



Aviation Safety Council

Taipei, Taiwan

**GE222 Occurrence Investigation
Factual Data Collection
Group Report**

Survival Factors Group

December 26, 2014

ASC-FRP-14-12-07

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I. Team Organization

Chairman:
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II. History of Activities

Date	Activities
/24/14 to 7/25/14	<ol style="list-style-type: none"> 1. Survival Factors Group established and invited the forensic pathologists from Institute of Forensic Medicine(IFM), Ministry of Justice to join and launched to scene in Magong. 2. Coordinated : <ol style="list-style-type: none"> A. Coordinated with the prosecutors, the policemen from Criminal Investigation Bureau (CIB), the forensic pathologists from Institute of Forensic Medicine before performed the forensic examination process to make sure whether ASC need. B. Collected survivors interview notes from prosecutors. 3. Completed all forensic inspections and autopsies in mortuary. 4. Collected : <ol style="list-style-type: none"> A. Passenger name and seat number of flight 222. B. Inspection and autopsy records. C. Information of Injured survivors status from two local hospitals.
7/26/14 to 7/27/14	Prepared for interviewing injured survivors, fire fighters and organization meeting.
7/28/14 to 7/31/14	<ol style="list-style-type: none"> 1. Interviewed : <ol style="list-style-type: none"> A. Interviewed 6 fire fighters and one policeman. B. Interviewed three residents. C. Interviewed one injured survivor's relative. 2. Collected : <ol style="list-style-type: none"> A. Ambulances video camera record. B. Photos on fire fighting on crash site. C. Interview notes of one injured survivor and four control tower controller from the prosecutor. D. Ground property damage report from Ministry of

Date	Activities
	<p>Transportation and Communications (MOTC).</p> <p>E. The distribution of victim's body area from fire fighting.</p> <p>3. Key in all pathology data to "Injury Database and 3-D Analysis Software".</p>
<p>8/4/14 to 8/6/14</p>	<p>1. Meeting :</p> <p>A. Progress Meeting.</p> <p>B. Survival Factors group review meeting(8/5,8/6).</p> <p>2. Confirmed the collected data .</p> <p>3. Discussed in Survival Factor Group:</p> <p>A. Impact sequence.</p> <p>B. Injury pattern.</p> <p>4. Collected the diagnosis of injured passengers and residences from Ministry of Health and Welfare (MOHW).</p>
<p>8/6/14 to 8/7/14</p>	<p>1. Collected :</p> <p>A. Toxicology report from IFM.</p> <p>B. Bodies location and photos from local police.</p> <p>2. Interviewed three injured passengers.</p>
<p>8/8/14 to 8/10/14</p>	<p>1. Group Review Meeting (8/11)</p> <p>2. Group Review Meeting (9/26)</p>
<p>12/3/14</p>	<p>Group factual report verification meeting</p>
<p>12/18/14 to 12/24/14</p>	<p>Interviewed three passengers</p>

III. Factual Description

1.2 Injuries to persons

There were 2 pilots, 2 cabin crews, 54 passengers, in total 58 people on board. All 4 crews and 44 passengers sustained fatal injuries, 9 passengers sustained serious injuries and 1 passenger sustained minor injury. 5 ground residents sustained minor injuries.

Table 1.2-1 Injury table

Injuries	Flight Crew	Flight Attendants	Passengers	Other	Total
Fatal	2	2	44	0	48
Serious	0	0	9	0	9
Minor	0	0	1	5	6
None	0	0	0	Not applicable	0
Total	2	2	54	5	63

1.2.1 Distribution of Injuries

The ATR-72 was configured with 72 economy class seats in cabin. There were 2 pilot seats in cockpit and 2 cabin crew seats in cabin.

