NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF AVIATION SAFETY
WASHINGTON, D.C.

May 30, 2008

SURVIVAL FACTORS GROUP FACTUAL REPORT

A. Accident : DCA07MA310

LOCATION	:	St. Louis, Missouri
DATE	:	September 28, 2007
TIME	:	1316 Central Daylight Time (CDT)[1]
AIRCRAFT	:	McDonnell Douglas DC-9-82 (MD-82), Flight 1400, N454AA
OPERATOR	:	American Airlines

B. Survival Factors Group

Chairman	:	Courtney H. Liedler National Transportation Safety Board Washington, D.C.
Member	:	Susanne Konrath Federal Aviation Administration Chicago, IL
Member	:	Lonny Glover Association of Professional Flight Attendants Euless, TX
Member	:	Steven Bereznak American Airlines Ft. Worth, TX
Member	:	Glennon J. Pudlowski Lambert-St. Louis International Airport St. Louis, MO

[1] All times in this report are central daylight time, based on a 24-hour clock

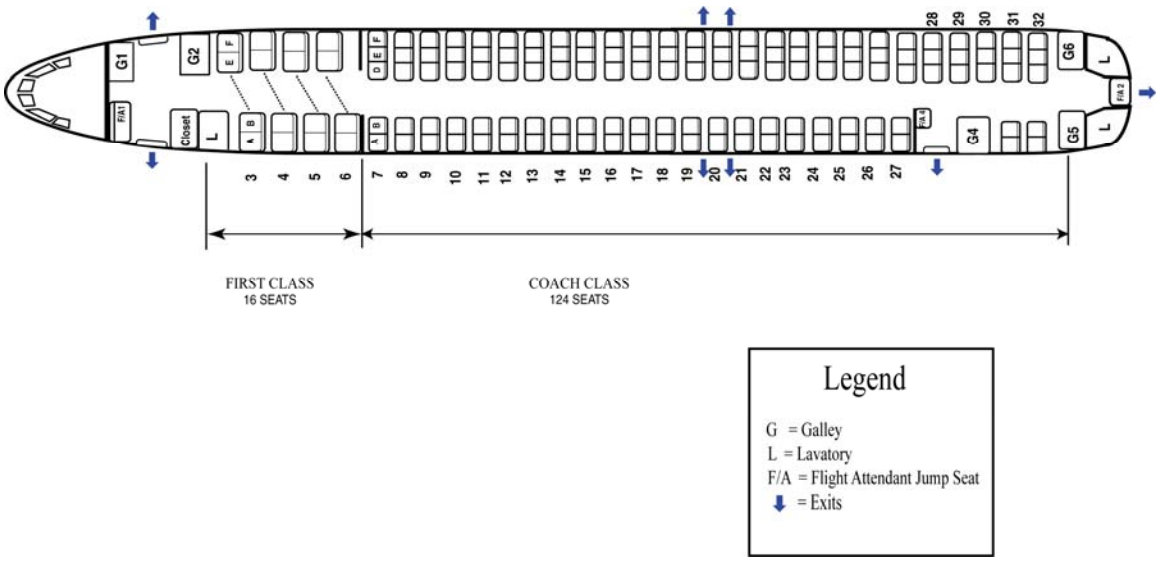
C. Summary

On September 28, 2007, at 1316 central daylight time, a McDonnell Douglas DC-9-82 (MD-82), N454AA, operated by American Airlines as flight 1400, executed an emergency landing at Lambert-St Louis International Airport (STL), St. Louis, Missouri, after the flight crew received a left engine fire warning during departure climb from the airport. The airplane sustained substantial damage. Visual meteorological conditions prevailed and an instrument flight rules flight plan was filed for the 14 CFR Part 121 scheduled domestic flight. After landing, the 2 flight crew, 3 flight attendants, and 138 passengers deplaned via airstairs and no occupant injuries were reported. The intended destination of the flight was Chicago O'Hare International Airport (ORD), Chicago, Illinois.

D. Details of the Investigation

1.0 Airplane Configuration

The below diagrams depict the airplane configuration for N454AA.



2.0 Crew Information

2.1 Cockpit Crew Interviews

Summaries of flight crew interviews are included in the Operations/Human Performance Group Chairmen's Factual Report.

2.2 Cabin Crew

All three flight attendants were qualified and current on the MD-82 airplane.

Flight Attendant Name and Position	Date of Hire	Recurrent Training Completion Date	FAA Certification Number
Nancy Harrigan, #1	May 14, 1999	March 08, 2007	2970027
Karen Allen, #2	March 5, 1992	July 19, 2007	2981027
Christine Kass, #4	August 13, 1992	April 23, 2007	2970553

2.2.1 Cabin Crew Interview Summaries[2]

Flight Attendant #1
Nancy Harrigan
Lead Flight Attendant
Forward Jumpseat
8.5 years of experience

Ms. Harrigan that during the preflight briefing the Captain told her there would be a 10 to 15 minute delay due to the start valve. About two to four minutes after takeoff, about a few thousand feet in the air, she heard the "bells and whistles" going off in the flight deck. She also heard the audible "fire left engine" sound through the flight deck door.

The Captain called to the FAs first, and then announced on the PA system that there was a problem with the engine. The Captain also told the FAs to be prepared to evacuate, but that he did not think it would be necessary. Ms. Harrigan said she was already going over the evacuation process in her head and had already picked out her "helpers."

Shortly after the PA announcement, the flight deck door came open on its own. Ms. Harrigan was not sure if the flight deck crew wanted it open or if it was a "takeoff

[2] Survival Factor Group Members Lonny Glover and Susan Konrath, along with the Group Chairman, participated in flight attendant interviews.

thing." She explained that although American Airlines procedure is to leave the door open until they level-off (not to close it while they are climbing), she thought it would be better to close it immediately because the flight deck crew was busy inside. That is when Ms. Harrigan realized they were no longer climbing, which "is not normal." Since they were flying level, she got out of her jump seat to close the flight deck door again. Ms. Harrigan said explained that she had trouble closing the door; it did not want to "catch." She sat back on her jump seat and she believed the First Officer was able to pull the door closed.

The Captain told her that they would be landing in about five minutes and told her to stay in her jumpseat. Then, the Captain made an announcement on the PA that they would be going back to St. Louis. Ms. Harrigan also made a PA announcement that they would be returning to St. Louis to "check something." Except for one woman sitting in row 3, the passengers seemed calm. Five minutes passed and they had still not landed at St. Louis. The flight deck crew made no interphone or PA announcements to explain why it was taking longer than five minutes. She explained that she was not really worried because she still did not know if there actually was a fire, and she did not feel any of the same airplane abnormalities as the two flight attendants in the aft.

