

2. Statistics on Injury Occurrence

According to the 14 cases of the accident investigation reports issued by JTSB and its predecessors (Table 1), emergency evacuation procedures were conducted not only in cases that a normal landing was not possible, such as an undershoot, overrun and runway excursion, but in cases that a fire occurred (Fig. 1). In most of such cases, passengers suffered injuries during evacuation (Fig. 2).

Why are there so many cases of injured during evacuation? Explanations of the statistic characteristics of serious injured based on these 14 cases are given below.

	Year	Place	Operator	Injured		Year	Place	Operator	Injured
1	1977	Haneda	Philippine Airlines	Slightly injured: 1	8	1996	Narita	Japan Airlines	<u>Seriously injured: 3</u> Slightly injured: 19
2	1977	Oshima	All Nippon Airways	Slightly injured: 13	9	1998	Narita	United Airlines	<u>Seriously injured: 4</u> Slightly injured: 20
3	1982	Ishigaki	Southwest Air Lines	<u>Seriously injured: 3</u> Slightly injured: 45	10	2005	Kansai	Qantas Airways	<u>Seriously injured: 1</u> Slightly injured: 8
4	1990	Narita	Cathay Pacific Airlines	<u>Seriously injured: 2</u> Slightly injured: several dozen	11	2007	Naha	China Airlines	None injured
5	1991	Narita	Northwest Airlines	<u>Seriously injured: 8</u> Slightly injured: 38	12	2013	Takamatsu	All Nippon Airways	Slightly injured: 4
6	1993	Hanamaki	Japan Air System	<u>Seriously injured: 3</u> Slightly injured: 55	13	2015	Hiroshima	Asiana Airlines	Slightly injured: 28
7	1993	Haneda	All Nippon Airways	<u>Seriously injured: 9</u> Slightly injured: 112	14	2016	New Chitose	Japan Airlines	<u>Seriously injured: 1</u> Slightly injured: 2

Table 1

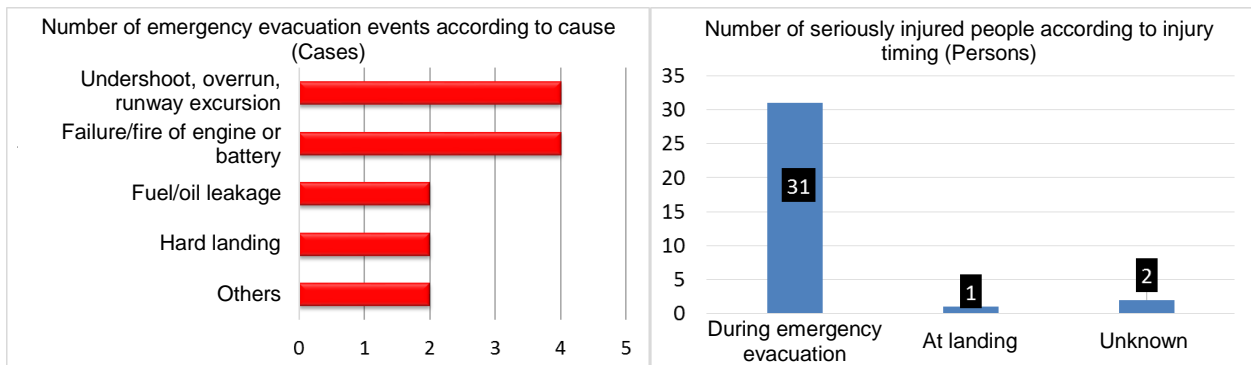


Fig. 1

In this chapter, the injury region of 34 seriously-injured persons, excluding slightly-injured persons, were analyzed and 27 injured person suffered a fracture of the thoracic spine, lumbar spine, pelvis, etc., and they account for nearly 80% of the total. (Fig. 3)

An analysis of the cases where serious injuries occurred during evacuation using evacuation slides revealed that, in each case observed the serious injured suffered in use of evacuation slides, the slides were deployed at a ground with a hard surface, such as a runway, taxiway, and aircraft

