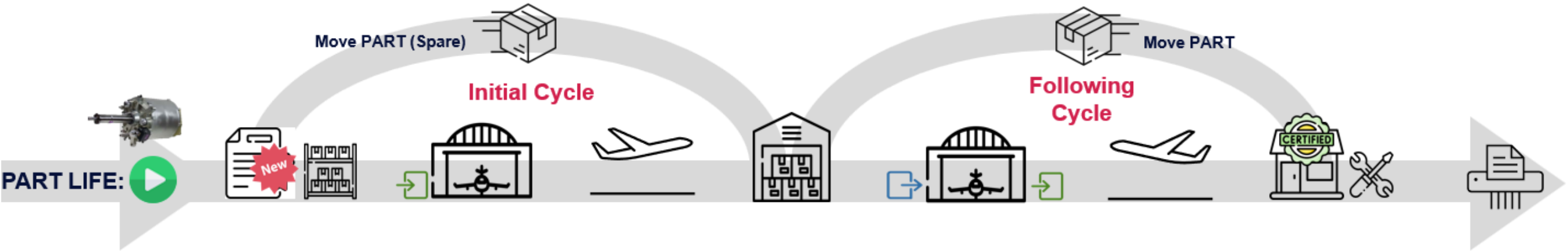
SkyThread for Parts VALUE FOR OUR ECOSYSTEM

REDUCING LEAD TIME, COSTS AND MITIGATING RISKS FOR THE MRO SUPPLY CHAIN



EVENT	PART Birth	PART Install	AIRCRAFT In Service	PART in transit	PART Remove	PART Install	AIRCRAFT (back) in Service	PART Repair	PART Sell (USM)	PART Scrap
STAKEHOLDER	Tier 1 OEM	Aircraft Manufacturer	Airline Operator	Pool Provider	Aircraft MRO		Airline Operator	Repair Station (Part 145)	Custodian	Decommis-sioner
STATE	As Built	As Installed	As Flown	In Transit	As Removed	As Installed	As Flown	As Repaired	As Sold	As Scrapped
Lead Time		✓				✓		✓	✓	✓
Costs				✓				✓	✓	
Full History / Authentication	✓	✓	✓	✓		✓	✓	✓	✓	✓

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SkyThread for Parts

DATA EXCHANGE AND RETRIEVAL, EASY, QUICK AND SECURE.

Airline Operators

- **Enabler towards fully digital data exchange.** No more manual transaction data acquisition.
- **Reduce risk of late releases due to documentation**
- On-demand complete data for independent pool-parts **reliability and performance assessment**
  - Past service reports and overhaul records
- Fast and **reliable back-2-birth** information:
  - Ownership, repair record, certificates
- **Part Authentication**
  - Reduce risk of counterfeit documentation/parts

Component Services Providers

- **Enabler towards fully digital data exchange.** No more manual transaction data acquisition.
- **Easy**, on-demand, access to **complete service & repair history**
  - Usage data: operator(s) and hours/cycles
  - Past service reports and overhaul records
- Fast and **reliable back-2-birth** information:
  - Ownership, repair record, certificates
- **Part Authentication & Export Control**
  - Reduce risk of counterfeit documentation/parts

Tier 1 & OEMs

- **Enabler towards fully digital data exchange.** No more manual transaction data acquisition.
- On-demand complete data for **reliability and performance assessment and demand planning**
  - Past service reports and overhaul records
  - Usage data: operator(s) and hours/cycles
- **Part Authentication & Export Control**
  - Reduce risk of counterfeit documentation/parts

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Thank you for your attention

Any questions?

Paolo MONTI
KLM E&M Big Data
Project Lead
Component Blockchain

Joerg GARSKE
SkyThread
Head of Business
Development Europe

Next steps

Collaboration and stakeholder interviews

Currently we are finalising the information gathering stage, where we want to get the complete views from aviation stakeholders.

If you would like to **collaborate**, and your view to be heard we would be glad to conduct an in depth interview.

Specially, if you are from one of these stakeholders' groups:

OPERATORS	LESSORS	OEMs

Future steps in the project

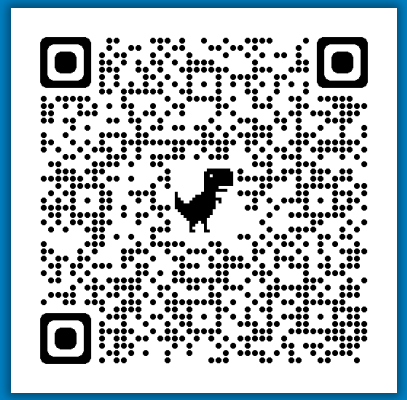
A project closing & **dissemination event** will take place this summer, where the results of the research project will be presented, as well as **training material** to blockchain-based solutions and their use in the industry.

EASA

European Union Aviation Safety Agency

More information:

EASA web



VIRTUA LinkedIn group

Thank you!