Accident Investigation Party Submission by the City and County of San Francisco under 49 CFR § 845.27

NTSB Accident File: DCA13MA120

Operator: Asiana Airlines

Flight Number: 214

Model: Boeing 777-200ER

Aircraft Number: HL7742

Date of Accident: July 6, 2013

Location of Accident: San Francisco International Airport
San Francisco, California

Date of Submission: January 17, 2014

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ACRONYMS AND ABBREVIATIONS

If not otherwise defined in this submission, the following acronyms and abbreviations shall have the following meaning:

AAAE	American Association of Airport Executives
ACI-NA	Airports Council International.- North America
A4A	Airlines for America
ARFF	Aircraft Rescue and Fire Fighting
ASO	Airport Safety Officer
ATCT	Airport Traffic Control Tower
CFR	Code of Federal Regulations
DFW	Dallas-Fort Worth Airport
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
EOC	Emergency Operations Center
FAA	Federal Aviation Administration
FARs	Federal Aviation Regulations
FTRC	Fire Training Research Center
HRET	High Reach Extendable Turret
ICS	Incident Command System
ILS	Instrument Landing System
MERF	Marine Emergency Response Facility
NIMS	National Incident Management System
NOTAM	Notice To Airmen
NTSB	National Transportation Safety Board
PAPI	Precision Approach Path Indicator
RSA	Runway Safety Area
RWY	Runway
SFFD	San Francisco Fire Department
SFFD-AB	SFFD Airport Bureau
SFPD	San Francisco Police Department
SFGH	San Francisco General Hospital
SFO	San Francisco International Airport
U.S.C.	United States Code
VMC	Visual Meteorological Conditions

ATTACHMENTS

San Francisco attaches the following documents as referenced in this submission:

A Airport Layout Plan

B FAA Certifications for SFO (2008-2013)

C NOTAM 06/005 dated June 1, 2013

D Outreach letters from Assistant Deputy Chief Dale Carnes dated January 16, 2014

E Report by ICF International

F Agendas for Events Sharing Lessons Learned

1 INTRODUCTION

The City and County of San Francisco ("San Francisco") is a municipal body and a party to the National Transportation Safety Board ("NTSB") Investigative Hearing for Asiana Airlines Flight 214. The San Francisco International Airport (the "Airport" or "SFO") and the San Francisco Fir e Department ("SFFD") are separate City and County departments. As a party to the Investigative Hearing, San Francisco makes this submission under 49 CFR § 845.27, to propose findings and recommendations concerning only the emergency response; San Francisco lacks the technical expertise to propose any findings concerning the probable cause of the accident. San Francisco appreciates the opportunity to make this submission.

The emergency response to the crash of Asiana Flight 214 on July 6, 2013 presented significant challenges for the Airport and the SFFD. Unique among recent major airplane accidents in the United States, the incident resulted in more than 300 persons receiving triage in the midst of heavy rescue and fire fighting activity with the potential for an imminent explosion. Active fires developed in the interior and exterior of the aircraft while the aircraft actively vented large volumes of fuel. Emergency personnel successfully applied their training and experience to address this mass casualty incident and extinguish all fire in short order.

The first responders used their best efforts to rescue passengers and crew remaining in the aircraft, successfully evacuating all people who were either trapped or those assisting passengers who were still trapped on the plane. Even so, the accident resulted in the deaths of three people and serious injuries to scores of others: Three young women suffered fatal injuries when they were ejected from the aircraft after its tail section sheared away following the initial impact with the seawall short of the runway. NTSB Investigative Information establishes that the young women, who were all seated at the rear of the aircraft near the sheared tail, were likely not wearing seatbelts during the final approach. Their seats were empty when the plane stopped moving. All three young women were found on the airfield; two were deceased and the third died six days later. A further tragedy occurred when one of the three young women, determined to be deceased by fire fighters very early in the response, was later struck by two fire fighting vehicles. San Francisco sincerely regrets the added insult to the body of the deceased and is working towards improved protocols that would reduce the risk of a secondary strike in the future.

In addition to such protocols, the circumstances of the crash and the emergency response presented further opportunities for learning and improvement. The Airport and the SFFD have embarked on a detailed review and analysis of the response for lessons learned, have shared and will continue to share this information with the aviation industry, and have initiated specific enhancements and improvements. These steps are described in detail in this submission.

2 BACKGROUND

2.1 The City and County of San Francisco

San Francisco is located on the northern end of the San Francisco Peninsula in the State of California. San Francisco comprises approximately 49 square miles and has a population of approximately 825,000. It is the only City and County in California to share a single geographic boundary. An elected Mayor and Board of Supervisors govern the City and County.

2.2 San Francisco International Airport

San Francisco owns the Airport. The Airport is a department of the City and County but is located outside of San Francisco's geographic boundaries. The Airport is located in an unincorporated area of San Mateo County, approximately 13 miles south of downtown San

Francisco. A five-member Airport Commission, appointed by the Mayor, oversees the operation and management of the Airport.

SFO is the largest airport in northern California. In 2012, it was the 8th busiest airport in the nation and served more than 44 million passengers with an average of 1,163 daily flight operations to and from locations all over the world. Air carrier flight operations are approximately 89% domestic and 11% international. SFO is served year round and seasonally by 12 domestic and 26 international passenger airlines.

SFO is bounded by the San Francisco Bay to the north and east and by land to the west and south. It has two sets of parallel and intersecting runways: 1/19 parallel Left and Right and 10/28 parallel Left and Right. The approaches to runways 28 Left and Right are over water. A map of the Airport layout is annexed to this submission as Attachment A.

2.3 San Francisco Fire Department Airport Bureau

The SFFD staffs the SFFD-Airport Bureau ("SFFD-AB") under an inter-departmental work order agreement between the Airport and the SFFD. The SFFD Chief appoints an Assistant Deputy Chief to manage the SFFD-AB, and effective July 1, 2013, appointed Assistant Deputy Chief Dale Carnes to that position. Chief Carnes is a trained and experienced Aircraft Rescue and Fire Fighting ("ARFF") commander who supervises three fire houses on Airport property with ARFF personnel and equipment that is primarily dedicated to Airport fire fighting and emergency medical services ("EMS"). The secondary responsibility of the SFFD-AB is to respond to building fires and medical calls for service on Airport property. At any given time, there are no fewer than 23 fire fighting and paramedic personnel on duty at SFO. All members of the SFFD-AB must have a minimum of five years experience in working as fire fighters within the City and County of San Francisco before transferring to the Airport. The SFFD-AB responds to an average of 300 fire or medical calls each month.

The SFFD-AB staffs seven fire fighting apparatus: three structural fire fighting vehicles and four ARFF vehicles. Three of the ARFF vehicles are Oshkosh Strikers, two of which are equipped with 65 foot High-Reach Extendable Turrets ("HRETs") with piercing nozzles. Each of the three Strikers has a capacity of 4500 gallons of water, 630 gallons of foam, 460 pounds of Dry Chemical and 500 pounds of Halotron. Each Striker is staffed with two fire fighters. The fourth ARFF vehicle is an Oshkosh T3000 and holds 3000 gallons of water, 420 gallons of foam and 460 pounds of Dry Chemical. This unit is staffed with two fire fighters and a lieutenant. Three additional ARFF vehicles are maintained as reserve vehicles.

