

## Review of Medical Response in 2015 TransAsia Airways Flight 235 Aircraft Crash

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TransAsia Airways Flight 235 was a domestic flight that crashed into the Keelung River on February 4, 2015, about several minutes after take-off from Taipei Songshan Airport. There were 53 passengers and five crew members on board, however, only 15 of them survived. Twenty-seven casualties were sent to eight nearby hospitals. All of them were sent by ambulances of fire departments. Among 27 casualties, 10 experienced traumatic out-of-hospital cardiac arrest and the remaining 17 had traumatic injuries or hypothermia. The accident revealed several important issues regarding disaster medical response in Taiwan. First, compared to previous aircraft crash accidents in Taiwan, the search and rescue process was much more difficult because the airplane had fallen into the middle of a river. It was much more like a river rescue than an aircraft crash. Responders could not reach the casualties and provide care initially due to lack of proper equipment needed to cross the river. Second, the airplane crashed right on the border between two cities, the “command and communication” issue was also confused in the beginning. Third, the role of the disaster medical assistant team (DMAT) in Taiwan should be re-evaluated, including various protocols and standard procedures for dispatch, task, cooperation, staff training and logistics. By reviewing the response, we hope we can improve our system for the challenges in the future.

### Introduction

Taiwan is an island situated in East Asia and is a hub for air and sea transport. Whether traveling to other countries or to domestic islands in Taiwan, air transport is an indispensable way to travel conveniently and quickly. In 2018, the number of passengers in all airports in Taiwan was at a high of 69.8 million per year, which is 4.43% higher than the previous year.<sup>1</sup> The number of passengers for domestic flights has reached 11.59 million per year, and it is anticipated that air traffic will increase further in the future.<sup>1</sup> However, while we see the prosperity of such a busy air transport system, aviation incidents remain a concern for Taiwanese people. Since the founding of Taiwan's first private airline in 1951, it has been through many different commercial aircraft incidents.<sup>2</sup>

The crash of TransAsia Airways Flight 235 into the Keelung River in 2015 is one of them. It is the first aircraft incident in Taiwanese history to have occurred at a river; therefore, the handling of this incident warrants much discussion.

### The Incident

TransAsia Airways Flight 235 was a domestic flight from Taipei Songshan Airport to Kinmen Shangyi Airport. It flew on February 4, 2015, at 10:45 a.m. (UTC+8), carrying 58 people in total: 53 passengers (48 adults and five children) and five cabin crew members. Shortly after take-off, at 10:53 a.m., the flight lost contact after sending a distress signal to air traffic control. The aircraft first avoided a building and then rolled 90 degrees anticlockwise, with the left

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wing striking a taxi on a viaduct (causing two people to be injured). Afterward, at approximately 10:55 a.m., the aircraft crashed into the Keelung River situated at the borders of the Nangang District of Taipei City, Neihu District of Taipei City, and Xizhi District of New Taipei City.

Upon notification at 10:55 a.m., seven fire brigades were engaged to send their units (with water bikes, boats, and rafts) for the rescue operation, and the chief of the corresponding district headquarter was informed to coordinate the rescue efforts and set up a field triage and medical station onsite. The Department of Health in Taipei City also carried out mass casualty/trauma event protocols upon notification and dispatched medical staff and ambulance from three nearby hospitals to the site to support the emergency rescue. At 11:25 a.m., another hospital was instructed to dispatch its staff to the site for further support. However, upon the timely arrival of the first batch of rescue staff, it was found that the aircraft crashed into the river. The rescue could not start immediately because the rescue staff from the fire department did not have the appropriate equipment with them. Because of the pressing urgency to rescue, many rescue staff from the

fire department took the risk to swim across the river's strong current, and roughly three of them managed to arrive at the aircraft wreckage to reach the injured, reassure them, and collect relevant information. The field triage used at the scene was the simple triage and rapid treatment method. Of the 27 casualties who were sent to hospitals, four of them were triaged as priority 1 (red), 11 were priority 2 (yellow), two were priority 3 (green), and 10 went into cardiac arrest before reaching the hospital (black). The casualties were sent to eight different hospitals. Field triage and patient distribution to different hospitals are shown in Table 1 and Fig. 1, respectively. Because of the strong current and accumulated silt, the body of the last victim was found on February 12. This aircraft incident caused a total of 43 deaths and 17 injuries.

