NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

December 9, 2011

SURVIVAL FACTORS GROUP FACTUAL REPORT OF INVESTIGATION

I. ACCIDENT : DCA11IA040

Location	**:**	New Orleans, Louisiana, Louis Armstrong International Airport (MSY)
Date	**:**	April 4, 2011
Time	**:**	07:15 Central Daylight Time
Aircraft	**:**	Airbus A320-200
Operator	**:**	United Airlines, Flight 497, Registration N409UA

II. SURVIVAL FACTORS GROUP

Group Chairman	:	Cynthia Keegan National Transportation Safety Board Washington, D.C.
Member	:	Bob Newman United Airlines Chicago, IL
Member	:	Vicki Jurgens Association of Flight Attendants (AFA) Chicago, IL
Member	:	Bruce Peleschak International Brotherhood of Teamsters Flight Safety (IBTFS) Chicago, IL

III. SUMMARY

On April 4, 2011, at about 0725 central daylight time, an Airbus 320-232, registration # N409UA, serial number 462, operating as United Airlines flight 497, exited the left side of runway 19 at the Louis Armstrong New Orleans International Airport (MSY) after returning to the airport due to automated warnings of smoke in an equipment bay. The airplane's nose wheel exited the side of runway 19 upon completing the landing roll, and an emergency evacuation was conducted. The airplane, with 109 passengers and crew aboard, had departed MSY about 20 minutes prior. The passengers and crew exited the airplane via the emergency evacuation slide/rafts. There were no reported injuries, and the airplane sustained minor damage.

IV. DETAILS OF THE INVESTIGATION

1.0 Airplane Configuration

The Airbus A320 cockpit was configured with captain and first officer seats and two cockpit jumpseats. The cabin was divided into two sections: first class and economy class with a total of 138 seats. There were 12 first class passenger seats divided into two rows of double seats longitudinally separated by one aisle. There were 126 economy class passenger seats, divided into two rows of three seats longitudinally separated by an aisle. There was a rear facing double occupancy flight attendant (F/A) jumpseat in the forward cabin, and a rear facing double occupancy F/A jumpseat in the rear cabin. See Figure 1, shows a cabin diagram of UAL flight 497.

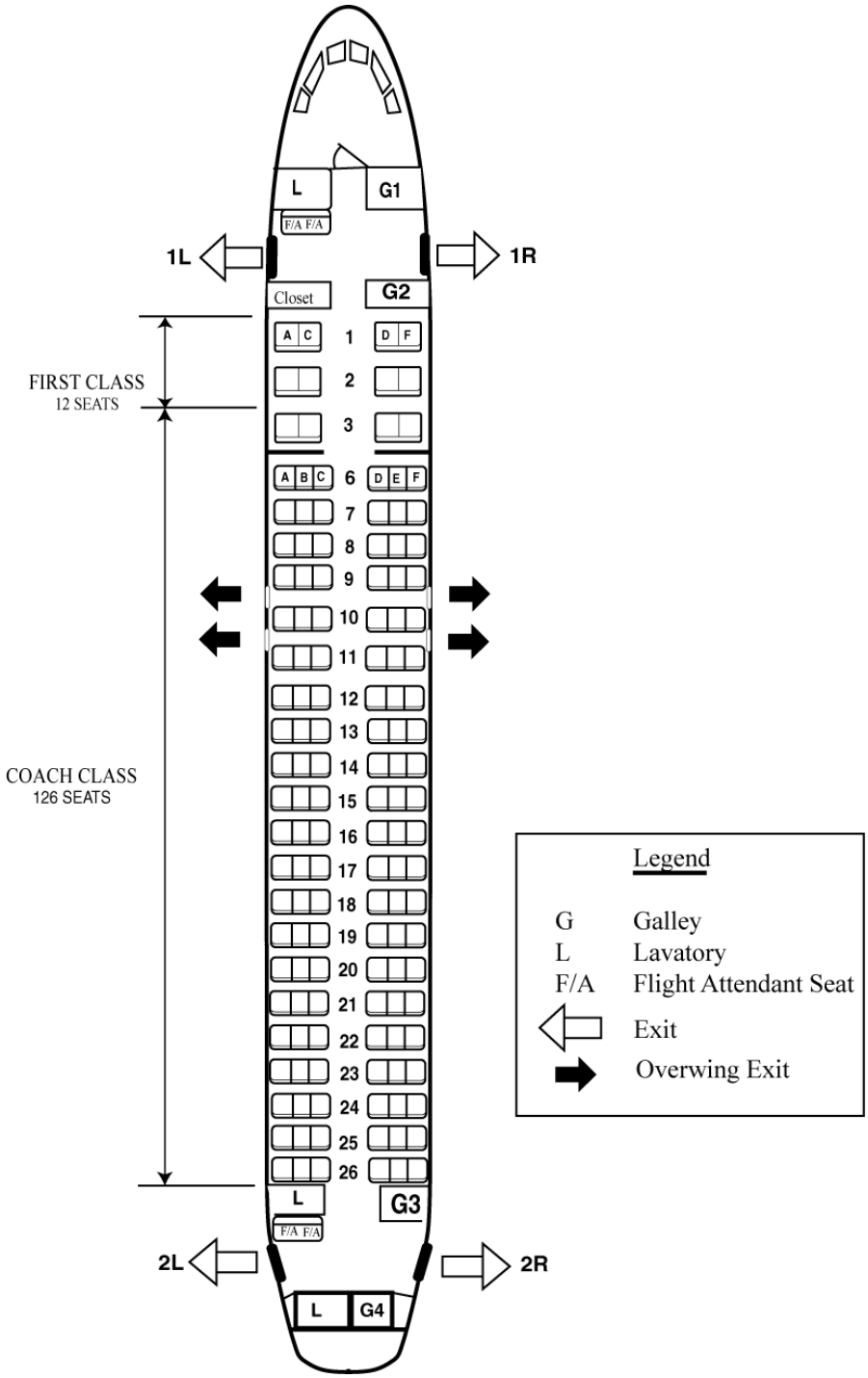

Figure 1. UAL 497 Cabin Diagram

2.0 Cabin Crew

There were three flight attendants (F/As) assigned to UAL flight 497. The purser was seated in the inboard forward F/A jumpseat, F/A 2 was seated in the aft inboard F/A jumpseat and F/A 3 was seated in the aft outboard F/A jumpseat. Table 1 shows the UAL F/A training history.

Table 1. Cabin Crew Training

Flight Attendant and Position	Primary Exit	Hire Date	Initial Training Date	Recent Training Date
Purser	1L	04/03/06	05/06	04/10
F/A 2	2R	07/04/98	09/98	08/10
F/A 3	2L	04/17/99	05/99	12/10

2.1 UAL F/A Requirements and Training Revisions

The October 1, 2010, merger of Continental and United Airlines and ongoing blend of policies and procedures has resulted in changes and revisions to UAL F/A training. The interview of the F/As on board UAL flight 497 (see section 2.2 of this report) identified recent training and procedure revisions that are included in the following paragraphs of this section.

2.1.1 UAL Revised Command

According to UAL, Revision 6 of the flight attendant operations manual (FAOM) was available to UAL flight and cabin crewmembers before April 4, 2011, and became effective on April 29, 2011. One of the FAOM Revision 6 changes revised the meaning of the command "remain seated." When the flight 497 incident occurred the command "remain seated" required F/As to strictly 'remain seated in their jump seat.' However, the April 29, 2011 change in Revision 6 required FAs to get out of their jumpseat, assess conditions at their assigned exit, and command passengers to "remain seated", after which the FA should wait for further instructions from the flight crew.[1]

2.1.2 Manual Inflation Handle

The current UAL written procedure in the FAOM requires that F/As pull the manual inflation handle "only" if the emergency evacuation slide fails to automatically deploy. This procedure became effective about April 2008, and prior to then UAL training instructed F/As to always pull the manual inflation handle regardless that the slide automatically deployed. Also, UAL recurrent emergency procedures training (RET) requires F/As to physically pull the manual inflation handle to familiarize themselves with the location and forces required to manually inflate the evacuation slide/raft.

