EASA
European Union Aviation Safety Agency

VIRTUA Project - Blockchain for airworthiness in aviation

Evaluating Benefits, Constraints, and Regulatory Impact

Introductory Webinar

December 2023

Funded by the European Union
* This project is funded by Horizon Europe

Workshop Speakers

Ana Marija DURANEC
EASA
Production
Organization Expert

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

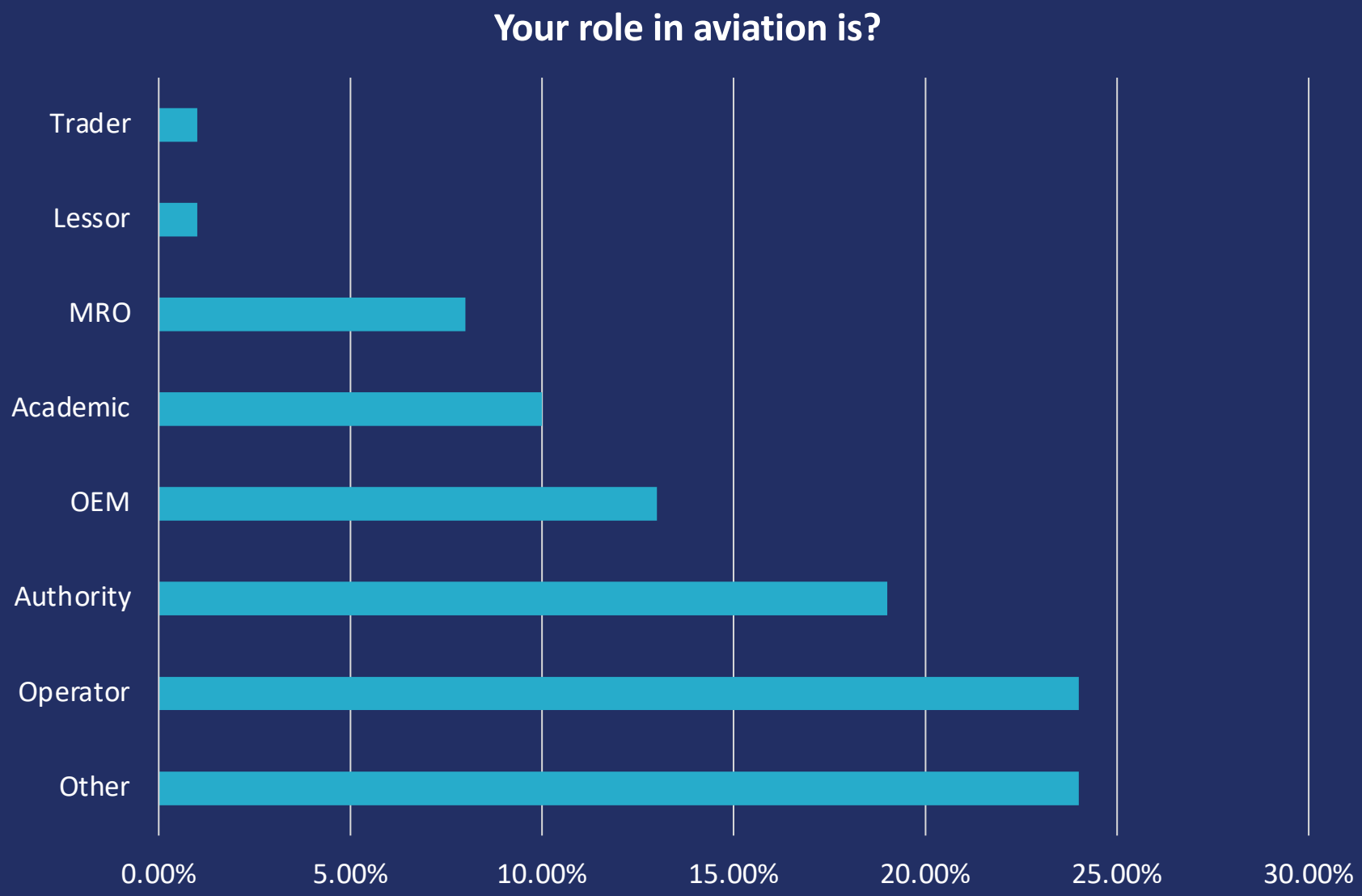
Questions & answers

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

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

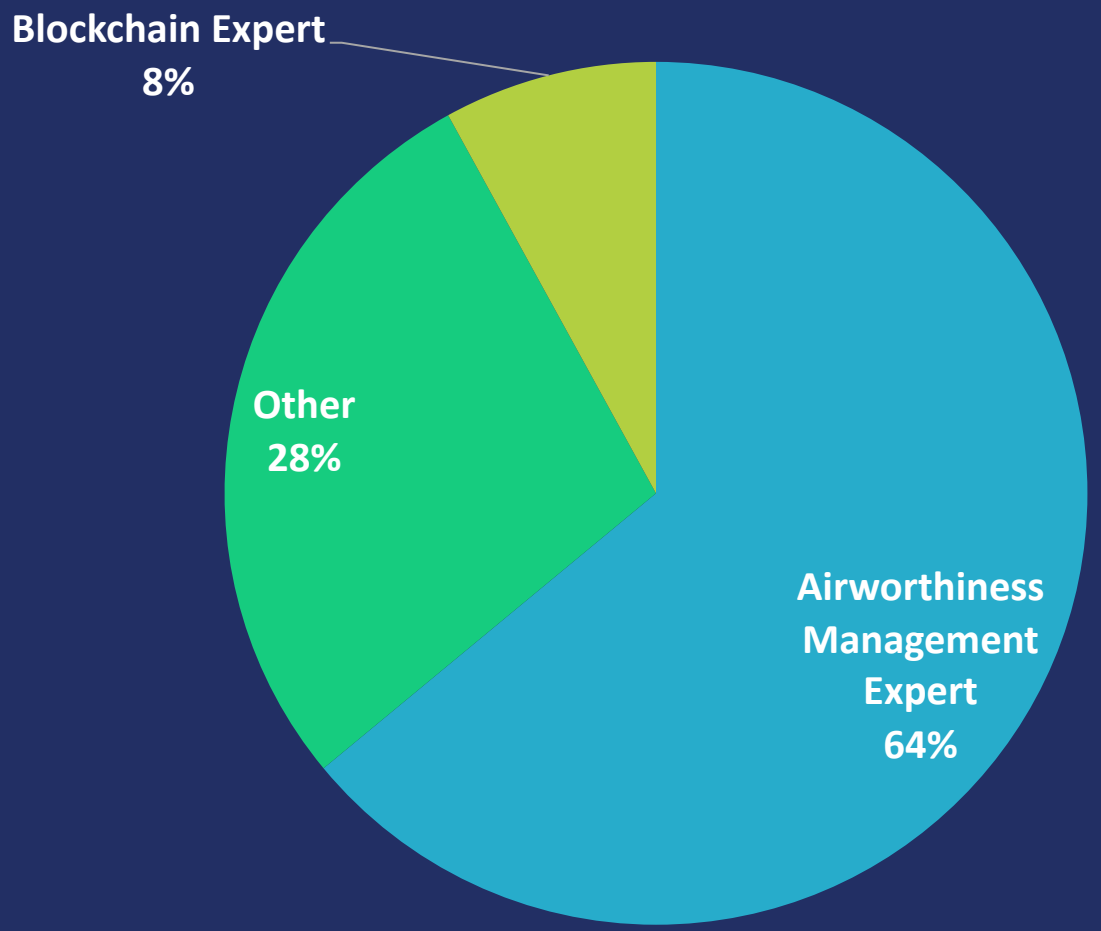
You can also respond to other participants