2.4 SFO and SFFD-AB Preparation for Aircraft and Mass Casualty Incidents Prior to July 6, 2013

SFO and the SFFD-AB have continually maintained a high-level training and emergency response program. In this section, San Francisco describes its preparation for aviation disasters and airport emergencies as of July 6, 2013. In section 5 below, San Francisco describes enhancements and improvements to the program which SFO and SFFD-AB have initiated based on lessons learned from the crash of Asiana 214.

Under 14 CFR § 139.325, Class I (large) airports must hold a full-scale airport emergency plan exercise at least once every 36 consecutive calendar months. As a matter of practice, SFO conducts full-scale drills on an annual basis (once every 12 months). The Airport prepares a different scenario each year using over 100 community volunteers and employees to prepare for different types of emergencies and to exercise multiple systems, agencies and Airport tenant capabilities. The Airport learns from each of these exercises and documents lessons learned in an After Action

Review. The Airport has also used the Homeland Security Exercise and Security Program to evaluate the responses to the exercises. In the past five years, SFO conducted exercises responding to the following simulated scenarios: a water crash/water rescue incident (2012); an air crash involving San Mateo County mutual aid (2011); a fire disaster involving an aircraft from Barcelona, Spain at the International Terminal gate (2010); a region-wide earthquake (2009); and an air piracy incident (2008). SFO did not hold an annual drill in 2013, as the crash of Asiana Flight 214 obviously provided a real-world aviation disaster.

In addition to these annual events, the Airport Operations and Security Division and SFFD-AB perform monthly "redcap" drills. Redcap Drills are designed as monthly "time trial" drills for ARFF personnel and also include exercises for basic strategy and tactics and for the positioning of ARFF units, initiating the Incident Command System (ICS), and establishing a unified command post with Airfield Operations and the Airport Duty Managers. Redcap Drills also involve the setup of the Preferred Standardized Emergency Response Pattern and the basic use of a staging area designed to manage mutual aid response. The SFFD-AB also conducts daily company level drills and weekly multi-company or "Captains' Drills" that generally cover individual elements of an ARFF response as compared to the multiple elements covered in the monthly Redcap Drills. There also are various regional exercises in which San Francisco, the Airport and/or the SFFD regularly participate.

The Airport also supports education and training through an Emergency Management /National Incident Management System (NIMS) and Incident Command System (ICS) Orientation available for all Airport Operations and Security Division staff and law enforcement and ARFF personnel assigned to the Airport. It is a 60-minute course that provides an overview of Airport Emergency Management functions, Airport Emergency Plan responsibilities, and an overview of NIMS and ICS. The Airport also sponsors an Emergency Operations Group which is a monthly meeting open to the airport community (airlines, government agencies, aviation support, county representatives and non-government agencies), to facilitate outreach and communication to the airport community. The monthly meetings include presentations on emergency programs, preparedness, response, recovery, incident after-action debriefings and similar topics. Finally, the Airport provides employee training on a quarterly basis consisting of a familiarization visit to the Emergency Operations Center, training on being a San Francisco Disaster Service Worker and a Personal Preparedness Course created by the American Red Cross.

3 FACTUAL SUMMARY

On Saturday July 6, 2013, at 11:27:48[1] Pacific daylight time, a Boeing 777, registration HL7742, operated by Asiana Airlines as Flight 214, struck the seawall short of Runway 28L at San Francisco International Airport. The airplane was destroyed by impact forces and fire. Three of the 291 passengers were fatally injured. The flight was a regularly scheduled passenger flight that originated in Shanghai Pudong International Airport, Shanghai, China, with a stop in Inchon International Airport, Seoul, Republic of Korea. The flight operated under the provisions of 14 CFR Part 129. Visual meteorological conditions ("VMC") prevailed at the time of the accident and the Federal Aviation Administration ("FAA") Air Traffic Control Tower ("ATCT") cleared the flight to land using a visual approach.

The aircraft impacted the approach end of Runway 28L and progressed into the level dry dirt infield between Runway 28L and Taxiway Foxtrot. The impact sequence severely damaged the tail assembly, or empennage, shearing it off the aircraft. Due to a shift in the center of gravity resulting

[1] All times in this submission are based on the timeline at NTSB Exhibit No. 6-N.

from loss of the empennage, the nose tilted downward while the rear of the aircraft elevated from the aerodynamic lift still being provided by the wings. The aircraft rotated counterclockwise approximately 330 degrees, creating a heavy cloud of dust and debris before crashing onto the infield or safety area approximately 2300 feet from the seawall.

Aboard the aircraft were 307 individuals: 4 flight crew, 12 cabin crewmembers and 291 passengers. The shearing of the tail assembly and the centrifugal force from the rotation in the nose down attitude during the accident sequence resulted in the ejection of five people: two crewmembers still strapped into the rear jump seats and three passengers seated in the last two passenger rows. When the aircraft came to rest, the two ejected crewmembers and two of the ejected passengers were in relatively close proximity to each other, on the north side of Runway 28L near the seawall, approximately 350 yards away from the aircraft. The third ejected passenger came to rest in the dirt infield runway safety area immediately forward of the left wing. The two ejected crewmembers incurred serious and critical injuries and have survived. The three ejected passengers incurred fatal injuries; two died at the scene and one died six days later.

Passengers began evacuating the aircraft approximately 90 seconds after final impact. Evacuation occurred primarily out the back of the plane and by slides deployed at the forward two left doors. Egress from the tail was possible not only because the tail assembly was sheared in the crash but also because the landing gear and engines were sheared from the aircraft – allowing the fuselage to rest on the ground with the aft fuselage closest to the surface.

A fire started in Engine 2, which was wedged against the right side of the fuselage. Jet fuel – estimated at nearly 3,000 gallons – was actively venting from fuel lines exposed where both engines separated from their supports under the wings, but primarily on the left side of the aircraft. A fire also began in the insulation lining the fuselage interior, beginning near the front of the aircraft. The interior fire produced heavy smoke inside the aircraft and presented a dangerous condition given the volatility of leaking jet fuel on the exterior and potentially explosive items on the interior such as oxygen tanks.

Airport Safety Officers ("ASOs"), responding from their airfield patrols, were the first Airport personnel to arrive on scene. ASOs are not trained first responders but have responsibility for conducting the Airport self-inspection program in compliance with FAA regulations (14 CFR Part 139). The ASOs immediately began directing self-evacuated passengers away from the aircraft and the runways. ARFF units from the SFFD-AB began arriving on scene within approximately three minutes of initial impact. Within several minutes, seven ARFF units and two paramedic units – 22 personnel total – were on scene. In the first 19 minutes after initial impact, the ARFF companies engaged in simultaneous rescue and fire fighting efforts. While most passengers and crew self-evacuated, fire fighters extricated five passengers and cleared the plane of all persons who were attempting to aid the rescue efforts. Rescues were made out the aft, through Door 4L. Fire fighters also extinguished all fire, including that in the interior lining of the fuselage, within 47 minutes of initial impact. Fire fighting companies and command staff from San Francisco and mutual aid from neighboring San Mateo County supported the emergency response.

