In-Slide Information

Most injuries resulting from emergency evacuations using inflatable slides are minor, but serious injuries can include fractured ankles, broken legs, major bruises and lacerations.

BY RICK DARBY

About 50 percent of emergency evacuations involving inflatable slide deployment during a 10-year study period resulted in injury, a report sponsored by the U.S. Federal Aviation Administration (FAA) has found.[1] Overall, about 10 percent of the injuries were serious, and in nine of the 10 years, serious injuries occurred in less than 20 percent of slide evacuations.

The 142 accidents and incidents included in the study database involved U.S. air transport aircraft operated under U.S. Federal Aviation Regulations Part 121, both scheduled and nonscheduled. The database included 441 minor injuries and 35 serious injuries.

To allow time for accident and incident reports to be completed, June 30, 2006, was chosen as a cutoff date for the events studied. Information sources included the FAA Accident/Incident Data System (AIDS), part of the Aviation Safety Information Analysis and Sharing (ASIAS) System; the U.S. National Transportation Safety Board (NTSB) Aviation Accident Database and Synopses; service difficulty reports; the U.S. National Aeronautics and Space Administration Aviation Safety Reporting System (ASRS); and several others. Because there were discrepancies among the sources, researchers conducted surveys to clarify the data.

"Three separate surveys were conducted," the report says. "The first survey was designed to obtain additional details on identified incident or accident cases, as well as to discover events that may not have been captured in the review for this research. The second survey was … designed to solicit information regarding the type, location and severity of injuries that may have been recorded by ARFF [aircraft rescue and fire fighting] units. The third survey was developed to solicit information about conditions faced by first responders during

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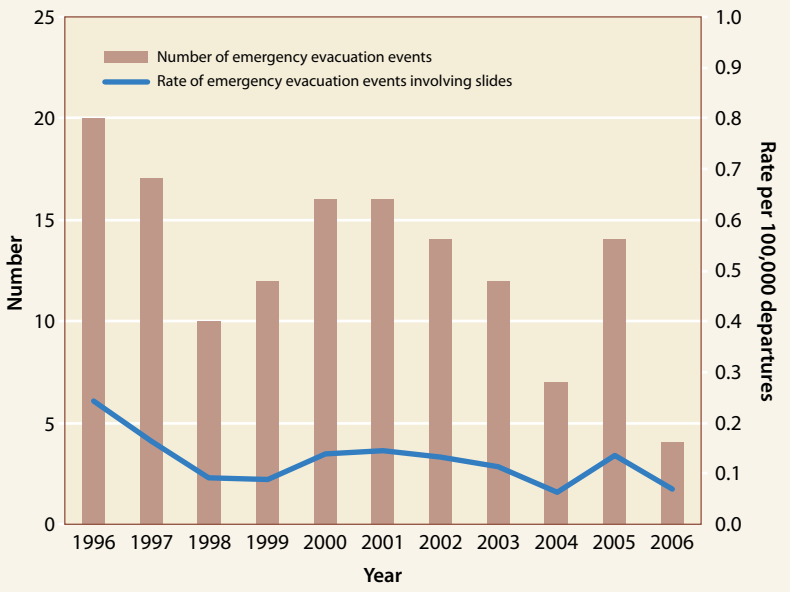
U.S. Air Carrier Emergency Slide Evacuations, 1996–2006

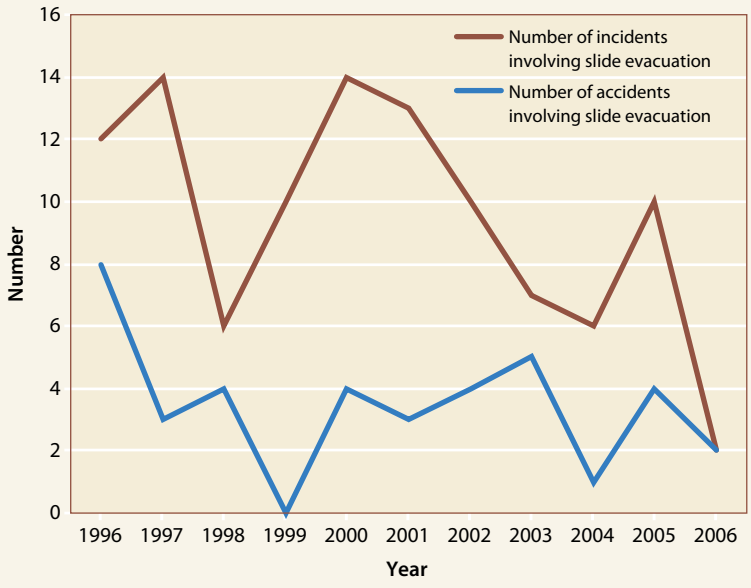


Note: 2006 data are through June 30.

Source: U.S. Federal Aviation Administration

Figure 1

U.S. Air Carrier Incidents and Accidents Involving Emergency Slide Evacuation, 1996–2006



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Source: U.S. Federal Aviation Administration

Figure 2

aircraft emergency evacuation and to seek their recommendations."

