The Unintended Consequences of Automation, HeliOffshore's Eye Tracking Programme

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HeliOffshore

Safety Through Collaboration

Understanding the consequences of automation

Enhancing flight operations safety by enhancing interaction between crew and automation.

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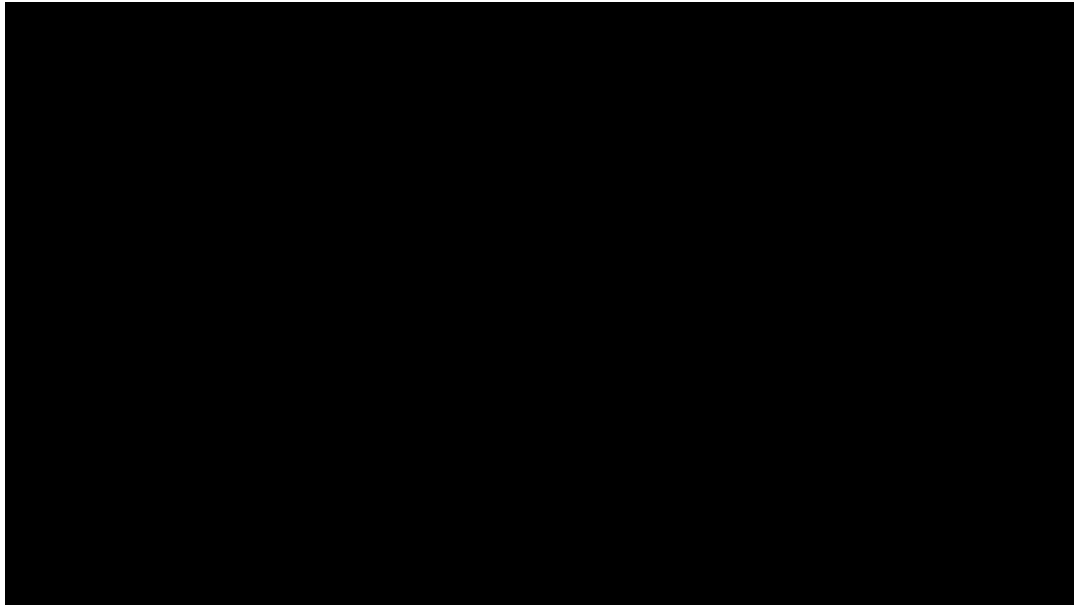
Areas of discussion

- Mode confusion and loss of mode awareness
- Manual flying skill degradation
- Over confidence and trust in automation
- Eye Tracking program results

Advantages of automation

- Automation brings greater accuracy and efficiency
- However, automation is best performing tasks autonomously
- Cooperation and coordination raises some unintended consequences



automation

- You can never fully predict what a human is going to do with it!

Mode Awareness

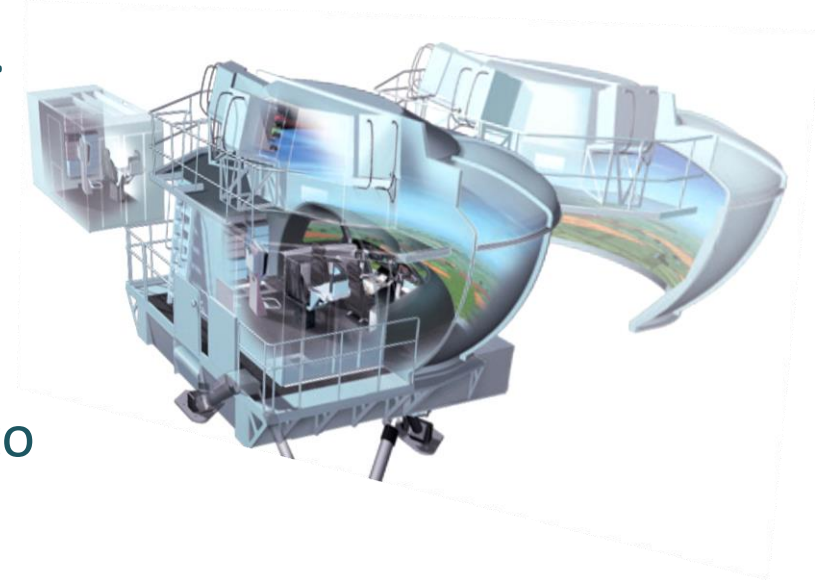
- Confusion at state of automation, current and future
- Breakdown of pilot-automation caused by loss of mode awareness
- Leads to mode errors and automation surprises

