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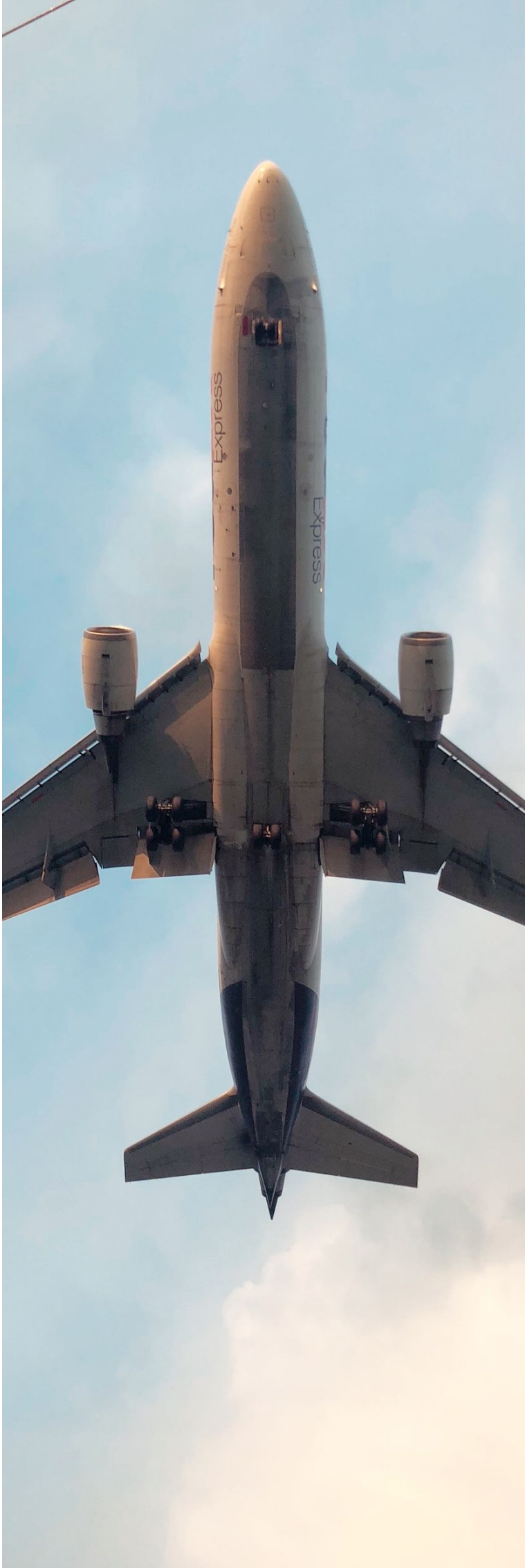
#007

The future of aviation: How collaborative data programs are leading the way

Collaborative data programs in the aviation sector have the power to transform the way we think about safety, efficiency, and sustainability in the industry. By bringing together airlines, Air Navigation service providers, regulatory agencies, and other stakeholders to collect, analyze, and share data, these initiatives have the potential to drive significant improvements in all aspects of aviation operations.

But what exactly are collaborative data programs, how do they work and what are the key success factors for their effective implementation? In this paper, we will explore the basics of such collaborative data programs in the aviation sector and delve into the ways in which these initiatives are driving progress and innovation in the industry.



1. Introduction

Collaborative data programmes in the aviation sector are changing the way the industry addresses safety, efficiency and sustainability. These programmes bring key players in the aviation sector around the same table, allowing them to share their views and jointly analyse their data leveraged by new technologies. Indeed, these initiatives often rely on advanced technologies to collect and process large amounts of data from a variety of sources, such as aircraft, ground operations, safety incidents and meteorological data. This collaborative ecosystem of data, organisations and processes for governance and coordination has tremendous potential to drive significant improvements in all aspects of aviation operations.