Through the flight deck door, the Captain asked Ms. Harrigan to go get the dead-heading Captain in seat 9D. She got up from her jumpseat and proceeded down the aisle to get him when he started heading up the aisle toward her. The Captain opened the flight deck door for the dead-heading captain and he went into the flight deck, closing the door behind him.

Ms. Harrigan said she could not see land through the window in the L1 door until the airplane made a turn and then she could see farmland below. She was unsure exactly where they were. Then Ms. Harrigan heard the landing gear go down and she felt a "hard landing." She said it seemed that the Captain was really braking hard. She estimated the time from take-off to landing was about 15 to 20 minutes.

When the airplane stopped Ms. Harrigan saw a fire truck pull up to the forward entry door. She was a little bothered by the fire truck parking in front of the door. If there was an evacuation, she knew they would not be using the aft left door if there was an engine fire. With a fire engine blocking the forward entry door, there would only be the over-wing exits left to evacuate through.

Shortly after the fire truck pulled up, the Captain came out of the flight deck and told Ms. Harrigan to disarm the L1 door to allow the firemen to come aboard. She did not recall the flight deck crew coming out of the flight deck to check cabin conditions or ask the flight attendants about the conditions in the cabin. She said that the firemen were on-board very quickly. Ms. Harrigan believed between four to six firemen came onto the airplane, however she did not recall how the firemen got onto or off the airplane. Ms. Harrigan said the firemen went straight to the back of the airplane. When the firemen returned to the front to get off the airplane, one fireman told her the engine was "really fried."

Ms. Harrigan said the flight deck crew told her something about being towed back to the gate, but the decision to be towed back changed quickly. She recalled that air stairs and buses arrived for deplaning of the passengers. There was a gap between the airplane and the top of the air stairs, so the First Officer and a fireman helped passengers across the gap and off the airplane. She backed away from the L1 exit into the flight deck to get out of the way. When she was in the flight deck, she asked the Captain if the passengers should leave their belongings. The Captain told Ms. Harrigan to ask the firemen. She did, and the firemen told her the passengers should leave their bags on the airplane. Both the Captain and Ms. Harrigan made a PA to the passengers to leave their bags on the airplane. She said the FAs elected to stay by their doors in case they had to "blow the slides."

After all the passengers were off the plane, the FAs got off the airplane to look at the engine. Then someone, who Ms. Harrigan recalled was not a crewmember or fireman, told the FAs to get their belongings and get on the bus "right away." A bus took the FAs to the terminal.

Ms. Harrigan said there was no flickering or electrical outage any time during the event. She stayed at her jumpseat most of the time in case there was a fire and they needed to evacuate. Although she disarmed the L1 door for the firemen, she never disarmed the R1 door. She was prepared for an evacuation, but really did not think it would be needed.

Ms. Harrigan did not hear any audible warnings in the flight deck regarding the landing gear, and did not overhear any discussion about the landing gear through the flight deck door. She was unaware there was a problem with the landing gear.

Flight Attendant (FA) #2
Karen Allen
Aft jumpseat/tailcone exit
16 years experience

Ms. Allen stated that taxi seemed and sounded normal. But, upon take off, the left engine did not sound normal; it sounded as if it was only operating on half power compared to the right engine. As the plane ascended, the engine still did not sound full capacity. She did not notice any electrical problems in the cabin.

Ms. Allen thought it was strange that the aircraft leveled-off after only one or one-and-a-half minutes, instead of continuing to climb higher. She thought that something might be wrong, so she looked to the flight attendant seated at the aft galley jumpseat (FA #4) and tried to get her attention by waving her arms. She held up the interphone so FA #4 would know that she wanted to talk. Ms. Allen asked FA #4 "what is wrong? Something does not sound right." FA #4 said, "I agree."

As she hung up the phone with FA #4, the Captain called the flight attendants via the interphone. She picked the phone back up and listened. Ms. Allen said that the

Captain told the flight attendants there was a warning light that indicated a fire in the left engine. Because of that warning they were heading back to STL and would be on the ground in five or ten minutes. The Captain instructed the flight attendants to stay in their seats. The Captain stated if an evacuation were necessary, he would signal the evacuation by saying, "easy victor." Ms. Allen said she felt there was good communication with the cockpit and had received enough information from the Captain.

Ms. Allen stated that a flight crewmember made an announcement to the passengers over the public address (PA) that there was "a problem with the left engine so they were returning to STL. Everyone should stay seated. There was nothing to worry about and they would be on the ground in five to ten minutes." She was not certain which flight deck crewmember made the announcement.

Ms. Allen felt the airplane climb a little more, and then level off again. The cockpit door opened and Ms. Allen saw FA #1 try to close the door, but FA #1 seemed to have difficulty closing the door. The first time FA #1 tried to close the door from her jumpseat, but when it did not "catch" FA #1 stood up to close the door. Then Ms. Allen saw FA #1 get up and begin to walk through the first class cabin, toward the deadheading Captain seated in row 9. FA #1 was only half-way through first class when the deadheading Captain got up from his seat, walked forward and entered the cockpit. The deadheading Captain closed the door behind him.

Ms. Allen stayed on her jumpseat while they circled around. She could not see outside because her jumpseat is in the back of the plane, near the tailcone. Ms. Allen explained there were no windows for her to look through. While seated, Ms. Allen heard two "pops" and then a "swooshing" sound, like the sound of an emergency escape slide deploying. Her first thought was that the tailcone slide had deployed. She looked through the little window on the door to the tailcone and saw that everything was normal. Ms. Allen again held up the interphone so FA #2 would know to pick it up. Ms. Allen asked FA #2 if she "could see the ground yet?" FA #2 replied, "yes, another minute or two." Ms. Allen said the passengers seemed calm, and the two women seated next to the engine in seats 31 A/B never gave Ms. Allen any indication that "anything was wrong." Ms. Allen explained the women in seats 31 A/B would not have been able to see the engine because they had lowered their window shade.

While on approach to land, Ms. Allen mentally reviewed her evacuation procedures because the Captain had given the flight attendants information on evacuation (the "TEST" questions[3]). Ms. Allen felt the approach was faster than normal when coming in for landing. Once the airplane was on the ground, it seemed to "sashay" a little bit side-to-side and it didn't seem as if the brakes were working right. She said she was not aware of any problem with the nose gear.

Once the airplane came to a complete stop, the passengers applauded. The Captain announced over the PA that there was emergency equipment outside. He advised the passengers not to be concerned because the emergency equipment was there for their

[3] "TEST" is explained further in Ms. Kass's flight attendant interview, below.

safety and that some of the ARFF were going to board the airplane. Ms. Allen stated she knew at that point there would be no evacuation since ARFF was coming on board.

