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

AIRPORT AND EMERGENCY GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

A. ACCIDENT: DCA-99-MA-060

LOCATION: Little Rock National Airport
Little Rock, Arkansas

DATE: June 1, 1999

TIME : 2351 Central Daylight Time

AIRCRAFT: American Airlines Inc.
McDonnell Douglas MD-82, N215AA

B. AIRPORT GROUP

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C. SUMMARY

On June 1, 1999, at about 2351[1], a McDonnell Douglas MD-82, N215AA, operated by American Airlines as flight 1420, regularly scheduled passenger service from Dallas, Texas, overran the end of runway 4R and collided with the approach light stanchion at the Little Rock National Airport (LIT), in Little Rock, Arkansas. The captain and 10 passengers sustained fatal injuries; the remaining 134 passengers and crewmembers sustained various injuries. Shortly before the accident, the weather conditions at the airport were reported as: wind from 180 degrees at 9 knots, visibility 7 miles with thunderstorms, few clouds at 7,000 feet in cumulonimbus clouds, ceiling broken at 10,000 feet; temperature 77 degrees F, dew point 73 degrees F; altimeter, 29.86 Hg; Remarks - ASOS observation - thunderstorm began at 23 minutes after the hour, frequent lightning in clouds, and cloud-to-cloud, located from the west through the northwest; thunderstorms west through northwest moving northeast. The airplane was being operated in accordance with 14 CFR 121, and an instrument flight rules (IFR) flight plan had been filed.

D. DETAILS OF THE INVESTIGATION

1. Airport Information

LIT, elevation 262 feet msl, is located approximately 2 miles east of Little Rock, Arkansas. LIT is owned by the City of Little Rock and operated by the Little Rock Municipal Airport Commission. LIT is certified by the Federal Aviation Administration (FAA) at Aircraft Rescue and Fire Fighting (ARFF) index C[2] in accordance with the applicable provisions of Title

1 All times herein are central daylight time (CDT) based on the 24 hour clock unless otherwise noted.

2 ARFF Index C - 14 CFR Part 139.315/317 -minimum required for aircraft at least 126 feet, but less than 159 feet in length two or three vehicles with a total of at least 3000 gallons of water and Aqueous Film Forming Foam.

14 CFR Part 139. The last full scale disaster drill was held in October 1996. The last FAA annual airport certification inspection took place July 29-31, 1998.

LIT is served by three concrete transverse grooved runways, 4L/22R, 4R/22L, and 18/36. Runway 4R is 7200 feet long and 150 feet wide, and it is configured for precision instrument landings, and is equipped with high intensity runway edge lights, and centerline lights. 4R is also equipped with a medium intensity approach lighting system with runway alignment indicator lights (MALSR). Runway 22L is equipped with a partially[3] frangible approach lighting system (ALS). The runway safety area (RSA) at the approach end of runway 22L was 500 feet wide, and 451 feet from the runway threshold, with an instrument landing system (ILS) localizer antenna located 410 feet from the runway threshold.

2. Coefficient of Friction Measurements and Runway Assessments

The following coefficient of friction measurements and runway assessments were completed by the Federal Aviation Administration (FAA) Technical Center group member for inclusion in the Airport Group Field Notes:

FAA Advisory Circular (AC) 150/5320-12C *Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces (dated 3/18/97),* provided terminology and criteria for the inspections.

2.1 Visual Inspection

The full length runway 4R/22L was grooved Portland cement concrete (PCC). There was no evidence of structural pavement failure. There were several small (4"± diameter) holes in the pavement on the south side (approach 4R) of the pavement. Some of the holes had been repaired with epoxy. Minor shrinkage cracking and joint spalling was evident.

Contamination of the runway surface was limited to rubber deposits. Evidence of rubber deposits began at approximately station 6+00. Deposits were light and covered only 30% of the pavement 10 feet either side of centerline. At station 10+00 and through station 16+00 the rubber deposits remained light but covered the surface approximately 10 feet on either side of centerline. Rubber deposits were not significant again until station 45+00 to 60+00. Deposits extended out approximately 10 feet on either side of centerline and are light to medium.

2.2 Friction Measurement

AC 150/5320-12C, Section 3, described the procedure for conducting and evaluating friction surveys with continuous friction measuring equipment (CFME). Tests were conducted

3 The walkway structure above the approximate runway elevation is considered frangible, however the ALS support structure is non-frangible, and is located in a flood plain area of the Arkansas River.

at both 40 and 60 mph in both directions (4R and 22L). Average readings indicated the pavement surface is above the "Maintenance Planning Level" established by the AC. The rubber deposits in the touchdown zone bring the friction numbers near this maintenance planning trigger. CFME equipment was supplied and operated by Dallas-Fort Worth International Airport personnel. Calibrations were performed in the presence of FAA personnel.