Introduction Polls



135 respondants

Would you consider yourself …



157 respondants

Horizon Europe

- **Horizon Europe**
  - the EU's key funding programme for research and innovation
- **Horizon Europe Project:**
  - Digital Transformation – Case Studies for Aviation Safety Standards

Lot	Area	Subject
Lot 1	Modelling and Simulations	Case study 1: Application of digital 'twin' concept for the design verification of VTOL and drones.
Lot 2	Virtualisation	Case study 2: Use of the blockchain technologies for the management of aircraft parts throughout their lifecycle.
Lot 3	Data Science Applications	Case study 3: Use of flight training data to support the application of evidence-based / competency-based training concepts. Case study 4: Application of new analytical methods and techniques for fuel management (pre-flight / in-flight) Case study 5: Data models for enhancing the use of operational or training data for safety.

Virtualisation

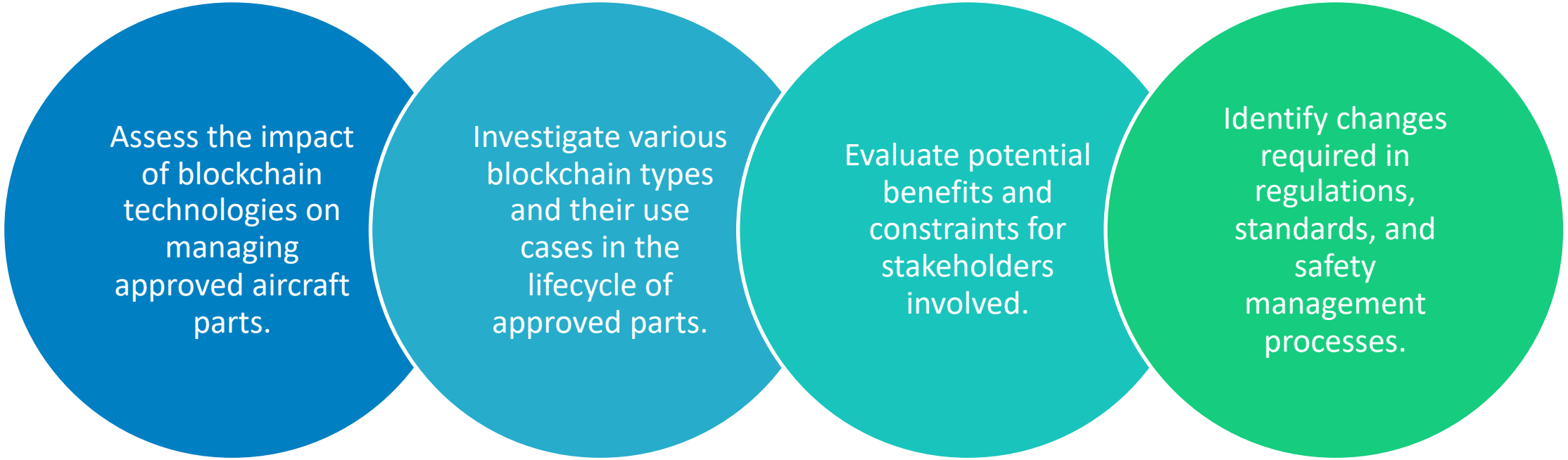
- Use of the blockchain technologies for the management of aircraft parts throughout their lifecycle

- Some challenges we see today:
  - Parts traceability
  - SUPs and fraudulent certificates/EASA F1s

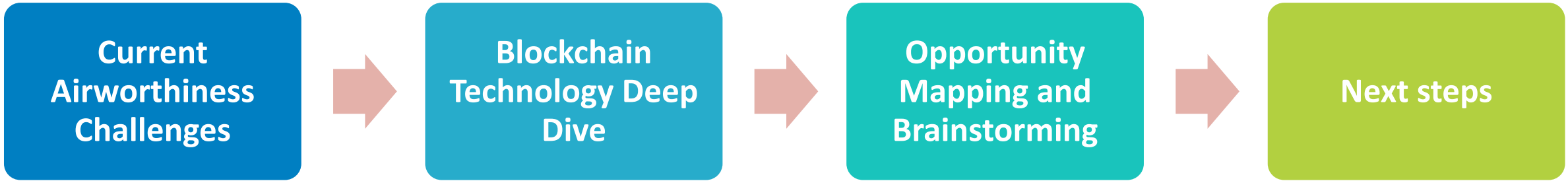
- What do we expect from this project:
  - Assessment of benefits and constrains using the blockchain technology
  - Recommendations for changes to be introduced in regulations, standards and working processes