Ms. Allen stated that ARFF boarded through the L1 door and came to the back of the airplane. She had remained at her jumpseat until then, but got up to allow ARFF access to the lavatory. They looked in the left lavatory, opened the window shades at seats 31 A/B to look out the window and asked Ms. Allen if she heard or smelled anything. Ms. Allen told ARFF that she heard two "popping" sounds and ARFF told her it was probably the engine fire extinguishers discharging. She also told ARFF there was a very faint electrical smell. When the window shade was up, Ms. Allen saw a black streak at the top and bottom of the left engine.

Once ARFF got off the plane, a flight deck crewmember made a PA that buses were coming to the airplane to take the passengers to the terminal and they should leave their carry-on baggage. The passengers were told that they could go back on the airplane to retrieve their belongings once it had been towed to the gate. FA #1 made another PA to tell the passengers they could take their purses. Ms. Allen stated that passengers deplaned faster than normal, probably because they left their luggage. However, there was no sense of urgency. She said the passengers deplaned as if they were late for their next flight and were in a hurry. Ms. Allen said passengers were not yelling or screaming, it seemed the passengers did not feel they were in danger.

Ms. Allen stated that she did not initiate evacuation because she was waiting to hear from the Captain and the Captain did not order an evacuation.

Flight Attendant #4
Christine Kass
Aft Door L2 Jumpseat
16 years experience

Ms. Kass was aware there was a problem with the manual start valve on the left engine before they left STL. The flight deck crew advised the FAs there was possibility that maintenance would need to replace the valve, which could take about 15 minutes. About five minutes later, the Captain said they were "good to go." They took off out of STL, headed to Chicago. Ms. Kass knew something was not right because the airplane was not accelerating and it was not climbing. She heard "grinding and groaning" noises. The passenger seated next to her (across from her jump seat) also knew something was wrong. Ms. Kass reassured the passenger everything was "okay." They flew "a little while longer" before the FAs received the emergency four-chime notification from the flight deck crew.

All Flight Attendants picked up their interphones. The Captain provided the emergency "TEST" information to the FAs. Ms. Kass explained that T.E.S.T was:

T~ Time: would be five to ten minutes until they landed
E~ Evacuation: would probably not be necessary

S~ Signal: would be the “Easy Victor” command
T~ Type of emergency: a fire indication in the left engine.

Immediately after the Captain called the FAs, the Captain made a PA to the passengers. He announced there was a problem with the airplane and they would be returning to STL. He advised the passengers to keep their seatbelts fastened, that everything would be “okay” and to remain calm. The Captain did not indicate to passengers the engine was on fire.

The lead flight attendant (FA#1) made a similar PA, reiterating the same information the Captain had just provided. The airplane did not appear to be flying level, the left side seemed “down slightly.” Ms. Kass heard noises from the left engine area that were not familiar sounding, similar to the sound of a slide deploying.

Ms. Kass sat in her jumpseat and mentally reviewed her commands and procedures. There was a dead-heading Captain seated close to her jumpseat that she knew would be the first at her door. She figured she would use him as her assistant in an evacuation, if it was necessary. The passengers were very attentive at this time and were watching the FAs actions. Ms. Kass continued looking out the windows on the right side of the airplane. About five minutes had passed and they had not landed. It felt as if the airplane was circling and it seemed like a really long time. Ms. Kass was not aware of a problem with the nose gear, or that they were conducting a go-around.

She picked up the interphone next to her jump seat to talk to the #2 FA, seated on the back tailcone jump seat. She told the #2 FA she “didn’t know what was happening but it had been an awfully long time.” She knew the engine was possibly on fire and wanted to get on the ground as soon as possible. Ms Kass sat in her jumpseat and continued to review her procedures and commands. Ms. Kass knew the flight deck crew was very busy and they would give the FAs as much information as they could. She never felt the flight deck crew was not providing enough communication with the FAs. She knew it would be “okay.”

Then the flightcrew made a PA to the passengers that they would be landing soon. They advised the passengers there would be firefighting equipment outside but not to be concerned, to pay attention to the FAs since they were well-trained and the best source of help in the situation. The PA seemed to “impress” passengers, they seemed calm, and gave Ms. Kass a sense of assurance as well. The passengers had their eyes on Ms. Kass and she felt confident.

The airplane had a hard landing and “bounced.” The airplane seemed to come in faster than normal and it took some time to stop. It also seemed the flight deck crew was having difficulty steering the plane. Once the plane stopped, all the passengers clapped. The FAs were on edge since they were still unsure if evacuation would be needed. The flight deck crew made another PA asking passengers to “please remain seated, everything was okay.” Ms. Kass still knew anything could happen and she was guarded “just in

case." Then Ms. Kass saw foam coming down the outside of her door and across to the other side of the airplane.

The flight deck crew made another PA that firefighters would be coming onto the airplane to "check things out" as a precautionary measure. She estimated approximately six or seven firemen came onboard. The firemen went to the back of the airplane to check things, and mostly spoke to FA #2. The firemen opened the aft left lavatory, a few overhead bins, looked in the galley and opened window shades. They asked FA #2 if she smelled anything funny and she told the firemen there was an "odd" smell when they were landing. FA #2 also said the cabin felt hot during the flight.

Ms Kass said the flight deck crew told the FAs they were going to taxi to the gate to let people off or would wait for a tug. A while later, the Captain announced there was some residual fuel from the engine and he and the firefighters decided it would be best to bring stairs up and bus passengers to the terminal. The passengers were asked to leave their luggage on the airplane. Ms. Kass kept her door armed because she did not know if she would need to evacuate at any time.

Passengers appeared to have different responses to the situation. Most were very calm, with no sense of emergency, and deplaned safely and orderly with no pushing or shoving. Some passengers started to collect their carry-on luggage and she told them to leave it behind since there was limited room on the buses. After the passengers deplaned, the FAs went toward the front and exited the airplane through the L1 door.

Ms. Kass never felt a sense of urgency to get passengers off because there was no smoke or fire. She remained on her jumpseat until they came to a stop since no decisions to evacuate are made until the plane comes to a complete stop. When the plane came to a complete stop the Captain made his PA and she did not feel the need to evacuate. She also figured her door would be the last to be opened because the fire was on her side of the airplane. She stated that if she does not hear from the flight crew, she would sit on her jumpseat and then call FA #1 to see if she knew anything. She learned in FA training that FAs may need to sit there for "awhile" before the flight deck lets them know "its okay." Ms. Kass also said that FA training included crew resource management (CRM).

