The**eyes**have it

seeingmachines

Seeing Machines and Airservices Australia are pioneering the use of eye-tracking technology to assess fatigue and alertness in ATC

Despite the challenges being faced by the aviation industry in the wake of the COVID-19 pandemic, the global aviation market is expected to continue to grow at a significant rate post-2021 and beyond. In 2019, Airbus forecast that the global commercial fleet was expected to double within the next 20 years[1].

As the industry prepares to double in size over the next two decades, air traffic control (ATC) systems and air navigation service providers (ANSPs) will need to expand to meet this increase in demand safely. With the introduction of HMI systemisation, digital/remote towers and automation, the demands on air traffic controllers in this dynamic environment will also need to change to safely manage the increasing density and complexity of aircraft traffic.

Consequently, ATC training systems will need to evolve to accommodate the shift in pressure and expectations of efficiency. Coupled with an increasing demand for innovation in the industry, there will be a requirement for advancing autonomy while retaining manual control skills.

This all points to a need to evolve training effectiveness, especially within performance monitoring. As controllers monitor increasingly complex systems and depend on progressive levels of automation, efficient scanning is critically important to situational awareness.

Seeing Machines' eye- and face-tracking sensor technology has the intelligence to measure degraded alertness and attention states. The company is a pioneer in the aviation sector for eye-tracking capability and its utility across

the aviation industry in three specific streams: simulators (training), aircraft (pilot monitoring) and consoles (air traffic control).

Eye-tracking technology can help ANSPs and controllers to assess the state of alertness and attention in live operations, provide valuable and timely data to controller teams, and help ANSPs to support controllers with more effective resourcing, scheduling and decisions, as well as providing valuable feedback and support regarding performance.

For the highly regulated and safety critical console-based environment, the key focus is on the 'human-in-the-loop'.

The human in the loop in a console environment

The primary method for assessing trainee scanning and monitoring functions is

through observation and interpretation of operator/controller behaviour. This involves understanding the state of the human in a complex, highly regulated, increasingly automated, safety-oriented console environment for training and operational purposes.

Typical parameters include the controller's workload – whether it is high, low or at an optimum level – and their attention levels – whether they are exhibiting signs of fatigue or drowsiness – as well as ways to support the 'active' controller versus the 'passive' monitor.

Therefore, eye-tracking technology is key to understanding, then working to overcome, gaps in console-based training and operations by enabling direct understanding of the controller's behaviour, decision-making patterns, scanning, and attention levels in real time.

Seeing Machines' technology is designed to enable a global capability to support console-based operations en route and approach, digital towers and other aviation elements such as drones.

For more than 20 years, Seeing Machines has been refining its industry leading eye-tracking technology and works with a number of major automotive manufacturers globally with its driver monitoring system (DMS) technology, which is implemented in cars to enhance safety and enable intelligent convenience features. DMS is going to become a fundamental safety requirement in all new cars in Europe from 2025, likely to also be mandated in North America in the near future. Validated by some of the world's largest carmakers, such as General Motors and Daimler, the company's technology is now driving around in more than 120,000 vehicles today, while also protecting over 31,000 commercial vehicles through its retrofit DMS product, Guardian.

The transition to aviation has been building for more than five years as the industry seeks to grapple with unprecedented growth and the increased demand for pilots across the world's skies. Already working with major simulator manufacturers, national defence and commercial airlines to provide safety efficiencies for pilot and operator training, Seeing Machines has maintained a clear focus on ATC as a key stream for its business, underpinning its purpose to enhance safety through delivery of proven eye-tracking technology globally. **ATM**

1 www.airbus.com/newsroom/press-releases/en/2019/09/airbus-forecasts-need-for-over-39000-new-aircraft-in-the-next-20-years.html

About...

THE AUTHOR
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SEEING MACHINES
Seeing Machines specialises in vision-based monitoring technology that enables machines to see, understand and assist people. The company is listed on the London Stock Exchange (LSE: SEE).

Below: **Airservices Australia's ATC training is responding to both short-term volatility and long-term growth at the same time** Airservices Australia

Airservices Australia case study

Airservices Australia enhances safety in air traffic management

In July 2021, Airservices Australia ("Airservices"), the Australian government-owned organisation responsible for providing safe, secure, efficient and environmentally responsible services to the aviation industry within the Australian Flight Information Region, announced that it was collaborating with Seeing Machines to integrate its technology into the ATC environment.

Airservices is managing the OneSKY Australia Program, the most complex transformation of air traffic management in Australian aviation history. OneSKY is a partnership between Airservices and the Department of Defence, replacing existing civil and military air traffic management systems with an advanced integrated system known as the Civil Military Air Traffic Management System (CMATS). OneSKY was established to deliver more efficient air services, support future air traffic growth and enhance national security.

Seeing Machines' initial programme of work will be focused on validation and development work, with Airservices and Seeing Machines jointly pursuing the development and integration of head-, eye- and face-tracking and related high-level signals including workload, fatigue and attention to support and optimise safe and effective controller performance in an increasingly automated air traffic control environment.

It is envisioned that this collaboration could potentially expand globally and provide utility across the entire aviation industry.

Signal validation

It should be noted that Seeing Machines' eye tracking technology is not a commercially off-the-shelf product. For example, the developer has been working with Airservices for more than five years on data collection and testing, including a feasibility study in their operational environment, prior to recently progressing this to a commercial stage. Initially, the collaboration will validate the core signals in the operational (naturalistic) environment, then jointly develop the higher level output, signals and alerts.

After this research is complete, both companies will seek to jointly pursue the development and integration of head-, eye- and face-tracking, and the related high-level signals including workload, fatigue and attention to support and optimise safe and effective controller performance in an increasingly automated ATC environment.

This will consist of targeted simulation and operator studies for workload and fatigue/drowsiness and targeted analysis of key areas of interest, gaze fixations, gaze dispersion, pupil diameter and blinks. These studies will be conducted over long periods, with greater control over workload and fatigue/drowsiness to create an optimised workload and fatigue capability that will provide highly accurate and reliable signals for workers in the air traffic control industry 24/7.