One ASO who arrived on scene prior to the SFFD-AB observed an object in front of the left wing, covered in the dust and dirt from the debris cloud raised by the impact and rotation of the aircraft. The ASO did not believe the object was a person. At least three fire fighters early in the response independently determined, based on visual and conclusive observations, that what the ASO believed was an object was a deceased victim (later identified as Passenger 41E, Ye Meng Yuan). As trained mass casualty responders, the fire fighters moved to other immediate tasks. Tragically and regrettably, two ARFF vehicles later rolled over the deceased during active fire fighting

operations. While we believe that this passenger was traumatically ejected from the rotating aircraft and died prior to being found in the dirt infield runway safety area, SFFD-AB is seeking to develop industry protocols for reducing the risk of secondary strikes in ARFF incidents.

Emergency responders effectively and efficiently triaged the passengers and crew. Fifty-six ground ambulances, two medical helicopters and two buses transported 179 patients to 12 area hospitals.

4 ANALYSIS AND PROPOSED FINDINGS

4.1 The Airport on July 6, 2013

In 2013 alone, 204,374 flights landed safely at SFO. The FAA annually inspects and certifies that SFO's airfield operations meet FAA requirements and that its runways are safe. On April 19, 2013, the FAA completed its annual inspection and issued the 2013 certification. Copies of the last five certifications by the FAA (2008-2013) are annexed to this submission as Attachment B.

The FAA owns, maintains and operates Navigational Aid ("NAVAID") systems at SFO. Runways 28 Left and Right are normally served by an Instrument Landing System (the "ILS" or "SFO NAV ILS"). In addition, a visual landing aid is available, the Precision Approach Path Indicator ("PAPI") system. The glideslope is a component of the ILS. From the period June 1, 2013 – August 22, 2013, the FAA disabled the glide slope on Runways 28 Left and Right due to modifications to the runways under the Runway Safety Area (the "RSA") project. The Airport is required to enhance the Runway Safety Area under Congressional mandate, the Runway Safety Act - Public Law 109-115. Complying with the Runway Safety Act means that the Airport must reconfigure all four runways by moving each of the thresholds from between 300 and 800 feet, construct new taxiways leading to the new runway thresholds, relocate the FAA ILS navigational landing instrument systems, and construct four engineered material arresting systems to protect passengers and aircraft in the event an aircraft overshoots a landing or aborts a take-off.

Under the RSA project, the thresholds of Runways 28L and 28R were moved to the west (toward the terminals), necessitating that the glideslopes on those Runways likewise be moved. On June 1, 2013, the FAA issued Notice To Airmen ("NOTAM") 2013-06-01 1340 advising that the SFO NAV ILS glideslope would be non-operational during the period 2013-06-01 1400 to 2013-08-22 2359. A copy of the NOTAM is annexed to this submission as Attachment C.

The new glideslope infrastructure and antenna towers, including the shelter, were constructed in advance behind the existing glideslope while the existing glideslope units were in operation. Immediately after the displacement of the runway thresholds, the existing glideslopes were decommissioned and demolished, so that the testing and flight checks could begin. The FAA could not relocate the glideslopes one runway at a time because the glideslopes for 28L and 28R are co-located in the area between the two runways. In fact, there were and are three glideslopes in the area: one each for 28L and 28R, and the third one for the Simultaneous Offset Instrument Approach (SOIA). The existing glideslope unit, including the common shelter, would be in the glideslope critical area of the new unit behind it. The testing of the new system behind the existing unit could not be performed while the existing antennas (in front of the new unit in the critical area) would disturb the signals.

SFO completed the first phase of the RSA project at Runways 28 Left and Right, in June 2013. The FAA reopened 28L on June 27 at 0100 and 28R on June 29 at 0800. (SFO will complete the project on Runways 1/19 Left and Right in late 2014.) The FAA reactivated the glideslope as scheduled on August 22, 2013. The Airport believes that when the FAA reopened Runways 28 Left

and Right, the PAPI system was operational. Numerous flights landed safely on the newly-opened runways in the days prior to the crash.

Under these circumstances on the morning of the crash, there was no glideslope information available from the SFO RWY 28 Left and Right ILS. The NTSB record of investigation confirms that the Asiana Flight 214 pilots were on notice of that condition. Further, as photographs of the runways and accident scene confirm, Runway 28L had all appropriate markings to reflect the newly displaced runway thresholds.

On July 6, 2013, the weather at SFO was clear, with visibility at 10 miles and light winds. Between the hours of 0500 and 1128, 155 planes landed safely at SFO. Two 777s landed on Runway 28L in the 15 minutes immediately prior to the crash of Asiana Flight 214. In brief, the circumstances called for a visual approach and landing by Asiana Flight 214 at the time of the accident, and conditions were suitable for such an approach and landing.

Accordingly, we find nothing in the record that indicates any unsafe condition existed at the Airport that would have contributed to the accident.

Proposed Finding: The San Francisco International Airport was suitable for landing at the time of the accident and no deficiency of the Airport caused or contributed to the accident.

4.2 The Mass Casualty Incident

4.2.1 Passenger Fatalities

On Asiana Flight 214, the three passengers who suffered fatal injuries as a result of the crash were sitting in Rows 41 and 42. They were Passengers 41B (seated in 41D), 41E and 42A. (Survival Factors Group Chairman's Factual Report, Exhibit No. 6-A, Section 8.2 Fatalities, pages 58—60.) Passenger 41G observed that Passenger 41E was not wearing her seatbelt for landing and that Passenger 41B (seated in 41D) was covered by a blanket at the time of landing, obscuring whether her seatbelt was fastened. (Passenger Interview Summaries, Exhibit No. 6-E, pages 2—3; see also, NTSB Board of Inquiry Hearing Transcript, 293:24—295:2.[2]) NTSB investigators found the 41D and 41E seatbacks broken and the seatpans fractured at all the attachments. They also found the 41D and 41E seatbelts attached and unbuckled. (Survival Factors Group Chairman's Factual Report, Exhibit No. 6-A, Section 4.5 Cabin Seats page 41.)

Immediately after impact, Passengers 41D (seated in 41B) and 41G noticed that Seats 41D and 41E were empty. Passengers 41D (seated in 41B), 41G and 41J all believe that Passengers 41B (seated in 41D) and 41E, seated next to each other, were ejected from the airplane after impact. (Passenger Interview Summaries, Exhibit No. 6-E, pages 2—3.)

Passengers 41B (seated in 41D), 41E and 42A were all found outside the aircraft after impact either deceased (Passengers 41B (seated in 41D) and 41E) or with what eventually proved to be fatal injuries (Passenger 42A). The following describes further details:

- Passenger 41B (seated in 41D) was found deceased behind the aircraft approximately 1,100 feet from the main wreckage, on the northeast area of Runway 28L.
- Passenger 41E (later identified as Ye Meng Yuan) was found in front of the airplane's left wing in the dirt infield runway safety area covered in the dust and dirt from the debris cloud raised by the impact and rotation of the aircraft. The first known observation of the deceased was by an ASO, who is not a trained first responder. The ASO arrived on scene at the left side of the

[2] All references to the Board of Inquiry Hearing Transcript are to the transcript issued by the NTSB on December 19, 2013, of the proceeding which occurred on December 11, 2013.

aircraft within 2 ½ minutes of initial impact (at 11:30:16), prior to any other responders. The ASO was unaware that what he observed was a deceased person and believed her to be a "big doll." He noted that there was no blood around the body and no movement. The ASO did not learn until the next day that what he took to be a doll was a person.