2.3 Flight Attendant Evacuation Procedures

The American Airlines Flight Attendant Manual, Section 3, *Evacuations*, states:

Section 3.1, *General Principles of Evacuation*:

GENERAL PRINCIPLES OF EVACUATION

- If an emergency situation develops, be prepared to evacuate the A/C. Stay alert to clues that may signal a possible emergency.
  - Unusual noises
  - Fire, sparks, or smoke
  - Impact forces
  - Abnormal A/C attitude
- Do not initiate an evacuation until the A/C has come to a complete and final stop.
  - Be prepared for more than one impact.
  - Be alert to any sense of motion, i.e., any sense of movement out the window, or outside noises if vision is impaired.
- Begin evacuation command immediately upon signal from the cockpit.
  - If one F/A initiates an evacuation, all F/As must initiate evacuation procedures immediately by shouting evacuation commands.
- Be aware of any additional instructions given over the P.A. by the Captain. For example, if the Captain instructs not to use a specific exit, do **not** use.
  - Any time the Captain specifies an exit during an evacuation P.A., it means **not** to use that exit.
- If the A/C is on taxiway and **time permits**, notify the cockpit prior to initiating the evacuation.
  - This will enable the cockpit to begin the cockpit checklist, i.e., shutting down engine power, pulling circuit breakers, etc.
- If an evacuation is necessary and the A/C is still moving, notify the cockpit immediately using four chimes.

Section 3.2, *Flight Attendant and Cockpit Crew [Evacuation] Authority*, states:

F/A AND COCKPIT CREW AUTHORITY

In a life-threatening situation, i.e., fire, smoke, impact forces, or abnormal A/C attitude, and when the A/C has come to a complete stop, F/As have the authority to initiate an evacuation without awaiting instructions from the cockpit.

- F/As will attempt to communicate with cockpit prior to evacuation, if possible.
- If contact with the cockpit is not possible, F/As will make an independent decision regarding evacuation and operate all usable exits.
- The Captain has the authority to override F/A procedures.
- The Captain has authority to check crews' knowledge of emergency procedures.

Section 3.2, *Flight Attendant and Cockpit Crew Safety Responsibilities*, states:

F/A AND COCKPIT CREW SAFETY RESPONSIBILITIES

F/As Responsibilities

- In an emergency situation, F/As are primarily responsible for passenger safety.
- F/As are responsible for informing the Captain immediately, and at any time, they believe the passengers, crew, or A/C are in jeopardy.
  - Provide Captain with continuous updates.
- F/A 1/Purser is responsible for coordinating with the cockpit crew.
  - All communication with the cockpit should be through the F/A 1/Purser.
  - Crew communication is of the utmost importance to ensure the safety of both the passengers and the crew.

Involved F/As must submit an AMR Event Report within 24 hours.

2.4 Flight Attendant Crew Resource Management (CRM) Training

2.4.1 CRM Training Requirements

14 CFR Part 121.404, *Training Program, Compliance dates: Crew and dispatcher resource management training* states,

"… after March 19, 1999, no certificate holder may use a person as a flight attendant … unless that person has completed approved crew resource management (CRM) initial training …"

14 CFR 121.427, *Recurrent training* (b)(4) requires approved recurrent CRM training."

2.4.2 Flight Attendant Human Factors Safety Training (HFST) [4]

According to an American Airlines Cabin Safety Administrator, all FAs completed Human Factors Safety Training (HFST) during initial and recurrent training. The HFST training provided to FAs is developed annually and is the same program for initial and recurrent training. The FAs do not attend HFST in the same class as pilots; however, the April 2007 training program included instruction assistance by a pilot. According to the American Airlines Recurrent Training Program, HFST is a one-hour class taught on the second day of training.

The April 2007 HFST discussed two emergencies that occurred on American Airlines flights to examine the HFST during the events. One of the emergencies discussed was an engine fire on take-off. After reviewing the details of the event, the instructor explains:

[4] American Airlines' Human Resource Safety Training meets the CRM training requirements.

"When a fire erupts on the exterior of an aircraft and the fuselage is intact, statistics show that it will most likely be extinguished **before** becoming life threatening to the occupants of that aircraft. To help us learn more about the threat of fire outside an aircraft, we're going to turn to the experts."

The instructor shows a training video, which was incorporated into the HFST training in 2007, of an American Airlines training instructor interviewing DFW ARFF personnel regarding flight crew communication with ARFF and evacuation decisions[5].

After watching the video, the FA instructor continues:

"As you can see, the Aircraft Rescue and Firefighting team plays an important role in keeping us safe. American Airlines F/As have the authority to initiate an evacuation, but we must consider what is "life-threatening". When an aircraft fuselage is fully intact, the chance of a fire outside the aircraft consuming the cabin interior before it can extinguished is very slim.'

"The greater danger might be what's happening outside the aircraft and the greater safety staying put. Attempt at all times to communicate with the cockpit before making the critical decision to begin an evacuation."

Then the pilot instructor assisting adds:

"The more knowledge we have of the capabilities of our resources on the ground, the more informed decisions we make. What we as pilots ask of you is to give us time to assess the situation and to give the ARFF personnel time to do their jobs. If you deem the situation to be life-threatening and you do elect to evacuate, please let us know, for we may not know what is happening in the back of the aircraft."

3.0 Passenger Information

3.1 Passenger Deplaning

Passengers deplaned while the airplane was on the runway. According to STL Airport Operations, passengers were transported via busses to the Main Terminal, Concourse C as directed by American Airlines management.

[5] A detailed description of this video is included in the Operations/Human Performance Group Chairmen's Factual Report.

According to the STL Operations and Communications Center *Aircraft/Incident/Accident Report* (see Attachment 1), the emergency buses were dispatched at 1320 local. The two field maintenance buses were staged at taxiway Delta and taxiway Victor, just south of runway 12R-30L and east of the aircraft scene, approximately five minutes after they were dispatched.

According to the STL Airport Police Department, *Law Enforcement Offense/Incident Report* (see Attachment 2), "the air traffic controller communicated to the captain by radio and asked [the Captain] twice if he wanted to de-board the passengers from the aircraft. The Captain advised the air traffic controller no, it wasn't necessary on both occasions."

According to the STL Airport Operations and Communications Center electronic logbook (see Attachment 3), at approximately 1402 local, "ARFF instructs the aircraft to deplane on the runway. ARFF airstairs and [maintenance] buses on scene."

3.2 Passenger Interview Summary[6]

Row 32, Seat B
Age 28
Female

The passenger seated in Row 32, seat B explained that she is a frequent flyer. She said she typically flies for work two to three times a week. Once she boarded the plane and took her seat, she opened the window shade and saw there was a gray painted engine outside the window. When she realized she was not able to see anything outside, she closed the shade again. She was not looking out the window during the incident.

She stated the Captain made an announcement to the passengers before leaving the gate that there was a problem with the left engine and it would take five minutes if they could fix it or 15 to 20 minutes if the part would need to be replaced. The problem was fixed and they departed the gate. The taxi seemed normal.