Figure 1.2-1 shows passenger seat positions, the injury and fatality distribution. The information of the passenger seating positions is based on the airline seating plan and interview notes of the passengers. (Referred to Attachment 7-1)

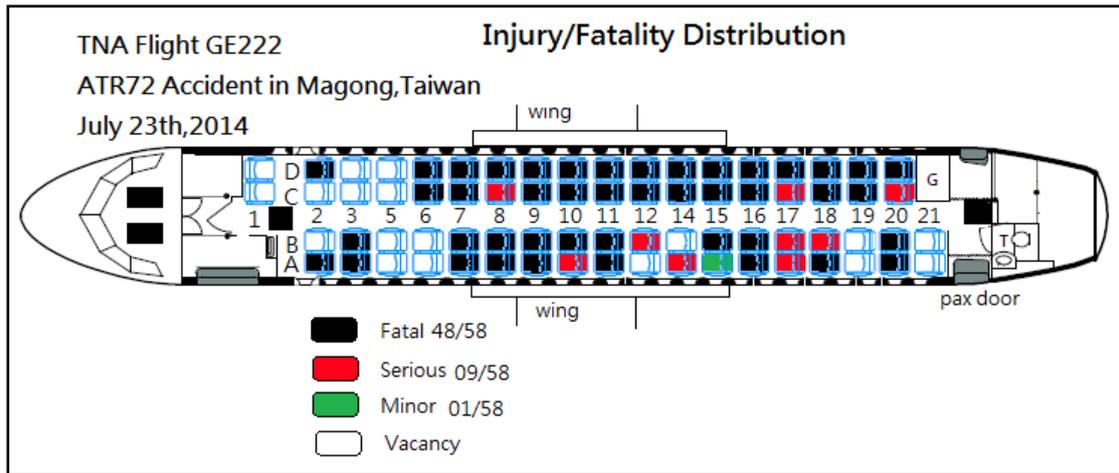


Figure 1.2-1 Injury and fatality distribution

1.3 Damage to Aircraft

As a result of aircraft impact with buildings, the wreckage scattered over Xixi village and sequentially described as follows:

1. the right wing tip and the right landing gear rested next to building No.7-1, as shown on Figure 1.3-1;
2. the central and root section of the right wing rested on the roof of building No.5-3, as shown on Figure 1.3-1;
3. the rear section of the fuselage (frame stations 31 to 35, 19 to 21 rows of passenger seats) rested on the roof of building No.58, as shown on Figure 1.3-2;(Refer to Attachment 7-2)
4. the rear section of the fuselage (frame station from 36 to 44) with part of the vertical wing root rested inside the No.59 building, as shown on Figure 1.3-1;
5. the vertical wing rested next to building No.106, as shown on Figure 1.3-1;
6. the fuselage (frame stations 28A to 31, 14 to 19 rows of passenger seats) leaned to left which rested next to building No.105, and it broken from the front fuselage (from nose to frame station 28A, cockpit crew seats to 14 rows of passenger seats) which rested upside down. The No.1 power plant stood upward. The left wing turned upside down, as shown on Figure 1.3-3;



Figure 1.3-1 the distributions of wreckages and buildings



Figure 1.3-2 the rear section of the fuselage on the roof



Figure 1.3-3 the front section of main wreckage on scene

No seats, emergency exit doors and their locations were recorded due to quick clean up on scene.

1.13 Medical and Pathological Information

1.13.1 Medical Treatment of Injured

After this occurrence, there were 9 out of 10 survivors who suffered serious injuries, including 6 of varying degrees of burns, 4 of bone fractures. The one survival passenger and the five injury residents suffered abrasion and contusion. The medical records and their abstract of the 10 surviving passengers are referred to Attachment 7-3.

The injured were initially transported to Penghu Hospital and Tri-Service General Hospital Penghu Branch. They were transported to Taiwan's hospital a few days later after achieving stable condition where most of the injured live in. They were transferred to the following Taiwan hospitals: Mackay Memorial Hospital Taipei Branch, Zuoying Branch of Kaohsiung Armed Forces General Hospital, Linkou Chang Gung Memorial Hospital, Kaohsiung Veterans General Hospital, Kaohsiung Medical University Chung-Ho Memorial Hospital and China Medical University Hospital. (Referred to Attachment 7-4)

1.13.2 Medical history of Flight Crews

The medical records of both flight crews in three months before this occurrence are abstracted to Attachment 7-5. Captain had hypertension and

took a syntace 10mg/tablet and an amoldine 5mg/tablet per day.

1.13.3 Toxicology information of Flight crews

The Institute of Forensic Medicine, Ministry of Justice conducted toxicology examinations on the 2 flight crews. The toxicology examination report is referred to Attachment 7-6. The test items included alcohol content, poisons, sedatives, hypnotics, carbon monoxide hemoglobin and the basic drugs screen (about one thousand items).