Our Partners

The VIRTUA Project objectives

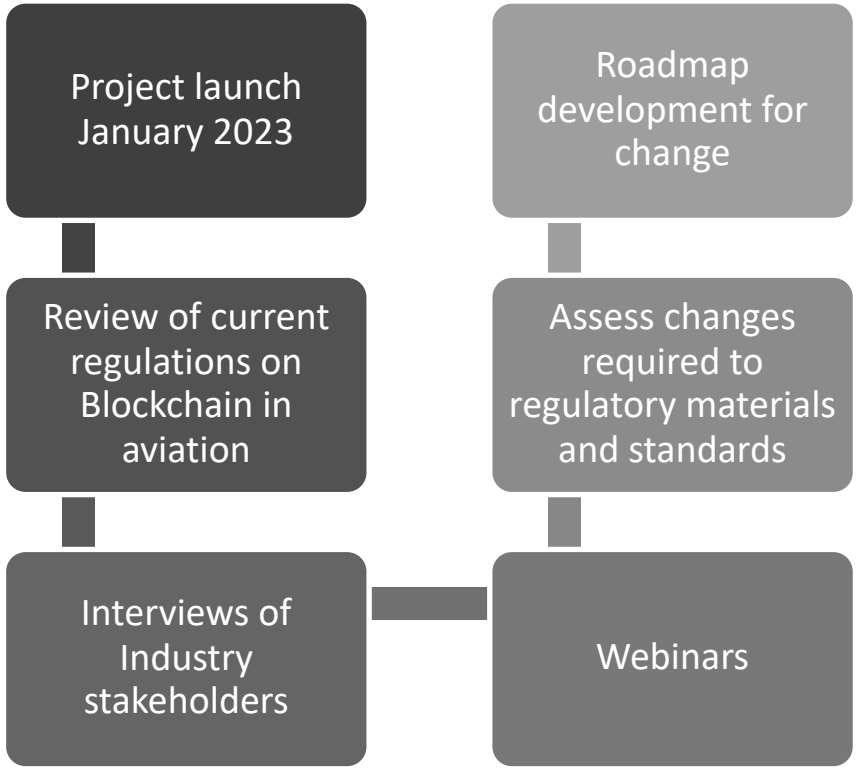


Workshop #1 – Identifying opportunities



Duration
2 hrs

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 a in depth interview.

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

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

Future steps:

The VIRTUA team is going to organise another Webinar on Developing Solution and Strategies for Integrating Blockchain in Airworthiness Management it is planned for 10th of January 2024.

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Current Challenges in Airworthiness

“

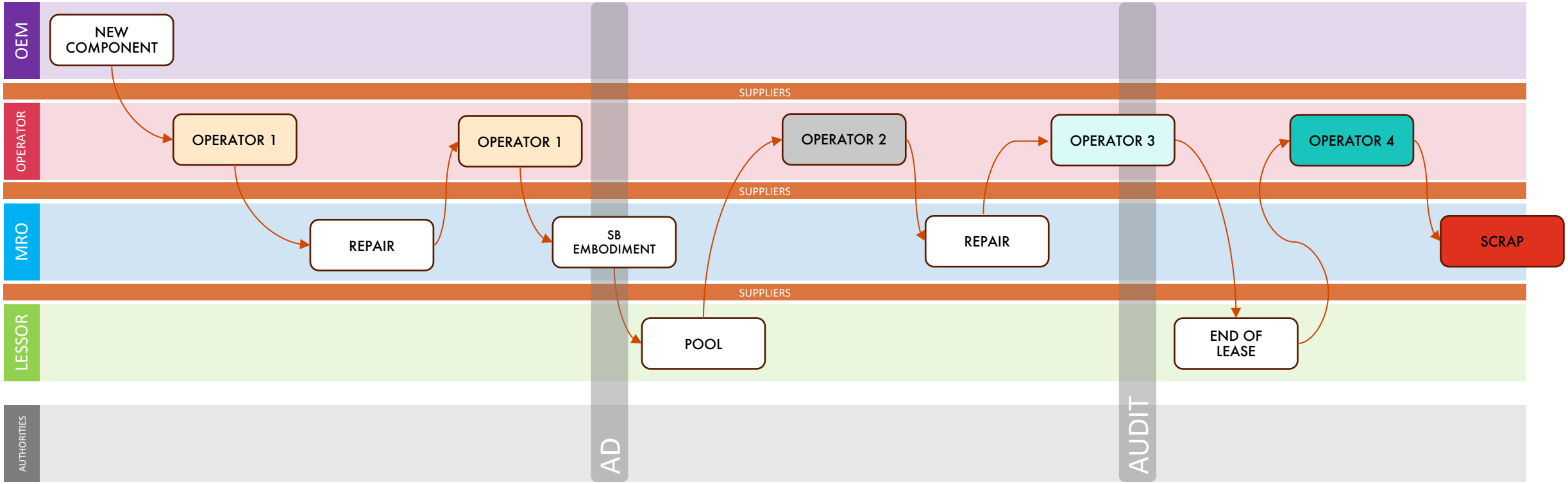
Fleets and MRO demand is expected to grow