Right away after take-off, she heard unfamiliar noises, like something had fallen off the airplane with a "whooshing" sound. She also heard a "popping" sound. The departure "did not feel right." Like the airplane was "lagging" and having trouble getting off the ground. She also felt the airplane was "swaying back and forth, going up and down." As if the flight crew was having trouble "steering" the plane.

She saw the flight attendant behind her waving her hand in front of her face, and the passenger thought the flight attendant may have been trying to tell the flight attendant in the front something. Other passengers were looking around the airplane and looking at the flight attendants. The passenger heard three dings and the passenger did not want to turn around for fear of the flight attendant's expression. The Captain made an

[6] Passenger interview conducted by Survival Factors Group Chairman.

announcement that there was a problem with the airplane. That they were returning to STL to make an emergency landing, the flight attendants should stay in their seats and they would be landing in about five minutes. The Captain made another announcement for the passengers not to be surprised when the passengers saw they emergency vehicles on the runway.

Right before they landed, it seemed as though the airplane was climbing again. Soon after, the airplane hit the runway. It did not feel like a "nice and straight" landing, rather it was "hard and fast." All the passengers clapped when the airplane came to a stop. Firefighters began spraying foam on the engine, she saw it hitting the window.

The Captain made another announcement for the passengers to stay in their seats with the seatbelts fastened that the airplane was going to be towed back to the gate but it would take a while because the trucks were slow. About 30 minutes passed and she was irritated that they were keeping her on the airplane; she really wanted to get off the airplane as soon as possible. The Captain made another announcement that firefighter were coming on-board.

Firefighters came on-board and walked to the back of the airplane. They asked the passenger if she smelled smoke or felt any heat, she said "no." The flight attendant told the firefighter she smelled smoke as soon as the airplane took-off. The firefighter opened the window shade and the whole engine was charred black. The firefighter got off the airplane.

The Captain "got back on" and made an announcement there was a residual fuel leak. He said passengers were going to evacuate onto the runway and busses would pick-up the passengers. The passengers were instructed to leave everything in the overheads, but for the ladies to grab their purses. She took her laptop out from her overhead bag.

All of the passengers evacuated through the front, but the flight attendants did not tell any of the passengers why they were only using one exit. She was the last passenger off the airplane. It did not seem like there was a "big rush" to get passengers off the airplane. The bus made three trips to the terminal; she was on the second trip. She estimated it took about ten minutes for the bus to return to the airplane between trips, and it was about a half-hour from when the started evacuation until she got to the terminal.

Once she arrived at the terminal, American Airlines employees told her to take a seat in the gate area. She thought the passengers would be taken to a private room to be debriefed on the situation and offered refreshments. The passengers seemed calm, but they were upset and wanted to know why the airplane even attempted to take off with the initial problems with the engine. In her opinion, the American Airlines employees were being "flip and smiling."

4.0 Medical and Pathological Information

According to American Airlines, no passengers or crew reported injuries following the accident.

4.1 Injury Table

Injuries	Flight Crew	Flight Attendants	Passengers	Total
Fatal	0	0	0	0
Serious	0	0	0	0
Minor	0	0	0	0
None	2	3	138	143
Total	2	3	138	143

5.0 Airplane Documentation

Safety Board staff did not document the interior of the cabin. According to American Airlines, the masks were not deployed, slides were not utilized, and all of the substantial damage to the airplane was on the exterior. There was no breech by fire or smoke into the main cabin area.

6.0 Airport Certification

6.1 Location of Airport

STL is located in St. Louis, St. Louis County, Missouri. The Airport is located approximately ten miles northwest of downtown St. Louis, and is positioned at 38°44’55.31”N and 90°22’12/10”W at an elevation of 618 feet. STL is certificated under Title 14 Code of Federal Regulations (CFR) Part 139, with Index D aircraft rescue and firefighting (ARFF) service.

The airfield consisted of four precision instrument runways (see Attachment 4 for STL Airport Diagram). Runway 12L-30R was 9,003 feet in length by 150 feet wide, and constructed of grooved concrete. Runway 12R-30L was 11,019 feet in length by 150 feet wide, and was constructed of grooved concrete. Runway 11-29 was 9,001 feet in length by 150 wide, and constructed on grooved concrete. Runway 06-24 was 7,602 feet in length by 150 feet wide, and was constructed of grooved concrete. All runways had instrument approaches. The airport had 24-hour air traffic control tower (ATCT) service.

6.2 Airport Emergency Plan (AEP)

The Federal Aviation Administration (FAA) approved the Lambert-St. Louis International Airport AEP, which is included within the Airport Certification Manual, document on October 2006.

According to the AEP, Section H - *Organization and Assignment of Responsibilities*¸ states:

1. **ATCT**
   a. Make ARFF notification and clear all necessary emergency equipment to the scene of the emergency/crash.
   b. Hold all incoming/outgoing aircraft away from the airport or accident site until notified by the Airport-On-Site-Commander that limited or normal operations may be resumed.

2. **ARFF**
   Proceed to the site of the emergency/crash with all available emergency response vehicles in order to manage and direct firefighting and rescue operations
   a. Establish/maintain radio contact with ATCT for updates
   b. In charge of rescue operations and initialization of actions to save lives and to protect property
   c. Preserve wreckage and safeguard flight data/voice recorders until the National Transportation & Safety Board arrives to take control of the accident site

7.0 Airport Emergency Response

STL maintains vehicles and personnel meeting the 14 CFR Part 139.315 and 139.317 Index D[7] aircraft rescue and firefighting (ARFF) requirements.

The ARFF District of STL is the Eighth District of the St. Louis Fire Department. The ARFF station is staffed 24 hours a day, 365 days a year.

7.1 Notification

Within the AEP, Part II - *Functional Annexes,* Section C*, Alert and Warning* specifies:

[7] 14 CFR Part 139.315 defines Index D as aircraft at least 159 feet but less than 200 feet in length; 139.317 specifies one vehicle carrying at least 500 pounds of sodium-based dry chemical, halon 1211, or clean agent, and two vehicles carrying an amount of water and aqueous film-forming foam (AFFF) so the total quantity of water for foam production by all three vehicles is at least 4,000 gallons.

"In the event of an Alert I, II, or III[8], the primary method of alarm notification will be the Air Traffic Control Tower-to-Airport ARFF hot line. This is a direct hook-up phone line between the ATCT and the three ARFF stations. This is a two-way hook-up with alarms being sounded in all three locations when the alarm is activated. There are also "Crash Boxes" monitored in five different locations throughout the Airport Authority offices that are automatically activated when the ATCT-to-ARFF hotline is picked up."

