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The effect of Type III hatch placement on evacuation from smaller transport aircraft.

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Acknowledgements

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- **The views expressed here are solely those of the authors.**

Background

- **Type III hatches have been disposed in a range of locations.**
- **Placement includes outside and inside the cabin.**
- **Inside the cabin hatches have been placed:**
  - **on the floor in the exit row**
  - **on the seats in the exit row**
  - **in the main aisle**

Background

- **An accident analysis of hatch disposal concluded that ‘approximately 80% were disposed of inside the cabin’.**
- **Authors acknowledge:**
  - **only a limited number of cases cited hatch placement.**
  - **hatch placement was cited as a hindrance in only 3 cases.**

(R.G.W Cherry & Ass, 2006, p4).

Background

- **McLean et al (2002) ‘Access to Type III exits’.**
- **Hatch disposal location was one of the variables manipulated: inside or outside.**

- **A few incorrect placements were reported, all during inside placement trials.**
- **‘Potential for the hatch to negatively influence access space at the exit and interfere with subject egress’ (McLean et al, 2002, p2).**

Aim of research

- **To investigate the potential influence of the placement of the Type III hatch on passenger evacuation from a smaller transport aircraft.**

Test facility

Modified to represent features associated with smaller transport aircraft:

- **Narrowing of fuselage**
- **Reduction of headroom**
- **Installation of seating doubles**

Type III exit

- **Type III exit in the centre of the starboard side of the cabin.**
- **Exit hatch was not in place during the trials - screened prior to boarding.**
- **Screening was removed on the call to evacuate.**

Independent variable

- **IV: The location of the Type III hatch.**
- **A replica hatch was constructed.**
- **Secured in advance of participants boarding.**

Exp condition 1:
No hatch in cabin

Exp condition 2: Vertical placement

Exp condition 3: Horizontal placement

Challenge

- **Challenge with hatch placement was balancing:**
  - **Safety: risks to participants had to be minimised.**
  - **Experimental control: hatch must be placed in the same location for each trial in condition.**
  - **Ecological validity: reduction due to the factors above.**

Dependent variable

- **Data extracted from time coded video footage.**
- **Main DV: participant egress time.**
- **Defined as: the time from the call to evacuate until the participant had their first foot on simulator wing.**

Participants

- **24 independent groups of up to 18 volunteers were recruited.**
- **Each group participated in one session.**
- **For safety and insurance provision, age and health criteria were in place.**

Experimental Design

Hatch placement		
No hatch	**Vertical**	**Horizontal**
8 groups of naïve participants	**8 groups of naïve participants**	**8 groups of naïve participants**

Procedure

- **Participants were greeted by “cabin crew”.**
- **Check-in procedure: information on trials, medical questionnaire, providing informed consent and a pre-trial briefing.**
- **Participants boarded the cabin simulator.**
- **Seating pre-allocated via a random seating plan.**
- **Each group were given a typical safety briefing.**