Three Fire Fighters visually determined Ms. Ye to be deceased. Lt. Christine Emmons "immediately characterized [the person on the ground] as a casualty . . . and saw that the body was covered with dirt that appeared to be the same color as the dust cloud from the airplane." Lt. Emmons observed that the "very small-statured female was not making any sound and was not moving." She made a "3 second" visual assessment and thought, "that's our first casualty," and told investigators that she considered the young woman to be "DRT" (dead right there).

While repositioning Engine 33 on the left side of the aircraft to fight the fuselage fire, firefighter Michelle Grindstaff saw "what looked like a small woman curled up (with her knees bent) on the ground. By the position of the body, [Grindstaff] thought the person was dead . . . " Firefighter Roger Phillips also, "noticed a young female on the ground, in a fetal position." The dust-covered figure "looked to be dead 'by appearance' . . . [Phillips] thought it was a mannequin because her face looked like wax. Her eyes were rolled back and her face 'looked like a grimace'." Phillips further described the body as looking "like a CPR [mannequin] they used for training."

- Passenger 42A, found near Passenger 41B (seated in 41D), was taken to the hospital from the scene and died six days after the accident.

(Survival Factors Group Chairman's Factual Report, Exhibit No. 6-A, Section 8.2 Fatalities, pages 58—60; Emergency Response Interview Summaries, Exhibit No. 6-J, Interview Summaries of Henry Choy, Airport Safety Officer, pages 1—3; Christine Emmons, Lieutenant, SFPD, pages 9—11; Michelle Grindstaff, Firefighter, SFFD, pages 18—19; Roger Phillips, Firefighter, SFFD, pages 28—29; Stuart Molver, Police Officer, SFPD, pages 84—85; Derrick Lee, Police Officer, SFPD, pages 77—78; Dennis Mahony, Sergeant, SFPD, pages 79—81; John Batkowski, Airfield Safety Officer, pages 90—92; Steven Crane, Airfield Safety Officer, pages 93—94; Bernardo Magana, Airfield Safety Officer, pages 95—97.)

The San Mateo County Coroner's Office performed autopsies on Passengers 41B (seated in seat 41D) and 41E and an external examination of Passenger 42A. (Survival Factors Group Chairman's Factual Report, Exhibit No. 6-A, Section 8.2 Fatalities, pages 58—61.) The cause of death of Passengers 41B and 41E (seated next to each other on the aircraft) was determined in both cases to be "multiple blunt injuries" and the manner of death to be "accident."

There are notable similarities in the autopsy findings of Passengers 41B and 41E, both of whom died at the accident scene. Both autopsies described extensive contusions and abrasions to the torsos and extremities. Examination of both heads revealed abrading of the skin. The Coroner's Office described the abrading on Passenger 41E to be, "brush-burn in character and many of the striations are oriented in a roughly vertical direction." (Survival Factors Group Chairman's Factual Report, Exhibit No. 6-A, Section 8.2 Fatalities, page 59.) With respect to Passenger 41B's head, the Coroner observed, "extensive black brush-burn abrasions involving the right and left sides of the forehead extending down into the left orbital and left zygomatic area." (Survival Factors Group Chairman's Factual Report, Exhibit No. 6-A, Section 8.2 Fatalities, page 60.) The lungs of both Passengers 41E and 41B were described as prominently congested and edematous. Intraparenchymal aspiration of blood was present in the lungs of both victims, more prominently in Passenger 41B. (Survival Factors Group Chairman's Factual Report, Exhibit No. 6-A, Section 8.2 Fatalities, pages

59—60.).) Significantly, neither report noted visible dust, dirt, debris, or fire fighting foam in the trachea or lung tissues of the deceased.

Proposed Finding: The violence of the aircraft impact and rotation resulted in the ejection of two crew members and Passengers 41B (seated in 41D), 41E and 42A.

Proposed Finding: Passengers 41B (seated in 41D), 41E and 42A were likely not wearing seatbelts at the time of impact.

Proposed Finding: The physical trauma of the ejections was the direct cause of death of Passengers 41B (seated in 41D), 41E and 42A.

4.2.2 Evacuation and Rescue

Most passengers self-evacuated the aircraft with the assistance of cabin crew and passenger volunteers. Passengers evacuated (a) out the back of the aircraft where the tail assembly had been; (b) down slides at Doors 1L and 2L; and (c) out Door 3R where no slide deployed but passengers climbed down the wreckage just outside the door.

Several passengers sitting toward the rear of the aircraft were trapped by seats and/or seatbelts. Within 11 minutes of impact, SFFD-AB initiated an interior search and rescue. Within eight minutes of initiating the search and rescue, fire fighters extricated all trapped passengers and removed them from the aircraft to triage. SFPD Police Officers assisted in this effort. Rescues were made through open Door 4L, a door which appears to have detached in the crash sequence (see Survival Factors Group Chairman's Factual Report, Exhibit No. 6-A, Section 4.1.7 Door 4L, page 16).

Fire fighters and EMS personnel faced challenges collecting all passengers into the triage area. Passengers evacuated and departed the immediate vicinity of the aircraft in multiple directions, some walking a significant distance away from the aircraft. Some passengers remained near the aircraft due to a lack of mobility, and perceived that they were not immediately assisted as fire fighters focused on fighting the fire to protect trapped passengers and the first responders who were rescuing passengers, and later moving individual passengers to the triage area.

Proposed Finding: Most passengers and crew self-evacuated the aircraft within three to four minutes of the accident.

Proposed Finding: Multiple egress routes for passengers created a challenge for managing individuals needing to be relocated for triage and medical attention.

Proposed Finding: SFFD-AB personnel successfully rescued five persons from the aircraft amidst an active interior fire without undue delay.

4.3 Emergency Response, Incident Command and ARFF

4.3.1 Emergency Response

The initial impact for Asiana 214 was at 11:27:48 hours. Approximately 12 seconds later, the FAA ATCT dispatched an Alert 3 in progress to all three SFFD-AB fire stations. In the meantime, ASOs on regular airfield patrol rushed to the scene, arriving on the left side of the aircraft at 11:30:16 and on the right side of the aircraft at 11:30:49. At 11:31, two minutes after being dispatched and three minutes post impact, the first ARFF unit, Rescue 88, arrived on scene, followed 37 seconds later by Rescue 9. Upon seeing that the initial passenger egress path on the left side of the aircraft was not threatened, both units immediately attacked the fire in Engine 2 lying alongside the aircraft's right side. By 11:33, five minutes post impact, all five SFFD-AB firefighting

companies and two paramedic units were on scene. Approximately three minutes later (at 11:36:31), the first of 56 ground ambulances from San Mateo County arrived on scene.