Fig. 2

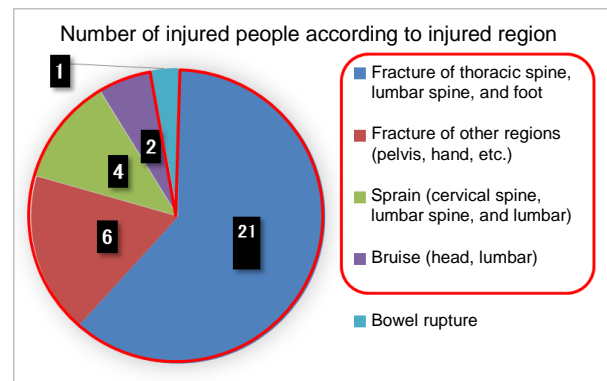


Fig. 3

Specific points of the injured are as follows:

- They flew out from the end of an evacuation slide, and injured their lower back.
- They slid out of their parent's arms to the ground, and fractured their pelvis.
- With no assistance on the ground, they fell and hit their back first, which caused a bruise.
- They were pushed forward by a succeeding passenger behind them, fell down with both hands on the ground, and fractured their left ankle.
- While sliding, they were hit by a suitcase of another passenger, and fractured their pointer finger.
- As the falling speed accelerated, they were thrown out of the slide, and fractured their hand.

The gender and age structures of the passengers vary. However, as far as the seriously injured are concerned, the tendency is more females in terms of the male-to-female ratio and people over 50 years old by the age. (Fig. 4, Fig. 5)

There are some medical study reports cited in the investigation report for the accident occurred in an All Nippon Airways aircraft in 1993 (Case (1)) (http://www.mlit.go.jp/jtsb/eng-air_report/JA8096.pdf), one report says that the spines of older people are weaker than those of younger people. And another report says that females suffer rapid reduction in bone mass after menopause, in contrast, males have less of a tendency for bone deterioration due to aging.

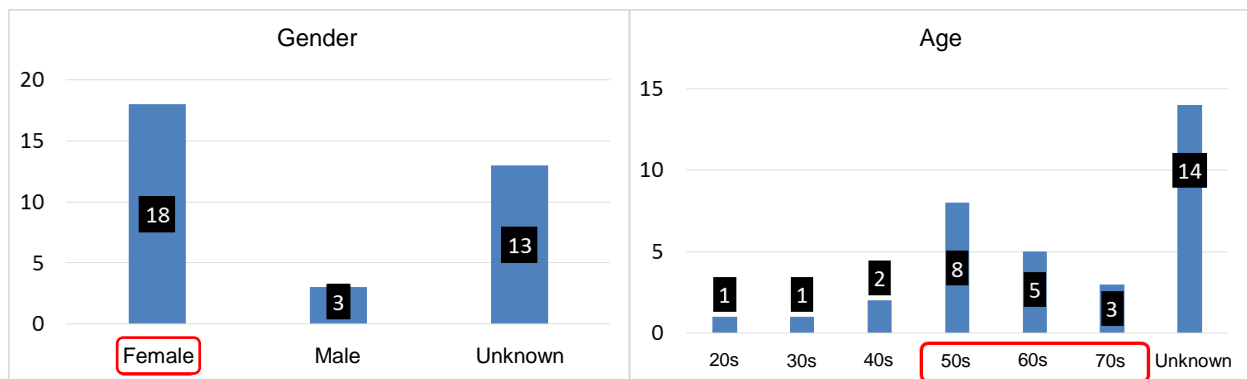


Fig. 4

Fig. 5

According to an airline company, key points to prevent injuries in evacuation using a slide are as follows:

- (1) Do not stop in front of the slide but jump onto it and sit down with your hips touching the slide
- (2) Hold your torso upright with both arms extended forward
- (3) Place your feet shoulder-width apart with your toes pointing upward
- (4) Keep looking at the landing point. This will bring your center of gravity forward, and thus prevent excessive speed.

However, in an emergency, sometimes it is difficult to take such a posture. It is important to assign some staff to assist the evacuating persons at the bottom end of the slide.

