

Digitalization, AI in Aviation and the Human Factor

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Introduction

Artificial intelligence (AI) is already starting to transform how the world lives and works, and the pace of AI deployment is currently rapidly accelerating. In a world increasingly driven by big data, and with massive developments in recent years in computing power and advanced algorithm use, AI will play a major role in all industrial sectors, driving competitiveness and productivity, and offering, if correctly deployed, huge economic and societal advantages.

AI in the EU

The European Commission is committed to enable scientific breakthrough, preserve the EU's technological leadership and ensure that new technologies are at the service of Europeans – improving their lives while respecting their rights. Commission President Ursula von der Leyen announced in her Political Guidelines a coordinated European approach on the human and ethical implications of artificial intelligence as well as a reflection on the better use of big data for innovations. Thus, the Commission supports a regulatory and investment approach that promotes the uptake of AI while addressing the risks associated with this new technology.

AI and aviation

As a sector, aviation is well placed to take full advantage of AI, in particular machine learning. Indeed, AI and machine learning are already contributing to a wide spectrum of value opportunities in the aviation industry, from non-safety critical to safety critical applications. AI has huge potential for use in areas where it can reduce human workload or increase human capabilities in complex scenarios. As aviation actors increasingly embark on digital transformation journeys, AI represents a potential breakthrough technology, capable of transforming the aviation industry value chain. In particular, AI will enable better use of aviation data leading to more accurate predictions and more sophisticated tools, increased productivity and enhanced use of scarce resources, helping both tackle capacity and environmental impact, the twin major challenges facing aviation today.

To modernise air transport and deliver a digital European sky as defined in the European ATM Master Plan, the next SESAR research and innovation programme will aim to deliver an AI powered ATM environment, more digital cockpit and ground assistants and exploit IA for better airborne operations.

Key AI challenges for aviation

The European Aviation AI HLG has identified a number of challenges, which need to be addressed if aviation wants to make best use of AI technology:

1. *Lack of a data foundation framework;*
2. *Evolution of the role of humans in AI:* One of the most common misconceptions of AI is that AI, as a new form of intelligence, will ultimately replacing the human, and that this is undesirable in a human-centric and safety-critical business environment.
3. *Certification/approval:* Since there can be nondeterministic aspects to certain adaptive algorithms whilst the learning component of adaptive control is permanent, hence verification, validation and safety demonstration is seen as a key challenge for AI-based safety-critical solutions. Moving forward, safety demonstrations need to include considerations for “learning assurance”, and provide confidence that the result of the end-to-end chain of software development is safe. Reproducibility will be a major topic, particularly in the context of incident and accident investigation.
4. *Cyber-resilience:* A key challenge is how best to exploit AI to increase the cyber resilience of aviation systems, as well as how to identify and address the new vulnerabilities of aviation in an AI environment.
5. *Partnerships:* Aviation has for decades formed a highly specialised world attracting highly skilled experts. However, the advent of transformative technologies such as AI poses its own risk in terms of skills: there is a significant risk that AI talents could be attracted to other sectors.

AI and safety

Aviation safety has historically developed primarily on the basis of lessons learned from previous incidents. To date, safety cases and demonstration requirements rely heavily on expert judgement. Digitalisation and AI, however, open up new possibilities for aviation safety, as huge amounts of data can now be processed in order to identify unknown risks, including previously hard-to-analyse data such as informal written reports. So while today we are still struggling to put in place an efficient safety occurrence reporting system across all aviation actors, digital solutions have the potential to process and detect unsafe situations that today could go unreported or unanalysed. In addition, digitalisation enables us to virtually recreate such events, and so improve the definition of preventative actions such as retraining, improved supervision, etc.

In order to provide a relevant database for developing IA in aviation, the European Union Aviation safety agency (EASA) is currently initiating the Data4Safety program, which principal objective is to ensure that all aviation safety, security and environmental components benefit from the digital transformation. This program will seek to gather all the data generated by the aviation system on a daily basis and organise a global partnership with the different actors that will deliver intelligence for aviation safety and environment.

Conclusion and next steps

Artificial intelligence is a strategic technology that offers many benefits for citizens and the economy, provided it is human-centric, ethical and respects fundamental values. Artificial intelligence offers important efficiency and productivity gains that can strengthen the competitiveness and improve the wellbeing of citizens. It can also contribute to finding solutions to some of the most pressing societal challenges, including the fight against climate change, the challenges linked to sustainability and demographic changes, and the protection of our democracies.

The Commission will put forward a White Paper on Artificial Intelligence to support its development and uptake and ensure full respect of European values and fundamental rights. Making the most of artificial intelligence will help us find new solutions to old problems and reduce the time required to perform a broad range of tasks. However, we need to establish an ecosystem of trust to ensure it develops within clearly defined ethical boundaries.

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