Supply chain and staff shortage issues are persistent

Operations will need to be more efficient

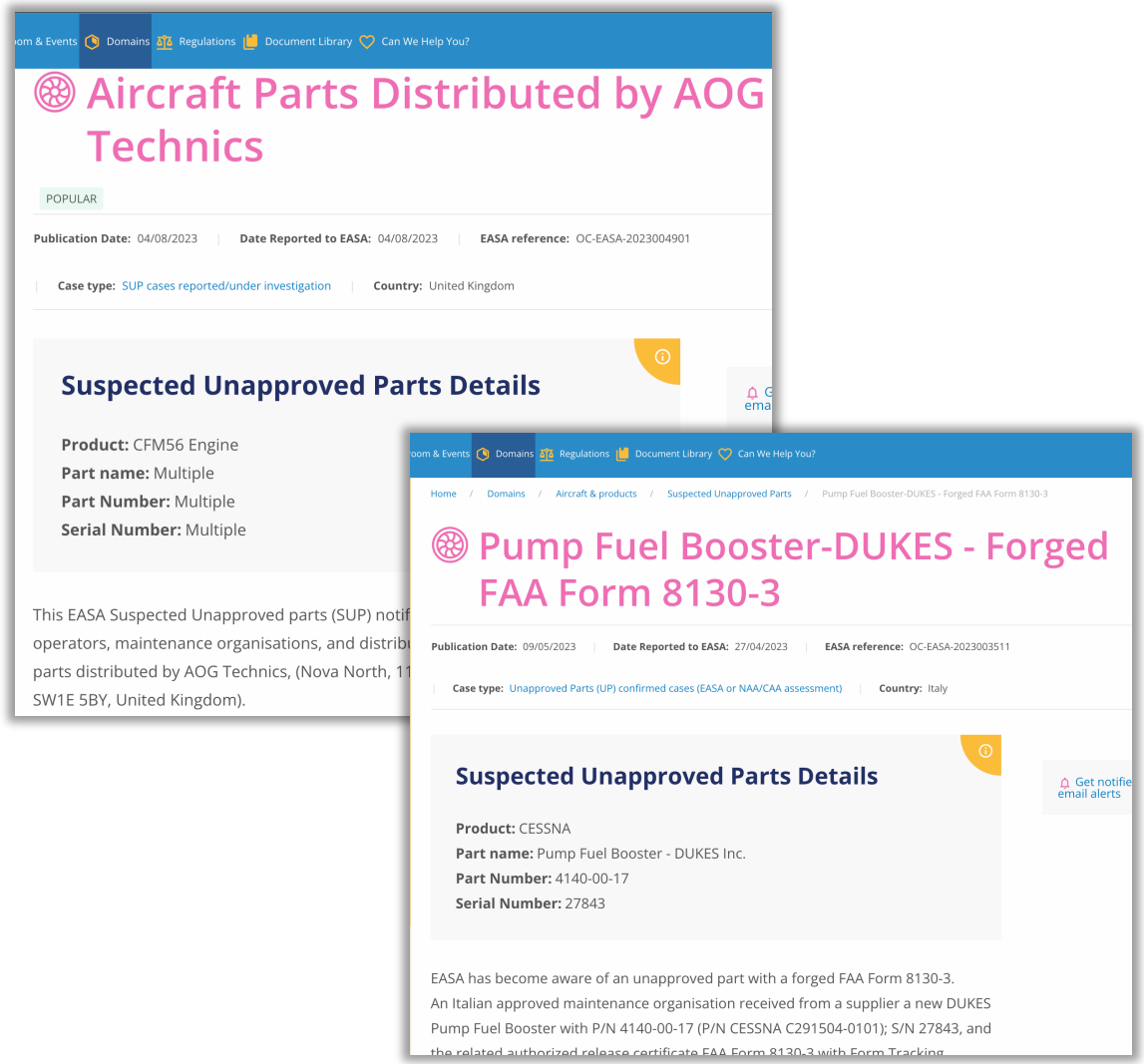
Life of a part

The different stakeholders that participate on the lifecycle of a component since it is manufactured are **OEM**, **Operators**, **MRO**s, **Lessor**s and **Authorities**.



Airworthiness Challenges

- Lack of Trust among stakeholders
- Limited traceability
- Manual tasks
- Approved vs Fake parts
- Documentation storage conditions
- Authenticity of Certificates
- Data sharing limitations
- Errors in data entry



Airworthiness Poll #1

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

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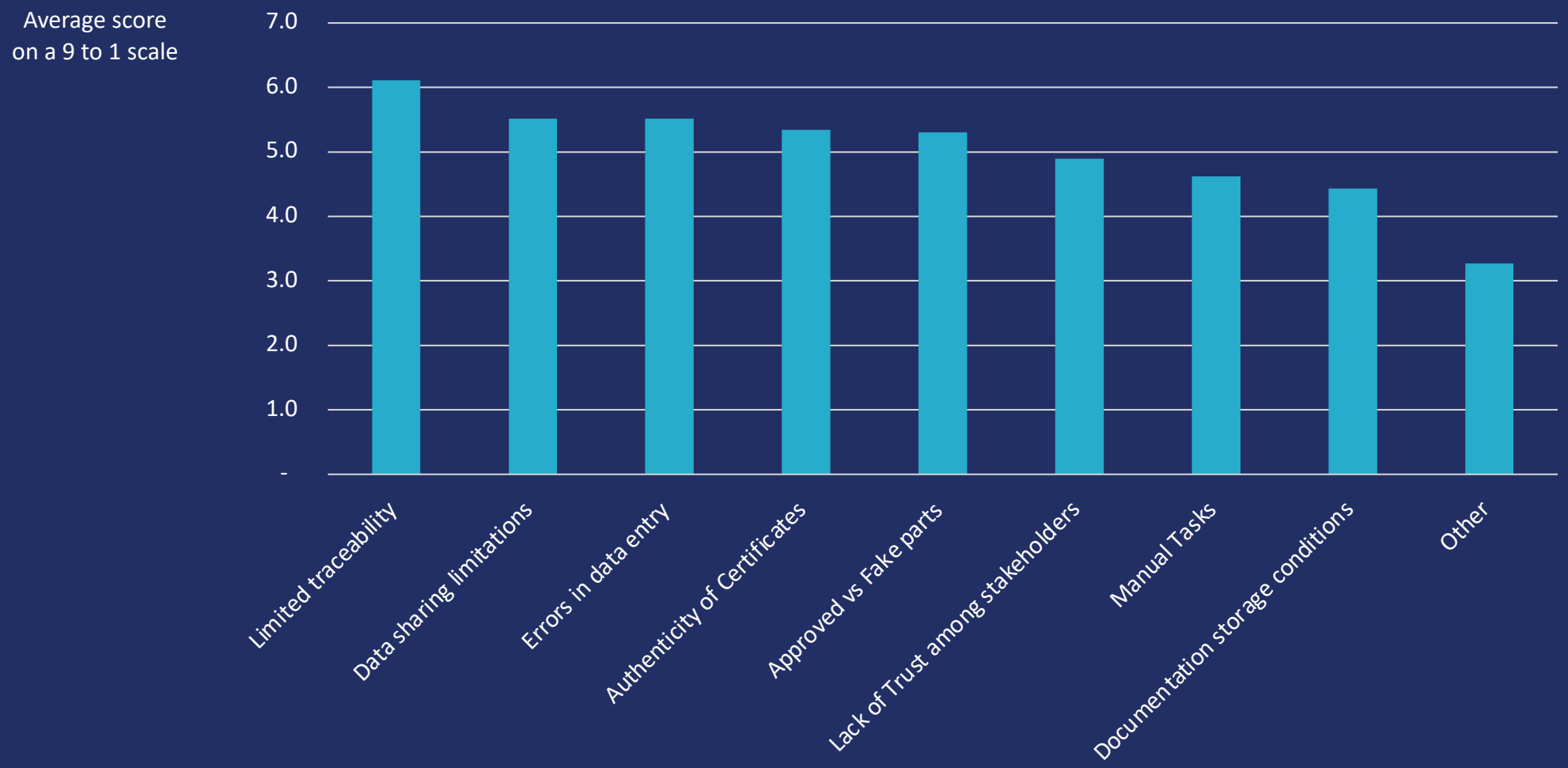
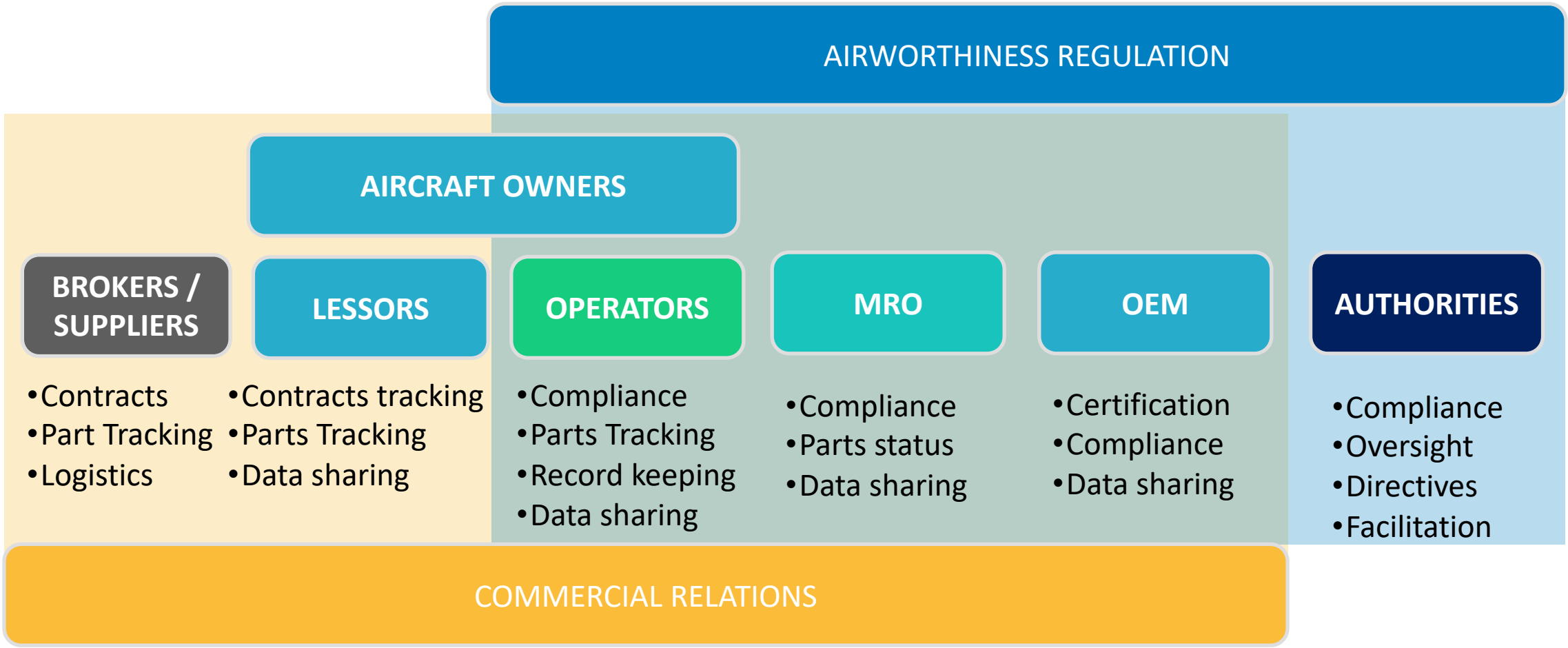