At 11:38:37, ARFF personnel entered the aircraft for search and rescue. By 11:47:31, less than 20 minutes post initial impact, all trapped passengers had been extricated from the aircraft, and by 12:19 all fire inside the aircraft was extinguished, with the support of multiple SFFD companies from San Francisco that arrived after the initial SFFD-AB responses.

At 13:01, the last ground ambulance initiated transport of patients from the airfield, and at 17:58 the last busload of the ambulatory, but later self-reported injured passengers, were transported from the terminal. The successful transport of this large number of patients was accomplished through the support of multiple mutual aid companies from San Mateo County as well as multiple private ambulances from San Francisco and San Mateo County. All told, 56 ground ambulances, two buses and two medical helicopters transported 179 patients to 12 local area hospitals.

Given the proximity of the initial impact and the potential for victims in the water, members of the SFFD-AB triage teams were initially instructed to proceed to the waterline near the sea wall and scan the water for any potential victims. With the large area to be assessed, the need for SFFD-AB personnel at the burning aircraft and the number of victims near the runway, the Incident Commander dispatched the SFFD-AB Fire/Rescue Boat, also known as Rescue 55. Rescue 55 responded from the SFO Marine Emergency Rescue Facility with one Firefighter/Boat Pilot and one Firefight/Rescue Swimmer. A thorough search of the water immediately south of the sea wall was made, and though debris from the aircraft was observed, no victims were located.

The Airport, San Francisco and San Mateo County all activated their Emergency Operations Centers. San Mateo County dispatch and the San Mateo County EMS Transport Officer managed the distribution of passengers to medical facilities.

Proposed Finding: Activation of the emergency response by the FAA ATCT and Airport personnel was immediate and appropriate.

Proposed Finding: The response by Airport and SFFD-AB personnel was timely and appropriate.

Proposed Finding: The response by the SFFD units was timely and appropriate.

Proposed Finding: The response by mutual aid organizations was timely and appropriate.

4.3.2 Incident Command

The first SFFD-AB ARFF unit, Rescue 88, arrived on scene at 11:31:01 with a lieutenant and two fire fighters. As the first arriving officer, the Rescue 88 lieutenant had the choice of establishing command or passing command. By immediately focusing on the active fire in Engine 2 to protect any trapped passengers, the Rescue 88 lieutenant effectively passed command to the next arriving officer.

The next unit to arrive with an officer on board was Rescue 33. The Rescue 33 lieutenant provided SFO dispatch with a condition report and assumed Airport Command. When the on duty Shift Captain on Rescue 65 arrived on scene, he assumed Airport Command (strategic command) and the Rescue 33 lieutenant assumed Operations Command, giving him tactical command of the companies on the field, with the remaining lieutenants, on Rescues 56 and 88, providing task level command. The fire fighter/paramedic on Rescue 93, the first SFFD-AB paramedic unit to arrive on scene, assumed the role of Medical Group Supervisor. This role was later assumed by the first arriving EMS Supervisor (Rescue Captain) from SFFD and the Rescue 93 paramedic then assumed

the role of Triage officer working with the AMR (ambulance company) Field Supervisor as the Transport Officer.

Additional resources arrived from San Francisco within approximately 24 minutes of initial impact. Upon arrival, the SFFD-City Division 3 Assistant Chief assumed Incident Command (IC). The Incident Commander assigned an SFFD Battalion Chief as the Fire Attack Supervisor and the SFFD-AB Shift Captain remained at the Incident Command Post as the liaison between SFFD Units and SFFD-AB units. Unified command was established at that time with representatives from SFPD, Airport Operations, San Mateo County Fire, and AMR (ambulance company) working in the command post with the SFFD Division 3 Chief functioning as the actual (or ultimate) Incident Commander. This incident command structure consisted of highly experienced senior chief officers who were not ARFF trained but also included SFFD-AB ARFF personnel in the command organization to provide technical guidance to the IC.

Radio communications presented a challenge for the incident command process. Prior to the crash, the Airport purchased and installed a new 700 MHz multi-frequency radio system for the use of all operational departments at SFO, including the SFFD-AB. The San Mateo County fire fighting units did not have the same capability. During the emergency response on July 6, the responding agencies did not have effective interoperability. The IC work-around for this situation was to have division supervisors (SFFD-AB, SFFD and San Mateo County) present at the incident command center to assure consistent communications were radioed to each division. This work-around mitigated the communication issue without any negative outcome. The Airport now has the ability to patch the radio frequencies from the SFFD and San Mateo County agencies into SFFD-AB's command frequency.

Proposed Finding: The Incident Command for the accident passed ultimately to a non-ARFF qualified SFFD Division Chief, which remains consistent with SFFD policy.

Proposed Finding: Active direction of the ARFF effort at one point transferred to a non-ARFF qualified Battalion Chief.

Proposed Finding: A recently acquired unified command radio communications system failed to permit universal radio communication by responders on the same network, requiring work-around measures to be adopted which assured communications to each responding division.

4.3.3 Fire Fighting Strategies and Tactics

The first tactical priority of initially arriving ARFF units is always to protect passenger egress. The first two arriving SFFD-AB ARFF units, Rescues 88 and 9, observed that the passenger egress paths on the left side of the aircraft were not threatened by fire and that evacuation was proceeding safely. Subsequently, both units immediately defaulted to their next tactical priority of extinguishing any exterior fire and attacked the fire in Engine 2 on the right side of the aircraft.

As additional SFFD-AB units arrived on scene, assistance was given to those passengers evacuating the aircraft by the slides at Doors 1L and 2L. SFFD-AB personnel directed those passengers to the casualty collection point being set up by the SFFD-AB paramedic units. When self-evacuation was complete, SFFD-AB personnel initiated entry into the aircraft for interior search and rescue. At least one working 1 ¾" hoseline was maintained in the aircraft at all times to support search and rescue and protect interior personnel and victims. To SFFD-AB's knowledge, this is the only documented use of a hand line for interior aircraft fire fighting simultaneous with an active interior search and rescue.

Once SFFD-AB removed all trapped victims from the aircraft and completed a secondary search with a subsequent "All Clear," all SFFD-AB personnel evacuated the aircraft. Conditions quickly worsened in the interior of the aircraft and fire fighters switched to an exterior defensive attack, focusing on getting the fire under control and avoiding any explosion that could jeopardize the fire fighters engaged in the effort. SFFD-AB ARFF units used a combination of bumper turrets, roof turrets and HRETs, utilizing both piercing nozzles and mass applications nozzles, to finally extinguish the interior fire once it had breached the exterior fuselage.

By using the HRETs, the ARFF units were able to use their piercing nozzles to pierce the skin of the fuselage and deliver water and/or fire extinguishing agent to the interior of the aircraft. Certain HRET tactics such as the "low attack mode" for foam application and "Snozzle" placement through existing openings in the aircraft, could have been used more effectively by SFFD-AB ARFF units. However, once the fire vented through the top of the fuselage, the ARFF units used their mass application "Snozzle" to deliver a large capacity, elevated water stream and other fire extinguishing agents down through the top of the fuselage. It was through application of the Snozzle by the operators of Rescue vehicles 10 and 11 that the fire was finally extinguished.

