

seeingmachines

Delivering value from an eye-tracking based training aid in a military flight training environment

Alexander Robinson & Patrick Nolan PACDEFF / AAvPA 1340 – 1410, Tue 22 March May 2022



Problem: Training Effectively

"There is currently limited ability for the instructor to determine where trainee pilots are looking at any point in time; so as to ascertain their collection and assimilation of information."

Mr. Mark Corbett, Institute of Aviation Medicine, RAAF







Jericho Dawn 18-8: Lessons – Objective

Main Hypotheses:

- Crew Training System (CTS) improved instructors' awareness of trainees' scanning behaviour
- CTS enabled instructors to improve trainee pilots' scan quicker than current methods
- Recordings of in-scenario CTS can be used as an effective debriefing tool with trainees
- CTS helped instructors to determine the proficiency level of pilots



 Crew Training System (CTS) will improve instructors' awareness of trainees' scanning behaviour
Questionnaire data provided mixed support for this (improved awareness when CTS was
provided support for this.
2. CTS will enable instructors to improve trainee pilots' scan quicker than current methods
Unable to be addressed using objective data due to data losses. Subjective data (interviews) provided some support for this hypothesis.
3. Recordings of in-scenario CTS can be used as an effective debriefing tool with trainees
Unable to be properly addressed as CTS was not used during debriefing. Subjective data
(interviews) however indicate that Instructors expect this tool to have significant potential for
debriefing.
CTS will help instructors to determine the proficiency level of pilots
Objective data provided mixed support for this (eye movement data indicated differences
between more experienced versus less experienced pilots, however instructors' subjective
data did not). Interview data provided support for this.



Jericho Dawn 18-8: Lessons – Subjective

"The critical success factors in delivering multi-crew eyetracking based training capabilities are...:

- effective systems integration, and
- instructional workflow integration.

Ensuring instructors and training organisations are empowered to use eye-tracking based training aids in curriculum integration and design, shared best practices, and ease of use are essential."

JERICHO DAWN 18-8 AWC 2018 005

FINAL REPORT - SEEING MACHINES







A Practioners' Perspective



System Integration = Enabler







Workflow Integration = Enabler









Display



- What?
- Where?
- How?
- When?
- To who?
- To best display eyetracking based information in realtime (to instructors)







Display

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Display: Emirates A380

- Targeted scenarios, i.e. *V1 cut 10 kts below V1
- Tracking PF and PM
- 26 Line pilots, 13 Crews
- Data available, real time, debrief and for aggregation





Display: Emirates A380





Macro (Cockpit)



Micro (PFD or HUD)





Display: Areas of Interest – Hawk 127



Display: CandyBar® – Hawk 127

- Visualisations
 - HUD and Head-Down Gaze Trail
 - Overall Candybar™
 - Live video feed (external view)



seeingmachines





Display Considerations

- Location:
 - Instructor Operating Station
 - Standalone Tablet
 - New screen
 - Onboard / offboard
- Areas of Interest
 - Precise
 - General
- Specific phases of flight
- Design
 - User Interface
 - Visualisation(s)
 - Customisable (preferences)









Debrief (Post-Event)

- What?
- Where?
- How?
- When?
- To use and learn from eyetracking based outputs in a training organisation
- Post-event learning and utility









Debrief Considerations

- How to display the data?
 - Onboard
 - Offboard
- How to access the data?
 - SOQA
 - Integration
- Who has access to the data?
- What is the purpose of the data:
 - Debriefing lessons learned
 Aggregate information







Debrief: ILS Intercept - Example





One QFI reviewed an ILS sequence with eye tracking active. His observations of performance and eye tracking resonated in terms of the potential organisational value of eye tracking.

"This is an interesting one: It's a good student with a wellstructured scan centred on the aircraft symbol, but the accuracy is not quite there, but he's attempting. It's a student with good ability, but his hands and feet are catching up, and he's overcontrolling / not yet comfortable with the aircraft. Parameters are good, but scan drops off intermittently.

The fact that his scan is well structured and the overall accuracy is OK indicates that he doesn't need remedial training, just a few more flights to bed down the accuracy."

Data



- What?
- Where?
- How?
- When?
- Who?
- To use and organise aggregate data to improve at an organisational level







Data: Emirates A380





2018/2019 Emirates PILOT FLVING O "ENG failure" O "Rorare" Windscreen PFD ND FCU EWD MFD SD Unidentified V1+6s MAN FLX / TOGA ٧I 70 KT \cap 0 Figure 12. PF CandyBar[™] Wall PILOT MONITORING Windscreen PFD ND FCU EWD MFD SD Unidentified O "ENG failure" O "Rorate" V1 + 6s () \cap \cap Figure 13. PM CandyBar[™] Wall

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Eye Tracking Report

Human Factors



Data: CandyBar® Insights (Hawk 127)

(start)

Base turns

Qualified Flying Instructors



ILS intercepts Qualified Flying Instructors 🔲 otw 📃 hgs 🔳 nd 🗌 aqa 📕 ed 📕 mfd 📙 hdfd 📃 csi 📕 alt 🛄 hi 📕 vsi (end) Trainees

Data Considerations

- Signals
- Features
- Access, Storage
 - Training
 - Pilots
 - Operations
 - Human Factors
- Data integration
 - SOQA
 - Training design
- Analysis, processing
- Improvement implementation





A Practioners' Perspective



Jericho Dawn 18-8: Practioners' Application