150 respondants

Requirements for aviation



REQUIREMENTS FROM STAKEHOLDERS: Traceability, Interoperability, Scalability, Security, Trust, Real Time

Airworthiness Poll #3

Grade the requirements that a solution to the presented challenges should deliver for aviation

Grade the requirements that a solution to the presented challenges should deliver for aviation

Security

4,8

Traceability

4,6

Trust

4,6

Interoperability

4,1

Real time data

4,0

Scalability

3,8

144 to 148 respondants

Q&A

Any other requirement?

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Blockchain Technology Deep Dive

Blockchain Poll #1

What is your current level of understanding of blockchain?

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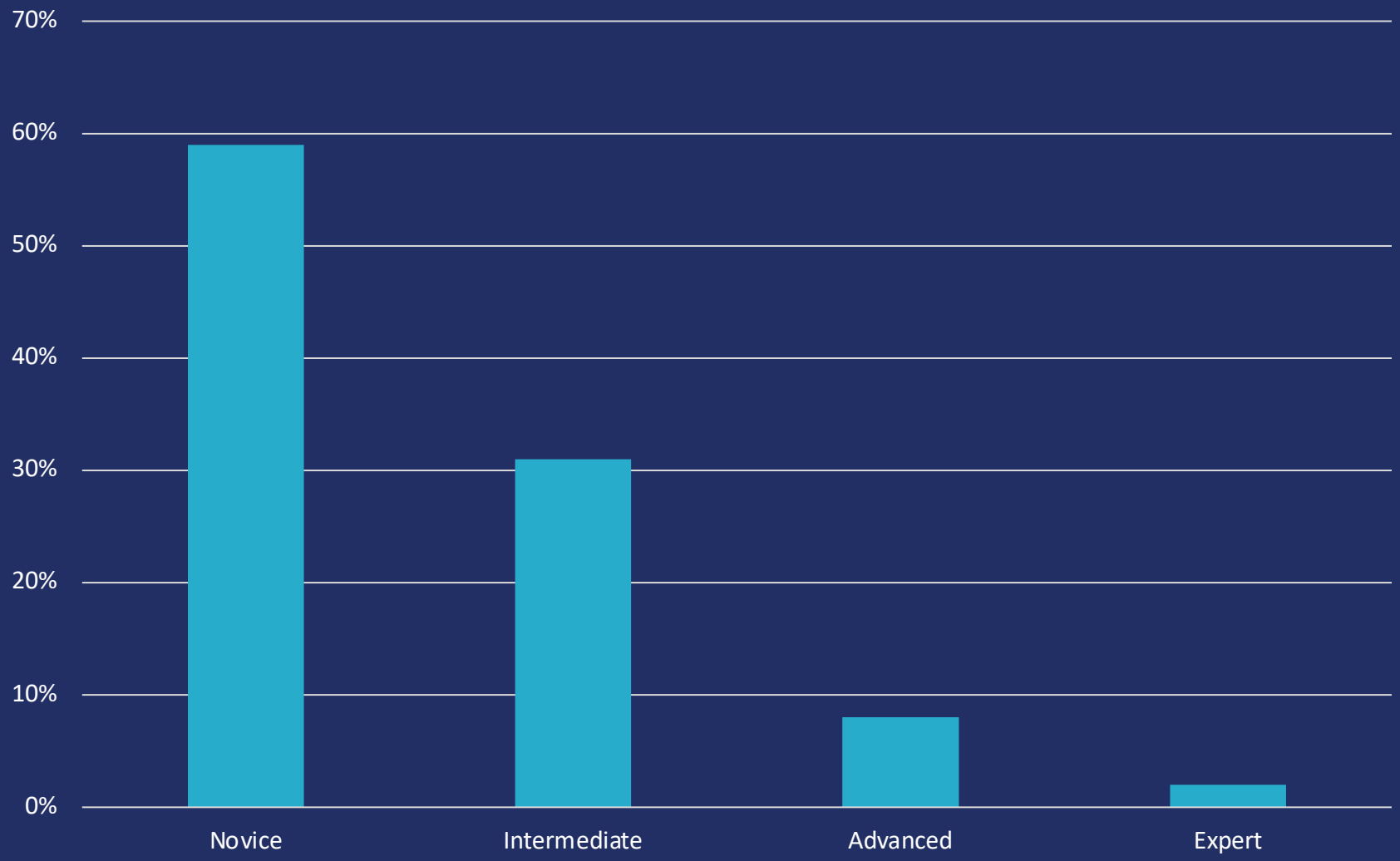