2.3 Texture Measurement

The National Aeronautics and Space Administration (NASA) representative conducted a series of grease smear test as described in AC 150/5320-12C. Results indicate texture of runway 4R/22L at touchdown and rollout (1st and 3rd thirds of the runway) were at the levels where the airport operator should be planning to remove the rubber deposits. It should be noted that these texture readings are normally used only when CFME reading are low (paragraph 3-22 in AC 150/5320-12C).

2.4 Groove Measurements

Nominal groove dimensions for runway 4R/22L were ¼ inch deep by ¼ inch wide and spaced 2 inches center to center. All inspected grooves met the ¼ inch width and 2 inch spacing as specified in AC 150/5320-12A. Thirteen panels were selected for inspection of groove depth. The depth of each groove in the 19 foot-long panel was measured with a micrometer. The panels were randomly selected along the full length of runway 4R/22L. Several panels were selected along the "scuff marks" left by the main gear tires. Although several panels displayed signs of shallow groove spots (roughly 3 feet by 3 feet in area), the statistical average depth is ¼".

2.5 Transverse Slope:

The Airport and Emergency Response Group Chairman requested that the NASA representative conduct a series of measurements to verify the design transverse slope. Construction drawings indicated a slope of 1.5% (down). Field measurements as accomplished by the NASA representative averaged 1.42%.

3. Engineered Materials Arresting System

On April 14, 1999, a Joint Planning Conference was held at LIT between the FAA, LIT and LIT tenants to identify airport development needs within the following five years. According to the conference report a runway 4R-22L arresting system was identified as a recommended project in the year 2000.

On July 8, 1999, the Airport and Emergency Response Group Chairman and representatives from Engineered Systems of Lester, Pennsylvania (ESCO), developers of an Engineered Materials Arresting System (EMAS), surveyed the accident area in the vicinity of

the approach end of runway 22L at LIT. The Group Chairman requested that ESCO provide a model of what the consequences and/or effects to AAL Flight 1420 would have been, if an EMAS had been installed at the approach end of runway 22L. (See exhibit 16F).

4. Emergency Response

4.1 Notification and Response

According to ARFF interviewees, at about 2355, the LIT Air Traffic Control Tower (ATCT) notified the LIT ARFF station via the direct crash phone that he had an AA plane down on 4R, but the controller didn't know the location. The LIT ARFF Station responded with all ARFF trucks and personnel, which included 4 fire fighters and 3 trucks (see figure 1), Redball 1, 2 and 3, with 4500 gallons of water and Aqueous Film Forming Foam (AFFF) (1500 gallons per truck). According to the Little Rock Fire Department (LRFD) fire ground radio frequency tapes, at 2358, Redball 2 notified the Little Rock Central Communications that ARFF was responding to "an alarm from the tower on American hit on four right, that they've lost contact with (the airplane), we're investigating." The ARFF trucks proceeded slowly (20 to 30 mph), due to the unknown location of the airplane, and the severely restricted visibility, via taxiway R to the approach (southwest) end of runway 4R. At 0003, the fire captain (Redball 2) requested a "full response" from Central Communications.

The ARFF trucks proceeded slowly from the approach end of runway 4R, in a northwesterly direction, while searching for the airplane. At 0006, the fire captain reported to Little Rock Central Communications (LRCC): "This aircraft is off the northern end of runway four right. He's on the ground outside of the airport. The aircraft is on the ground he is burning, it is a (sic) Alert 3[4]," and at 0008, he reported: "…it appears to be in the river, we haven't gotten there yet, we're trying to get to it." The ARFF trucks observed the airplane on fire, from the approach end of runway 22L. They were unable to proceed directly to the airplane, because they could not traverse the rip rap slope at the end of the runway. They proceeded southwesterly on runway 22L to the access road, then northwesterly via the perimeter road to the accident site. Redball 2 reported on the scene at 0011, and set up a command post. ARFF trucks began to apply water and AFFF to the fire at the rear of the fuselage, and extinguished it in under 60 seconds.