According to the STL Operations and Communications Center radio log, the initial notification call was received from air traffic control (ATC) at approximately 1317 to set-up on runway 30R for an MD-80 with smoke in the aircraft, 142 souls-on-board and 3 hours of fuel. While ARFF was enroute to their stand-by locations for runway 30R, ATC changed the landing runway to runway 30L, subsequently changing ARFF's stand-by positions. ATC did not declare an Alert at the time of the emergency notification.

7.2 ARFF Response

According to the STL Airport Police Department, *Law Enforcement Offense/Incident Report,* ARFF arrived at their stand-by (see Attachment 5) locations at 1320. The airplane landed uneventfully on runway 30L at 1332 with the "left engine still slightly on fire and hydraulic issues with main landing gear doors hanging open." STL ARFF trucks followed the airplane down the runway on roll-out and positioned their vehicles around the airplane (see Attachment 6).

7.3 Command of ARFF Activities

Chief Henderson (in Truck 41) from the STL ARFF Department, North fire house, assumed command of the scene upon arrival at approximately 1332 and maintained command until the airplane was towed to the hangar at approximately 1537.

The IC sent three ARFF personnel (one Fire Captain and two firefighters) into the airplane to conduct a primary search of the airplane to ensure the fire had not penetrated or breached the interior of the airplane. The three ARFF personnel entered the airplane via the airstairs, through the L1 doorway. According to the IC, he did not want to use the tailcone stairs to gain access into the airplane because of the hazards associated with the fire in the left engine. To avoid any hazards, he used the airstair truck and evacuated the passengers out L1 door.

[8] According to the AEP, an Alert I is any incident, other than aircraft that requires some type of response by airport personnel, an Alert II is classified as an aircraft incident, and an Alert III is classified as an aircraft accident

According to the IC, ARFF can make the decision that an airplane should be evacuated depending on the emergency conditions and the type of incident involved. In the case of AA 1400, the flight crew mentioned a desire to taxi to the gate, but the IC made the final decision to deplane the aircraft.

7.4 ARFF Communication with Flight Crew

According to the IC, it is the responsibility of both, the flight crew or ARFF to initiate communication depending on the emergency conditions inside or outside of the aircraft that need to be conveyed to the other party. In the case of AA 1400, ARFF made visual contact with the flight crew upon arriving on-scene and then communicated with the flight crew on the discreet frequency and through an open flight deck window.

7.5 ARFF Equipment List

Seventeen ARFF personnel responded to the incident in 10 vehicles.

A list of ARFF equipment that responded to the site is included in Table 1, below.

Table 1. ARFF Vehicles Responding to Accident

Radio Call Sign	Personnel/Fire Station[9]	Vehicle Type	Capacities
Truck 41 (Car 841)	2/North	Chief's Vehicle, 2007 Chevrolet Tahoe	N/A
Truck 42	1/North	Quick Response, 2006 Mark I Quad Agent	90 gal H_2O, 10 gal AFFF[10], 500 lbs dry chemical
Truck 43	2/South	ARFF, 1999 Oshkosh T-3000	3,000 gal H_2O, 410 gal AFFF
Truck 45	2/North	ARFF, 2003 Oshkosh T-3000	3,000 gal H_2O, 420 gal AFFF, 700 lbs dry chemical
Truck 46	2/West	ARFF, 1994 Oshkosh T-2500 with Snozzle	2500 gal H_2O, 405 gal AFFF, 700 lbs dry chemical
Truck 48	2/North	ARFF RIV, 1992 Oshkosh 1500	1585 gal H_2O, 205 gal AFFF, 700 lbs dry chemical
Truck 49	2/South	Quick Response, 2005 Mark III Quad	90 gal H_2O, 10 gal AFFF, 500 lbs dry chemical

[9] STL has three on-airport ARFF Stations; north, south and west.
[10] AFFF is Aqueous Film Forming Foam

Radio Call Sign	Personnel/Fire Station[9]	Vehicle Type	Capacities
		Agent	
Truck 50	1/North	ARFF Rescue, 1997 Hummer	N/A
Truck 52	2/West	ARFF, 2006 Oshkosh (RIV) T-1500	1500 gal H_2O, 210 gal AFFF, 500 lbs dry chemical
Truck 53	1/West	Quick Response, 2006 Crash Rescue/ Access (Stair Truck)	90 gal H_2O, 10 gal AFFF, 500 lbs dry chemical

7.6 ARFF Interview Summaries[11]

Chief Raymond Henderson
38 years with the St Louis Fire Department
15 years as ARFF Fire Chief at STL

The ARFF Chief's vehicle was located in the north fire house and his designation is Truck 41 (or car 841). He received the audible over the alarm system for an MD 80 airplane with smoke in cabin, engine fire, and no nose gear. Based on ARFF's procedures, the sound of the alarm meant ARFF would set up on runway 30R. The Chief set up with the other ARFF units from the North fire house, at taxiways Echo and Papa. After staging the ARFF vehicles, he received a call from ATC that the airplane was conducting a fly-by to get a visual on the nose gear. Chief Henderson noted that the nose wheel was not down. Then the ATC instructed ARFF that the airplane would be conducting a go-around and all ARFF units needed to restage for runway 30L. Chief Henderson heard another call from airplane's captain that there was no smoke in the flight deck, the nose gear was down and there was still fire in the left engine. The airplane's Captain requested that ARFF vehicles follow the airplane down the runway. Chief Henderson explained that all ARFF trucks can monitor communications between ATC and the flight crew. However, only Truck 42 is allowed to communicate directly with ATC or talk on the discreet frequency with flight crew. Chief Henderson stated that the discreet frequency was used to speak to the flight crew between the time the airplane came to a stop on the runway until just prior to deplaning.

Once the airplane stopped, the airplane's Captain requested ARFF check the left engine for fire. Chief Henderson assumed the role of Incident Command. Initially, the Chief did not see any flames coming from the left engine, but noticed a "tremendous amount" of heat waves coming from the left engine. This indicated to him that there was

[11] Survival Factor Group Members Lonny Glover and Glennon Pudlowski, along with the Group Chairman, participated in ARFF interviews.

the possibility of existing fire inside the left engine cover. A Fire Captain walked up to the rear of the engine, looked into the tail and saw fire inside. Chief Henderson ordered a handline to be discharged inside the engine. The handline was pulled off of Truck 43 and 'Halotron' was discharged through the handline into the rear of the left engine. There was still a lot of heat coming from the engine. Chief Henderson ordered Truck 43 to use the rooftop turret to discharge foam into the left engine. The heat wave dissipated and Chief Henderson believed they had "hit the seat of the fire."