167 respondants

“

At the most basic level,

every blockchain application is merely a digital ledger of transactions

that take place on a peer-to-peer network

Blockchain differs from traditional data management systems in 7 key concepts

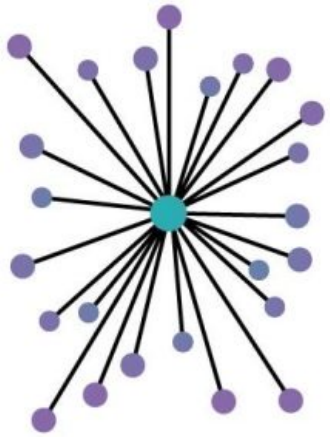
“

Each of these blockchain concepts represents a **fundamental aspect of the technology's potential**. However, it's important to recognize that **they are not rigidly fixed in all implementations**.

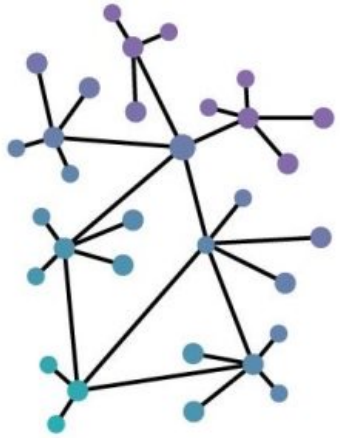
In practice, these concepts function on a **spectrum and can be adapted or even omitted**, depending on the specific needs and objectives of the system's architects, its users, and the particular use case.

1 Decentralization and distribution: blockchain facilitates data sharing among stakeholders, balancing decentralization and distribution with varying degrees of centralized control.

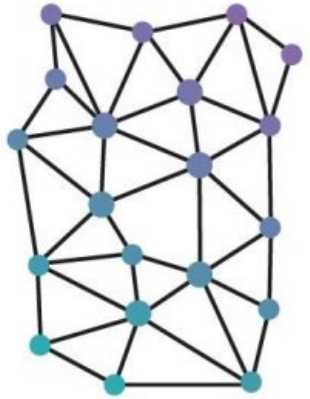
From **Centralized**, traditional networks ...
(entities connected under a single authority)



... to more **Decentralized** networks ...
(no single authority, but relatively dependent entities)



... and fully **Distributed** networks
(all entities are independent and interconnected with each other)



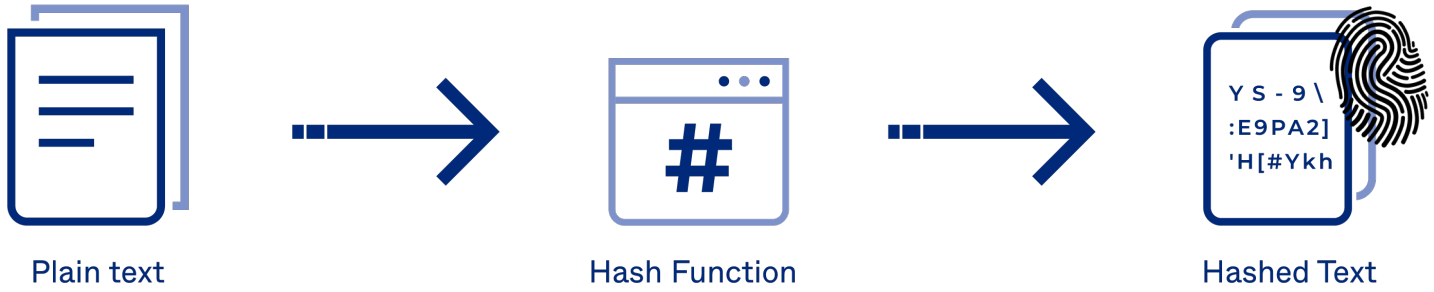
2 The cryptographic nature of blockchain ensures secure data storage and transmission, minimizing the risk of tampering and fraud

Encryption

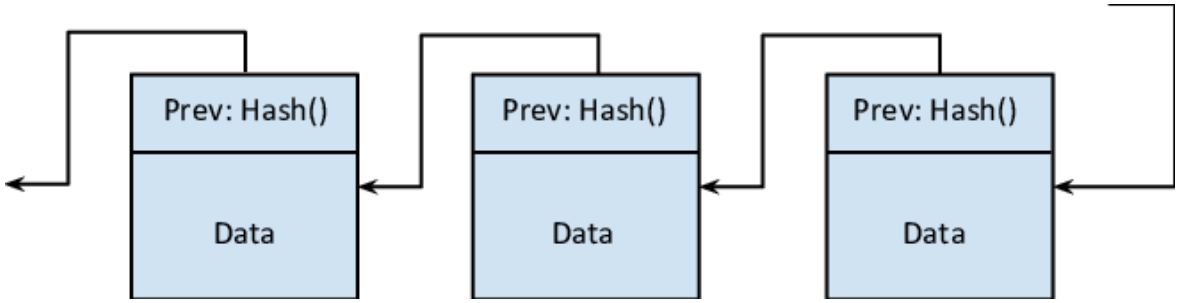
(used to protect sensitive information)