The Metropolitan Emergency Medical Service (MEMS) dispatch received notification of an Alert 3 at 0005[5] from an off-duty dispatcher, who overheard Redball unit radio transmissions on his scanner. MEMS dispatch confirmed the Alert 3 at 0006 with the LRCC. At about 0008, the MEMS Supervisor received a radio transmission from MEMS dispatch that there were 80 persons on board. At 0011 the LRCC advised MEMS: "there was an American Airlines plane

4 Alert 3 - Defined in the LIT Emergency Plan as: "..an aircraft accident has occurred on or in the vicinity of the airport."

5 According to the LRFD accident report there was a difference of 2 minutes and 46 seconds between LRFD and MEMS recorded times.

down—we need a big response." The first two MEMS units reported in the area at 0017. After proceeding to a locked gate adjacent to the United Parcel Service Facility, which they could not open, they radioed the District Fire Chief, and proceeded through the south gate. The first 3 MEMS units, arrived at the accident site at 0022.

The LRFD reported that at the peak of the emergency response 13 engine companies, one ladder company, 1 heavy rescue unit, 1 hazardous materials unit, and 9 staff vehicles were involved. MEMS estimated that 19 ambulances, plus a number of other medical support/supply vehicles responded. The fire captain estimated that all three ARFF units used about 2300 gallons of AFFF and water to knock down the initial fire and a total of 520 gallons of AFFF concentrate for the total operation.

4.2 Interview Summaries

4.2.1 Aircraft Rescue and Fire Fighting Interviews

The driver of Redball 2 stated that he was outside the station, watching the weather, but he did not hear the airplane land or engine reverse thrust. As he came in the station door, the tower direct line crash telephone rang once. When he answered, the tower controller said, "I have an AA plane down on 4R , I've lost them, I don't know where they are." He responded, "You don't know where they are?" The tower repeated, "I don't where they are." He pushed the door-operating button and the doors opened. He beat on the dormitory door to alert the other firefighters, but he was met by firefighters already responding. He stated that there was no delay; the overhead door opened without delay with a punch of a button. He stated that the trucks were rolling in less than a minute.

Redball 3, drove out of the door on the right side, into blinding rain and wind, and drove to taxiway T. When the Redball 3 turned on the truck quartz lights it caused a "white sheet" effect As the trucks left the station they couldn't get city communication to respond due to large volume of radio traffic. As the trucks crossed taxiway T, at the south end of runway 4R, Redball 2 called the tower and reported that he couldn't find the aircraft, and asked if they should sweep the runway. Tower replied yes. The water on the airfield, was noted to be ½ inch to 3 inches or more, so the trucks were limited to 15-20 miles per hour maximum due to the poor visibility. Redball 3 went out taxiway T on the right, following Redball 1 with Redball 2 on the left. When turning the corner at taxiway R, they found it hard to see the taxiway edge lights, although they noted that the lights were on. Redball 3 looked in ditches for the airplane. As the trucks entered taxiway R city communications called and asked if full response was requested, which was confirmed by the Captain.

Visibility was about 100 feet at the approach end of runway 4R. As they headed north and passed the mid-field point on runway 4R, visibility improved. Redball 2 traveled the whole length of runway 4R, on left side. Through his rear-view mirror he saw the lights of another truck swing indicating to him that the other truck was hydroplaning. Redball 2 stated that he

experienced sliding on the pavement. As the trucks passed taxiway W, Redball 2 noted airplane tire tracks leaving the runway surface and that a runway light was missing. They had received no directions from the tower after the initial alarm except to grant clearance onto runway 4R. When the trucks arrived at the painted numbers (22L) they saw a glow and the Captain notified the tower of the Alert 3 status. Smoke from the fire was blowing diagonally to the Northeast.

They saw the airplane and fire in the low area adjacent to the river below the riprap at the north end of runway 4R, and they observed some survivors jumping out of the airplane through fire at the fuselage. The trucks turned around on the runway and proceeded back to the connector road on the east side of runway 4R to gate 34. The Captain and a fire fighter got out to open the locked perimeter security gate, which took about 20 seconds. As the trucks proceeded along the gravel perimeter road, they slowed as they encountered 30 to 40 survivors in the vicinity of the low-water bridge, about 2000 feet from the wreckage. Some of the survivors were hiding under hay bales trying to get out of the weather.

As the trucks approached the airplane they initiated bumper and roof turret applications on the main fire near the fuselage, and knocked it down in about 60 seconds. Fire fighters then got out and used the 1 inch booster lines to extinguish additional small fires under the left wing, which took about 30 seconds to knock down. Fire fighters continued to suppress smaller fires, and applied AFFF for another hour.