In the accident of a China Airlines aircraft in 2007 (Case (3)) (http://www.mlit.go.jp/jtsb/eng-air_report/B18616.pdf), the aircraft was badly damaged and destroyed by fire, leaving only part of the airframe intact. Despite the damage, the 165 persons on board, consisting of 157 passengers and 8 crew members, were all safe.

As for this smooth evacuation with no injured even on the hard ground, it is attributable to the fact that a ground crew member noticed at an early stage an abnormal condition of suspected fuel leakage, and voluntarily went to assist passengers at the bottom end

of the slides.

The number of deployed evacuation slides is also an important factor for smooth evacuation. During an emergency evacuation, some emergency exits are judged as dangerous to use due to a fire, and thus not all slides can be used. (Fig. 6, Fig. 7)

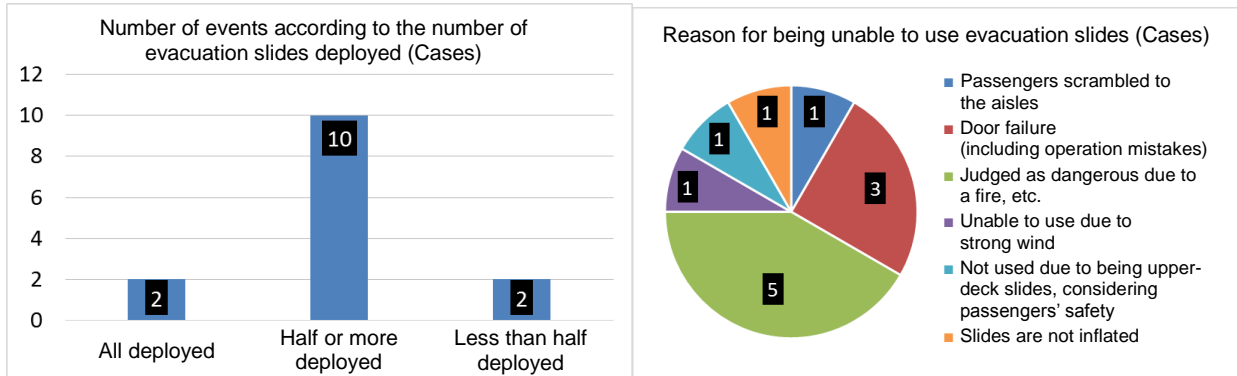


Fig. 6

Fig. 7

In the accident of a Cathay Pacific Airlines aircraft in 1990 (http://www.mlit.go.jp/jtsb/eng-air_report/VR-HOC.pdf), a hard landing was conducted due to strong wind. Then, out of eight of all evacuation slides, only four slides on the right side could be deployed because of fuel leakage. In addition, deployed evacuation slides were flapped by strong wind and most of them became unusable. Thus, the passengers remaining on board were forced to use only one slide for evacuation. Two of the passengers suffered serious bone fractures due to the congestion when using the evacuating persons,

In the accident of a Northwest Airlines aircraft in 1991 (http://www.mlit.go.jp/jtsb/eng-air_report/N663US.pdf), five doors, out of ten doors, were opened and evacuation slides were deployed. However, due to the fact that the cabin pressure still remained, it took about one minute from the captain's evacuation instruction to door opening. Thus, after evacuation slides were deployed, passengers scrambled to evacuate. Many of them fell on the paved ground surface, or collided with other passengers, thereby suffered injuries by receiving hard blows on their back, buttocks, limbs, etc.

Finally, as for the capability of evacuation slides, the design criteria for aircrafts stipulate that it must have been demonstrated that, by using the slide, all of the specified number of passengers can evacuate within 90 seconds under the specified conditions.

However, in an actual emergency evacuation, the required evacuation time depends on such factors as the weather at that time, the time zone, the number of evacuation slides deployed and the degree of emergency. (Fig. 8).