2.1.3 Inoperative PA and Interphone

Chapter 2 of the UAL FAOM standard operating procedure (SOP) addresses the following F/A procedure for an inoperative PA and Interphone system:

[1] Revision 6 of the UAL FAOM states the "remain seated" command relates to a planned or unplanned emergency, where after landing the captain may immediately initiate an evacuation using evacuation commands and/or the evacuation alarm. The captain may also announce "Remain Seated, Remain Seated" while determining whether or not to evacuate.

• If the interphone or PA is inoperative, discuss with the Captain and flight attendants how communication is to be accomplished.
• If interphone is inoperative, use any or all of the following:
-Chimes or lights
-Personal contact (face to face)
-PA
-Megaphone (cabin communication only)
• If PA is inoperative, use any or all of the following:
-Individual briefings of small groups of passengers
-Megaphone

2.1.4 Evacuation Alarm Activation

The UAL procedures for activating the Airbus A320 emergency evacuation alarm required the Purser and F/A 3 to activate the emergency evacuation switch (located on a panel adjacent to the 1L and 2L exits) prior to the evacuation of flight 497. A UAL representative stated that prior to the incident flight, the Purser and F/As 2 and 3 received hands on training to activate the evacuation alarm and they were tested on the commands and actions associated with activating the alarm. The emergency evacuation alarm procedure is contained in the UAL evacuation responsibilities section of the FAOM for the A319/320 airplane. United 2010 RET program also included the emergency evacuation alarm training with combined with home study training for all F/As. UAL 2011 procedures required that if the alarm was already activated and sounding, no other crewmember needed to activate the evacuation alarm switch.

2.1.5 UAL Baggage

The following statement is presented in the cabin safety video on board the aircraft for passengers: -"If an emergency evacuation becomes necessary, leave all carry-ons behind." In addition, the UAL cabin preparation announcement in the emergency landing states: "Release seatbelts, get out, leave everything, come this way, you and you stay at the bottom; pull people off and send them away." UAL F/A training includes a live exercise regarding managing passenger baggage during an evacuation. Also, the April 1, 2010 revision of the Emergency Procedures, Evacuation section of the UAL FAOM states:

- Direct the customers to leave the baggage in a seat or near the door; or
- Direct the customers to throw the baggage forward or aft of the slide; or
- As a last resort, allow the customer to take the luggage down the slide.

Each of the F/As on board UAL flight 497 had received the above passenger baggage training and procedures before the incident.

The UAL Event Management Exercise (EME), effective April 1, 2011, revised F/A RET for 2011(associated with the merger.) One exercise between a UAL Instructor and a F/A for a planned ditching involves practicing the following scenario:

> A UAL Instructor approaches an exit with carry-on baggage and the UAL F/As is expected to use the FAOM guidance to manage and remove bags from the instructors.

None of the F/As on board UAL flight 497 had received the EME training prior the incident.

2.2 Cabin Crew Statements

On April 14, 2011, Cindy Keegan (NTSB), Jeff Plantz (UAL), Tom Parrine (UAL), Beau Morrow (FAA) Bruce Peleschak (IBTFS) and Vicki Jurgens (AFA) interviewed the F/As on board UAL flight 497, via conference calls.

Purser, door 1L
Forward aft-facing, inboard F/A jump seat.
Height: 5' 7"
Weight: 140 lbs.
Age: 38

She was giving her welcome announcement after takeoff over the public address (PA) system, and when she got to the announcement about the movie for the flight a female passenger in first class advised her that the PA cut off. She stated that it was not unusual for a PA to cut off therefore she did not realize right away that the PA was inoperative. About 20- 30 seconds after the PA cut off, she felt the airplane start to "shimmy" or shake back and forth not like normal turbulence, and she noticed the emergency lights in the cabin had turned on for 3-4 seconds. About 20-30 seconds later, the cockpit door opened and first officer (FO) came out of the cockpit and asked if she heard any calls or chimes. She replied "No", and the FO told her they were going to return to MSY for an emergency landing. She could tell by the FO's rushed tone and his return to the cockpit, he did not have time to respond to her questions about the reason for the turnaround; such as nature of emergency, the time available before landing, or the landing conditions. She also assumed that the inoperative PA was related to the reason they were returning to land at MSY. After she realized the PA was not working, she went to the rear cabin and briefed the aft F/As that they were turning back to the airport for an emergency landing. She came back to her jumpseat and got strapped into her seat.

She could not see out the 1L door window while restrained in her jumpseat, so she asked a first class passenger to describe the landmarks outside the cabin window. The passenger informed her they were flying over the water, then over land and then they were near the runway. The airplane landed hard and fast. She did not instruct passengers about the brace position during landing and she did not do her "silent review"[2] in preparation for landing. During landing the cockpit door opened, and she heard one of the pilots yell, "remain seated, remain seated." She thought the cockpit door opened because the FO might not have secured the cockpit door when he opened it earlier in flight. The passengers clapped when the airplane landed. Just before the airplane came to a stop the FO gave a command to remain seated. When she heard the command "remain seated" it indicated to her that the FO meant that they would not be evacuating the cabin. She got out of her seat, and the FO came out of the cockpit and told her to evacuate, and it confused her, and she asked the first office "Through the doors?", and the first officer confirmed to proceed with the emergency evacuation through the exits.

[2] Chapter 5 of the UAL FAOM includes "Silent Review" and provides a list of 5 physical actions: how to notify (switches and controls, where to assess conditions, how to open exits and how to open doors manually if power assist fails, where to protect self, and where to locate and how to operate manual inflation handle.

When the FO told her they were evacuating she did not activate the evacuation switch (next to the 1L exit) because she was in the galley away from her jumpseat. After receiving the order to evacuate she went straight to the 1L exit window and then opened the 1L door and began her commands. Because she is trained to activate the emergency evacuation switch as she gets out of her jumpseat, she did not activate the switch when the FO told her to evacuate because of her proximity to the switch.

She opened the 1L door and shouted the commands; "come this way" and "leave everything." She turned to the 1R door, and opened the door. The 1R door opened quickly, and she did not use excessive force to open the door. It opened with the same force as it took to open the 1L door. The slide dropped out of the door and began to unfold and inflate. She thought that the upper slide release (frangible link) looked like it was trying to let go, but it appeared there was not enough pressure in the slide to separate the release or to fully inflate the slide. She bent down and pulled the slide's manual inflation handle located on the aft side of the slide but it had no effect on the slide. She announced that the 1R exit was blocked by yelling, "exit blocked go across" and she turned and made an "X" by crossing her arms and told passenger to go out the 1L exit. She did not recall any noise coming from the 1R evacuation slide. When she turned toward the 1R door again, she saw fire fighters at the bottom of the slide trying to pull down the non-deployed portion of the slide.

After blocking the 1R exit the FO went back into the cockpit and she stood between the 1L and 1R doors (closer to the 1L door) and directed passengers to the 1L exit. She did not have problems with passengers trying to take their bags with them, except for a couple of passengers carrying purses. When the male passenger with a lap child arrived at the 1L exit, she told him to hold the infant carefully and very tightly when he used the slide. The parent and the infant evacuated without a problem, although the father had to turn on his side while sliding down the slide to prevent the passenger behind him from hitting him and his child. The passengers were orderly when they evacuated the airplane, but she thought that they were not exiting fast enough. She thought that the passengers were not moving fast because they did not expect an emergency evacuation after the smooth landing. She used the following commands during the evacuation: "come this way", "jump", and "stay at the bottom to assist others."

After the first class passengers heard her command to evacuate, the passengers behind first class realized they should also evacuate the cabin. She could see the passengers seated in the forward third of the coach class, and she thought that if the passengers could see her they could also hear her commands. It occurred to her that the passengers in the rear cabin may have thought that the passengers exiting the airplane were exiting out stairs because some of the aft passengers brought their carry-on bags with them. She did not remove any carry-on bags from the passengers. F/A 2 told the purser that she had briefed the over-wing passengers about the use of the over-wing exits prior to the flight however she believed these passengers did not consider opening the over-wing exits because the landing was so smooth.