From improving safety to reducing the environmental footprint and increasing efficiency, the objectives of these initiatives are clear and numerous. What is even more interesting: most of these objectives are shared, as they are part of common goals and best practices defined by international organisations, such as the International Civil Aviation Organisation (ICAO), subsequently translated into regional/national regulations and finally captured by organisations as strategic levers. While the possibilities for collaboration are virtually limitless, let's take a closer look at the core areas where data collaboration programmes are having a positive impact on the industry:

- **Improving safety:** Collaborative data programs are helping to make flying safer for everyone by identifying and addressing potential safety risks. By collecting and analyzing data on aviation reported safety occurrences, flight sensor data or registered incidents by ATC systems, aviation safety stakeholders can identify trends and patterns that can help prevent future safety occurrences.
- **Increasing efficiency of operations:** These initiatives can help aviation stakeholders make our operations more efficient, using data to optimise routes and flight schedules, as well as identifying and addressing inefficiencies in aviation operations. By using data analysis tools and techniques to process and interpret data, stakeholders can identify opportunities to streamline processes and improve performance.

- **Reducing our environmental impact:** Environment has become a key element within the strategic agendas of all organizations in the sector. As indicated in the point above, data can help at optimizing the operations and with that, reduce the fuel consumed by aircrafts or minimize the emissions both of in-flight and ground operations. Beyond that, data cooperative platforms can be used to monitor the environmental impact of the sector, supporting a proactive and collaborative policy-making environment geared towards more sustainable and clean operations.

Overall, collaborative data programs are a powerful force for driving progress and innovation in the aviation sector. By bringing together multiple stakeholders to collect, analyze, and share data, these initiatives have the potential to transform the way we approach safety, efficiency, and sustainability in the industry.

2. Cooperation is already here: some data sharing initiatives

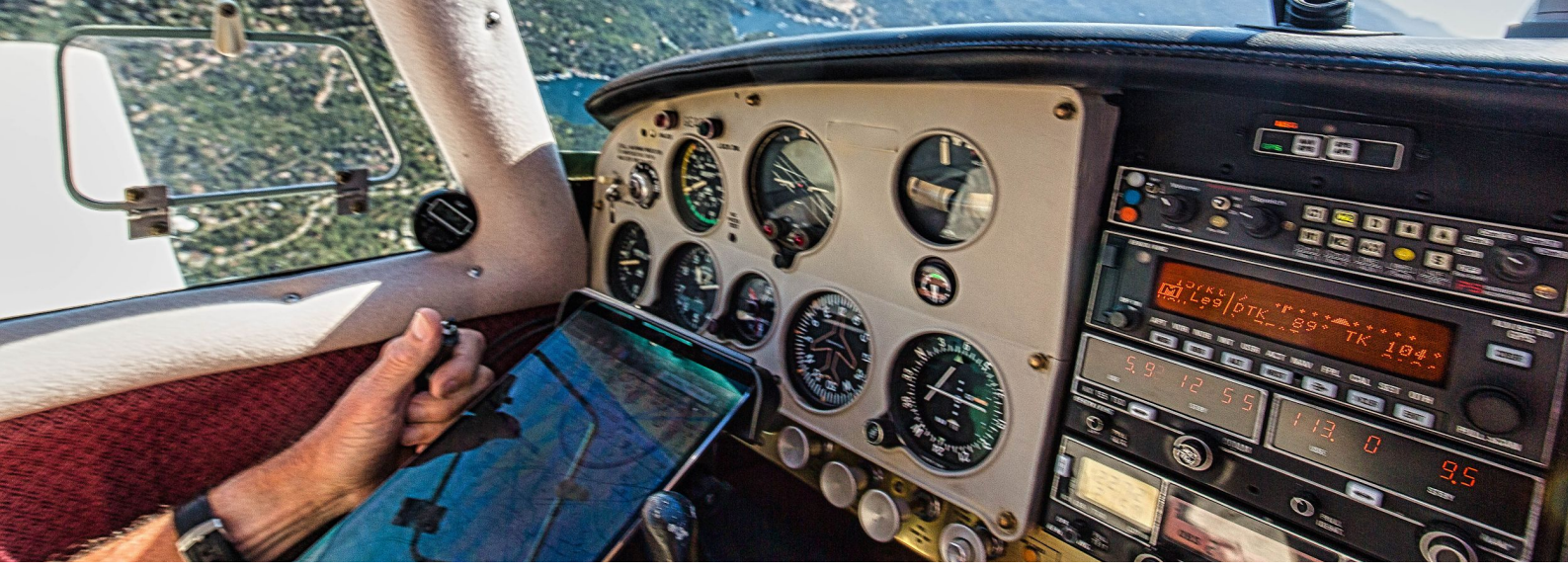
The aviation sector is an increasingly data-driven industry, with technical systems producing a considerable volume and variety of data on a daily basis. Aviation stakeholders already share this data for strictly operational purposes, as it could be several mandatory data exchanges between aircraft operators and Air Navigation Services Providers, Airport operators and Regulatory bodies. However, beyond these cases of strictly operational interaction, a number of research and innovation initiatives have been launched to enable aviation stakeholders to cooperate successfully on data.

