



**ORE#: 45559**

**Study Title:** Moving towards competency-based training in aviation.

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**Student Investigators:** Claudia Calderon Martin, Katarzyna Wisiecka

## **Information Letter**

Dear \_\_\_\_\_,

This letter is an invitation to take part in a study being conducted to gain insight into the skill proficiency and competency of flight instructors as they control and fly a plane. The outcomes of this research will help develop tolerance limits of performance metrics to inform progression of student pilots learning how to control and fly a plane. This research will help develop evidence based, standardized and objective measures to monitor and assess progress in skill development. As such, this research serves as a fundamental stepping-stone towards developing training paradigms within the aviation industry that could make the training more efficient.

### **What is the purpose of the study?**

Majority of aviation accidents occur due to human error involving a failure in the pilot's ability to process relevant information, broadly referred to as errors in situation awareness. Existing assessment tools are quite limited because situation awareness reflects complex mental processes that are difficult to measure. Eye movements may reveal the hidden aspect of information processing and the pilot's level of situational awareness; however, research is needed to select and validate eye tracking metrics reflecting situation awareness. The long-term goal of our research is to innovate pilot training by harnessing modern eye tracking technology and computational tools to select and validate objective and non-intrusive measures of situation awareness that will improve assessment of pilot's competency level.

### **What will the study involve?**

If you are interested in participating in this study please see the following sections for a more detailed explanation on eligibility and what you will be doing during the study.

### **Am I eligible?**

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Individual must meet the following criteria:

- age between 18 and 45 years old
- have a Commercial or Airline Transport Pilot License
- have attained their Instructor Rating
- meet medical standards for a pilot license - class 1 medical clearance for aviation

Individuals will not be able to participate if they are not fluent in the English language.

Participation in this study is voluntary. If you are eligible, you will be invited to come to the University of Waterloo for 3 experimental sessions.

**Session 1** will take place in EXP-2696 and will consist of several tests to characterize the individual's sensorimotor and cognitive performance. Vision will be assessed using a standard visual chart (eg. Bailey-Lovie) to determine acuity and a Preschool Stereoacuity test to assess stereopsis. Note that the eye assessment completed in this study is not a replacement for a clinical exam, and that if the researchers discover an issue they will recommend that you follow-up with a full eye exam.

The state-trait anxiety will be assessed using a validated questionnaire (The State-Trait Anxiety Inventory). Three aspects of executive functions will be tested: visuospatial working memory (Corsi test which requires remembering the location of 4 to 8 blocks presented on the monitor), attentional control (multiple object tracking which requires following several moving objects, remembering a subset and inhibit distractors), attention shifting (Visual Search task, which requires switching between different modes of visual search as well as between goal directed (top down) and stimulus driven (bottom up) search). These tests will be performed while the participant is seated in front of a monitor while wearing eye tracking glasses.

**Session 2** will take place in the Flight Simulator lab in EV1-242. When participants arrive in the simulator lab, they will be set up with the eye tracker and heart rate equipment, and complete the experimental session consisting of flight tasks that will last approximately ~2hrs. Participants will complete two questionnaires about situational awareness and cognitive load following each trial.

**Session 3** will take place in the Flight Simulator lab in EV1-242. The same flight protocol will be used as session 3 with additional tasks to increase the difficulty level. For example, the simulator will be programmed to simulate increased wind which increases the demand placed on controlling the plane. Another task will be used to assess the effects of a dual task on flight performance: participants will be asked to respond to an auditory tone by pressing a button while they are flying in the simulator. Participants will be asked to perform a trial that will be evaluated by an instructor and maybe shared with students in class as an example. The best performance will be eligible for receiving additional remuneration. The session will last approximately ~2 hrs. Participants will complete two questionnaires about situational awareness and cognitive load following each trial.

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Upon completion of the study a feedback letter will be emailed to provide an aggregate summary of the results and conclusions of the study. Updated information on the ongoing research can be found at (<https://uwaterloo.ca/kinesiology/> or WISA website).

### **Where will the study take place?**

The first sessions will take place at the University of Waterloo, Health Expansion building (EXP- 2696). All other sessions will take place in the Flight Simulator lab in EV1-242

### **Are there any risks in taking part in this study?**

There are transient risks associated with taking part in this study and include mild mental/cognitive fatigue from completing the cognitive tests in session 1 or from flying the simulator in the other sessions, as well as discomfort from wearing the eye-tracker (potential headaches). We will schedule breaks and allow you to request them as you please. There are no other known or anticipated risks associated with this study.