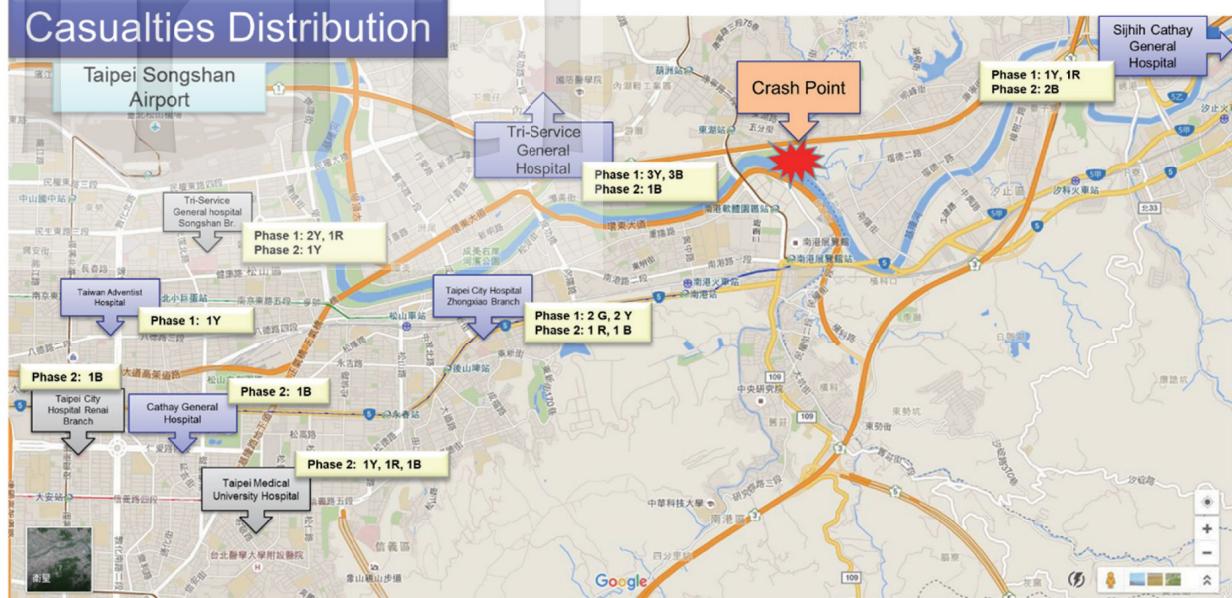
## Discussion

Taiwan is relatively experienced in handling aircraft incidents, yet the situation differed for each of these incidents. The TransAsia Airways Flight 235 incident occurred during take-off, and it crashed into a river. Therefore, there was no significant fire or

**Table 1.** The result of field triage, diagnosis and disposition of causalities who had sent to hospitals

Field triage	Diagnosis	Disposition
Priority 1 (red)	Multiple bony fractures and hemothorax	Intensive care unit
	Drowning with aspiration pneumonia	General ward
	Right radial fracture	General ward
	Missing data	Intensive care unit
Priority 2 (yellow)	Hypothermia	Discharge
	Close fractures and lacerations	Discharge
	Hypothermia and abrasions	Discharge
	Hypothermia and abrasions	Discharge
	Hypothermia, oral laceration and sprain	General ward
	Contusions and lacerations	Discharge
	Pneumothorax, head laceration, humeral fracture	General ward
	Humeral and ribs fractures, head injury	General ward
	Head injury, back contusion	General ward
	Lung contusion	General ward
Priority 3 (green)	Multiple contusions with internal bleeding	Intensive care unit
	Head injury and multiple abrasions	Discharge
	Foreign body in eyes	Discharge
Deceased (black)	Traumatic out-of-hospital cardiac arrest × 10	Expired

Simple Triage and Rapid Treatment (START) method had been used for field triage during this incident.