There are several examples of collaborative data programs in the aviation sector, leaded by key players in the industry, which often have a strong interest in driving progress and innovation in the industry and are well-positioned to bring together multiple parties to collect, analyze, and share data. Most commonly, international organisations are found in this position, empowered with a mediating role across different organisations (e.g. international bodies, regional entities or manufacturers).

A clear example is the US Federal Aviation Administration (FAA), which runs the Aviation Safety Information Analysis and Sharing (ASIAS) programme, which draws together a wide variety of safety data and information sources across Government and industry, including voluntarily provided data. The ASIAS program allows participating organizations to share safety-related data, including incident and accident reports, in a confidential and anonymous manner. The ASIAS program works closely with the Commercial Aviation Safety Team (CAST) and the General Aviation Joint

Steering Committee (GAJSC) to analyse data, identify trends and potential safety risks, and to develop strategies for improving aviation safety. Its counterpart in Europe is the European Aviation Safety Agency (EASA) Data4Safety programme, in which ALG has played a key role as Data Analytics Provider (DAP) for the complete programme.

Another example of very extensive collaborative programmes in terms of data exchange can be found in air traffic flow management, such as EUROCONTROL as Network Manager. The Network Manager cooperates closely with air navigation service providers, airports, airlines and the military to support safer, more sustainable and efficient operation of the European Network. Cooperation is at the core of the Network Manager concept, as all stakeholders contribute in industry-led governance bodies to the smooth functioning of the organization, the definition of priorities and monitoring of progress. On top of that, EUROCONTROL has launched a robust framework of data initiatives to improve the efficiency and predictability of air traffic management in Europe, as it could be its contribution to the deployment of SESAR. In the ATFM field, there are many more worldwide initiatives and collaborative frameworks, not limited to the European system or the FAA's cooperative concept. However, they all have a common denominator: the need for collaboration and data sharing between stakeholders to ensure continuous improvement of capacity and demand.



Airbus Skywise & IATA FDX and many more stakeholders seek to establish innovative, data-driven cooperation frameworks for different industry players to collaborate on improving operational efficiency and safety performance across the industry. There are other collaborative data initiatives more focused on environmental protection objectives, such as the Airport Carbon Accreditation (ACA) programme managed by the European Association of Airport Operators (ACI Europe) and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) of the International Civil Aviation Organization (ICAO). To support 'green recovery' and sustainability policies, EASA has launched the "Environmental Label programme" with the aim of informing passengers of the environmental impact of their flight options and thus support more environmentally sustainable aviation.

These are just some of the examples present in the industry and many more are sure to emerge as organisations begin to understand the value available in the tremendous amount of data the industry generates, as well as the potential to apply advanced analytics to many use cases.

Although most of the launched initiatives are yet at an implementation stage, preliminary results from initial data sharing initiatives, show that such platforms have the potential to become a fundamental pillar in the toolbox of aviation stakeholders, becoming medium-term capacity enablers to the realisation of a digital-driven sky.

3. What are the benefits of collaborative data programs?

In today's changing business environment, it is more important than ever that aviation organisations remain competitive, resilient and evolve at the same pace as the operating environment. Data is becoming a key asset in this regard, which can help organisations along the entire value chain build capabilities to help them meet the challenges ahead, most of which stem from increasing traffic levels.

Until a few years ago, and this is still the case, each aviation stakeholder has developed its own data-driven solutions to address these challenges, relying primarily on its own internal data sources, enriched with public and, potentially, external procurable sources. However, the benefits of data can only be maximised by having access to the largest possible data sets, ensuring not only the volume but also the variety of data outside the strict boundaries of each organisation's data silo and business. In other words, the data must be representative of the complex reality of aviation operations as a whole.