There was "a significant annual variation in the number of emergency evacuation events involving slides," the report says (Figure 1). "There has been an appreciable reduction in emergency evacuations since 1996." However, the variation in the rate per 100,000 departures, also shown in Figure 1, "given the low number of total events" was "not statistically significant."

The number of incidents involving slide evacuation exceeded the number of accidents involving slide evacuation in almost every year of the study period (Figure 2). "The emergency evacuation events classified as accidents are, on average, less than a third of total events," the report says.

The annual variation in the percentage of slide evacuations causing injury ranged from less than 30 percent to more than 70 percent, averaging 50 percent (Figure 3). "The nature of the injuries varies significantly, depending on the causes and conditions of evacuation," the report says. Injury categorization was based on the Abbreviated Injury Scale, a metric used by the U.S. government's highway safety agency. Based on available data, minor injuries incurred during the slide evacuations included sprains, friction abrasions, scrapes from slides, strains, abrasions and contusions. Serious injuries included fractured ankles, broken legs, major bruises and lacerations — injuries involving a cutting of the skin or other tissues.

The annual numbers of reported injuries in slide evacuations (Figure 4) varied from a maximum in 1998 to a minimum in 2004. Nevertheless, the report says, "There is no particular trend or underlying reason for such variations because the size and type of aircraft (e.g., cargo versus passenger operation) and behavior of passengers and crewmembers are significant factors in risk exposure levels." It adds that "in some cases, it is difficult to ascertain if all injuries have occurred on, or in conjunction with the use of, inflatable slides. This uncertainty is due to the poor documentation

of injuries incurred during evacuation of commercial aircraft, and is especially the case for minor injuries."

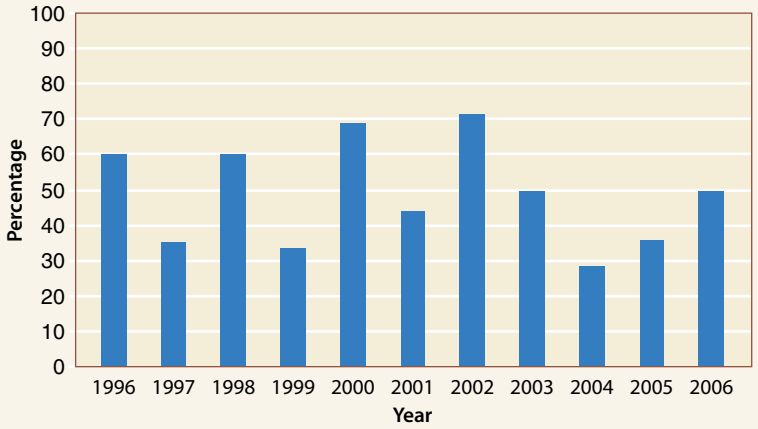
The percentage of serious injuries among all injuries associated with slide evacuations is shown in Figure 5 (p. 52). "Except in 2004, when only two events resulted in injury, less than 20 percent of emergency evacuation events involving inflatable slides caused serious injury in any given year in the study period," the report says.

Based on NTSB accident data, there appears to be no correlation between the rate of accidents and the rate of slide evacuations in most years (Figure 6, p. 52). "The rate of emergency evacuation is lower than the total accident rate, despite the fact that the emergency evacuation rate involves both accidents and incidents," the report says.

"As a part of this study, the performance of slides during high winds was examined within the scope of required regulations for evacuation using slides," the report says. "Since the total number of events is very low, there are no statistically significant effects that can be deduced from the existing data. Existing literature also points to a very low probability of mean wind speeds exceeding 25 knots — about six instances per billion departures, as derived from measurements at 601 airports. Nevertheless, because delayed landing or diversion may not be an option in an emergency, use of evacuation slides during conditions of high wind must be addressed."

The main challenges under high-wind conditions include maintaining the stability of slides and preventing slides from turning and twisting, the report says. "Flight crewmembers often instruct the first passenger down the slide to help stabilize the slide by holding it down," the report says. "In practice, however, passengers often walk away, and this task falls to the first responders. Following a crash, fire or other emergency, when all available ARFF personnel must respond to imminent hazards, assigning ARFF personnel to help with slide stability may be a problem."

Percentage of Emergency Slide Evacuations Resulting in Injury, U.S. Air Carriers, 1996–2006

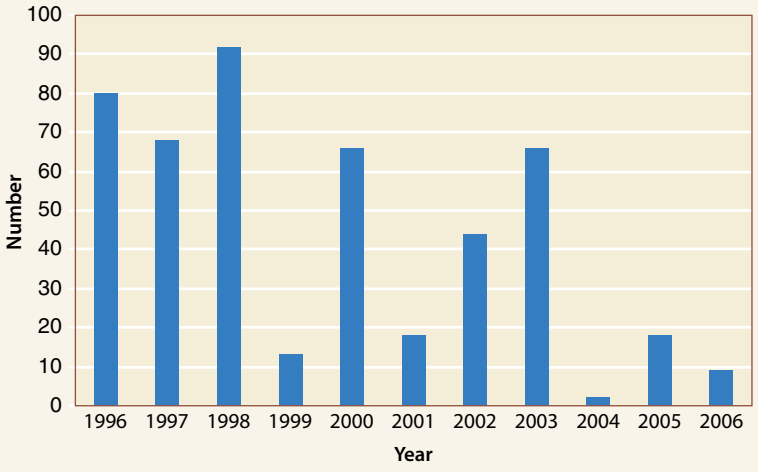


Note: 2006 data are through June 30.