In the later stages of the fire, supplementary searches were completed by SFFD personnel to re-confirm that no occupants remained on the aircraft. No additional victims were located. All fires were extinguished by 12:18.

Proposed Finding: Fire fighting efforts were effective, with appropriate prioritization of effort, although use of the HRET and application of fire fighting agents could have been more efficient.

4.4 Secondary Strike/Rollover

San Francisco deeply regrets the added insult to the body of the deceased which occurred when two ARFF vehicles rolled over Ms. Ye's body during the fire fighting operation. While there has been some speculation that Ms. Ye was alive at the time of the rollovers, suggesting that first responders mishandled the situation, ample evidence refutes this. As explained in section 4.2.1 above, Ms. Ye was deceased at the time of the rollovers: Ms. Ye was sitting in the penultimate passenger row of the aircraft within feet of where the tail assembly sheared from the airplane; at least one passenger sitting near Ms. Ye noticed that she was not wearing her seatbelt before the impact and that her seat was empty when the plane stopped moving; the passenger sitting next to Ms. Ye was also ejected from the aircraft and received similar traumatic and fatal injuries to her body from the violent accident sequence.

Any review of the handling of Ms. Ye's body should be made in context of the particular circumstances and with reference to nationally-recognized mass casualty response procedures. The fire fighters who visually assessed Ms. Ye saw that she was covered in the dust and dirt from the debris cloud raised by the crash sequence, that she was lifeless and ashen and that her eyes were rolled back. First responders are trained to recognize persons who are dead or beyond saving and to prioritize their duties to do the most good for the most people. In this instance, the responding fire fighters who first encountered the body were all trained and experienced, with a minimum of five years of service with the SFFD before joining the SFFD-AB. Each individually determined that Ms. Ye was dead.

In his presentation before the NTSB Board of Inquiry, Chief David Whitaker, Chairman of the Aircraft Rescue and Fire Fighting Working Group, described the START (Simple Triage and Rapid Transport) system of triage, which is based on a quick evaluation of victims in a mass casualty situation. (NTSB Board of Inquiry Hearing Transcript, 246: 1—247: 1.) Chief Whitaker acknowledged that it is a "hard call for a first responder" but, in order "to do the most good for the

most number of people" it is imperative that "those that are deceased or obviously in a dying state are left in that position." (NTSB Board of Inquiry Hearing Transcript, 246: 8—23.) This is not a matter of being careless or callous, but rather reflects that professional rescuers must maneuver through a complex and dynamic environment to save as many lives as possible. (Testimony of Assistant Deputy Chief Dale Carnes, NTSB Board of Inquiry Hearing Transcript, 298:14-19.)

In this situation, the ASO who first discovered Ms. Ye's body (shortly after arriving at the accident scene at 11:30:16) was unaware she was a real person and he immediately proceeded to direct passengers to safety away from the burning aircraft which had fuel actively venting from it. The fire fighters who arrived at the scene just after the ASO identified the body and made independent, visual and conclusive determinations that she was deceased and immediately moved to their higher priority rescue and fire fighting efforts.

A second consideration then came into play causing Ms. Ye's body to be left in place during active fire fighting operations. Fire fighters on scene understood that the bodies of any deceased individuals found at the scene of an accident had to be left in place, exactly where initially found, awaiting the coroner. Presumably, the practice is to allow an investigation into the cause of death. The SFFD-AB is attempting to clarify this policy and determine if it is necessary to leave bodies in place at an aviation accident in the future.

Unfortunately, there currently are no national standards or industry best practices for avoiding the risk of rollovers during an active ARFF operation. (NTSB Board of Inquiry Hearing Transcript, 295:24—25.) ARFF personnel must use their training and experience to quickly assess a situation and prioritize tasks. The operators of the ARFF vehicles that rolled over Ms. Ye's body were trained ARFF personnel who were engaged in fire fighting duties. Even after all passengers had been evacuated from the burning aircraft, there remained a risk of an explosion that could have injured the fire fighters engaged in the fire fighting effort and possibly others in and around the crash scene. The fire fighting activities which resulted in the secondary strikes are more specifically described as follows:

11:50:46 – Rescue 10 rolled over the deceased while maneuvering for the external attack on the fire. (Emergency Response Timeline, Exhibit No. 6-N, page 3.) This occurred during a technical operation under circumstances in which the fire fighter's attention was devoted to applying a stream of foam over vented fuel and then at the burning aircraft. Rescue 10 initially repositioned near the aircraft's left wing to lay a foam blanket in front of the left wing where there was venting fuel. This activity was critical to reducing the risk of explosion and/or spread of the exterior fire. The operator of Rescue 10 was subsequently shooting foam from the roof turret onto the Door 2L area, before slowly advancing perpendicularly to the burning fuselage, in order to conduct a piercing operation with the HRET, while simultaneously and intermittently using the bumper turret. The deceased was partially covered with foam at this time. (Survival Factors Group Chairman's Factual Report, Exhibit No. 6-A, Section 7.0 Emergency Response, page 57.)

12:01:11 – Rescue 37 rolled over the deceased while leaving the scene to refill water and foam tanks on the vehicle. (Emergency Response Timeline, Exhibit 6-N, page 3.) The driver of Rescue 37 arrived later than other fire fighters to the accident scene and was therefore not aware that there was a body located in the vicinity of the left wing. Operational necessity dictated that the driver of Rescue 37 proceed forward from the 11 o'clock position in a wide arc instead of backing up. The deceased was covered in foam at time of the second strike. (Survival Factors Group Chairman's Factual Report, Exhibit No. 6-A, Section 7.0 Emergency Response, page 57.)

In his testimony before the NTSB Board of Inquiry, Chief David Whitaker also described the complexities involved in operating massive ARFF rigs. (NTSB Board of Inquiry Hearing Transcript,

232: 5—233: 22.) Chief Whitaker described the challenges associated with maneuvering these behemoth thirty-five/forty-foot vehicles with limited visibility, all the while with the operator performing multiple tasks required during active fire fighting.

This recitation of facts is not intended to discount the tragedy of secondary strikes but rather and hopefully to provide impetus for the development of procedures to reduce the risk of such events. SFFD-AB is actively working within the ARFF community to identify a nationally-accepted standard for avoiding such incidents.

Proposed Finding: During the active fire fighting efforts, two ARFF vehicles rolled over the body of Ye Meng Yuan, Passenger 41E; the rollovers were accidental and occurred in the course and scope of fire fighting operations.

Proposed Finding: There is currently no national or standardized training or guidance for avoiding secondary strikes when responding to an ARFF incident.

Proposed Finding: Recognizing that each ARFF incident presents unique and dynamic circumstances, and that measures to protect against rollovers may not be practical or even possible in an active aircraft rescue and/or fire fighting environment, industry guidelines or recommendations could reduce the risk of secondary strikes.

4.5 Triage

Responding units triaged and transported all non-deceased passengers off of the airfield within 93 minutes of initial impact; the last critically injured patient was transported at approximately 12:49. The triage and selection of patients for transport effectively prioritized the most severely injured.