The captain's toxicology report shows 1% of carbon monoxide hemoglobin, Ramipril and Amlodipine in urine and no other drug or toxin was found.

First officer's toxicology report shows no evidence of drugs or toxin.

1.13.4 Forensic inspection and autopsy

The Penghu District Prosecutors Office, the Kaohsiung District Prosecutors Office, Institute of Forensic Medicine, Criminal Investigation Bureau and Aviation Safety Council had a coordination meeting to make sure they jointly collected required information before performing of the forensic inspection. The forensic pathologists from IFM performed the autopsy of two flight crews.

There were no victims location to be recorded before moved by firefighters or rescuers.

1.13.4.1 Inspection report of victim

Based on the inspection report by IFM, referred to Attachment 7-7, most causes of the death are multiple traumatic injuries and burns. The direction of the fatal impact force was predominately from front to back. The victims had head crush and extremity bone fracture injury. Burn injuries included choking and burning of the body surface. Their abstract are referred to Attachment 7-8.

1.13.4.2 Injury patterns

Eight injury patterns (included comminuted skull fracture, hinge fracture of skull base, extremities bone fracture, waist tear-off or nearly tear-off, imprints of roof tiles, seatbelt mark, burns and choking) and their descriptions related to cabin distribution drawn by using " Injury Database and 3-D Analysis Software¹ " are described in Attachment 7-9.

¹ produced by ASC and Institute of Forensic Medicine in 2009

1.13.4.3 Abstract of pilot's autopsy

The autopsy abstract of 2 flight crews are referred to Attachment 7-10.

1.14 Fire

1.14.1 Notification and dispatch

According to notification records of the local fire bureau (referred to Attachment 7-11), between 19:06 and 19:12, residents and local patrol policeman, total 3 people called 119 that either houses caught on fire or an aircraft crashed.

At 19:07.12, local 119 command center dispatched 1 fire engine (2 people), 1 water tank (2 people) and 1 ambulance (1 people) in total of 5 people of Huxi fire fighting station to the scene while could not make sure aircraft crashed. At 19:09, the command center confirmed the aircraft had crashed. The first fleet arrived on-site at 19:12.45 and reported to command center. Peng Nan, Baisha, Shiyu and Magong fire fighting stations in a total of 30 people was subsequently dispatched to the scene for fire fighting, search and rescue for survivors.

According to airport task logs (referred to Attachment 7-12) and notification records of local fire bureau, around 19:10, the control tower notified airside operation division of the airport that one aircraft had lost contact. At 19:29, the airport confirmed an aircraft was crashed and noticed the local fire bureau. Three airport standby fire engines were dispatched to the scene after the airport shut down at 19:43.

1.14.2 Post fire and fire fighting

Summary of the interviews with the survived passengers (referred to Attachment 7-13), the airplane impacted objects, and caught on fire in front cabin with sparks, and the sparks ran to aft cabin. In total of 2 explosions occurred, the first explosion was bigger than the second one.

Summary of the interviews with the Xixi village residents (referred to Attachment 7-14), around 19:00, there was heavy rain with thunder and lightning outside. Few minutes later, 1 resident heard a loud bang similar to a thunder and then heard noise like rotating propeller hitting objects. He walked out from his house and saw flames erupting very high in front of an alley. He notified 119 immediately.

Summary of the interviews with local fire fighters (referred to Attachment 7-15), the fire engines couldn't approach due to narrow alleys and stay at 30 meters away from the site. They did not see any smoke or fire when they just arrived. Then they got off the fire engines and tried to confirm the

actual location of the site. They suddenly heard sound of an explosion and saw the flames (about 3 floors height) in front. The fire fighters began to prepare foams and pulled the fire hose to the site along the alley. When they approached to 10 meters away from the site, the second explosion with flames about 1 floor height happened. Because of the explosion, the fire fighters began to wear oxygen masks and approach in squatting position. They saw the airplane cockpit and burning wing sections. They attempted to extinguish the fire by using foam meeting and notified to 119 to confirm aircraft crashed. They also requested more manpower and vehicles for support. On scene command post was established in a resident house. The fire was suppressed at 20:05 and fully extinguished at 20:37. The fire was reignited at 02:31 next morning. The fire engines of Huxi Station came to put out the fire.

A policeman who arrived the scene also saw that the alley was too narrow to drive fire engines through. The firemen parked fire engines at the intersection of No.68 and No.113 house and pulled their host to the scene.