The Chief stated that during the extinguishing operations, a Fire Captain was communicating through the open flight deck window with the airplane's Captain to determine if there was smoke or fire inside the cabin. The flight crew reported none. Since there was no remaining fire in the engine, and no smoke in the cabin, the Chief said that he was going to allow the aircraft to taxi to the gate as requested by the flight crew. He stood-by with another Fire Captain discussing the passenger's safety and taxiing the airplane when a large amount of fluid "gushed' out of the bottom of the left engine. The "gush" then became a steady trickle. Chief Henderson figured the fluid may be fuel and ordered it be covered with foam. At this point he had determined that it was not safe to allow the aircraft to taxi or to be towed to the gate with the passengers still on board. The Chief told the Fire Captain to relay to the flight crew that the airplane would not taxi to the gate. The passengers would be deplaned in its' location using the airstairs and would be transported to the terminal via airport buses.

Chief Henderson asked the Fire Captain to notify ATC of the deplaning. The Chief stated that ATC also made contact with the flight crew to relay the airplane would not be able to taxi to the gate and the passengers were to be deplaned. Chief Henderson called for Truck 53 (the airstair vehicle) to position at the L1 door. Then he contacted airport operations and requested that buses respond to the airplane to transport passengers back to the terminal. The Chief stated that the passengers were deplaned, not evacuated, it was not "hurried or rushed."

After the passengers were off the airplane, an airline mechanic assessed the damage to the left engine. They were then allowed to tow the aircraft to the hanger, and ARFF followed behind the airplane.

The Chief said that once he made the decision to deplane, "it was final." The Chief explained that the flight crew may not have agreed with his decision to deplane, but he was hoping they would "go along" with it because "no matter what the flight crew wanted, a deplaning was going to occur."

The Chief stated he felt communication between the flight crew and ARFF was "good." There were some short conversations between the pilot and the Fire Captain on the discreet frequency, nothing specific; but most of the communication with the flight crew was accomplished face-to-face with the Fire Captain.

Captain Thomas McMahon
29 years with St Louis Fire Department
2 years at STL ARFF

Captain McMahon was stationed at the South Firehouse and responded in Truck 50, a 1995 Hummer. Truck 50 was designated as field commander at the time of the incident. Capt McMahon explained that Truck 42 used-to-be the truck 'In-Command' for all incidents. However, the truck In-Command recently changed to Truck 50. Capt McMahon stated air traffic control was talking to Truck 42 as the command vehicle 'out of habit.' Air traffic dispatched the south fire house to set up for an airplane emergency, an engine fire or engine out, on runway 30R. All ARFF equipment responded to their positions.

As the airplane approached, it appeared to be 'too high.' The left wing "dipped down" and he could see the left engine had a long trail of white smoke. He also noticed the nose gear was up. As the airplane passed over, Capt McMahon could see the left engine was destroyed. He saw the engine was burned black; the bottom of the engine was gone and there were dangling parts. He did not see visible fire on this pass.

ATC instructed all equipment from the South Firehouse to reposition for runway 30L. Both the South and West Firehouse's equipment came together at the intersection of runway 30L and taxiway November. There were a total of five vehicles the Captain Outlaw wanted dispersed along runway 30L before the airplane landed. The Captain ordered Truck 49 to stay at the intersection of runway 30L and taxiway November. Trucks 52 and 53 were staged at the intersection of runway 30L and taxiway echo, and Trucks 43 and 50 were staged at the taxiway Charlie – taxiway Romeo intersection. ATC notified ARFF that the airplane requested ARFF to follow it down the runway after touchdown, that it may be a violent landing.

Captain McMahon was the first truck to the airplane and he made eye contact with the pilot. Truck 49 chocked the nose gear and Truck 43 was positioned at the 7-o'clock position. Captain McMahon took a handline off Truck 43 and brought it to the left engine of the airplane. He then ran up to the pilot's window in the flight deck and motioned for the pilot to open the window. Captain McMahon asked the pilot if there was smoke in the cabin, and the pilot said there was none. He ran back to the left engine and saw small flames (similar to"candlelight") on the "belly of the engine housing." He extinguished the fire. He also noted evidence that there was fuel leaking from the engine. He could smell the fuel and the firefighting foam had a brown discoloration.

At this time, the other Fire Captains and all ARFF vehicles arrived, and the Chief assumed Incident Command. Two trucks poured foam on the back third of the fuselage and engine using their turrets. Once the Chief took command of the scene, Captain McMahon was assigned to the "hose team." Captain Redding and another firefighter placed a ladder up to the left engine. Captain McMahon instructed them to take the ladder down and instructed Truck 45 to position next to the left engine. Truck 45 was at a 4-o'clock position at the tail. Captain McMahon ordered firefighters to climb on top of

the truck with a hoseline to cover the engine with foam. They covered some of the fuselage and the engine before Captain Redding relayed that the Chief did not want this to continue. Firefighters moved the truck away from the airplane.

Captain McMahon returned to Truck 50 and listened to radio 'chatter' between the flight crew, ATC and ARFF (being relayed through airport operations personnel). He heard the flight initially wanted to taxi to the gate. Then the flight crew changed to having the airplane towed back to the gate. At this time, the tug was already connected to the airplane. ARFF then decided they did not want the airplane moved and Truck 53 was positioned to the L1 door to deplane the passengers. The passengers boarded busses and were taken to the terminal.

While passengers were deplaning, Captain McMahon was standing by the L1 door with a handline. As he stood by, the constant run-off of fuel from the left engine continued and the fuel smell was increasing. Captain McMahon applied foam to the ground.

ARFF equipment from the South fire house followed the airplane as the tug towed it to the hangar. Captain McMahon estimated the entire incident took about two-and-a-half hours.

Captain Ellis Outlaw
22 yrs with St Louis Fire Dept
3yrs at STL ARFF

Captain Outlaw responded from the North fire house in Truck 42, a rapid response truck (similar to Medium size pick-up truck). He received the alarm in the fire house for an MD-80 on short approach, four to five miles out, with smoke in the engine. They were told to stand-by for 30R. Captain Outlaw said it is difficult to understand the relayed information in the firehouse due to PA system.

His truck (42), and Trucks 48 and 45 responded to their stand-by points. Captain outlaw explained that the assigned stand-by positions for Trucks 42 and 48 are the intersection of taxiways Foxtrot and Juliet; and Truck 45 is the intersection of taxiways Foxtrot and Sierra. However, during this event Truck 45 responded to the intersection of taxiway Echo and Sierra due to the on-going construction of the new runway. ATC advised ARFF of the number of passengers and pounds of fuel on-board on the way out to the field from the North fire house.

While he was at his set-up location, ATC advised that the airplane could not get its nose gear down. ATC said the airplane was going to pass over the airport to verify that the nose gear was not down. Captain Outlaw used his binoculars and saw gear was not down and smoke was coming from the left engine. With this information, he advised his fireman to prepare for something more serious and have their "silvers" on.