The megaphone was in the overhead bin above seats 1 A/B, and she thought about grabbing it on her return from briefing the aft FAs. She decided not to the megaphone because she did not know where she would place it after she sat in her jumpseat, or when she opened the doors during the emergency evacuation which required two hands. She also considered getting the megaphone

from the overhead bin after she had opened the 1R door, but she was concerned that she would have blocked the flow of exiting passengers if she tried to get the megaphone out of the overhead bin at that time.[3] She believed that the megaphone would not have projected her voice very far through the cabin, even if she yelled, although she thought that the use of the megaphone could have inspired passengers to move faster during the evacuation. After the passengers had evacuated, she tried but was unable to release the megaphone from the brackets in the overhead bin. Eventually one of the pilots retrieved the megaphone from its stowed location.

After she saw that F/A 3 had cleared the rear cabin, the F/As swept the cabin for remaining passengers. After they confirmed all the passengers had evacuated the airplane, the FO told her to evacuate, so she exited down the 1L emergency evacuation slide. After she exited the airplane she was surprised to see that the airplane was off the runway and its nose wheel had sunk into the mud, because the landing did not feel like they departed the runway. Police and firemen had gathered all the passengers away from the airplane, and she joined them. The passengers and crew were gathered along the service roadway that runs along the edge of the runway. She did not remember a passenger count being taken after the evacuation. They waited about 30 minutes for the busses to arrive and take them to the terminal. While they waited the captain gathered the crew together for a briefing, but he was interrupted by a call on his cell phone.

Her uncle and cousin were on the flight, and although this was her cousin's first flight, he seemed calm. One passenger fainted and a female passenger was lying on the grass. A passenger reported a hurt back but declined medical assistance. Most of the passengers seemed extraordinarily calm, which she believed was because the landing was so smooth. There was one infant and a couple of children under 10 years old on the airplane. There were no disabled or elderly passengers on board the flight.

She did not smell smoke or any other unusual smell during the flight. The flight crew told her they activated the evacuation alarm in the cockpit, but she did not hear the alarm or see any lights indicating an evacuation. During the flight when the PA system went out the emergency lights came on for about three seconds and went out again. The PA cut off about 3-5 minutes after takeoff, during her briefing and it did not come back on during the remainder of the flight. The emergency exit lights came on during passenger boarding, and the captain informed her that his hand accidently brushed the emergency lights switch. Her training for communicating with other F/As and the flight crew when the PA is inoperative included the use of the megaphone, face to face communications, and the use of chimes and cabin lighting. She used face to face communication when she went the rear cabin to inform the aft F/As about the emergency landing, and during the two separate times she spoke to the FO. She thought the flight crewmember's communication with her went very well.

Although the evacuation did not go anything like the UAL training or the RET training, she believed that her training gave her the confidence to make good decisions during the incident. UAL evacuation training describes procedures for initiating an evacuation by activating the evacuation alarm. She would not have done anything different but it would have been nice if she had easier access to the megaphone. Although, had she retrieved the megaphone prior to landing it would have been difficult to get into the brace position while holding the megaphone, and it

[3] The megaphone is mounted in a bracket in the overhead bin similar to the mount for the oxygen bottles.

could have become a projectile during the emergency landing. Her only safety suggestion was to relocate the megaphone storage location closer to her jumpseat and closer to the emergency exit doors. She thought that the use of the megaphone could have helped communicate to the passengers about the evacuation, but retrieving it from its current location may have blocked the flow of passengers evacuating the cabin.

F/A 3, door 2L
Rear aft-facing, outboard F/A jumpseat
Height: 5'7"
Weight: 180 lbs.
Age: 48

After takeoff, as the airplane ascended, the fuselage seemed to rock back and forth, as if they had departed a windy departure city like Las Vegas, Nevada or Denver, Colorado. During the ascent he noticed that all emergency lights came on, and then turned off, except the overhead lights in the galley remained on. The purser was making a PA announcement and the announcement abruptly cut off. He thought the reason that the PA cut off, was that the captain was trying to call the purser which could interrupt the PA. He assumed that the captain was telling the purser why the emergency lights came on. The airplane was rocking back and forth, and it seemed like the airplane leveled off for a while and seemed to hover above the clouds longer than normal and to the point where it did not feel right. The purser came to the rear cabin and told the aft F/As that they were turning back to make an emergency landing. Before takeoff he turned off the galley lights and F/A 2 turned the in-flight lights off, so it was very apparent when the overhead lights came on (after the PA cut off.) The floor and overhead emergency lights came on, and then the floor lights went off, and the overhead galley lights and the exit lights above the doors remained on during the remainder of the flight and during the landing.

After the purser told him that they were returning to the airport for an emergency landing, she left so quickly, that he could not ask the nature of the emergency. He assumed the interphone was not working because the purser came to talk to them instead of picking up the cabin interphone and relaying the message. After the purser went back to her seat, he mentally thought about the "silent review" and he reminded F/A 2 about the review. He told F/A 2 that the airplane would be landing hard and fast because they had no time to dump fuel before landing. He thought the purser did not know why they were returning to the airport otherwise she would have told them. The overhead emergency lights remained on, and the airplane started to head back to the airport. The landing was smooth; completely opposite of how the airplane flew in flight. The airplane came to a complete stop, he remained in his jumpseat, and he heard the passengers clap.

He expected the captain to make an announcement and explain the situation. A passenger came to the back of the airplane and asked; "so what do we do now?" F/A 2 stated "oh, they [the passengers] are up." He attempted to call the pilots twice on the interphone, to determine what was going on, but got no response. Some passengers got up and started to get their bags out of the overhead bins, one of the passenger asked what was going on. He stood on the passenger seat arm rests at the last row of seats and noticed that the front of the cabin was brighter than the aft cabin, because the morning light coming in through the forward exits. He also saw passengers in the forward cabin moving toward the forward doors. He assumed the evacuation

had begun because the movement of the passengers in the forward cabin, and because there was no way the 'air stairs' could have been brought out to the airplane that quickly.

He did not notice any smoke or fire during the flight. He noticed that emergency lights were illuminated beneath the overhead bins. He returned to his door and he looked out and saw fire fighters out the 2L door. He opened his door and bent down and pulled the manual inflation handle although the 2L slide was already inflating. He pulled the manual inflation handle because the UAL recurrent training had previously instructed F/As to pull the manual inflation handle even if the slide automatically inflates. After he opened the door, he stood in the galley between the bathroom and oven and he told the passengers to evacuate. The passengers were lined up in the aisle holding their carry-on bags. About 99 percent of the passengers who used the aft exit doors, had their carry-on luggage with them, and he physically grabbed the bags from the passengers and put them on the galley counter. After the galley counter filled up he dropped the bags in front of his feet. The bags began to crowd the exit. He told passengers "leave everything behind" and he grabbed their carry-on bags from them. The passengers did not want to give up their bags. The bags piled up in front of his feet, and the passengers had to step over the bags to exit the airplane.

He did not stand by the door for the evacuation because he could not stand there with two passengers side by side while he continued to take the bags from the passengers before they exited down the evacuation slide. Removing the bags from the passengers necessitated his standing in the galley during the evacuation. As he was taking carry-on bags from the passengers he kept an eye on the condition of the 2L slide and the firemen at the bottom of the slide. He did not see the slide moving around as a result of the wind.

He yelled "get out", "leave everything." The passengers had already gotten out of their seats, and as each passenger evacuated, the next passenger followed the passenger in front of them down the slide. The area between 2L and 2R is very small. He took away at least 40 bags and stacked them up in the galley and into the 2R exit. Although he knew he was suppose to stand at the 2L door during the evacuation and hold onto to the assist handle, he believed there was not sufficient room for himself and passengers with backpacks and bags to safely exit out the exit. He was concerned that the persons with the backpacks would pull him out the exit when they pushed through the doorway with their backpacks and bags. He ended up standing between the oven and the lavatory because of the amount of bags he removed from passengers. He needed two hands to remove passenger's back packs off their backs, and he felt safer where he stood in the galley and using both hands to remove the bags.

