

Eye Tracking - SWISS teams up with NASA and ETH

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A number of our SWISS pilots are currently performing some unusual activities at Swiss AviationTraining (SAT). The pilots concerned are being asked to fly various manoeuvres in our Airbus A320 simulator; and, as they do so, four infra-red cameras installed in the simulator cockpit are carefully recording every movement – however tiny – of their eyes. The recordings are part of an ‘eye tracking’ study that is being jointly conducted by SAT, the Swiss Federal Institute of Technology in Zurich (ETH Zurich) and NASA’s Ames Research Center.

The eyetracking study is looking at the pilots' scanning – how they read and monitor their cockpit instruments. Or, to put it more simply, it's trying to determine what cockpit displays the pilots tend to turn to in what situations. The findings here should be a big help in developing efficient training products. And last Monday (28 November) the three project partners presented the study to the media and other interested parties.

Added value for all

“SWISS and SAT's involvement in this study is a good example of our Flight Operations Safety proactively making things happen,” says Christoph Ammann, our Head of Operations Training. While scanning is a vital and integral part of a pilot's cockpit routines, there are very few data available on how this process could be trained more effectively. The new study is intended to fill the data gap here, and its results and conclusions will be directly channelled into new training programmes.

In addition to SWISS and SAT, the study partners at the ETH Zurich and the NASA Ames Research Center are benefiting from the collaboration, too. “The data that the study is delivering will be extremely valuable for future aviation safety research,” says Martin Raubal, Professor of Geoinformation Engineering at the ETH. And if further proof of the project's importance were required, it's one of just seven such flight safety undertakings – out of 104 that were submitted – which are being part-financed by the Swiss Federal Office of Civil Aviation.

The study's design

But how exactly does the study help raise flight safety? Dr. Immanuel Barshi of the NASA Ames Research Center explains how it's designed. “The aim of the study is to see if there's a correlation between the scanning strategies of experienced pilots and the success of their flight operations,” he says. In a first study phase, pilots are asked to fly predefined scenarios and their scanning behaviour is recorded. These data are then used to develop a training programme which a group of pilots are instructed on later.

In the second phase the scenarios from the first phase are flown again – by both “trained” and “untrained” pilots. And the scanning behaviour of these two groups is then compared. In case of a successful training the trained pilots will have the information they most need available more quickly; and this should enhance the speed of their response to any difficult situation.

How eyetracking works

What sounds fairly straightforward in theory actually entails a lot of technical work, as SWISS First Officer Michel Kölla and ETH doctoral student David Rudi explain. To record the pilots' scanning behaviour, a digital reproduction of the cockpit instruments must first be generated. The next step is to install four infra-red cameras in the simulator cockpit that are capable of

recording the pilots' tiniest eye movements. The movements recorded by the cameras are then applied to the digital cockpit reproduction to determine exactly which instrument a pilot is looking at when. (The software here also needs to be specially pre-calibrated for each pilot to ensure optimum results.)

In a final step, the scanning behaviour of the pilots is compared with the flight data from the simulator, to show the connections between the scanning conducted and the flight's course and movements. This also meant the SAT and ETH specialists installing an additional computer into the SAT A320 simulator specifically for this.

The fruits of all these efforts should be seen by the end of 2017 at the latest. That's when the project, which began in summer 2015, is scheduled to end, with the final new training product developed and incorporated into SWISS's training.

It will be eagerly awaited!

Reto Deuber

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