Mental Model

- Incomplete mental model
- Automation feedback can be inadequate
- Complex logic differs from pilot reasoning
- Differs considerably across manufacturers

Barriers to mode confusion and loss of awareness

- Change flight deck interface, improve salience of change without pilot input.
- Pilot support for current and future autopilot states
- New flight deck design
- Training
- Pilots are not well supported on how to monitor automation (Scanning & knowledge)



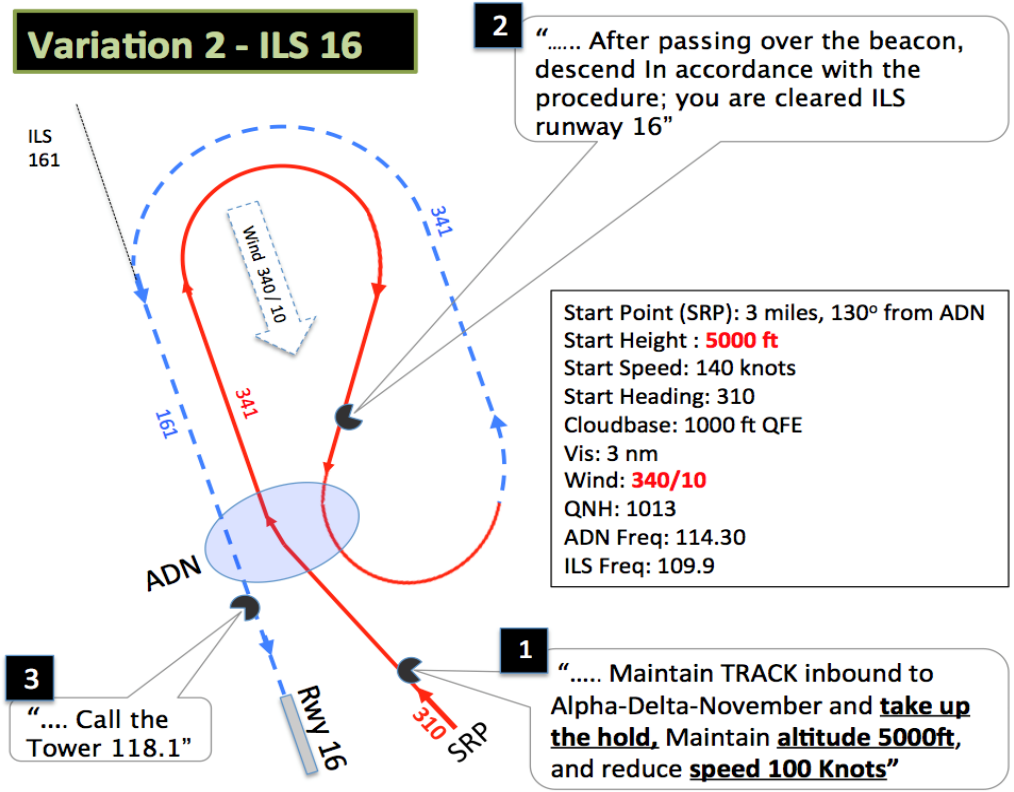
Barriers to mode confusion and loss of awareness