Ambulatory passengers, meaning passengers who identified no immediate injuries at the accident scene, were initially transported to a meeting room in the International Terminal. A significant number of these passengers later reported injuries, which is not unusual as adrenaline dissipates and pain begins to manifest itself in injured parts of a person's body. These ambulatory passengers underwent secondary triage at the International Terminal, and where appropriate, some were transported to hospitals. By 17:58, the last of these passengers had been transported from the International Terminal to area hospitals. Not removed from their resting place or transported to the hospital were the two passengers identified on scene as deceased; the San Mateo County Coroner later removed those bodies.

In summary, 56 ground ambulances, two medical helicopters and two buses transported 179 patients to 12 area hospitals. In an interview provided after the accident, the Chief of Surgery at San Francisco General Hospital ("SFGH"), Dr. Margaret Knudson, commended the exemplary triage and appropriate prioritization of patients bound for SFGH. This is particularly noteworthy because SFGH was the hospital designated to receive the most critically injured patients. The day after the crash, on July 7, 2013, Dr. Knudson updated reporters on the injuries sustained by Asiana passengers being treated at SFGH. In describing the crash injuries suffered and treatment rendered, Dr. Knudson remarked, "whoever triaged these patients at the airport did a fabulous job because they got to us the sickest patients in the shortest period of time or I don't think those patients would have survived, truly."

San Francisco believes that the airline faced significant challenges in assisting ambulatory passengers to locate family members who were transported to hospitals and the family members of passengers and aircrew who were not traveling with those passengers who suffered injuries. San Francisco raises this issue here because even though the responsibility to communicate the location

of passengers remains with the airline, San Francisco recognizes that there was a lack of communication causing frustration to family members. As the government entity closest to the incident, San Francisco received inquiries to which it could neither respond nor refer family members to a reliable source of information. The large number of minors traveling without parents but with chaperones who were also injured exacerbated the fractured communication when hospitals apparently were unsure of who could properly receive information about minors. Certain hospitals may have provided information to law enforcement but the airline was apparently unable to establish reliable chains of communication. The information which would have been most helpful need not have been personal medical information about any passenger, but simply the location of each patient.

Proposed Finding: Multiple units from SFFD-AB, SFFD and San Mateo County effectively triaged over 300 passengers and crew in a timely manner.

Proposed Finding: The responding SFFD and medical personnel properly prioritized the transportation of the more critically injured patients.

Proposed Finding: San Francisco and San Mateo County policies were effectively followed to appropriately assign and distribute the injured passengers to area hospitals according to the nature and seriousness of their injuries.

Proposed Finding: The airline was unable to establish reliable chains of communication to assist family members and friends in locating hospitalized passengers.

5 POST-ACCIDENT SAFETY INITIATIVES AND ENHANCEMENTS AND SHARING LESSONS LEARNED

Since the crash, the Airport and SFFD have carefully reviewed the emergency response for any lessons that might be learned from this actual event and areas where improvement is possible. The purpose of this review process is to improve the emergency responses to such events and to share information with the larger ARFF and airport management community.

The Airport and SFFD have determined that while the response to this accident was successful overall, enhanced training and refined procedures would make airfield emergency response even more effective in the future. As a result of its review process, the Airport and SFFD-AB have initiated improvements and enhancements to their emergency resources and training which will be discussed in this section.

The lessons learned from this incident will also provide valuable guidance for the airport industry, and the Airport and SFFD are committed to sharing those lessons and working with the industry for even safer travel. SFO has reached out to the airport community to share information and lessons learned from this event. SFFD-AB has engaged with other Category E ARFF commands and with the local mutual aid community to improve procedures for mass casualty incidents.

5.1 Training Enhancements

- 40-hours ARFF training for all personnel provided by DFW Fire Training Research Center (“FTRC”).
- Advanced level ARFF training at the DFW FTRC budgeted for a 2014 start.
- Adoption of DFW curriculum for drivers training and HRET training.
- Adoption of Blue Card incident management training and certification of all officers.

5.2 System and Equipment Improvements

- Adoption of EMT3 START Triage System to enhance mass casualty incident management and patient tracking.
- Adoption of the Passport Accountability System for tracking all fire and emergency personnel on scene.
- Budgeted for the purchase of two dedicated SFFD-AB mass casualty unit vehicles, each holding 250 backboards, one to be purchased in 2014/15 and one in 2015/16.
- SFFD-AB has integrated the new 700 MHz radio system and has established interoperability with SFFD and San Mateo County.
- Installation of an airfield fire hydrant: The Airport has added an airfield fire hydrant to its 2014/15 Capital Plan, to be located approximately 2500 feet in from the 28R threshold, near Taxiways Charlie and November.
- In December 2013, the Airport purchased and now has on site a B 767-200 aircraft to be used as an emergency training aircraft. This aircraft replaced one that had served the SFO emergency response and law enforcement community for over 20 years and was aging. The new aircraft was in service as recently as November of 2013, under operation by ANA. This wide body aircraft will be an invaluable training platform for use by the SFFD, SFPD, CAP, FBI and other agencies for many years to come.
- In 2014, the Airport will require each airline regularly operating at SFO to review with Airport officials its individual safety plans as required by federal law (49 U.S.C. §41113, 49 U.S.C. §41313, and the Aviation Disaster Family Assistance Act).

5.3 Personnel Development

- EMS Supervisor position has been upgraded from a 40-hour/week position to a 24/7 position.
- The Fire Fighters' union has agreed that assignment to the SFFD-AB will be a five-year commitment, where there was previously no commitment.
- The Airport has developed a new managerial level position, effective January 6, 2014, for a Director of Safety and Strategic Programs. The Director of Safety and Strategic Programs provides centralized policy oversight of the Airport's already comprehensive safety programs, assists in defining Airport's high level organizational effectiveness and structure to ensure a continually elevated safety culture, and is the key executive contact with other government agencies in negotiating solutions to complex Airport safety policy and procedural changes.

5.4 Outreach to the Mutual Aid and ARFF Communities

By letters dated January 16, 2014, SFFD-AB Chief has requested that the national ARFF Working Group convene to develop standard protocols for addressing deceased victims in ARFF incidents. The Assistant Deputy Chief has also requested guidance from the San Mateo County Coroner as to recommended protocols for removal or retention of bodies in risk of a secondary strike during rescue and fire fighting operations. Copies of the letters are together annexed to this submission as Attachment D.

SFFD-AB has also been working with San Mateo County fire fighting units to coordinate the interoperability of the SFFD-AB radio system and increased interagency training beyond the large-scale mass casualty drills.

5.5 Internal Review

Soon after the crash, the Airport engaged in an extensive, in-depth analysis of lessons learned by retaining ICF International. ICF facilitated four de-briefing session in July, August and September, engaging numerous personnel involved in and affected by the crash. The personnel participating in the debrief sessions represented multiple divisions of the Airport, airlines, federal agencies and mutual aid agencies. ICF has issued a report entitled, "Beyond Asiana – Moving Forward Together," annexed to this submission as Attachment E.