Hashing

(used to validate information)



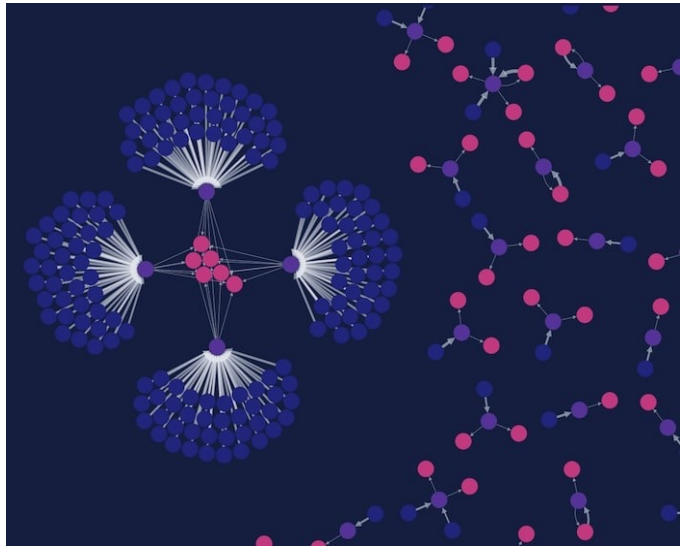
3 Data immutability: once recorded, data on the blockchain cannot be altered



Each new data input contains a unique hash of its data and the hash of the previous data input, creating a linked chain that is tamper-evident.

4 Transparent audit trail: blockchain provides a transparent and traceable record of all transactions and, depending on its parameters, interactions with digital twins of physical objects

Blockchain has the capability of providing a clear, accessible, and traceable record of all transactions and interactions.



Inputs, outputs, status updates, links between organizations and/or events

Cambridge Intelligence Blockchain visualization

5 Blockchain enhances record-keeping efficiency by automating post-entry updates and maintenance of records, despite requiring initial human or system data input

Once data is entered into the blockchain, subsequent updates, modifications, or interactions with the data are automatically recorded and synchronized across the network.

Examples of possibilities offered in record-keeping management

- REAL-TIME CERTIFICATION
- IMMUTABLE RECORD HISTORY
- CERTIFICATE STATUS CHANGE
- REDIRECTION TO LATEST CERTIFICATE

6 Blockchain's consensus mechanism ensures data accuracy and validity by requiring agreement among participants before recording information

Consensus mechanisms in blockchain are protocols that require all network organizations to agree on the validity of transactions before they are recorded, ensuring its accuracy and legitimacy.

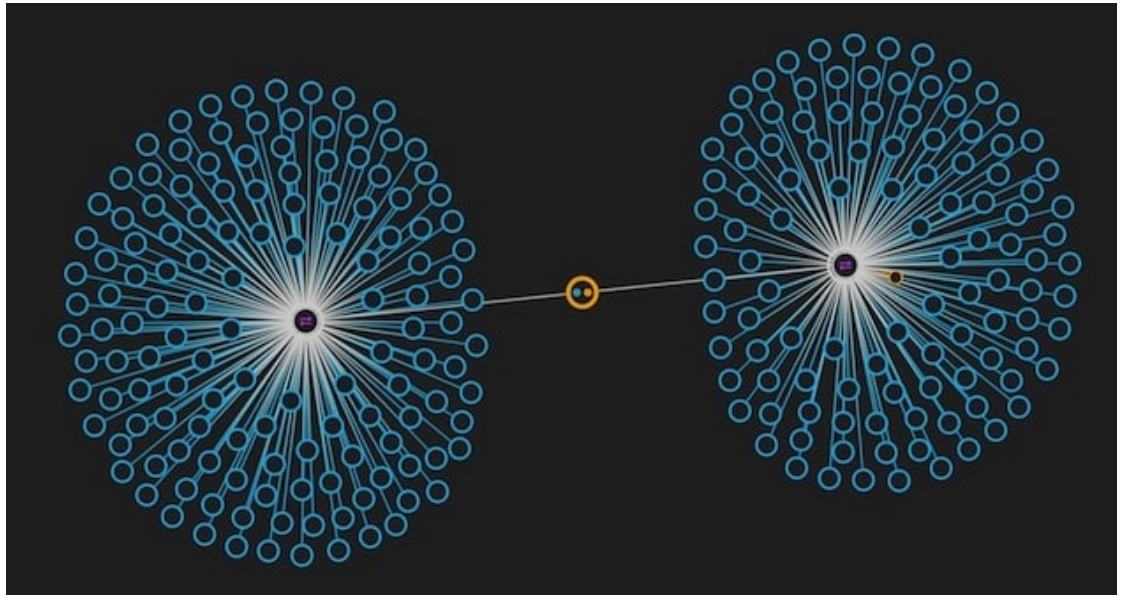
Examples of possibilities offered in record-keeping management