After all passengers in the aft cabin had exited, he stepped over the pile of bags and went through the cabin sweeping for remaining passengers. When he reached the forward galley the purser and flight crew told him to exit the cabin. He went back to the 2L exit and he and F/A 2 went down the 2L slide. His slide was fully inflated and two firemen were at the bottom of the slide were holding the 2L slide. After he exited the airplane he was surprised to see that the airplane was off the runway and in the mud, because the landing was so smooth. The police and fire fighters moved the passengers away from the airplane toward a police car. One passenger was out of breath from the excitement and a passenger who stated she was a nurse helped calm the excited passenger. A lot of passengers wandered away from the group taking photos with their phones. The crew stayed together but also kept and eye on the passengers to ensure they were

staying together. An ambulance arrived but no passengers needed to be taken to the hospital, so the ambulance eventually departed without any passengers. About 30 minutes passed before the passengers were taken back to the airport terminal.

His evacuation training instructed him to hold one hand on the door assist handle during evacuations. He could not get back to the 2L door and hold onto the door assist handle because he was busy removing passenger's bags and backpacks. The most difficult of part of the evacuation was removing the backpacks from the passengers. He did not activate the emergency evacuation signal because he did not feel it was safe to go back into his position at the 2L door because of the number of passengers with backpacks. He was not aware that there was a megaphone in the overhead bins in the rear cabin.

He believed the passengers were calm during the evacuation, because there was no evacuation alarm. He had received the UAL Revision 6 for his FAOM manual but he had not reviewed the revised information. Because the crew arrived in New Orleans at noon the day before the incident flight, he was able to get plenty of rest before reporting to work on the day of the incident flight. He said that he thought the adequate rest assisted the cabin crew with effectively handling the incident. He received a call from the scheduling desk at about 0400 the day before the incident informing him that he had a 0800 check-in for a 0900 departure. The day of the incident he reported to work at 0600. He thought that the carry-on bags and backpacks were larger and heavier and should be monitored more closely when passengers board the airplane.

F/A 2, door 2R
Rear aft-facing, inboard F/A jumpseat
Height: 5' 1"
Weight: 127 lbs.
Age: 43

The incident flight was the second day of the four day trip. She awoke at 0430 and the cabin and flight crew were picked up at their hotel at 0600. Some passengers moved to the empty seats in the rear of the airplane during boarding. The takeoff was a bit rough which may have been because of the strong winds. After takeoff the airplane swayed back and forth a little bit and she noticed the emergency lights come on and then go out. The exit light above her door went out and the lights under the overhead bins stayed on. The purser was making a PA announcement and it cut off. She and F/A 3 discussed that they assumed that the PA cut off because the captain was calling the purser and it interrupted her PA. They assumed the captain was briefing the purser about why the emergency lights had come on. The airplane was climbing and the purser came to the back and told the aft F/As they were turning back for emergency landing. She did not know why they were turning around, because she did not have time to ask the Purser. The airplane landed and came to a complete stop. The landing was "real nice" and there seemed to be nothing wrong with the airplane. The landing was smooth, but it felt like a much larger airplane (such as a Boeing 767) landing. The passengers clapped and the next thing she knew the passengers were standing and taking bags out of the over head bins.

The cabin was dark during the evacuation. She does not remember any floor track lighting being illuminated for the evacuation. F/A 3 stood on the arm rests and then came back to the 2L door and informed her that the forward cabin was evacuating the airplane. F/A 3 opened the 2L door,

and she turned and looked out the door 2R window to make sure it was safe to evacuate out this exit, and she opened the 2R door and her slide inflated correctly. She was surprised the 2R slide inflated so quickly and how it inflated completely. The passengers were facing forward, when the aft flight attendants initiated the evacuation in the aft cabin. Most passengers evacuated out the 2L door because of the pile up of bags at the 2R door. She and F/A 3 kept shouting to drop the bags and get out. She shouted "come this way" and yelled "leave everything and get out." The passengers put everything by her feet. She put bags on the aft galley counter and they began to pile up. There were not as many passengers coming out her door because the bags where in front of her door. She kept enforcing the command to get out and leave the bags. The passengers who evacuated from the 2L door had to step over bags to get to the door. She did not identify passengers to assist at the bottom of her 2R slide. She thought it was not safe for passengers to jump over the baggage and onto the 2R slide because the 2L door was more easily accessible. She did not use the blocked exit command at the 2R exit because although there were bags in the way of the exit, it was still usable, and because passengers automatically went to the 2L exit. F/A 3 made his sweep of the cabin to make sure everyone was out and then came back and he and she went out the 2L slide.

Flight 497 was ¾ full. The airplane had 132 passenger seats, and there were 104 passengers on board the incident flight.[4] Because it was not a full flight, the passengers were spread out through the cabin. She was responsible for conducting the exit row briefing and verification. During boarding she asked the overwing passengers if they understood what was required of them regarding opening the overwing exits during an emergency evacuation. Each of the passengers seated in the over-wing exit row told her they understood and had read the briefing card. There were about 7 passengers in the two rows of over-wing exit seats. There were no elderly or disabled passengers on board flight 497.

After she exited the airplane she saw a women lying in the grass that reportedly fainted and was being looked after by a passenger nurse. The captain called the crew together to talk to them, but he was distracted by a phone call on his cell phone. She did not know that the airplane left the runway, until after she exited the airplane and saw the nose gear in the mud. After they evacuated the airplane, the captain used a megaphone to tell passengers to get away from the airplane and moved the passengers into a large group on the service road. The passengers were mostly younger passengers. There were a couple of non-English speaking passengers, and she did not experience any problems with the non-English speaking passengers during the evacuation. They seemed to know what to do even though they did not speak English. After the passengers were taken to the terminal by bus, UAL operations picked up the crew and brought them back to the terminal.

Other than the purser informing her that they would be turning back for an emergency landing, there was no other sign of an emergency and therefore after the airplane landed she did not understand the urgency to evacuate. She did not hear an announcement that they were turning back to the airport. There was a megaphone in the rear cabin, but she never thought of using it because the evacuation happened so quickly, and was orderly, and because the passengers acknowledged they could hear her commands. UAL training on the use of megaphones instructs the F/A to use the megaphones when the PA is inoperative. She thought that the current

[4] N409UA was configured with 126 coach class seats, and 12 first class seats, or a total of 138 passenger seats.

megaphone stowage location (in the overhead bin) is an inaccessible location from the aft F/A jumpseats. Her pre-departure safety check includes checking the slide pressures, checking the location of her flashlight and survival kit. Passenger carry-on bags were very large and heavy. The long layover for this trip allowed her the opportunity to get a good night sleep and was very helpful during the response to this emergency. She had not yet read the UAL Revision 6 but she had placed the revised pages in her manual.

2.3 Passenger Information

According to the UAL passenger manifest there were 104 passengers on board flight 497. Of the 104 passengers on board flight 497, there were 3 children and 1 infant lap child. Questionnaires were mailed to 36 passengers on board the incident flight from available mailing addresses UAL provided to Safety Board. Copies of the completed questionnaires will be included in an Addendum report.

The mother of the infant lap child was interviewed by Cindy Keegan (NTSB) on June 23, 2011.

2.3.1 Passenger Interview

Seat 15 B
Age: 26
Height: 5ft, 3 inches
Weight: 119 lbs.

She was traveling with her husband and her 15 month old son (born January 16, 2010.) Her husband occupied seat 15A, she occupied seat 15C, and their infant son was sleeping deeply on seat 15B, with his head on her knees during takeoff. She had the seatbelt fastened around her infant son, but it was not very tight. She decided not to wake her son before takeoff because he would have cried loudly (he is usually very fussy in airplanes.) There were two boys who appeared to be about 10 years old traveling with an adult seated in the row behind hers in seats 16 E and F. The beginning of the flight was normal. She watched the safety briefing video, and during the flight attendant briefing about the in-flight movie the PA cut off and there was no further announcements during the remainder of the flight. Because there were no announcements after the PA cutout, she did not know why the flight was returning to land at MSY. She did not smell any smoke or any other unusual odors during the flight or during the landing. She woke her baby right before landing and held him tightly during the landing. When the airplane landed all of the passengers applauded.