Phase 1 (11:50-12:30) → 16 casualties: 2G, 9Y, 2R, 3B

Phase 2 (12:30-13:30) → 11 casualties: 2Y, 2R, 7B

**Fig. 1.** Casualties distribution. Casualties transport from the scene divided into two phases and distributed to eight hospitals.

Simple Triage and Rapid Treatment (START) method had been used for field triage. R = red = priority 1; Y = yellow = priority 2; G = green = priority 3; B = black = deceased.

explosions, and the altitude was low before crashing. Because of these, the survivors did not sustain the commonly seen burns, toxic gas or particulate inhalation, or decompression sickness, which are also the usual injuries of aircraft incidents.<sup>3,4</sup> The hospitalized victims in this accident only experienced polytrauma, hypothermia, and vital organ injury.

The rescue operation for this air incident was likened to that for a sunken ferry or river rescue. Casualties could not be reached and pulled out immediately without proper equipment; hence, the time taken for rescue was longer than for most other traffic incidents. The two casualties from the taxi that was hit at the nearby viaduct were rescued by the response team about 15 minutes after the aircraft crash. In contrast to the causalities on land, the first survivor of this plane crash was pulled out by the response team about 40 minutes later.

Problematic coordination and communication are common in all sorts of incidents and disasters. During the Singapore Airline crash at the Taiwan Taoyuan International Airport in 2000, the main problems with coordination and communication were incident/field status not well evaluated and reported,

information management, communication failure, medical incident command system failure, and no patient dispatch control to hospitals.<sup>5</sup> Similar problems happened in the TransAsia Flight 235 incident.

In term of coordination, because the aircraft crashed at the border of two cities, there was a problem with jurisdiction between Taipei and New Taipei cities. There was also initially a confusion with jurisdiction between the central and local authorities. Some people thought that the central government should be in charge of the response effort from the start, according to the "Disaster Prevention and Protection Act," but it is a misunderstanding of the law. The local government should provide the initial response, even in an aircraft crash incident.

As to communication, there was congestion in the wireless network; thus, calls to the 119 emergency hotline would likely have been transferred to different cities' fire departments. Because of the network congestion, the 119 Rescue Command Center could not ascertain the best way to transport the casualties. Fortunately, because of the immediate coordination within the emergency response team, as well as the additional telecommunication systems, the flow of information

was improved within a few hours, and the casualties were sent to different hospitals in a coordinated manner. This was a significant improvement compared to the rescue mission of the Singapore Airline crash.

Finally, there was a support issue from the hospital-based medical team. Learning from the experience of the Singapore Airline crash, the hospital-based medical team could not function properly onsite if they could not arrive at the incident site within the critical first 30 minutes, if they were not rostered in advance, and if they were not trained or did not prepare the appropriate equipment. Hence, they may risk becoming casualties themselves.<sup>5</sup> Because of the difficulty of this rescue, the evacuation of casualties was not very fast. Therefore, the medical team still functioned properly on the site about one hour after the aircraft crash, and afterward, they also treated the response team who were injured because of the rescue operation. To date, in addition to the Northern and Southern National Disaster Medical Assistance Team (National DMAT) for large and long-term disasters, different counties, cities, and even hospitals in Taiwan are working towards creating different types of DMAT. However, in the future, the focus should be put into definite dispatch protocols and task protocols, including cooperation for different types of DMAT. We also need better practical training for DMAT staff, modular preparation of relevant rescue equipment in advance, staff rostering, and other logistics management. These would allow medical teams to reach the site quickly and function better in performing the

triage, medical treatment, and transportation requirements.

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