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.
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.
• 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.

• 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 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

<table>
<thead>
<tr>
<th>Hatch placement</th>
<th>8 groups of naïve participants</th>
<th>8 groups of naïve participants</th>
<th>8 groups of naïve participants</th>
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<tbody>
<tr>
<td>No hatch</td>
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<td>Vertical</td>
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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)

Hatch placement conditions:
- No hatch in cabin: 48 ppm
- Horizontal placement: 42.8 ppm
- Vertical placement: 35.1 ppm
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.