According to the notification records and disaster report of local fire bureau (referred to Attachment 7-11), a total of 87 fire engines and rescue vehicles trips, 26 ambulance trips and 1,526 people involved in the search and rescue.

1.15 Survival Aspects

1.15.1 Emergency Evacuation

According to the interview record (referred to Attachment 7-13) of passenger A (seated in middle section and left side of cabin), there was heavy rain with thunder and lightning before the aircraft approached Penghu. The aircraft encountered turbulence frequently on route. About 19:00, Captain announced to prepare for landing. Passenger A felt the aircraft started to descent and suddenly heard a loud bang. The aircraft vibrated and seemed like it hit something. The aircraft caught on fire in front cabin with sparks, a lot of sparks ran aft to hit and burn passenger A's face. Then the aircraft broke apart. Passenger A felt that the aircraft was still moving forward. Passenger A was thrown out of the cabin and came to rest on a pile of rubble in a very short time. The aircraft burned into a fireball in front of passenger A. Passenger A got down the rubble relied on lights from burning aircraft and walked in short distance to a building for help. Passenger A heard a loud explosion in the building. The powerful explosion made all windows shaking. There were 4 injured passengers in this house and they were sent to Tri-Service General Hospital Penghu Branch by an ambulance together.

According to the interview record of passenger B (seated in rear section and left side of cabin), before the aircraft approached Penghu, there was turbulence and the flight was bumpy on route. Captain announced the aircraft was in holding pattern, and waited for control tower's instruction to land. The holding lasted about 50-60 minutes. Passenger B saw thunderstorm and lightning outside, the flight remained bumpy. It then suddenly started to descend like a roller coaster, and moved upward and downward rapidly. There were a lot of impact sounds and then seemed to impact some objects with loud bang. But the aircraft did not stop. A lot of objects came from the front cabin. The front cabin became dark. Passenger B could smell of rain and burning and saw the airplane fuselage was distorted. After the aircraft stopped, there was fire about one-floor height on the left side of passenger B and smoke came from the bottom. Passenger B shouted to ask if anyone was in the cabin but none responded. When evacuated from the aircraft, Passenger B heard some voice from the cabin. Then the first explosion happened and then became silence. When he went out the cabin through the fire, Passenger B heard shouting under rubble. Passenger B ran to a building asking for help and the second explosion happened. Passenger B recalled this explosion was bigger than the first one. Passenger B tried to borrow some tools for rescuing his friend but he could not find any tool in this building. Passenger B once went back to the scene but failed to find out his friend.

According to the interview record of passenger C (seated in rear section and left side of cabin), captain announced the aircraft was preparing to land, and then heard a loud bang of impact. After impact, passenger C went into coma. When woke up, passenger C found herself still sitting on the passenger seat while the aircraft already rested on ground and broke apart totally. Passenger C found a hole nearby, and went out of the cabin through this hole. Passenger C saw lights of the houses near the scene and then walked to the houses. Passenger C saw one little girl sitting on seat, then held her to the house for help. Both of them were brought to an ambulance later and sent to the Penghu hospital, MOHW.

According to the interview record of passenger D's relative (seated in front section and right side of cabin), passenger D fell asleep when the aircraft was in approach. When passenger D woke up, the aircraft had crashed already. Passenger D unfastened seat belt to evacuate and remembered to stand on a very high place. Someone told passenger D to jump down, otherwise she could die. Passenger D was afraid of jumping down because of the height and could not remind other things.

According to the interview record of passenger E (seated in rear section and right side of cabin), the cabin light extinguished suddenly after impact.

Passenger E immediately took brace position using hands to protect his head before the occurrence happened. Passenger E could not remember how he was rescued. But he was told while he was in his seat with the seat belt fastened (separated with cabin) and he asked for help to a fire fighter.

According to the interview record of passenger F (seated in middle section and left side of cabin), the aircraft was in holding for at least 30 minutes. Passenger F felt quite happy after captain announced the aircraft was landing shortly. Suddenly the impact occurred and Passenger F loss his conscious. When passenger F woke up due to the voice of the passenger in front, she found herself still in the seat, and was in a left bank attitude. She observed the fire came from the aisle at row 11th. She found a hole at her left side, passenger F said. She unfastened her seat belt, kicked floor and slipped out of the cabin. Then she ran to Xixi village house no.56 and she heard a big explosion sound within minutes.