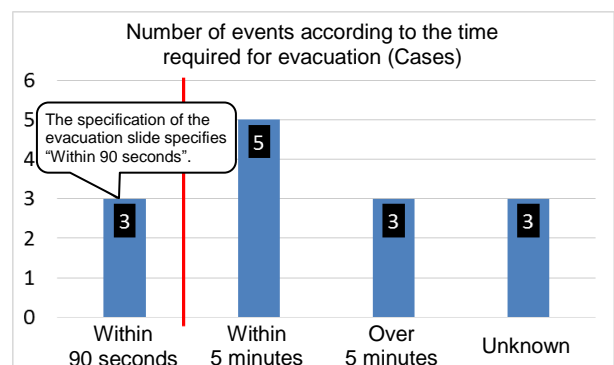


Fig. 8

Participating “Emergency Evacuation Training”

The current issue of the Digests features injuries that occur when using evacuation slides. This time, with cooperation from Japan Airlines (hereinafter referred to as “JAL”), I had the opportunity to participate in an “Emergency Evacuation Training”, as part of operation skill improvement. The JAL training facility near Haneda Airport has a full-scale mock-up that imitates a part of the fuselage of a middle-sized passenger carrier in service. In this facility, initial training for new cabin crew members, as well as annual regular training for all active cabin crew members, are carried out. One of the things required when a state of emergency occurs is that cabin crew members have knowledge and capability regarding safety-related actions during an emergency, such as appropriately guiding passengers. Actions required during an emergency situation vary depending on the situation. Evacuation procedures also vary depending on the aircraft model. Cabin crew members must be familiar with these actions from various aspects, and must thoroughly brush up on skills to attain a certain level. Otherwise, cabin crew operations cannot be performed.

The first menu of the training was evacuation through an evacuation slide. First, we learned the evacuation posture, in which the hands were held straight forward. Then, we got into the mock-up, which recreates a cabin so faithfully that we felt as if we were in a real cabin. Looking down from the emergency exit, it was about 4 meters off the ground and for a moment I hesitated to slide. From the sitting posture, I slid at a fairly high speed and landed in an instant. Landing was no problem because we practiced the evacuation posture beforehand. But, even for adults, sliding and landing require courage, and evacuation will be difficult if you are carrying baggage. For older people and children, sufficient support should be given. We heard that, in an actual emergency evacuation, you should not stop in front of the slide. Instead, you should jump from a standing posture with your hands held straight forward. The instructor gave the following tips: Never evacuate while carrying baggage because by doing so a proper sliding posture cannot be taken, which could result in injuries; it is important to not to stay near the aircraft after evacuation but to move to a safe place. I understood that this was very important in order to prevent the number of injuries from increasing.



Next, we got onto the mock-up again to perform training for an emergency landing. With the assumption of an emergency landing on the ground, an emergency command was given. The instructor, who was a cabin crew member acting as safety staff, repeatedly said “Heads Down!” both in English and Japanese in a loud voice, and instructed us to take an anti-shock posture. Overwhelmed by the forceful instructor, we took a head-protection posture by crossing both arms and leaning toward the seat in front of us. Images of an emergency state were shown on the monitor installed in the mock-up, sounds of shock were realistically reproduced, and the space was filled with smoke. Thanks to this recreated emergency state, we experienced a sense of reality and urgency. The instructor also explained that, when many passengers panic during an emergency, it was important to give instructions in a loud voice. After that, we learned how to guide passengers onto an evacuation boat floating on a pool for water-evacuation training assuming an emergency water landing.

The training on that day was finished at this point. We heard that various situations were prepared as emergency scenarios and that the training of that day was only a portion of the entire training and that new cabin crew members were given strict training for one week. I previously thought that cabin crew members were on-board service staff meant to keep the cabin comfortable for passengers. However, as safety staff with the task of safely delivering passengers to their destinations, cabin crew members bear an important role of fully ensuring safety during an emergency. This original function was now understood.

Throughout the training, the following was understood: It is the top priority of an airliner that, in an emergency, safety staff give instructions to passengers promptly and appropriately to prevent passengers from panicking and maintain a high level of safety; it is necessary to make passengers aware and understand that selfish behaviors without following the crew’s instructions will directly lead to the loss of safety.