With this in mind, the aviation community has recognised the need to facilitate access to third party data to improve the reliability and accuracy of data-driven tools, reducing duplication of effort and thereby adding value for all stakeholders.

It is clear that collaboration can be a powerful tool for businesses in the aviation sector, bringing numerous benefits to companies of all sizes. But what exactly are the advantages of data collaboration programmes and how do they differ from a siloed approach? Let's take a look:

- **Sharing data can lead to more comprehensive and accurate insights:** By pooling data from multiple sources, organizations can gain a more complete and accurate picture of trends and patterns in the industry, beyond what they can infer from isolated data sources with their own perspective.
- **Collaboration can be more cost-effective:** By sharing resources and pooling data, organisations can often achieve their objectives more efficiently and cost-effectively than if they acted on their own. As an example, large cooperative platforms can often negotiate better terms with suppliers and other stakeholders. Collaboration can also help companies manage risk by spreading it across multiple parties, ensuring continuity of progress.
- **Collaboration can lead to more effective problem-solving:** By working together, organisations

can share knowledge and experience, enabling them to identify and address complex problems more effectively. In addition, through cooperative systems, organisations can build trust and empowerment, which can lead to more effective decision-making and problem-solving. This is especially important for drawing conclusions and reaching consensus on critical issues, such as safety-related studies.

- **Increased & democratized innovation:** Collaboration can also foster innovation by bringing together diverse perspectives and expertise, which can lead to new ideas and approaches. Ultimately, these cooperatives schemes favor an environment that benefits the whole industry, democratizing solutions whose impact might reach smaller companies.

Data are an asset, but if analysed in silos, they can only provide a biased and limited view of reality. If we want to address cross-cutting, dynamic and complex challenges, such as safety risks or environmental policy-making, there is no other option than cooperation. Cooperation offers opportunities in terms of problem-solving and cost-effectiveness that can help the aviation industry take its data initiatives to the next stage.

4. Overcoming challenges in collaborative data programs

Collaborative data programmes in the aviation sector offer a number of benefits that can help drive progress and innovation in the industry. However, these initiatives also come with their own set of challenges that need to be managed in order for the collaborative platform to work effectively. Based on our experience, challenge is a continuum in these types of initiatives, being diverse in terms of impact and typology. It is therefore crucial to establish adaptive mechanisms that allow the initiative to be flexible and dynamic in the face of any challenges that may arise. Although the challenges are diverse, let's explore together three of the main challenges that organisations may face when participating in data collaboration programmes and discuss strategies to overcome them.

One of the main challenges that exists stems from the need to establish the basic principles of cooperation and, in particular, to **build trust between stakeholders.** With so many organisations involved, it can be difficult to establish a common goal and to build the trust needed to work together effectively, sharing data and knowledge in a transparent and constructive way. This can be particularly difficult when organisations have different objectives and priorities or face competitive environments, as far as programme participation is concerned. To overcome this challenge, it is important to reach clear agreements on roles, responsibilities and expectations for the programme, and to establish mechanisms for resolving conflicts and addressing problems as they arise in its implementation. In addition, trust also depends on data privacy and security. Strong data governance frameworks are important to protect the privacy of individuals and organisations and to ensure that data is used ethically and responsibly.

Another challenge of collaborative data programmes is the data per se, and more specifically its availability as well as the **management of data quality and integrity.** The aviation sector is an intertwined ecosystem and the analysis of isolated data sources provides a limited and biased view of reality. As data comes from a variety of sources, it is important to establish protocols and processes to integrate them into a single silo, ensuring their quality and homogeneity as far as possible. This may involve establishing clear definitions and standards for data collection, as well as applying checks and balances to ensure the accuracy and integrity of the data.

Finally, once data is accessible, it needs to be exploited and relevant insights extracted, which is not always a straightforward process. Organisations involved in collaborative programmes can face challenges in **navigating the complexities of data analysis.** With large amounts of data collected from a variety of sources, it can be difficult to process and interpret this data in a meaningful way. It is also the case that, despite having accessible and ready-to-use data assets, organisations find it difficult to draw useful conclusions from the data. To overcome this challenge, it is important to select the right technologies and tools for the task, and to ensure that those involved have the skills and resources to use them effectively. The gap between technical and business language is a common failing of many digital projects, so the involvement of cross-functional teams that combine data and aviation expertise is key to the success of these initiatives.