The flight attendant in the front of the cabin began yelling for everyone to get out of the airplane. All the passengers got out of their seats and began evacuating the airplane. She grabbed her carry-on bag beneath the seat in front of hers (containing baby supplies) and her husband and infant and she got into the long line of passengers in the aisle moving toward the front of the airplane. It seemed like it took a long time for the passengers to evacuate the airplane. The flight attendant in the forward cabin kept yelling "get out of the airplane." Her husband held her son when he exited down the evacuation slide. Her husband informed her that their son laughed when he went down the slide in her husband's arms. Neither she nor her husband or son was injured during the evacuation.

3.0 Airplane Damage

3.1 Cabin Interior Examination

The cabin seats, restraints, overhead bins, and cabin furnishings were intact. The standoff bracket above the cockpit door's upper hinge (inside the cockpit) separated from the bulkhead. The screws that secure the standoff bracket to the bulkhead were missing from the bracket. An emergency evacuation slide/raft manual inflation handle was found on the floor in the aft galley adjacent to the 2R exit. See Attachment 1 for photographs of the airplane, cabin, and evacuation slide/rafts.

4.0 Doors and Emergency Evacuation Slides

4.1 Continental Airlines Maintenance Observations and Actions

Two Continental Airlines mechanics secured the incident airplane and removed the emergency evacuation slides from the airplane before it was moved from the side of MSY runway 19. The mechanics where interviewed by Cindy Keegan (NTSB), Bruce Peleschak (IBTFS) and Bob Newman (UAL):

Continental Mechanic Mike Laville
Continental Airframe/Powerplant Mechanic since 1984

He arrived at the airplane at approximately 0820 and assisted another Continental mechanic with securing the airplane. All the passengers were off the airplane, and the fuselage was oriented nose down. The engines were not touching the ground. The 1R slide/raft was deflated and connected by the girt bar in the brackets at the 1R doorway. The slide/raft was hanging from the 1R door and lay limp against the fuselage. The 1R door was fully latched open, and MSY ARFF had placed a ladder at the 1R door. The 1L, 2L, and 2R slide/rafts were fully inflated and attached at their respective doors.

He observed that the 1R aspirator had ingested its sea anchor, so he made sure not to disturb the aspirator and sea anchor. He and the other mechanic removed luggage from the overhead bins and slid them down the slide/raft at the 2R exit. A belt loader was brought to door 1R for the remainder of the bags. He and the other mechanic removed the slide/rafts at each door by deflating the slides and disconnecting the girt bar at each exit. When they got to the 2R door he mistakenly pulled the slide's manual inflation handle thinking that it would release the slide from the door. He put the manual inflation handle on the cabin floor at the 2R doorway. They released the pressure from the 2R slide and unhooked the girt bar from the doorway. He and the other mechanic removed the slide/rafts at exits 1L and 2L and lowered them to the ground and left them in place. He unlatched the 1R slide/raft girt bar, and he observed that the inflation tank pressure gauge indicated 0 pressure. They identified each of the slide/rafts to the corresponding exits by putting blue cloth ties on each of the slides and marking the cloth with the exit location. They put the 1L, 2L, and 2R slide/rafts in the aft cargo compartment and the 1R slide in the

forward cargo compartment to keep it separate from the other slide/rafts.

He installed the gear locks on the main and nose gear. He went to the cockpit to pull circuit breakers K16, K17 and K18 for the DFDR. The other mechanic had pulled the circuit breakers on the overhead for the CVR. He also turned off the inertial reference system (IRS) navigation switches to silence the battery horn. They closed the doors from inside the aircraft and departed from door 2R exit via a ladder.

Mike Sellers
Airframe Powerplant mechanic with Continental since 1992

He and Mike Laville arrived at the incident airplane about an hour after it landed. When he approached the airplane, he thought that ARFF had deflated the 1R slide to put a ladder at the 1R door. The 1R slide/raft hung limp from the door. He entered the airplane and went into the cockpit and pulled the circuit breakers to shut down the electrical systems. He noticed that no breakers were popped when he entered the cockpit.

All of the doors on the airplane were latched in the open position when he arrived. He took photographs of the 1R slide/raft and someone told him that the 1R slide/raft did not inflate. He checked the inflation bottle pressure gauge and noted that the bottle was discharged. He noticed the mooring line and sea anchor jammed inside the slide/raft aspirator. He and the other mechanic knew not to disturb the 1R slide/raft. When he removed the 2R slide/raft from the airplane, mechanic Laville mistakenly pulled the slide's manual inflation handle (instead of the ditching release handle.) Eventually, he and the other Continental mechanics were given clearance to move the airplane, and when they put power on the airplane the emergency evacuation alarm started to sound.

4.3 Evacuation Slide/Raft Examination

The slide/rafts were removed from the cargo compartments and examined. The slide/rafts at door 1L, 2L and 2R were reported to have deployed normally. The slides were photographed and the information on each girt was documented. The 1R slide/raft's sea anchor and sea anchor line were found ingested in its aft aspirator. The 2L slide/raft's forward aspirator was compressed and the flappers did not seat completely. Examination of photos that were taken by MSY ARFF soon after the evacuation revealed that the 2L slide/raft's lower tube had deflated. Table 2 shows the information that was recorded from each slide/raft girt:

Table 2. Slide/Raft Girt Information

Position	1L	1R	2L	2R
MR number	25613-003	25613-002	25612-022	25612-035
Slide Serial Number	A5764	A5770	5744	A6799
Mfg Date	09-93	09-93	07-93	01-99
Fwd Aspirator part number	60322-103	60322-105	60322-103D	60322-103
Fwd Aspirator	C4842	[None]	C5045	A82376

serial number				
Aft Aspirator part number	60322-103D	60322-103-0	60322-108D	60312-103
Aft Aspirator serial number	A6345	A6359	A6304	A8283
Bottle serial number	751-4502	751-3676	751-4495	751-2594
Bottle last overhaul	26Sep08	29Jan2010	05Aug10	20Aug10

The 1R and 2L slide/rafts were packaged and shipped to Air Cruisers, Inc., for future examination. The examination of the 1R and 2L slide/rafts will be included in an Addendum report.

Each slide/raft pack at each door was examined and documented. Each slide/raft was manufactured by Aerazure and conformed to TSO C-69a, DGAC QAC 143.[5] The slide/raft at doors 1R, 1L, and 2L were manufactured in Jonzac, France, and the 2R slide/raft was manufactured Cognac, France. The following table shows the information that was recorded from each slide pack at the respective doors.

Table 3. Slide/Raft Pack Information

Position	1L	1R	2L	2R
Identification	A320 S/R evac system FWD D30664-105	A320 S/R evac system FWD D30664-105	A320 S/R evac system FWD D30665-105	A319/A320/A321 S/R Evac system FWD D30665-105
Serial Number	A 5795	A 5799	A 5772	A 6732
Weight	46.3 kg. 102 pounds	46.1 Kg, 101.6 lbs	47.2 kg. 104 pounds	46.5 kg. 100.7 pounds
Date of Mfg.	09-93	09/93	07-93	02-99
Service Bulletins	SB 004-25-52	SB 004-25-38 SB 004-25-52 SB 004-25-35 SB 004-25-41	SB 004-25-11 SB 004-25-41	SB 004-25-52 SB 004-25-41
Other information	Inspected per AOT 25-12 rev 01, complies with AD 97-23-13			

[5] According to Airbus, the A320/A319 (i.e. A318, A319, A320 and A321) emergency evacuation slide/rafts successfully qualified for use on the most critical adverse attitude, which included: aircraft leaning back, one main gear down, one main gear up and the aircraft resting on an engine. In addition, the slide/rafts were qualified to provide sufficient capability to evacuate passengers safely to the ground under all standard adverse attitudes.

The slide/raft arming handle at door 2L was found in the armed position, and the arming handles for slide/rafts 1R, 1L, and 2L were found in the unarmed position. The slide/raft inflation bottle safety pins were found in the pack pouches at doors 1L, 2L, and 2R. The inflation bottle safety pin for the 1R slide/raft was found on the floor of the forward cargo compartment.

