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Risk factors associated with flying in adverse weather: From the passengers' point of view

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ABSTRACT

Risk factors on the demand side of aviation safety are rarely addressed as the focus of research is most often placed on the supply side of aviation service. Even though airlines have the prerogative to cancel flights in the face of adverse weather, stranded passengers have to be reckoned with in the event of cancellation. Passengers' awareness of the risks associated with flying in adverse weather may help mitigate the confrontation as well as induce passengers to take the lead in adopting preventive measures. The aim of this article is to study the attitudes air travelers say they have towards flying in adverse weather, as well as risk factors regarding cancellation of trips in adverse weather. A conceptual framework is presented which outlines the links between risk factors and preventive measures. Data generated from a quantitative survey of 1145 air travelers, conducted in July 2015 at Taiwan's Kaohsiung International Airport, is used to examine this framework using correlation analysis and one-way analysis of variance (one-way ANOVA). The factors of trust, risk perception and domestic destination are found to be positively related to passengers' stated attitude toward taking preventive measures. Income, purpose of the trip and direct experience generate ambiguous results. The outcome also suggests the following paradox: while pilots make the final decision regarding aviation safety in adverse weather, they appear to enjoy the lowest level of passenger trust.

1. Introduction

Weather is the cause of approximately 70% of flight delays in the National Airspace System (NAS) of the United States (Kulesa, 2003; Federal Aviation Administration, 2015). According to the National Aviation Weather Program Council (1999), weather costs the United States $3 billion annually in accident damages and injuries, delays and unexpected operating costs. Weather is also an important contributing factor in 23% of all aviation accidents. A recent study by Oster et al. (2013) indicates that weather was the cause of eight percent of accidents and seven percent of fatalities in the period 1990–2011, and ranked fourth among eight causes identified. Although the impact of weather was limited, it was far from negligible. According to the Aviation Safety Council (2015) of Taiwan, wind shear and thunderstorm rank fourth among ten risk factors in the analysis of 35 aviation accidents in Taiwan over the period 2004–2013, applying the incidence categories of the International Civil Aviation Organisation (ICAO). When applying the categories of the US National Transportation Safety Board, weather accounted for 27.8% of the aviation accidents in Taiwan in the same period of time. Unsafe actions taken in response to adverse weather can also be triggered by a poor technological environment created by weather conditions. Daramola (2014) found that quite a significant number of the aviation accidents in Nigeria during the period 1985–2010 were weather-related, primarily due to poor visibility. These figures and findings illustrate that the impact of weather on flight safety is not insignificant.

Extreme wind speeds can mean that aircraft are denied permission to depart. High winds can also prevent aircraft from landing at the destination airport and require landing at an alternative airport. Rain, often the cause of poor visibility, can substantially increase delays and cancellations (Changnon, 1996; Eads et al., 2000). Some airports are vulnerable to storm surges of 5.5–7.0 m (Kafalenos and Leonard, 2008). Flight takeoffs and landings can also be affected by the wind and rain caused by a typhoon, a mature tropical cyclone that develops in the North Western Pacific Basin. The number of typhoons that visit Taiwan is on the rise, according to Lu et al. (2011). An increase in the frequency of typhoons implies a greater impact of adverse weather on

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aviation.

Flight delays and cancellations often lead to passengers being stranded, which can place airlines under pressure. Even though the delays are beyond the control of airlines, airlines may have to go to great lengths to appease disgruntled passengers. A better understanding of passengers' perspectives towards flying in adverse weather may help airlines reduce the pressure caused by flight cancellation as well as improve flight safety.

The risks associated with flying in adverse weather are borne by aircrew, airlines and passengers alike. How passengers respond to such risks has rarely been studied, however. Even though aviation safety improvement is moving from a reactive toward a more proactive approach (Oster et al., 2013), the solutions to managing aviation risks proposed to date focus primarily on aircrew decision-making, particularly by pilots. Based on a survey of pilots from a major US carrier to examine the types of risks pilots encounter in their profession, 79% of the responses reflected concerns with safety and only 16% were concerns about job security (Orasanu et al., 2002). Within the first group of responses, risks associated with an individual pilot ranked first. These risks include 'the ability to manage risk,' to make good decisions, loss of skills and fatigue. Environmental factors, including adverse weather, turbulence, and slippery runways, ranked second. Flying in severe weather, particularly after working long hours, can potentially exacerbate the fatigue of pilots. Hunter (2002) found that pilots' perception of risk associated with weather is negatively related to tolerance for risk. Pilots are more likely to engage in higher risk activities when they fail to perceive the risks associated with adverse weather. In other words, pilots with a lower perception of risk expose the passengers and the entire crew to a higher level of risk. Orasanu et al. (2002) suggest that pilot awareness of when an airline is under financial pressures may translate into efforts to reduce fuel costs or to take off as scheduled regardless of impending weather.