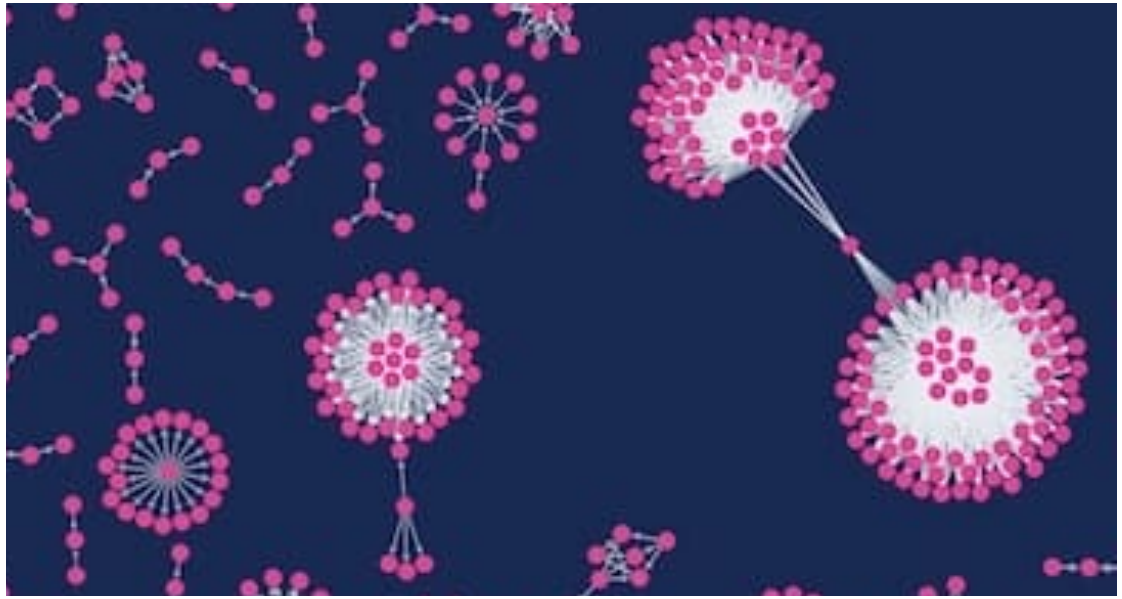
MULTI-STAKEHOLDER OR MULTI-AUTHORITY VALIDATION

AUTOMATIC DATA AUTHENTICITY CROSS-CHECKS WITH EXTERNAL DATABASES

7 Competition and Collaboration Balance: only share the essential data while maintaining your competitive advantages

Among the quantity of data added on the system by an organization,
just a part of it might be shared to other stakeholders



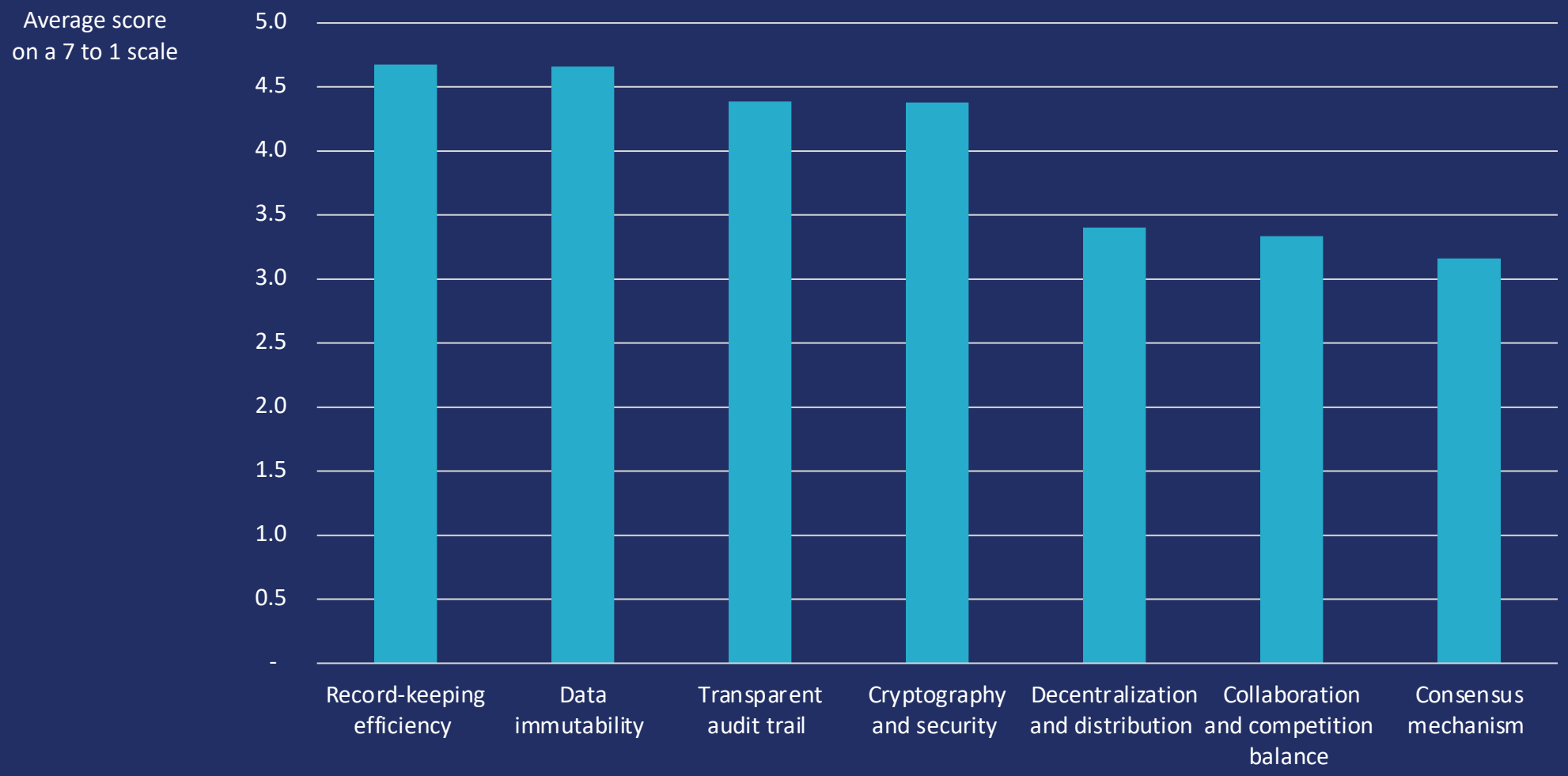


Cambridge Intelligence Blockchain visualization

Blockchain Poll #2

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

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



129 respondants

While blockchain technology holds great promise, the journey towards its widespread adoption in the aviation industry is marked by several challenges

Blockchain Q&A

Please ask us any questions in the Q&A section

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Identifying opportunities

Now it's your time!

Individually, think about ideas of potential blockchain solutions to meet the presented challenges.

Share your ideas in the Q&A, detailing your thoughts and point of view.

The Webinar Team will share them one by one to all the audience, and you will be able to interact with other participants ideas (as comments in the Q&A), sharing your insights on the benefits and feasibility of each solution.

Next steps

Collaboration and stakeholder interviews

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 a in depth interview.

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

OPERATORS	LESSORS	OEMs

Future steps in the project

The VIRTUA team is going to organise another Webinar on **Developing Solution and Strategies for Integrating Blockchain in Airworthiness Management.**

It is planned for 10th of January 2024, and you can register here, by flashing the QR Code

https://events.teams.microsoft.com/event/f24729a3-5ae4-4dfe-a753-ae0cad459fe3@f01e930a-b52e-42b1-b70f-a8882b5d043b

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Thank you!

Next workshop registration page

10th of January 2024