Impact of Aviation Highway-in-the-Sky Displays on Pilot Situation Awareness

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Highway-in-the-sky HITS

- Displays course guidance via perspective view of a path on a display

HITS

HITS: Key Factors

- Horizontal and vertical guidance
- Situation awareness (SA)

Interesting note:
- Landmark locations via HITS is mixed bag
Brass Tacks

- 3 SA's
- Relative flight path position
- Other aircraft
- Primary flight information

Participants

- 36 (31 men, 5 women)
- Private pilot certificate
- 53 to 9800 hours
- 58% instrument rating
- 19 to 67 years old

Equipment

- AGARS (Piper Malibu)
- HITS on CRT
- Video eye-tracking

Experimental Design

- Variables
  - Pathway type
    - Goalposts
    - paving stones
  - Guidance symbology
    - Follow-me airplane
    - Flight predictor only
    - None
Procedure

- Experience questionnaire
- Video eye-tracking calibration
- Training (10 minutes)
- 3 Flights (9 to 12 minutes)
- Break
- 3 More Flights (9 to 12 minutes)

Results

- Oldest pilot problem (bad, bad, bad)

Results

- Significant difference between
  - no-guidance and follow-me
  - Flight-predictor and follow-me

Results

- Significant Difference
  - Flight-predictor and follow-me
  - Flight predictor and no-guidance
  - But not between no-guidance and flight predictor – Huh?
Results

- Practice Effects
  - Practice eliminated the differences in pathway acquisition attributable to variables.

Results

- Traffic Awareness
  - Average of 3.25 / 6
  - T-test = fewer than possible???
  - Looking out
    - 0 to 52% mean 14%
  - Baseline study
    - 18 pilots paired by background
    - 41% and significant via paired t test
    - 4.22 but not significant

Discussion

- Pilots like goalpost but paving-stone was better
- 2D to 3D problem
  - Possible tied to video game experience (but not asked, bummer)
  - It is all old people’s fault (old story)

Game Statistics (ESA) - Get it right

- How Many People Play Computer and Video Games?
  - Fifty percent of all Americans play video games
- For Computer Gamers...
  - 35% < 18
  - 26% 18 to 35
  - 39% > 35
- For Console Gamers...
  - 35% < 18
  - 25% 18 to 35
  - 40% > 35
- Fast growing - Near Future
  - >50
Conclusions

- Practice more important than symbols
- HITS less head-out time

Improvements
- Traffic
- Synthetic terrain