4.4 Door 1R Power Assist Actuator

The power assist actuator on the 1R door contained the following information:

Manufacturer – Ratier-Figeac
Modification ABCD
"Damper & Emergency Open Cylinder"
P/N FB 174-0011
S/N 1465
Code: 69.768.502.00
Assy. Date 1T-93
Fluid Air 3520

1R power assist actuator pressure gauge showed "0" pressure indication on the gauge.

4.5 Crew Interphone, Public Address and Emergency Evacuation Alarm

According to Airbus, the A320 PA, cabin interphone, and emergency evacuation alarm system are powered by the cabin intercommunication data system (CIDS). The CIDS is powered by the direct current (DC) service bus and DC essential bus. According to an Airbus representative, the PA, cabin interphones, and the emergency evacuation alarm are designed to remain operative in "EMER ELEC CONFIG" even when the airplane electrical system is powered only by its batteries. In addition, when activated, the emergency evacuation alarm is triggered once the aircraft comes to a stop. The speakers for the emergency evacuation alarm audio on board N409UA were installed in the forward and aft cabin near the 1L and 2L F/A jumpseats.

The airplane emergency evacuation alarm was tested in the cockpit and cabin, using the airplane's battery power, and the evacuation alarm sounded and worked properly during the test. The PA system and crewmember interphone system were also tested using an external power source. The PA system and the cockpit and the flight attendant crewmember interphone systems worked properly on the external power source.

4.6 Regulations for Crew Interphone, PA, and Emergency Evacuation Alarm

Title 14 CFR Part 121.319, Crewmember Interphone System, requires the operation of an airplane with a seating capacity of more than 19 passengers be equipped with a crew member interphone system that (in part):

> (2.) Is capable of operation independent of the public address system required by 121.318…
> (b.)(1.) It must provide a means of two-way communication between the pilot compartment and –

(i.) Each passenger compartment; and,

(b.)(2.) It must be accessible for use from at least one normal flight attendant station in each passenger compartment;

Title 14 CFR Part 121.318 Public Address System, requires the operation of an airplane with a seating capacity of more than 19 passengers, be equipped with a public address system which, in part:

(a.) is capable of operation independent of the crewmember interphone system required by 121.319…

(d.) For each required floor-level passenger emergency exit which has an adjacent flight attendant seat, has a microphone which is readily accessible to the seated flight attendant, except that one microphone may serve more than one exit, provided the proximity of the exits allows unassisted verbal communication between seated flight attendants, and

(g.) requires that transport-category airplanes manufactured on or after November 27, 1990[6], meet the requirements of 14 CFR 25.1423.

Title 14 CFR Part 25.1423 requires that a public address system must be powerable when the aircraft is in flight or stopped on the ground, after the shutdown or failure of all engines and auxiliary power units, or the disconnection or failure of all power sources dependent on their continued operation. In addition, Part 25.1423 (e) requires that the public address system be capable of functioning independently of any required crewmember interphone system.

5.0 Injury Information

Table 4. Injury Information

	Cockpit Crew	Flight Attendants	Passengers	Others	TOTAL
Fatal	0	0	0	0	0
Serious	0	0	0	0	0
Minor	0	0	0	0	0
None	2	3	104	0	109
TOTAL	2	3	104	0	109

6.0 Airport Certification

6.1 Location of Airport

The Louis Armstrong International Airport (MSY) is operated by the New Orleans Aviation Board (NOAB.) The airport is under the direct control of the Director of Aviation, who is appointed by the NOAB. MSY is a Class I airport in accordance with Title 14 Code of Federal

[6] The incident airplane, registration N409UA, serial number 462, was manufactured on March 21, 1994.

Regulations (CFR) Part 139 and is owned and operated by the City of New Orleans.[7] MSY is approximately 11 miles west of the City of New Orleans and is at an elevation of 6 feet MSL. The airport averages over 321 operations per day, mostly air carrier activity. Runway 19 is 7,001 feet long and 150 feet wide aligned to 193 degrees magnetic. Runway 10 is a 10,104 feet long and 150 feet wide aligned to 103 degrees magnetic. Both runways are constructed of grooved concrete and are built to withstand 380,000 double tandem weight (DTW) bearing capacity. Runway 19 has a 500-1,000 foot safety area.[8] The touchdown zone elevation for runway 19 is 2.3 feet above sea level, and the arrival threshold is not displaced. Runway 19 has high intensity runway edge lighting, in-pavement centerline and is equipped with a 1,400 foot medium intensity approach lighting system (MALS.) There is a 4-light precision approach path indicator (PAPI) system for runway 19. Runway 19 has no significant obstacles and was dry at the time of the incident.

Cindy Keegan (NTSB), Vicki Jurgens (AFA), Bruce Peleschak (IBTFS) and Bob Newman (UAL) interviewed the MSY Airport Operations Manager on April 6, 2011. Walter Krygowski, Deputy Director and Chief Operations Officer, and Michael McMillan, Asst. Airport Operations Manager, were also present during the interview.

Ronaldo Nodal, Jr.
Airport Operations Manager

He has worked at MSY for the past 11 years. He was en-route to MSY from his home when he received notification from the Airport Operations Supervisor about UAL flight 497.

The MSY standard operating procedure (SOP) for a closed runway requires that maintenance contact ATC and obtain an "all clear" to close the runway for maintenance. Airport Operations alerts ARFF, the FAA, and the airlines and airport maintenance when they schedule maintenance on the runways or taxiways. The closure of a runway is always coordinated with ATC and the area to be repaired is cordoned off before the work begins. Airport Operations schedules "hard" and "soft" runway closures. A "soft" closure involves a one-hour prior permission required (PPR) to the airlines, whereas a "hard closure" is longer term and requires pre approval from ATC, ARFF, FAA and airlines. The repair of the sinking runway 10 shoulder required a "hard closure" of the runway. ATC can override Airport Operations plan to proceed with a planned closure if need be.

Runway 10/28 was rebuilt in 2005. The first 1,500-2000 feet of the runway 10 threshold is built on pilings which formed a subterranean bridge over a tunnel built for a highway. Over the years the shoulders of the runway that were built over the bridge began to sink. The closure of runway 10/28 was scheduled about a month before the incident to repair the shoulder of runway 10/28. Airport Operations considers the weather when planning for runway closures and coordinates airport maintenance with ATC. The repair work was scheduled for two days, and was dependant on good weather to complete the repair.

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[7] Title 14 CFR Part 139.5 *Definitions* – "Class I airport" means: an airport certificated to serve scheduled operations of large air carrier aircraft that can also serve unscheduled passenger operations of large air carrier aircraft and/or scheduled operations of small air carrier aircraft.

[8] The MSY runway 19 safety area is 500 feet wide (250 feet on either side of the runway centerline) for the entire length of the runway. The runway safety area off both runway ends is 1,000 feet long.

NOTAM 04/002 was issued April 1, 2011 to advise all airlines of the runway 10/28 closure and was in effect between 1200Z to 2359Z (7:00 a.m. to 6:59 p.m. local time) on April 4, 2011. During the runway 10 repair, maintenance closed taxiway Echo, west of Bravo for access to the runway 10 shoulder. See figure 2 for the FAA diagram of MSY airport. Repairs to the runway shoulder were completed on April 6, at about 1:10 p.m.

When ATC received the report that UAL flight 497 requested landing on runway 10, ATC radioed Airport Operations supervisor, Mike Edwards, (Oscar 2) who was on runway 10 managing the runway maintenance. Oscar 2 attempted to get the workers and the equipment off of runway 10 as quickly as possible, however, a large milling machine (shown in photograph 1) that moves at about 3 mph could not be moved from the runway quickly enough to clear the runway in time for UAL 497 to land.