According to the interview record of passenger G (seated in front section and left side of cabin), after boarding he fell asleep. When he woke up, the aircraft was still in holding. Then he heard 2 continuous sounds for reminding passengers to fasten seat belts. However, he unfastened his seat belt because he wished to quickly disembark after landing. During the impact period, he did not feel any inertial force due to the impact. After the impact, he stood on the cabin aisle and walked forward. He evacuated from a broken hole. Then he ran to Xixi village house no.56 too.

1.15.2 Search and Rescue

The conditions of search and rescue are described below by time sequence. The house number and its location of Xixi village houses are shown in Figure 1.15-1.



Figure 1.15-1 The location of Xixi village in house number

1. The first trip of Huxi ambulance

According to the interview record (referred to Attachment 7-15) of the ambulance driver first arrived, this ambulance was following with fire engines rushed to Xixi village. They were blocked by a male villager with flashlight when approached a temple of Xixi village. The villager asked the ambulance driver to transport 4 survivors in No. 56 house. Based on the description of section 1.15.1 in this report, these 4 passengers evacuated themselves. Three of them could get on the ambulance themselves but the other one needed assistance. They were sent to the Tri-Service General hospital, Penghu Branch.

2. Peng Nan ambulance

According to the interview records of the policeman(referred to Attachment 7-16) who arrived first at the scene, around 19:00, he was driving patrol vehicle. Due to heavy rain and low visibility (just 10 meters) at that time, he stayed at an abandoned police office of Xixi village. He then received a notice regarding the houses at Xixi village caught on fire from police command center later. Then he approached to the scene and saw flames immediately. He went to the third floor of one resident's house and found an aircraft crashed. He immediately reported to the command center and ran to the scene. He found a girl sitting on a blade of aircraft engine which was vertically overturned. He asked the girl to jump and promised to catch her. The girl hesitated because of the height. Then he left for a while to look for more resources to support. He heard an explosion and rushed back to check the girl. He found her on the ground already. He

held her to a resident's house and handed her over to a resident. A policeman saw a female passenger walked out from the scene later. He helped her walk to the same house and waited for an ambulance, as the policeman found no ambulances or fire engines had arrived yet at the time.

Another fire fighter found 2 female survivors nearby No.66-1 house, one was a girl who suffered 2nd to 3rd degree burns. He held the girl immediately and handed her over to the policeman. Then the fire fighter helped them board an ambulance.

3. The second trip of Huxi ambulance

According to the interview records of the fire fighters, after the fire was suppressed, he searched the west area of the main wreckage. He found an adult man who got bone fracture lying on the ground. He directed the rescuers to help this passenger to board an ambulance with a spinal board. The survivor was sent to Tri-Service General hospital, Penghu Branch by Huxi ambulance.

4. Vehicle from passenger's relative

According to the interview records of the fire fighters, a fire fighter found a young male survivor walking around the main wreckage area. This passenger tried to discover his friend who might be under the wreckage. The fireman asked and guided him to the triage area nearby No. 53-1 house while he could walk. Later, he was sent to Penghu hospital ,MOHW by private car of his friend's relative.

5. Unknown Ambulances

The fire fighters continuously searched and shouted for signs of survivors. The fire fighters heard sound of an older male from behind the aircraft engines in the main wreckage area. The fireman asked rescuers to disassemble house door immediately, let the injured passenger lay on the door, and sent him to Penghu hospital ,MOHW.

Most of the survivors escaped by themselves. If passengers could not escape by themselves from cabin before the big bang, the survival possibility was very low.

IV. Appendices

NIL

V. Attachment List

No	Item
7-1	Passenger manifest
7-2	Major part of wreckage
7-3	Medical records of injured
7-4	Hospital records
7-5	Medical records of flight crews in three months before occurrence
7-6	Toxicology examination report
7-7	The database of victim inspection
7-8	The abstract of victim inspection
7-9	Different types of injury pattern
7-10	The abstract of pilot's autopsy
7-11	The notification records and disaster report of local fire fighting
7-12	Airport daily task log
7-13	Passenger interview notes
7-14	Resident interview notes
7-15	Firemen and ambulance driver interview notes
7-16	Policeman interview note
7-17	Ambulance video and their observation description