5.6 Sharing Lessons Learned

Airport and SFFD-AB officials are committed to sharing lessons learned from the crash in various industry forums. The following events demonstrate the Airport's efforts to reach out to the aviation community:

- Airport Council International-North America (ACI-NA) Annual Conference (San Jose, CA) – September 22, 2013: The Airport Director shared insights from his perspective with approximately 100 high ranking airport officials. The Airport General Counsel participated in a panel discussion with the NTSB General Counsel on the legal aspects of NTSB investigations.
- NTSB Seminar PA302-102413 / Managing Communications Following an Aircraft Accident or Incident – October 24/25, 2013: The Public Information Officer presented a case study regarding insights into the media response efforts following the accident. Attendees included major U.S. airlines, airport authorities and foreign counterparts to the NTSB.
- ACI-NA SFO – November 5, 2013: The Airport hosted over 130 participants from 44 different North American Airports. The Airport Chief Operating Officer, the SFFD-AB Assistant Deputy Chief, and first responders shared their insights and lessons learned with attendees. The all-day series of presentations closed with a high level review of the ICF Lessons Learned initial findings. A copy of the agenda is annexed to this submission as part of Attachment F.
- SFO Senior Officials Workshop – November 18, 2013: The San Francisco Office of Emergency Management facilitated a session for senior Airport officials. The Workshop was designed for all personnel who might act in a policy role, but not actively manage the Emergency Operations Center (EOC). The session covered a broad spectrum of topics to include a review of the Incident Command System (ICS) and National Incident Management System (NIMS).
- Public Information Officer Event – November 20, 2013: The Airport Public Information Officer invited local news reporters who had been covering the story of the crash to share lessons learned. A copy of the accompanying press release is annexed to this submission as part of Attachment F.
- ARFF Working Group's Annual ARFF Chief's and Leadership School – January 23, 2014: The ARFF Training Alliance, a joint cooperative between the ARFF Working Group and the American Association of Airport Executives (AAAE) will host ARFF officers and chiefs from all over the United States and Canada. The SFFD-AB Assistant Deputy Chief will share insights and lessons learned with attendees. The 45-minute session will cover a broad spectrum of ARFF leadership and management topics including training, policy and procedure development, and the NTSB investigation process. A copy of the agenda is annexed to this submission as part of Attachment F.
- SFO Airport Community – The Airport has scheduled lessons learned events with the SFO airline tenants through Airlines for America (A4A) (February 18, 2014) and SFO International

Terminal Operations Committee (February 19, 2014). The Airport Director of Safety will review key lessons learned with tenant airline general managers.

- American Association of Airport Executives (AAAE) Annual Conference – October 6-8, 2014: The Airport Director of Safety scheduled to be a speaker on lessons learned from the crash of Asiana Flight 214.

6 CONCLUSION AND PROPOSED RECOMMENDATIONS

6.1 Conclusion

The successes of the rescue and fire fighting efforts on July 6, 2013 should be credited to the San Francisco first responders, Airport personnel and San Mateo County mutual aid responders and their professionalism, hard work and commitment to public safety and security. While everyone wishes never again to experience another plane crash at SFO, the experience provided opportunities for learning and improvement not just for SFO but for the greater airport and ARFF communities. The most regrettable part of the emergency response, the secondary strike of a deceased passenger, presents a circumstance requiring attention from industry leaders. Learning from this incident will surely make air travel even safer than it already is.

San Francisco has been privileged to work with the NTSB in the course of its investigation and hearing process and will continue to assist as the NTSB brings this matter to a conclusion. San Francisco requests that the NTSB consider the following proposed findings and recommendations as supported by the factual explanations above.

6.2 Proposed Findings

Proposed Finding: The San Francisco International Airport was suitable for landing at the time of the accident and no deficiency of the Airport caused or contributed to the accident.

Proposed Finding: The violence of the aircraft impact and rotation resulted in the ejection of two crew members and Passengers 41B (seated in 41D), 41E and 42A.

Proposed Finding: Passengers 41B (seated in 41D), 41E and 42A were likely not wearing seatbelts at the time of impact.

Proposed Finding: The physical trauma of the ejections was the direct cause of death of Passengers 41B (seated in 41D), 41E and 42A.

Proposed Finding: Most passengers and crew self-evacuated the aircraft within three to four minutes of the accident.

Proposed Finding: Multiple egress routes for passengers created a challenge for managing individuals needing to be relocated for triage and medical attention.

Proposed Finding: SFFD-AB personnel successfully rescued five persons from the aircraft amidst an active interior fire without undue delay.

Proposed Finding: Activation of the emergency response by the FAA ATCT and Airport personnel was immediate and appropriate.

Proposed Finding: The response by Airport and SFFD-AB personnel was timely and appropriate.

Proposed Finding: The response by the SFFD units was timely and appropriate.

Proposed Finding: The response by mutual aid organizations was timely and appropriate.

Proposed Finding: The Incident Command for the accident passed ultimately to a non-ARFF qualified SFFD Division Chief, which remains consistent with SFFD policy.

Proposed Finding: Active direction of the ARFF effort at one point transferred to a non-ARFF qualified Battalion Chief.

Proposed Finding: A recently acquired unified command radio communications system failed to permit universal radio communication by responders on the same network, requiring work-around measures to be adopted which assured communications to each responding division.

Proposed Finding: Fire fighting efforts were effective, with appropriate prioritization of effort, although use of the HRET and application of fire fighting agents could have been more efficient.

Proposed Finding: During the active fire fighting efforts, two ARFF vehicles rolled over the body of Ye Meng Yuan, Passenger 41E; the rollovers were accidental and occurred in the course and scope of fire fighting operations.

Proposed Finding: There is currently no national or standardized training or guidance for avoiding secondary strikes when responding to an ARFF incident.

Proposed Finding: Recognizing that each ARFF incident presents unique and dynamic circumstances, and that measures to protect against rollovers may not be practical or even possible in an active aircraft rescue and/or fire fighting environment, industry guidelines or recommendations could reduce the risk of secondary strikes.

Proposed Finding: Multiple units from SFFD-AB, SFFD and San Mateo County effectively triaged over 300 passengers and crew in a timely manner.

Proposed Finding: The responding SFFD and medical personnel properly prioritized the transportation of the more critically injured patients.

Proposed Finding: San Francisco and San Mateo County policies were effectively followed to appropriately assign and distribute the injured passengers to area hospitals according to the nature and seriousness of their injuries.

Proposed Finding: The airline was unable to establish reliable chains of communication to assist family members and friends in locating hospitalized passengers.

6.3 Proposed Probable Cause

San Francisco does not have the technical expertise to propose a probable cause of the accident.

6.4 Proposed Recommendations

Proposed Recommendation: The national ARFF Working Group take the lead in developing protocols and techniques for decreasing the risk of secondary strikes in an aircraft rescue and fire fighting operation and communicating such measures within the ARFF community.

Proposed Recommendation: The SFFD-AB and San Mateo County Coroner's Office consider development of guidance that will more effectively reduce the risk of secondary strikes to deceased victims found in the vicinity of an aircraft accident on SFO property.

Proposed Recommendation: Consider proposing federal legislation to amend the Aviation Disaster Family Assistance Act to allow direct communication to the airline concerning the location of hospitalized passengers.