Source: U.S. Federal Aviation Administration

Figure 3

Injuries Reported in Emergency Slide Evacuations, U.S. Air Carriers, 1996–2006



Note: 2006 data are through June 30.

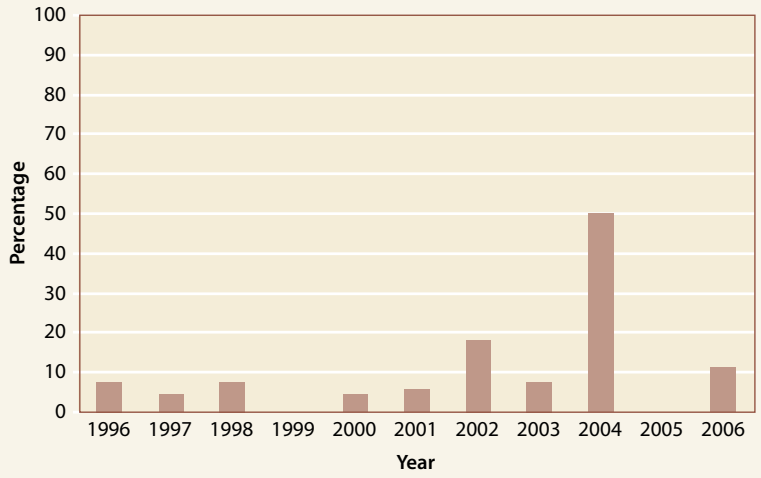
Source: U.S. Federal Aviation Administration

Figure 4

The researchers offered recommendations based on their survey of ARFF personnel and analysis of the available information on emergency evacuations:

- "Improvements are needed in communication, coordination and action planning

Serious Injuries as a Percentage of All Injuries in Emergency Slide Evacuations, U.S. Air Carriers, 1996–2006



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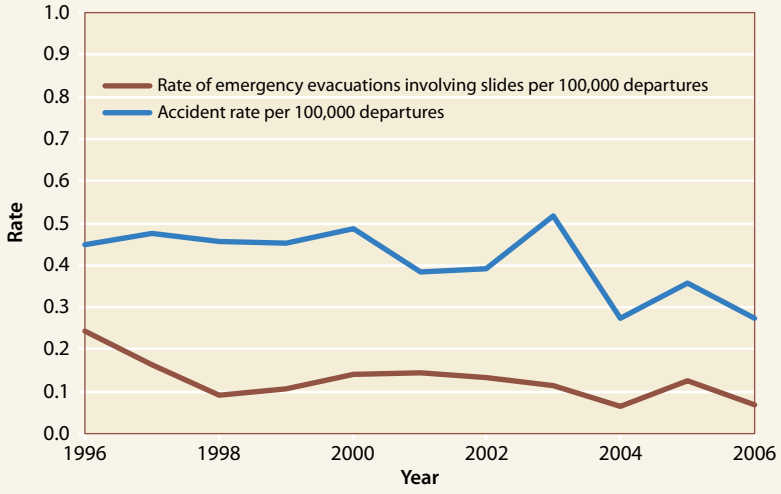
Source: U.S. Federal Aviation Administration

Figure 5

Rate of Emergency Slide Evacuations Versus Accident Rate, U.S. Air Carriers, 1996–2006



Note: 2006 data are through June 30. Accident rates are based on data from the U.S. National Transportation Safety Board.

Source: U.S. Federal Aviation Administration

Figure 6

among rescue personnel at airports, flight crews and airline operation personnel." Airports should work with the control towers to establish discrete emergency frequencies for secure and rapid communication with flight crews during emergencies, and "hands-on training is needed to increase coordination and communication between ARFF units and flight crews so that unnecessary evacuations can be eliminated," the report says.

- "It would be beneficial for rescue personnel to train with the flight crews and operation personnel of various airlines on various aircraft. Training should focus particularly on the operation of slides during adverse conditions."

- "ARFF personnel assistance with slide evacuation should be concerned with the following: establishing sectors/slide zones and identifying hazards; identifying several predesignated multi-casualty incident staging areas on the air operating area; identifying a separate passenger area of refuge/assistance; ensuring proper slide deployment; stabilizing slides by holding them down; moving evacuees away from the slides quickly … ; assisting with passenger flow; dispersing fire-fighting agent to protect evacuees; and distinguishing controlled evacuation from emergency conditions."

Note

1. Motevalli, Vahid; Monajemi, Layla; Rassi, Maryline. "Evaluation and Mitigation of Aircraft Slide Evacuation Injuries." Airport Cooperative Research Program Report 2. Washington, D.C.: Transportation Research Board of the National Academies, sponsored by the FAA, 2008. Available via the Internet at <www.trb.org/news/blurb_detail.asp?id=9046>.