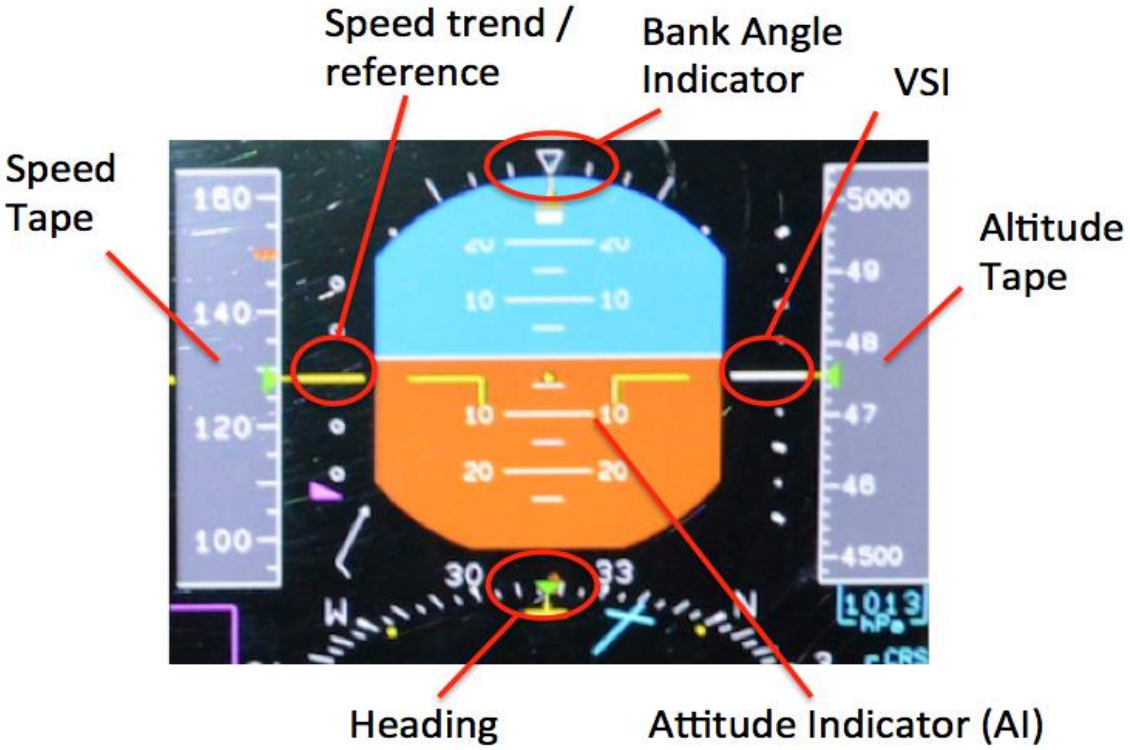
- “T” scan was the accepted wisdom
- Pilots need to monitor more diverse set of indications

Eye Tracking

- Baseline study
- Phase 1 of the program
- Looking at parallels between fixed wing and rotary wing
- Rotary wing validation through some operators for context
- Comparisons drawn from Boeing study (2001)

Introduction




Speed trend / reference
Bank Angle Indicator
VSI
Speed Tape
Altitude Tape
Heading
Attitude Indicator (AI)
160
140
120
100
5000
49
48
47
46
4500
10
10
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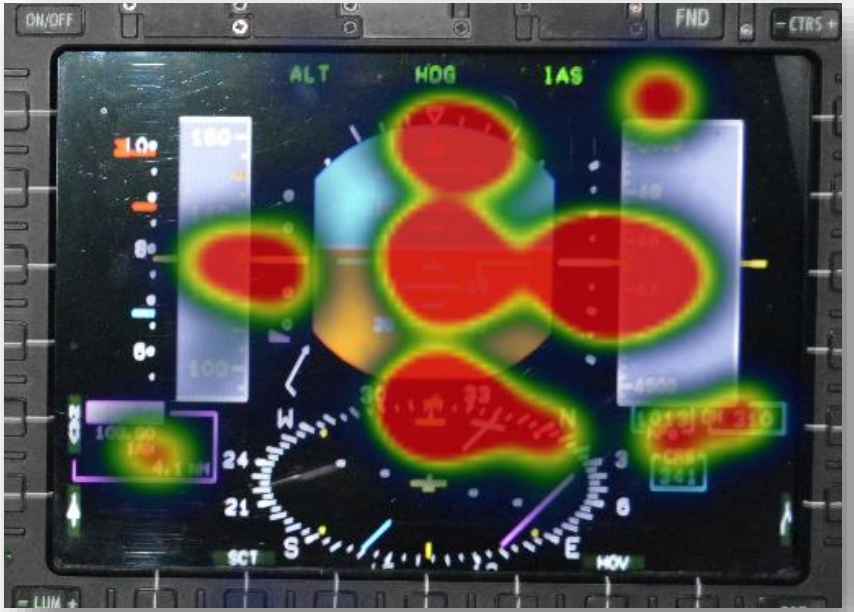
1013