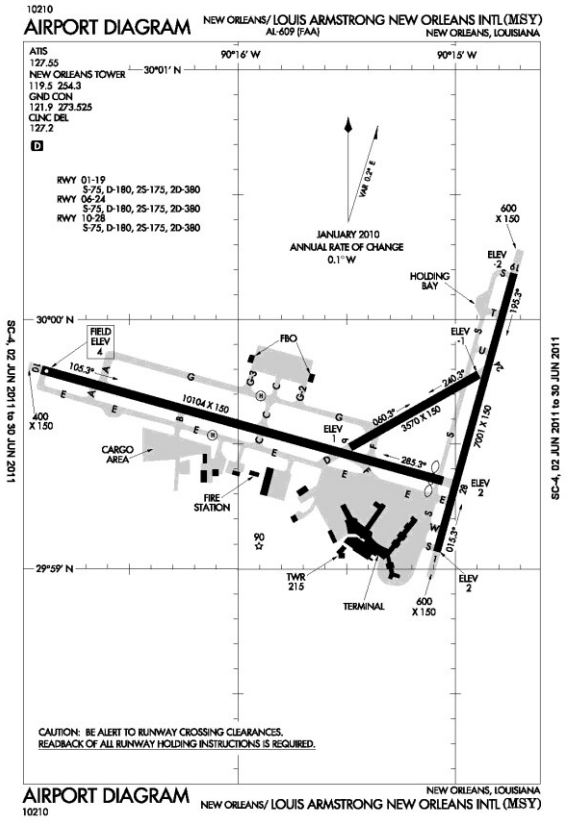

Figure 2. FAA diagram of MSY Airport

After the incident, MSY Airport Operations closed runway 1/19 with NOTAM 04/008, and canceled NOTAM 04/002, advising all MSY Operators that runway 10/28 reopened. In addition, MSY Airport Operations informed the ATC Tower that runway 10/28 was clear, after the maintenance crew and equipment were off runway 10/28.

Photograph 1. Milling Machine on MSY Runway 10

He stated that although Oscar 2 monitors the ground frequency at all times, he is not required to remain at the construction site, but could depart the site and attend to other duties during the runway construction. If the Operations Supervisor is absent from the site, ATC would contact the Operations Supervisor via the operations truck radio. MSY ARFF paramedics responded to the incident and helped to organize buses to transport the passengers and crewmembers. He arrived at the incident scene at 0730 after all occupants had evacuated the airplane. He noticed a yellow section of the 1R slide/raft hanging from the 1R door, but he did not get a good look at the 1R slide/raft.

The Airport Aviation Communication Center (AVCOM) is located in the terminal building. Runway 10 is not visible from the AVCOM. ATC uses transponders to communicate with AVCOM, Airport Operations and Maintenance. MSY ARFF uses the emergency frequency of 119.50. Airport Operations is responsible for providing escorts for emergency response vehicles and personnel (police and ambulance) on the airport. MSY was inspected in June 2010, and the next inspection will occur May 2011. See Attachment 2 of this report for the MSY NOTAMs and photographs of the runway 10 shoulder maintenance.

7.0 Aircraft Rescue Fire Fighting (ARFF)

Cindy Keegan (NTSB), Vicki Jurgens (AFA), Bruce Peleschak (IBTFS) and Bob Newman (UAL), interviewed the MSY ARFF Incident Commander on April 6, 2011. Walter Krygowski, Deputy Director and Chief Operations Officer, was present during the interview.

Peter Erick Lindblum
Captain , Station Engine 46
New Orleans International Airport

MSY ARFF has a full time staff of 3 platoons. Each platoon has 12 full time ARFF personnel who work a 24 hour shift from 0700 to 0700.[9] He had just finished his shift that began April 3 and was briefing Captain Forester about the work 'set-up' that needed to be done at the station. He typically comes in around 6:00 a.m. to handle manpower and stays late to complete the next

[9] MSY ARFF has 12 ARFF personnel assigned to each of the three platoons. Vacations and sick leave can result in varied ARFF staffing, however, in accordance with the MSY Airport Emergency Plan, a minimum of 3 ARFF and 1 Duty Captain man MSY Station Engine 46 at all times.

shift's 'set-up.' When an incident or accident occurs, the ARFF Incident Commander (IC) remains at the station and communicates with the captain on scene the ARFF resources needed at the incident or accident. ARFF receives incident information from AVCOM through a Crash phone that connects ATC, ARFF and AVCOM.

Captain Lindblum was the acting ARFF IC and remained at the fire station during the ARFF response. He was notified around 0714 or 0715 that UAL flight 497 was returning for an emergency landing at MSY. UAL flight 497 flight crew reported smoke in the cockpit, and requested to land on runway 10/28, but ATC designated runway 19 as the runway. He provided the information about runway 19 to Captain Forrester because three ARFF trucks had already departed the fire station for runway 10/28. The ARFF trucks repositioned to their pre-determined locations for runway 19.

Two Oshkosh 1500's, an Oshkosh 1000, and a Type 1 Seagrave 1250 structural pump vehicle responded to the incident. MSY ARFF vehicles do not have video capability because the video equipment is undependable and requires constant maintenance. In addition, a medical unit was on standby at the MSY ARFF station. Nine ARFF personnel responded to the incident airplane.

Captain Lindblum remained at the fire station and provided communication support to Captain Forester until the incident airplane came to a stop. During the approach the airplane's wings appeared to 'flutter.' He saw the airplane land on runway 19 and it appeared to come to a stop at about the 2,000 foot mark. He arrived at the incident site in FOX 9 about 2 minutes after UAL flight 497 touched down. When he arrived the evacuation was still in progress and he saw passengers deplaning from the 1L exit. He noticed that some passengers removed their shoes before going down the slide/raft and a few passengers had carry-on baggage with them. He observed the flight attendant directing the evacuation at the 1L doorway. Firemen were holding down the base of the slides and moving passengers off of the slides, while the other firefighters were conducting an initial head count.

He noticed that the 1R slide/raft had not deployed, and strong winds had flipped the slide underneath itself. It appeared the 1R slide/raft had doubled up on itself. One of the firemen had placed a ladder at door 1R. Captain Forester and Fireman Barrios boarded the airplane at 1R door using the ladder. Captain Forester reported that there was nothing unusual, that there was no smoke or fire, and that there were no persons onboard the airplane. Because there was no smoke or fire on the airplane they did not need to don the self contained breathing apparatus (SCBA). After he was informed there was no smoke or fire coming from the incident airplane, he gave the command to relocate the crash trucks to a hard surface. He was concerned that the trucks would get stuck in the soft ground adjacent to runway 19.

He was initially informed of one potential injury. A female passenger reported lower back pain and reported that she suffered from previous cardiac issues. He contacted AVCOM and requested emergency medical technicians (EMTs.) Two ambulances arrived at MSY from East Jefferson Hospital; however none of the passengers were transported by ambulance to a hospital. An ARFF paramedic and an intermediate EMT (EMTI) handled triage of passengers who reported injuries. In addition to the passenger with lower back pain, another male passenger sitting on the ground reported chest pains. The paramedic and EMTI hooked him up to EKG equipment. There were four passengers who sought medical assessment/treatment, but he was

unsure of the nature of the other two complaints. Two MSY Police assisted ARFF with unified command by escorting the ambulances and rental car shuttle buses to the incident site. The rental car buses were used to transport the passengers to the Hilton Hotel. One of the ambulances followed the rental bus to the Hilton as a precautionary measure. He requested the number of 'souls onboard' from one of the F/As so that ARFF could verify a head count of the passengers who had evacuated the airplane, and he was informed there were 104 passengers and 5 crew on board flight 497. He also received a passenger manifest, but was unsure who provided it to him. He stated that no airplane occupant leaves an incident or accident site without being accounted for.

He reported that the passengers clapped and commended the captain on the safe landing; although a few passengers voiced concern about the lack of communication during the emergency landing. He said that the professionalism of the FAs helped to control the excited passengers. The UAL Station Manager, Daryl North, was on site very quickly, and did a marvelous job of handling the passengers.

He requested the fuel quantity on board the airplane from the incident captain and he thought the captain told him there was 53,000 gallons[10], on board. About 7 minutes after the incident Continental mechanics arrived at the airplane to secure and prepare the airplane to be moved to a secure location at MSY. The Continental mechanics removed the emergency evacuation slide/rafts from the airplane and stored them in the cargo compartments. The MSY ARFF firefighters are trained about the various types of emergency evacuation slides and slide/rafts and they are aware not to disturb the slides following an incident or accident. Neither he nor the other ARFF firefighters disturbed or deactivated any of the slides/rafts. ARFF was on standby when the airplane was moved.