Organisations may face a wide range of challenges during the implementation of a collaborative data programme, although many of these will stem from the broad areas mentioned above: building trust in the cooperation, accessing quality data, and exploiting the data effectively. Understanding the implication of these challenges and developing appropriate strategies to overcome them is critical if these initiatives are to successfully drive progress and innovation in the sector.

5. Lessons from our experience: best practices for effective collaborative data programs in aviation

Establishing an effective collaborative framework is essential to the success of any cooperative data programme. As obvious as it may sound, implementing such a framework is not straightforward and requires a sound strategy that takes into account the sensitivities of all actors involved, which is particularly important in the aviation sector.

We must bear in mind that in this sector, with so many different stakeholders and given the sensitivity of the data involved, it is a basic, if not the most important, pillar to establish clear best practices to work together effectively to collect, share and analyse such data, as well as to define relevant actions based on the insights.

As a company with extensive experience in supporting the implementation of such programmes in the industry, we have learned first-hand the importance of effective collaboration and best practices that can help ensure the success of these initiatives. In our experience, some of the key factors for successful data collaboration programmes in the aviation industry include:

Start small, with clear objectives and roadmap: What are our objectives? What is our mandate as a cooperation body? It is important to have clear and well-defined goals and objectives for the initiative, as this will help to ensure that all stakeholders are working towards the same result. On top of that, there should be a roadmap of Use Cases for progressive implementation. Start small, with quick-win digital solutions that can derive valuable lessons learnt for the initiative and build upon that baseline.

Strong leadership and management: The initiative should have strong leadership and management to ensure that it is well-organized and that all stakeholders are working together effectively. This includes procedures for decision-making (e.g. defining strategic roadmap of the initiative) as well as to moderate the inclusion of potential new members.

Robust data governance & prepare your data: A strong data governance framework is critical to ensure that data is used ethically and responsibly and that the privacy of individuals is protected. Security of all shared data sources is key for any member contributing into the programme, guaranteeing that any company without the right permissions cannot access to its data. On top of that, data sensitivity should also be considered, including data anonymization rules to avoid identification of flights, passengers or professionals. After that, get ready and prepare your data, boosting data integration and quality as your first priorities.

Right members & capabilities: Data needs to be handled, exploited and analysed. It is not enough to share the data. To that end, the cooperation initiative needs to consider what are the right members to assume each role within the overall process and regulate to which extent they need to be involved. In some cases, third-parties or providers are also asked for participation, importing some additional capabilities into the cooperative scheme.

Adequate resources and funding: The initiative should have adequate resources and funding to ensure that it has the necessary support and resources to be successful. Such resources may have operational expenses with a higher or less degree of variability, as it is the case of the costs associated to the technological platform (e.g. storage costs, processing costs), which should be considered to ensure the continuity of the programme.

Clear communication and transparency: Clear communication and transparency are key to building trust and cooperation among stakeholders. It is important to ensure that all stakeholders are informed about the initiative and are able to contribute and participate in decision-making processes. Given the strategical importance of such initiatives to the industry, these initiatives should carefully consider their external communication as an asset, ensuring that it is planned and executed in a way that keeps the industry informed, building hype and democratizing the knowledge obtained.

Indeed, most of the best practices have more to do with the actual organizational & strategic framework over which we built our data platform, rather than the actual technical capabilities themselves. Technical capabilities are a core asset to these initiatives but winning trust, engagement and compromise of all members in such a safety-critical and rigorous industry, as it is the aviation industry, is even more important.

Invest time in defining the strategic, management and responsibilities of the future cooperation scheme, both from organizational and technological perspectives. As per our experience, these are the most important best practices that can help ensuring that a cooperative data initiative consolidates within the sector and becomes successful in achieving its goals and objectives.

6. Conclusion

Collaborative programmes, and data-driven ones in particular, are proving to be a key tool for driving progress and innovation in the aviation sector. By sharing data and working together, different organisations and companies in the aviation sector can pool their resources and expertise to identify trends, solve problems and develop new technologies and approaches that can help improve the safety, efficiency and sustainability of the sector.

