Dror Yahav, CEO, Universal Avionics

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Dror Yahav, CEO of Universal Avionics, explores how artificial intelligence (AI), augmented reality and voice control are being used to help improve situational awareness and safety in the cockpit.

Pilots face increasingly complex environments where quick, informed decision-making is crucial. This is where technologies such as Artificial Intelligence (AI), Augmented Reality (AR) and voice control come into play, improving cockpit operations and bolstering safety.

AI is revolutionising the way pilots manage information and make decisions during flight. Traditional cockpit interfaces rely on 2D screens that require pilots to interpret data and understand it relative to the real world. AI solutions simplify this workflow by integrating and processing information from multiple sources – such as ADS-B, weather systems and onboard sensors – delivering a real-time, enriched visual experience directly onto the pilot's head-up displays (HUD).

Universal Avionics' Aperture solution, for instance, uses AI-powered insights to provide a comprehensive image for pilots by fusing data from cameras and sensors. This system not only enhances visual awareness but also offers predictive information about potential obstacles, weather patterns and traffic, allowing pilots to make proactive, rather than reactive, decisions. As the AI system is progressively trained from learned data, system insights and accuracy will only continue to improve. By leveraging AI to reduce manual data interpretation, pilots can focus on what matters most – navigating the aircraft safely and efficiently.

AR is an extension of AI, changing how pilots visualise and interact with the environment outside the cockpit. The integration of AR into cockpit systems allows for an overlay of critical information directly onto the pilot's view. This capability bridges the gap between instrument data and real-world scenarios, reducing the cognitive load on pilots and improving situational awareness.

Universal Avionics' systems combine real-time video, sensor data and AI analysis to generate visual guides, such as taxiway directions, obstacle identification and visual positioning cues. These cues are projected directly into the pilot's field of vision through a Head Up Display such as SkyLens and also on a multi-function display in the cockpit. The digital overlay ensures that pilots have immediate access to the information they need while maintaining their focus on the runway or airspace ahead. This intuitive design significantly reduces the risk of runway incursions and other ground-based hazards, enhancing safety from take-off to landing.

Miscommunication between pilots and air traffic controllers remains a significant risk factor in aviation, often leading to errors that can compromise safety. AI-driven voice recognition technology is addressing this issue by converting air traffic controller instructions into visual cues displayed on flight screens or wearable HUDs. This ensures clear, actionable information for pilots without the need to manually input data.

Universal Avionics has developed automatic speech recognition tools that transform spoken commands into visual guidance. This minimises the chances of misunderstanding verbal instructions and integrates seamlessly with other avionics systems to display critical information precisely when it's needed. By marrying voice control with visual aids, pilots can manage their workload more effectively, concentrating on essential tasks while maintaining a high level of situational awareness.

AI offers immense potential for aviation. By integrating critical information into the pilot's vision and reducing distractions, flying is made safer and more intuitive.

These technologies will only become increasingly integral to modern cockpits. By aligning cockpit developments with regulatory frameworks such as the FAA's AI safety roadmap ensure that these systems not only enhance current safety standards but also evolve with future challenges. The future of aviation looks set to be increasingly intelligent, intuitive and above all, safe. ■