The last MSY ARFF full scale Tri-annual drill was October 2010 and the last table top exercise was September 2010. The last few drills before the October 2010 drill were in preparation for the Tri-annual drill. Participants in the drill included the City of New Orleans, the Kenner Fire Department, and the 3rd District Jefferson Parish Volunteer Firemen. MSY ARFF receives training primarily on general aviation airplanes and on some transport category airplanes. Southwest Airlines provides an airplane to MSY ARFF for some of their training exercises, and FedEx and UPS provide larger airplanes for ARFF familiarization training. All MSY training is coordinated by ARFF Training Officer, and follows the National Incident Management Standards (NIMS) ARFF training program. MSY is categorized as an index D airport[11]. ARFF training is scheduled on a monthly basis and includes information about deploying slide/rafts and deactivating the inflation cylinders and the opening of cabin doors. All MSY ARFF are experienced veteran New Orleans firefighters.

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[10] The incident airplane, N409UA, had 5,200 gallons of fuel when it landed on MSY runway 19.

[11] 14 *CFR* §139.317 *Aircraft rescue and firefighting: Equipment and agents*, requires Index D airports to have either of the following: (1) Three vehicles— (1) One vehicle carrying the extinguishing agent as specified in paragraph (a) (1) or (a) (2), and (2) Two vehicles carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for FAOM production carried by all three vehicles is at least 4,000 gallons. Section (a) (1) and (a) (2) of 14 *CFR* §139.317 states: (a) (1) 500 pounds of sodium-based dry chemical, Halon 1211, or clean agent, (a)(2) 450 pounds of potassium-based dry chemical and water with a commensurate quantity of AFFF to total 100 gallons for simultaneous dry chemical and AFFF application.

Cindy Keegan (NTSB) interviewed the MSY ARFF firemen Forester and Barrios on April 10, 2011.

Gerald Forester
Captain , ARFF MSY Station Engine 46

He has worked at Station Engine 46 at MSY for the past 1 ½ years, and for New Orleans Fire Department for the past 17 years.

He received the call that UAL flight was making an emergency landing on runway 10. Fire fighter Barrios picked him up in Fox 6 (a Dodge Durango) and they drove towards runway 10. He talked to ATC Controller in the Tower over the ARFF frequency while Barrios drove Fox 6. While driving toward runway 10, ATC directed them to relocate to runway 19 because the workmen on runway 10 where unable to clear the runway 10 in time for UAL flight 497 to land. Each ARFF truck got into position for runway 19. The airplane landed, and appeared to blow out two tires and then exit the left side of the runway into the soft ground where it stopped instantly. Barrios drove Fox 6 toward the 1R slide, and parked about 60-50 feet from the airplane. Fox 5 was positioned on runway 19 facing the nose of the airplane. Fox 7 faced the right wing, and Fox 2 was positioned by the tail of the airplane.

The firemen got out of their trucks and positioned themselves at the bottom of the slides to help the passengers off the slides. The 1L door opened and the emergency evacuation slide inflated. The 1R door opened and the emergency slide fell out of the door, and as it started to unfold it appeared to become tangled in some lines. The bottom part of the slide was sticking straight up in the air, and he and another fire fighter grabbed the slide and tried to pull it down so that it would completely unfold, however the tangled lines prevented the slide from completely unfolding. One of the pilots came to the 1R doorway and put a tape across the doorway to block the exit.

At first passengers evacuated from the 1L slide, then he noticed passengers evacuating from the rear emergency evacuation slides. The firemen assisted passengers coming out the rear exits because the passengers seemed to be coming down the aft slides "way too fast." After all the passengers had evacuated the airplane, the firemen put a ladder at the 1R door. After all the passengers were off the airplane, firemen Newman, Burke and Barrios entered the airplane and went through the cabin to make sure everyone was off the airplane. He did not smell any smoke or electrical smell when he entered the cabin. After it was confirmed that everyone was off the airplane, the firemen went into the cockpit and asked the pilot to come back on board the airplane to make sure all of its electrical systems were shut down. He did not hear the evacuation alarm when he entered the airplane. He contacted AVCOM to arrange for busses to pick up the passengers and crew and take them to the terminal. It took about 1 hour for the busses to arrive. Initially three passengers complained of bumps and bruises but everyone refused treatment.

He believes that MSY ARFF is short handed. There were originally 12 ARFF firefighters per shift, but because of budget constrictions, now there are only 6 firefighters per shift.[12] He is

[12] At the time of the incident MSY ARFF met the requirements of 14 *CFR* §139 for staffing and equipment.

concerned that the current reduced staffing only allows for one ARFF firefighter for each truck, and if there were a mass casualty accident they would not have enough men to search the airplane. Also, with only one firefighter per truck, and they leave the truck to assist passengers, there is no one to work the fire extinguishing agent on the truck. Although each ARFF truck is equipped with 3 SCBA's, there is insufficient staff to man the equipment.

Wade Barrios
10 years with MSY ARFF, 20 years fire fighter

He normally drives his truck around the airfield in the morning to familiarize himself with any changes around the airfield that occurred when he was off duty. He was driving Fox 6 near the west end of runway 10, when the alert came in over the radio. He drove back to the firehouse and picked up Captain Forester. He and Captain Forester drove to the intersection of taxiway Echo and Charlie and positioned the truck at the designated ARFF standby position for runway 10. Captain Forester received a call from ATC that the airplane was landing on runway 19, so Fox 6 repositioned to the standby position for runway 19. Captain Forester told the driver of Fox 2 to go around the service road and follow the airplane in for landing on runway 19. Fox 5, Fox 7 and Fox 6 waited by the terminal (adjacent to runway 19) for the airplane to touchdown. As the airplane landed he saw a burst of smoke, and a second burst of smoke (from the tires skidding on the runway), then the airplane veered off the runway and came to a stop in the soft ground adjacent to the runway.

The ARFF trucks moved within a safe distance of the airplane. After the airplane came to a stop, he saw the 1L slide deployed. He and Captain Forester got out of their truck and approached the 1R exit. The 1R slide dropped out the door and began to inflate, but was tangled in lines and would not fully extend or inflate. He and Captain Forester reached up and attempted to pull the slide toward the ground, but it would not fully extend because of the tangled lines. The co-pilot was standing in the 1R doorway and blocked the 1R door.

He went around the airplane and assisted passengers coming down 1L slide. After the passengers had evacuated the airplane, he got a ladder out of an ARFF truck and put it at the 1R door to enter the cabin. He entered the airplane and made an initial search of the cabin, and found that all the passengers had evacuated the cabin. He did not see any signs of smoke or smell smoke. He entered the cockpit and made sure the electrical systems were shut down. He received the passenger manifest from one of the pilots and he was asked to get baggage for passengers who needed medication from their luggage. He stated that there were 104 passengers listed on the manifest.

After they got the luggage off the airplane, a couple of the firemen evaluated passengers with minor back pain and anxiety issues. One passenger wanted his vital signs taken. He thought that passengers coming down the 2L and 2R slides were coming so fast that three or four people became stacked at the bottom of the slide. ARFF was at each slide and helped the passengers off the slides. About 1 hour passed before the busses arrived at the service road to pick up the passengers. Airport Operations personnel, captain Lindblom, and Airport Police had moved the passengers and crew about 100 yards away from the airplane, on a service road until the busses arrived. There originally were 12 firefighters per shift, now the minimum is 6 firefighters per shift. The reduced ARFF staffing occurred in the middle of last year, right after the new airport

administration took office. With only 6 ARFF firefighters they would not have enough firefighters to staff the ARFF trucks and send firefighters inside a burning airplane to rescue passengers.

Cynthia L. Keegan
Sr. Survival Factors Engineer

Attachments

1. Photographs of UAL 497 (provided by UAL and MSY ARFF where noted)
2. MSY NOTAMs