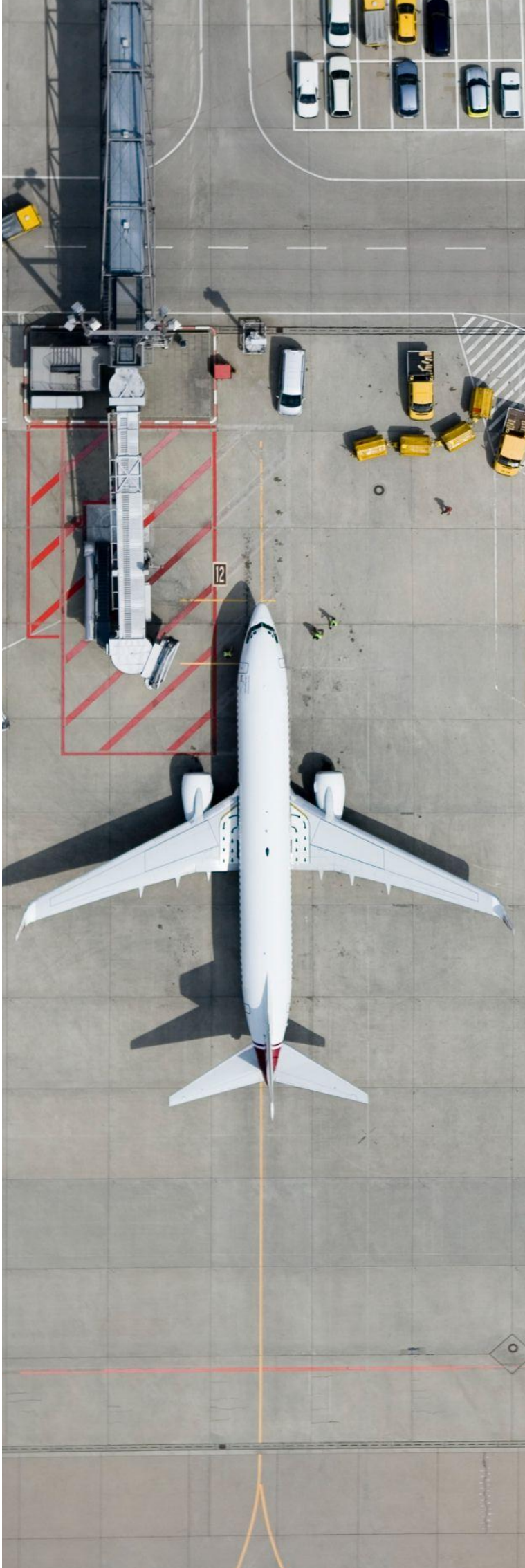
These cooperative initiatives can also help facilitate communication and support decision-making between different aviation stakeholders, including airlines, air navigation service providers, manufacturers, regulators and other industry partners, which can further enhance the industry's ability to innovate and adapt to changing conditions. There are already many good examples of successful initiatives across the industry, led mainly by international organisations such as the FAA, EASA, EUROCONTROL and IATA. Many of these initiatives involve partnerships between different organisations and companies, involving coordination processes and the establishment of IT systems for the analysis and exchange of data from a variety of sources, including flight data, maintenance data and operational data.

In this article, we have also discussed a number of challenges that collaborative programmes in the aviation sector may face. These challenges can include issues related to privacy, security and data ownership, as well as technical challenges around data integration and analytics. Beyond enabling key technical enablers, based on our experience we believe that the key to success lies in creating a strong organisational and governance framework on which to conduct shared analytics, with clear objectives,

responsibilities and control over the data.

At ALG we have been closely supporting different organizations in the aviation sector at defining, setting-up and implementing Collaborative data programs. We have extensive experience in supporting the definition and implementation of cooperative operational initiatives in national environments, such as Airport Collaborative Decision Making (A-CDM) programmes in different countries around the world.

Additionally, ALG is participating in some of the industry's leading data-driven collaboration initiatives, leveraging advanced analytics and Big Data technologies to support joint stakeholder decision-making. Our most recent experience is our role as “Data Analytics Provider” for the EASA Data4Safety programme, which has already successfully closed its Proof-of-Concept phase and is moving now towards a new development phase. This is just one good example of how such cooperative initiatives are progressively winning inertia, becoming more mature and contributing to the future data-driven aviation ecosystem.



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