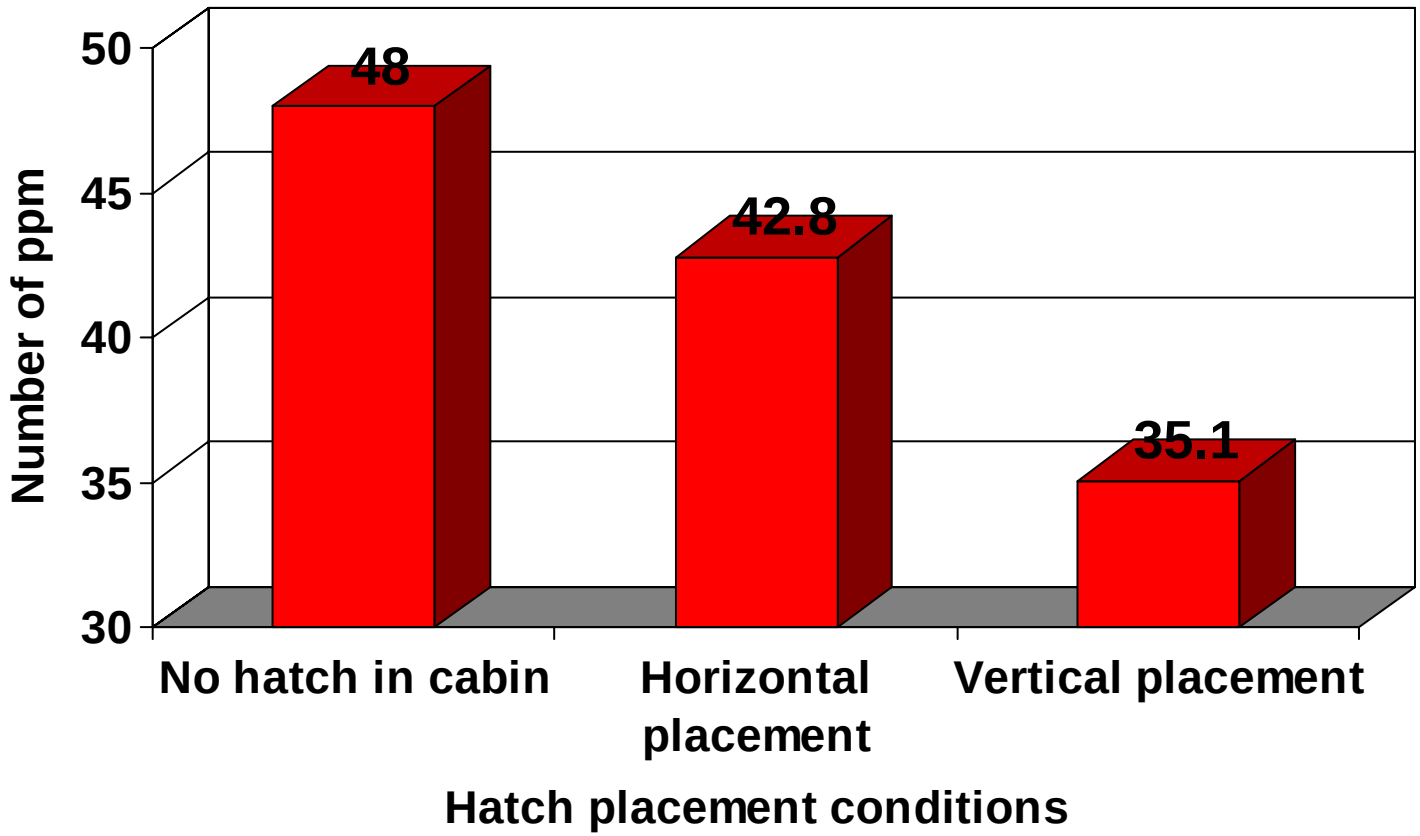
Evacuations

- **A recording of engine noise played, followed by Captain's command to "Undo your seatbelts and get out!"**
- **Cabin crew issued assertive, positive and concise commands (Muir & Cobbett, 1996).**
- **Group incentive to evacuate as quickly as possible.**

Results

- **The time for each participant to evacuate was extracted from video footage recorded outside the exit.**
- **All evacuations were successfully completed.**
- **Evacuation rates were calculated as the dependent variable for analysis.**

Mean evacuation rates (pax per minute)



Inferential statistical analysis

- Statistically significant difference in evacuation rates (ppm) due to the placement of the hatch.

- Rates were significantly higher when:
  - no hatch was in the cabin compared to when the hatch was placed horizontally or vertically.

  - the hatch was placed horizontally compared to vertically in the cabin.

Conclusions

- **Results relate to preliminary experimental work.**
- **Raise interesting issues regarding Type III exits in smaller airframes.**

- **Research has shown a significant effect for hatch placement on the rate at which passengers could egress through the Type III exit.**

- **Result is not surprising, as hatch placement led to a partial or total obstruction of the exit row.**

Conclusions

- **Results highlight the importance of ensuring that hatch operators:**
  - **clearly understand the task requirements.**
  - **are able to dispose of the hatch into an appropriate location so that it does not impede egress.**
- **One solution to inappropriate placement is an automatically disposed hatch.**

Conclusions

- **Further investigation into hatch placement is required:**
  - **Alternative hatch placement locations.**
  - **Different motivational strategies.**
  - **Different seating configurations.**
  - **Enhancing ecological validity, whilst ensuring high levels of safety and control.**

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