While the airplane flew around again, ATC called and changed the set-up for runway 30L. This changed his stand-by location to the intersection of taxiways Echo and Juliet. Then ATC made another announcement that the flight crew secured the nose gear and they wanted to be followed down the runway. Captain Outlaw confirmed the information coming from ATC regarding the airplane, the number of passengers and pounds of fuel on-board.

The airplane landed nose high, landed hard with a bounce and then "settled down." It took up a lot of runway, not stopping until it was on the other side of runway 6-24. The airplane veered right as it stopped. He followed behind the airplane as it rolled down the runway and observed "moderate" smoke from left engine.

Captain Outlaw drove his truck around the aft right side of the airplane, drove up and around the front of the nose; and parked the truck slightly behind the L1 door area forward of wing. The ARFF vehicles parked in an "X" pattern around the airplane.

As a Captain, he was responsible for "sizing up" the airplane, but he explained he was not the field commander. He saw Truck 49 chocking the airplane tires and saw what appeared to be a small fire burning in the engine. Captain Outlaw communicated to ATC that part of the engine looked as though it had burned away, there was still a small fire burning in the engine and ARFF was in the process of extinguishing. Handlines were pulled off Truck 43 to extinguish the fire, which Captain Outlaw estimated took less than one minute.

Captain Outlaw saw the Captain of Truck 50 communicate with the pilot face to face through the cockpit window. Captain Outlaw was told the airplane was going to taxi back to the terminal. He relayed the information to ATC, that the airplane was going to taxi back to the gate and the fire was extinguished. Captain Outlaw explained that typically Truck 50 communicated with ATC, but since the Captain from Truck 50 was out of his truck speaking face-to-face with the flight crew, he took over communications. Their portable radios do not have tower frequency for communication; and ARFF speaks on the ATC frequency from inside a truck.

Captain Outlaw prepared vehicles to be moved and out of the way in preparation for taxi. He said the fire was out and conditions seemed to be stable. STL Airport Operations and American Airlines maintenance checked the left engine and wheels. ARFF stood by while this occurred. Then Captain Outlaw heard a tug was coming out to tow the airplane back to the terminal.

A few minutes had passed when he and the Chief discussed sending firefighters into the airplane in an effort to reassure the passengers and look for any signs of fire (such as an odor or smoke). The Chief positioned Truck 53 (air stairs) at the L1 door, and Captain Outlaw and four firemen went inside the airplane to check things out. They scanned the interior and found nothing, "everything looked good." Capt Outlaw and the other firefighters exited the airplane and Truck 53 moved away from the L1 door. ARFF also used a thermal imaging camera on the outside of the airplane again to assess any

heat. Everything looked normal with the exception of a 'little hot area' toward the top of the engine.

Captain Outlaw was standing on the left side of the airplane when he observed a large amount of fuel come out of the left engine and spill to the ground. He estimated it to be 15 to 20 gallons suddenly "gushed" out. Truck 43 was ordered by the Chief and several Fire Captains to blanket the spill and engine with foam.

After the fuel spill, the Chief decided to get the passengers off the airplane. The Chief spoke to airport operations to get the busses ready and repositioned Truck 53 back to the L1 door for deplaning. Captain Outlaw told two or three firefighters to go to the top of the stairs to advise the FAs that the passengers would be deplaned and assist passengers off the airplane. Captain Outlaw positioned two firefighters at the top of the stairs, two in the middle and he was at the bottom on the ground. The passengers deplaned orderly, and seemed very calm while deplaning.

When questioned who makes the decision to evacuate the passengers, he stated ARFF can make that decision. If an airplane lands and ARFF can see an immediate need to evacuate, ARFF would communicate that need to the flight crew and coordinate an evacuation. No matter what the flight crew says, ARFF can see dangers outside the airplane that the flight crew can not. His general concern was that the Incident Commander needed to be more assertive in making a decision to deplane the passengers.

Captain Zeffrow Redding
City of St. Louis Fire Department for 32 years
STL ARFF Department for 15 years

Captain Redding responded from the West fire house in Truck 53, which is the air stair truck. He explained that when he 'sets up' for runway 30L or 30R, he positions his vehicle at the Taxiway Tango and Taxiway Charlie intersection. For this response, air traffic told the west house fire equipment to set up at 30L at Taxiway Sierra. Because of this change in the set up position, Captain Redding knew they had something serious. He was not sure what the air traffic control tower said, but he recalled another ARFF member mentioning something about no nose gear. He responded down taxiway Bravo to taxiway Tango, and held short of the taxiway Charlie-runway 24 intersection.

While he was waiting at his set up position, the airplane conducted a fly by and he noticed smoke coming from the left, number 1 engine. When the airplane landed, he thought it was a "harder than normal" landing. He followed the plane down the runway. When they pulled Truck 53 up the plane, there was visible fire on the left engine. He parked the truck at the nose of the airplane. He described the fire was on the lower part of the engine and could see a "netting" or "micromesh of some sort was burning. There were two "shots" of agent fired at the engine. He estimated that it took about 10 to 15 seconds to extinguish the fire using handlines off of Truck 43.

Captain Redding explained that the ARFF Incident Commander takes command of the scene upon arrival and will make all decisions to evacuate when there is an on-going fire. Only once the fire is out does the flight crew get to make the decision. When there is no fire, ARFF usually waits for the flight crew to make a determination to evacuate.

Captain Redding stated there was no need to expeditiously egress the passengers, initially. It would get them upset and be an arbitrary evacuation. But after the fire was out, about 10 to 15 gallons of fluid 'dropped out' of the engine. At this point, agent was put on the fluid and Truck 42 relayed to Captain Redding there would be an evacuation. When an evacuation was decided, Captain Redding set the airstair truck up to the L1 door for evacuation. He assisted passengers from the top of the airstairs, over the gap between the stairs and the airplane. The fire had been extinguished when the passengers were evacuating.

STL ARFF had a discrete frequency; however, only truck 42 and the Chief's truck have the capability to use it. The discrete frequency cannot be obtained with STL ARFF's handheld radios.

Courtney H. Liedler

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Survival Factors Investigator

8.0 Attachments

1. STL Operations and Communications Center, *Aircraft/Incident/Accident Report*
2. STL Airport Police Department, *Law Enforcement Offense/Incident Report*
3. Airport Operations and Communications Center Electronic Logbook
4. STL Airport Diagram
5. STL ARFF Stand-by Locations
6. STL ARFF Staging Positions Around the Airplane

References:

1. Lambert St. Louis International Airport Certification Manual, dated January 3, 2008.
2. American Airlines Recurrent Training 2007-08, *Human Factors and Safety Training*, April 2, 2007.