### **What kind of data will be collected?**

During the research eye tracking and other physiological signals will be collected (e.g., heart rate as well as behavioral signals such as audio and video recordings of the hands and feet, which might explain eye tracking and flight performance results). Sessions in the flight simulator will be video recorded if you provide consent for video recording.

### **Will I be remunerated for my involvement?**

Participants will receive \$35/hr remuneration.

### **Are there any benefits in taking part in this study?**

Participation in this study may not provide any personal benefit to you. By participating in this study, participants will have access to the flight simulator on campus.

### **Can I change my mind about being in the study?**

Participation in this study is voluntary and you may withdraw from this study at any time you wish, without any repercussions. If you choose to withdraw, you have the option of withdrawing screening and study information including withdrawal of data. You can request your data be removed from the study up to the time when the results are published, as it is not possible to withdraw your data once papers have been submitted to publishers.

### **What information of mine will be kept confidential and how will it be secured?**

Raw data files and video-recordings of eye position data will be stored on a secure server at the University of Waterloo and Clemson University (this is necessary as one of the researchers works at Clemson U). All data will be encrypted and password protected. The consent form will be stored on a password-protected UW server called Qualtrics XM and will be downloaded onto a password-protected lab-computer. All personal information collected during this study will be kept confidential. Participant's name will never be used on any document, paper or electronic, excluding the master coding sheet. Participants will only be identified by the codes

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they were assigned. Physical documents will be kept in a locked cabinet within a locked office, with controlled key access at the University of Waterloo.

Eye movement data will be shared with AdHawk Microsystems to improve their eye tracking device and analysis algorithms. Some examples of de-identified eye tracking recordings stored in a password protected files will be shared with AdHawk by email. Electronic data will be erased after a minimum 7 year(s) following publication.

With your permission, your dataset will be uploaded to a UW WISA repository controlled by the research group and may also be used by members of the research team for other aviation projects related to the development of competency based pilot training and the development of computer models for pilot training that have received Research Ethics Board approval. Sharing your data is voluntary. You can still participate in the study even if you do not want your data to be used for other studies. Sharing data helps to avoid duplicating research efforts and allows existing data to be reused to answer new research questions. Once your data are deposited, you will not be re-contacted about reuse of your data in future research projects. It will not be possible to remove data that has been shared. However, by contacting the principle investigator (Dr. Niechwiej-Szwedo) at [eniechwi@uwaterloo.ca](mailto:eniechwi@uwaterloo.ca) you can request that your data be removed from the repository so that no further data sharing will occur. The master key code linking you to your data will be destroyed when it is no longer needed for the current study. At this time, we will no longer be able to remove your data from the repository because we will no longer know which data are yours.

Further, if you agree, de-identified data may in future be shared outside of the research group. The data we share will not have your name on it, so people will not know your name or which data are yours. Steps have been taken to make sure the risk of identifying you is minimized. For example, we will also not share any other information that we think might help people identify you or connect you to your data. However, new technologies may evolve that introduce new risks to privacy. You should be aware that not everyone (eg. companies) who may benefit from use of the data are covered by the same ethical rules as academic researchers but requests for data will be reviewed regarding the purpose of the request by UW researchers prior to sharing any data. In the event your data are used for commercial purposes you will not receive any financial benefit from this. Letting us share your data is voluntary. You can still participate in the study even if you do not want your data to be shared with others outside the research group. Similar to data shared within the research group once your data are deposited, you will not be re-contacted about reuse of your data in future research projects outside the research group. It will not be possible to remove data that has been shared. However, by contacting the principle investigator (Dr. Niechwiej-Szwedo) at [eniechwi@uwaterloo.ca](mailto:eniechwi@uwaterloo.ca) you can request that your data be removed from the repository so that no further data sharing will occur. The master key code linking you to your data will be destroyed when it is no longer needed for the current study. At this time, we will no longer be able to remove your data from the repository because we will no longer know which data are yours.

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**What if I have concerns about my participation in the study?**

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board (ORE#45559). If you have questions for the Board contact the Office of Research Ethics, at 1-519-888-4567 ext. 36005 or [reb@uwaterloo.ca](mailto:reb@uwaterloo.ca).

**What do I have to do if I am willing to participate?**

Please contact Claudia Martin Calderon by email at [ca6marti@uwaterloo.ca](mailto:ca6marti@uwaterloo.ca)

**What if I have questions about the study?**

Should you have any questions about this study, please feel free to contact Dr. Ewa Niechwiej-Szwedo at the University of Waterloo at 519-888-4567, ext. 48311, or by email at [eniechwi@uwaterloo.ca](mailto:eniechwi@uwaterloo.ca)

Yours sincerely,

Ewa Niechwiej-Szwedo