Cabin safety and emergency evacuation: Passenger experience of flight CI-120 accident

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\textbf{A B S T R A C T}

Aircraft evacuation effectiveness is a critical but challenging issue in the civil aviation industry. This paper explores the cabin safety perceptions of passengers from their emergency evacuation experiences in an actual aviation accident. A questionnaire survey and in-depth interviews were conducted with China Airlines flight CI-120 passengers. The qualitative and quantitative results provide insights into passengers’ views of cabin safety. The in-depth interview results show that passenger safety education requires more instructions about the use of emergency equipment. The data from the passenger perception questionnaire were analyzed using the factor analysis method; the findings indicate that crew assistance and emergency procedures are the most important factors. The results are likely to be of value to the aviation industry when taking into account passenger perceptions in implementing safety programs.

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\textbf{1. Introduction}

The ability to quickly unload passengers is important in the day to day operations of air, sea, and rail mass transit vehicles, and essential in emergency situations. The US National Transportation Safety Board investigated 46 accidents that occurred between September 1997 and June 1999; 2651 passengers were involved in emergency aircraft evacuations. These evacuations occurred every 11 days, on average (NTSB, 2000). Rapid and safe evacuation of aircraft during actual or perceived emergencies is a very important component of aviation safety. The US Federal Aviation Administration (FAA) requires that all passengers and crew members must be able to safely abandon the aircraft cabin in less than 90 s, with half of the usable exits blocked, with the minimum illumination provided by floor proximity lighting, and a certain age-gender mix in the simulated occupants (FARs Part 25.803, 1999).

Evacuations, whether real, computer-generated, or live full-scale experiments, have three major components: aircraft, crew and passengers. A change in one of these components intrinsically changes the outcome of an evacuation. The certification trial provides little useful information regarding the suitability of the cabin layout and design or the cabin crew procedures in the event of a real emergency (Galea et al., 2003). To validate the aircraft evacuation system design and procedures, demonstrations have been performed according to various scenarios (Galea et al., 1996; Muir et al., 1996; Owen et al., 1999; Wilson et al., 2004). Numerical simulation tools have recently been developed to overcome the limitations of real demonstrations. One of the main difficulties encountered in the numerical simulation of an evacuation operation is related to the modelling of passenger behavior, which is influenced by a complex mixture of socio-psychological and physical factors (Poudel et al., 2005).

It is essential that a comprehensive understanding of behavior in highly stressful and disorientating conditions in an actual accident be used to develop steps to improve the probability of a successful evacuation of all of passengers from an aircraft in an emergency. Unfortunately, limited research has been conducted on the impact of passenger behavior on aircraft emergencies and evacuation. The aim of the present study is to investigate passenger perceptions of cabin safety by focusing on emergency evacuation experiences in actual accidents to examine deficiencies in passenger safety education and cabin crew training.

China Airlines (CAL), the flag carrier of Taiwan, flies to destinations in Asia, Europe, North America, and Oceania. On August 20, 2007, China Airlines Flight CI-120, a Boeing 737–800 (serial number: 30175; registration: B-18616; build date: 2002) flying out of Taiwan Taoyuan International Airport, caught fire shortly after landing at Naha Airport in Okinawa Prefecture, Japan. After the aircraft stopped at Spot 41, the engine immediately started smoking and burning, and later exploded, engulfing the aircraft in flames. All 157 passengers (including two infants) and 8 crew members left the plane unharmed through emergency slides at four doors in 90 s. The most severe explosion happened when the last group