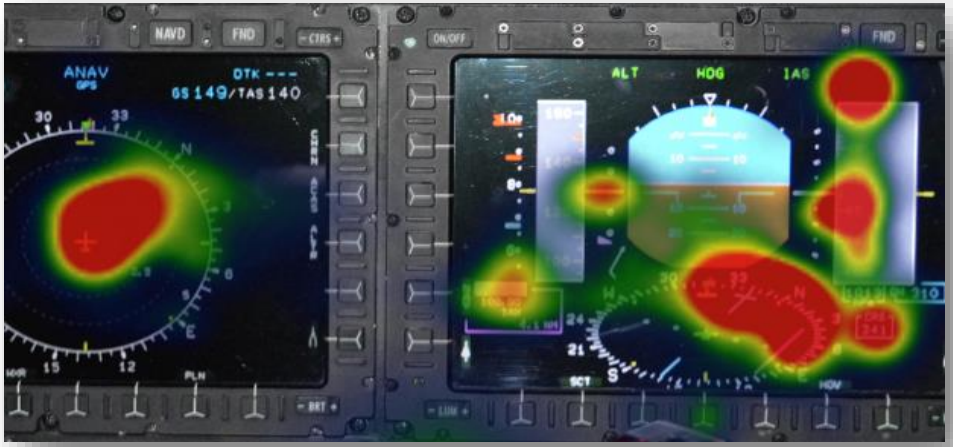
Main implications of findings

- PF flying ‘uncoupled’
  - Kite shaped scan
- Omission of AOIs (Areas of Interest)
  - Large refresh-gaps
- FMA (Flight Mode Annunciators)
  - Bringing FMA into scan
- Flight Path Vulnerability ‘upper modes engaged’
  - Priority of scan to PND
- Three axis flying: inner control loop monitoring
  - Monitoring AI and Bank Angle collective uncoupled

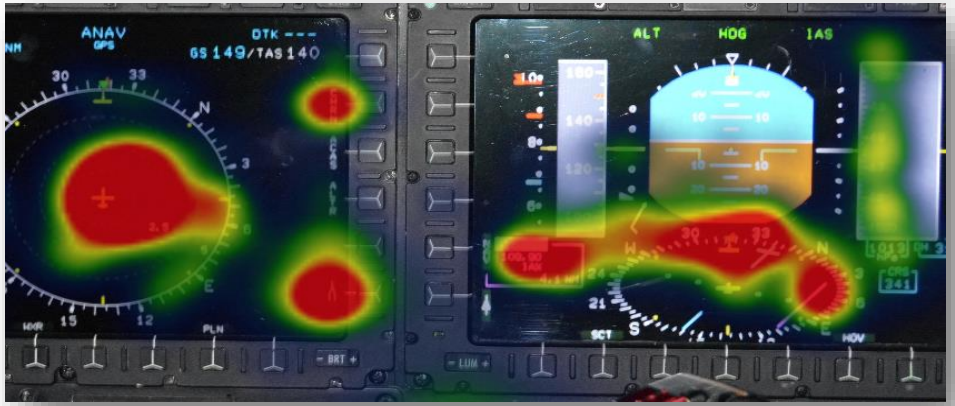
Two different pilots Area of Interest (AOI) dwell time from the PF during a 3 minute uncouple period.



Two different pilots Area of Interest (AOI) dwell time from the PF during a 4 minute uncoupled flying in the hold.



Two different pilots in the PM role with autopilot engaged



Conclusion

- Pilots have insufficient knowledge of automation behavior
- Giving us the tools to start making improvement in training
- Good argument for Evidence based training
- Initial training for new pilots
- This will link into other programmes we're doing?
  - LOSA, FCOM, Approach Path Management, EBT etc..
- Work with OEMs on design philosophy, ergonomics and automation
- Training to improve **knowledge** driven monitoring is crucial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Thank you

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