When attention is mostly focused on the supply side of aviation service, risk factors on the demand side of aviation service receive little attention. In the case of flying in adverse weather conditions, government, airlines and/or pilots make decisions to fly or postpone, but passengers themselves can also take the initiative to adopt preventive measures. Research attention is rarely paid to the passengers' perspective toward flight safety in adverse weather, however. An individual deciding to travel by air voluntarily exposes her/himself to the risk of death or injury. Passengers today have access to a variety of weather forecasts at the airports of take-off and landing, and can check the safety record of an airline company as well. Passengers can decide whether or not to take an aviation risk in the event of adverse weather. Even though the airlines have the prerogative to cancel flights facing adverse weather, they have to deal with stranded passengers when they do so. Better passenger awareness of the risks associated with flying in adverse weather could mitigate such confrontation. Passengers' perspectives on aviation risk therefore merit research attention.

Fig. 1 presents a framework that outlines the links between risk factors and preventive measures. Four risk factors are incorporated, i.e., experience, trust, ability and risk perception (Burningham et al., 2008; Terpstra, 2011; Wachinger et al., 2013). Experience includes both direct and indirect categories. Direct experience refers to a respondent's personal experience, whereas indirect experience relates to the experience of others known to the passengers. Direct experience can have a positive as well as a negative effect on the adoption of preventive measures. It has been found that individuals with no direct flood experience tend to underestimate the dangers associated with flooding (Ruin et al., 2007). Lack of direct experience makes it difficult to appreciate risk communication with respect to hazard that has a low probability of occurring (Magat et al., 1987; Camerer and Kunreuther, 1989). Also, if the past

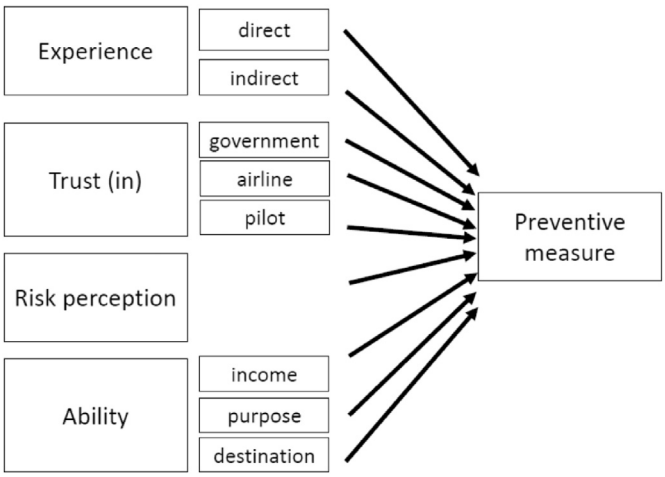

Fig. 1. A conceptual framework of risk factors contributing to preventive measures.

event did not negatively affect the individual, the individual may believe that s/he will also escape negative consequences in the future event (Green et al., 1991; Halpern-Felsher et al., 2001).

Trust refers to passenger trust in government regulation, airline decision-making, and pilot judgement. A government agency such as the Civil Aeronautics Administration has the authority to close an airport in the event of adverse weather. If an airport is allowed to remain open, an airline company has the right to decide whether to let its planes fly. The final decision is made by the pilot, however. Trust in authorities is found to be lower among those who believe that they themselves have sufficient knowledge about particular risks (Siegrist and Cvetkovich, 2000). An individual with less knowledge about a particular risk tends to place more trust in the advice of authorities (Terpstra, 2011). In other words, a high level of trust in authorities can be counterproductive for individuals as they may be less inclined to take preventive measures.

Ability covers financial capacity, destination and purpose of a trip. Passengers may understand the risk of flying in adverse weather conditions, but choose to take the risk nonetheless because the perceived benefit may outweigh the perceived cost. Cancellation of a trip may mean something different to business travelers as opposed to leisure travelers. A change in a business schedule may in some cases have greater consequences than change of a holiday plan. The cost of canceling a holiday trip will often be borne by the traveler, while the cost of canceling a business trip will be borne by the company one is affiliated with. Domestic travelers are often better off than international travelers in terms of the availability of alternative transportation measures. Personal income may also influence one's ability to take preventive measures.

Risk perception plays an important role in motivating an individual to mitigate, adapt or ignore risks. Understanding risk perception is important for understanding and anticipating public responses to hazards in the field of risk management (Slovic et al., 1982). A perceived risk may not directly lead people to take preventive measures (Slovic, 1987, 2000). Other factors, such as experience, trust and ability, may be relevant with respect to taking preventive measures.

Taking preventive measures means either taking the initiative to postpone a trip or accepting cancellation of a flight. Taking preventive action helps individuals to mitigate the risks associated with flying in adverse weather. For this study a survey was used to gather data on passenger attitudes toward the prospect of flying in adverse weather. How passengers would actually respond in reality is difficult to assess. It therefore remains challenging to uncover the