Passenger Exit Selection Decisions in Aircraft Evacuation Situations with Implications for Passenger Safety Briefings

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EXTENDED ABSTRACT

In aircraft accidents involving narrow body passenger aircraft such as the B737, in which all three exit pairs are available, a large number of passengers tend to select the centre overwing exit for evacuation [1]. This is somewhat surprising as the centre exit is the smallest exit (known as a Type-III window exit) on the aircraft which requires a significantly greater amount of time for passengers to pass through than the forward or rear exits (known as Type-C exits). The Type-III exit requires the passenger to climb through the exit while the Type-C exits allows the passenger to walk through. Average flow rates for the Type-C exit are 64 people/minute while for the Type-III the average flow rate is 35 people/minute. Furthermore, in controlled evacuation certification trials, the number of passengers using the overwing exit is considerably smaller than found in real accidents and is almost optimal [1]. This is thought to be due to the successful intervention of cabin crew redirecting passengers to the larger more efficient forward and rear exits in the near ideal conditions of a certification trial. It is conjectured that in real emergency situations a large number of passengers utilise the overwing exits because they do not realise that the exit is smaller and hence slower. They are simply moving towards their nearest exit without taking into consideration the flow capabilities of the exit.

It is important to understand why passengers over utilise these exits in order to provide better safety briefing instructions for passengers allowing them to make more informed exiting decisions. Furthermore, in order to improve the decision making capabilities of aircraft evacuation models such as airEXODUS [2] it is important to understand the decision making process involved in the exit selection process. To better understand the decision making process associated with passenger aircraft exit selection the authors devised a questionnaire and submitted to 459 members of the travelling public. The questionnaire consisted of 16 multi-part questions and required approximately 20 minutes to complete. This paper will discuss the questionnaire and review the findings; here we briefly discuss some of the results.

The sample consisted of 61% males and 39% females with 25% in the 18-30 year age bracket, 52% in the 31-50 age bracket and 23% in the over 50 age bracket. Over 93% of the sample had flown at least once in the past three years (Figure 1). Results were analysed as a function of age, gender and flight experience. Here we simply present an overview of the results. The questionnaire focused on narrow body aircraft with a single passenger aisle and a pair of large Type-C exits in the front and rear with a pair of Type-III exits over the wing as shown in Figure 2. The first few questions were intended to ascertain the understanding the participant had of the aircraft layout with regards to exit number, size and location. Participants were also asked which exit they would use if they were placed at an equal distance between two exits with no other passengers in their way (to remove the complication of queuing) as in Figure 2 and with equal numbers of passengers queuing up at both exits.

Of the sample population 75% could correctly locate the three exit pairs on the aircraft. This indicates that a surprisingly high number of participants (25%) did not know where the exits were located on the aircraft. When asked if all the exits were the same size, only 37% of the population realised that the exits were not the same size, with 40% saying that the exits were the same size and 23% not knowing that the exits were of different sizes. These results indicate that a quarter of the sample population did not know where the exits were located and almost two thirds did not know that the exits were of different sizes. Of greater concern was the fact that only 23% of the entire population could correctly locate the position of the smaller exit. Furthermore, of the sub-population that knew of the existence of the smaller exit, only 62% could correctly locate its position. These results clearly

indicate that the sample population have a poor configurational awareness of the aircraft. It is suggested that this poor level of understanding is a contributory factor in the poor exit selection decisions made by passengers in emergency situations.

When asked which exit they would select in an emergency situation if located at position "X" in Figure 2, 72% chose the larger forward exit while 25% chose the smaller overwing exit. Again, this indicates that a quarter of the participants would make a sub-optimal exit selection. Of those who knew the correct location and distribution of exits (107 participants), 79% selected to use the large forward exit and 20% selected the smaller overwing exit. When the participants were informed of the correct distribution and size of exits and the implications to average exit flow rate, the participants were again asked to select which they would use if placed at position "X". This time over 91% selected the large exit.

The results of this survey strongly suggest that passenger exit selection is guided by a lack of understanding of the nature of the cabin exits and given correct information, they are more likely to make a correct decision as to which exit to select.

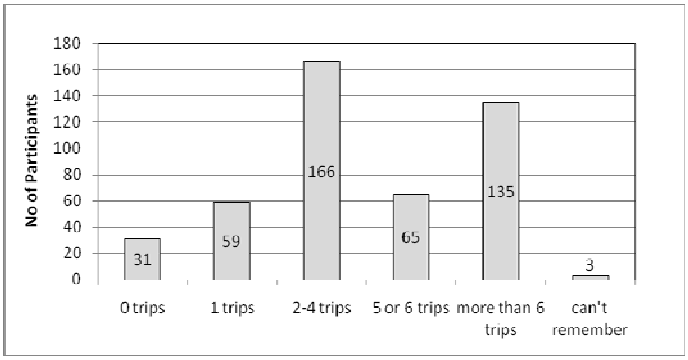

Figure 1: Number of return trips of participants in the last 3 years

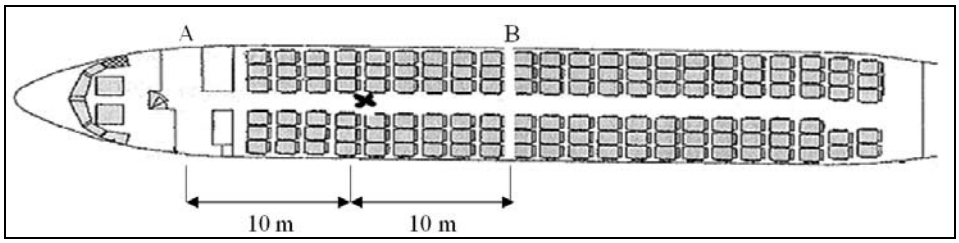

Figure 2: Aircraft layout as presented to the participants without exit size or type information. The "X" marks the location of the participant which is equi-distant between two exits.

References:

[1] E.R.Galea, K.M.Finney, A.J.P.Dixon, A.Siddiqui and D.P.Cooney. "An analysis of exit availability, exit usage and passenger exit selection behaviour exhibited during actual aviation accidents.", The Aeronautical Journal of the Royal Aeronautical Society, Vol 110, Number 1106, pp 239-248, 2006.

[2] Galea, E.R., Togher, and Lawrence, P., "Investigating the impact of exit availability on egress time using computer based evacuation simulation". Proceedings, 5th Triennial International Fire and Cabin Safety Research Conference, Atlantic City, USA, 29 Oct – 1 Nov 2007, publishers US FAA, website: http://www.fire.tc.faa.gov/2007Conference/proceedings.asp.