The LIT fire fighters stated that they did not use Self Contained Breathing Apparatus (SCBA) because donning the SCBA is too time consuming, and they lacked the additional personnel to don the SCBA while responding. They also commented that until they noted the tire tracks off runway, the trucks had to drive slowly in a search mode, and that this was a search and not a response since the tower had not given specific information of the airplane's location. Also some additional time was lost (about 20 seconds) while they had to stop and unlock a gate enroute to the accident site. They also stated that they found 5 burned bodies piled on each other "at forward edge of the aft section." The trucks expended water and half a tank of foam. They replenished water from two structural pumpers and kept applying foam to prevent re-ignition. Because all 4 fire fighters were involved in fire fighting, there were no ARFF personnel available to perform rescue operations.

The LIT fire fighters who were interviewed stated that an emergency locator transmitter (ELT) and receiver would have helped to locate the airplane if the airplane had been equipped with an ELT and if ARFF personnel had available, and were trained to use ELT detection equipment. They also observed that a crash grid chart[6] might have been helpful if the tower knew the location of the airplane. They also reported that a fire captain and a fire fighter went through the airplane and turned switches off. The floor track lighting in the cabin was still on.

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6 A crash grid chart is a diagram or map of the airfield an surrounding are which has a grid superimposed over it with numbers/letters designating each block, designed to facilitate response to a downed aircraft, when it's location is known.

4.2.2 On-Scene Commander Interview

The On-Scene Commander (OSC), a Little Rock Fire Department District Chief, responded from the central fire station, and went to scene as operations officer. He arrived at 0011. He reported that when the storm came through, several calls were received at the communications center regarding lightning. He monitored his radios and overheard Redball 2 report that an the tower had lost communication with AA 1420.

He advised the communications center that he would respond as operations officer, and he instructed the communications center to perform the notification checklist, and to advise MEMS that they needed all the ambulances. He then asked for a second alarm and police to monitor all gates to control traffic.

Upon arrival at the accident site he found that most of the fire was out and handlines were in use. He saw numerous people walking out of area. The OSC set up triage with MEMS and sent some of the city fire fighters into the aircraft and into the hayfield to search for survivors. The hay had been recently cut, and people were sheltering themselves from the storm with the bales. He then asked for buses to transport walking wounded and he asked for medical support vehicles with supplies and people to man them. After sending the fire fighters into the airplane, and having fire fighters complete line-abreast searches with multiple personnel, arms-width apart in the area, the OSC was confident that all passengers were accounted for in all areas except the tail which was inaccessible. Fire fighters also did two line-abreast searches with multiple personnel, arms-width apart to search for survivors. The search pattern included the area from the perimeter road north to the river and an area 100 feet east and west of the airplane. Fire fighters had to pull two or three people out of the first class cabin. Other personnel cut metal to get to the First Officer and extricate him.

4.2.3 Emergency Medical Services Interviews

The MEMS Supervisor, who was located at MEMS headquarters in downtown Little Rock, stated that at about 2350 a big thunderstorm came through, so he went to the MEMS communication center to check on the generator. At that time another MEMS employee called him from home to offer to come in to help with a plane crash he had heard about on the scanner. The MEMS supervisor checked with MEMS dispatch and learned of the crash.

About five minutes after departing from the communications center for the accident site, the MEMS supervisor arrived at the gate located by the United Parcel Service Facility, but found it locked. He looked for access but didn't know where the roads were so he radioed the district chief who directed him to the south gate. He followed a fire unit on to the airfield. He drove down the perimeter road on to runway 4R and went to the north end and parked. He arrived on the scene at 0022, saw the aircraft fuselage, retrieved his triage equipment, and went down the rocks to the scene. MEMS unit 219 arrived within two minutes of his arrival.

The MEMS supervisor reported that he found dozens of passengers who were walking, carrying injured persons. MEMS Unit 219 began triage activities with the mass-casualty incident truck that included two Emergency Medical Technicians (EMTs) and a paramedic. The MEMS Supervisor set up triage near the site, adjacent to the perimeter road east of the aircraft.

One patient had immediate need for transportation, so the MEMS Supervisor requested a MedFlight helicopter which landed on the runway, then repositioned on perimeter road west of the airplane and transported one red tagged[7] and one yellow tagged patient. One MEMS Advanced Life Support (ALS) unit loaded two more people. Ten ambulances staged along perimeter road. The MEMS supervisor was concern with bottle necking so airport personnel tried to unlock gate number 33 for a circular route but they were unable to open it, because they had no bolt cutters. The MEMS Supervisor estimated that there were 40 to 50 patients triaged and treated at the on-scene triage area in about 2 hours. There were 10 red tagged patients and 19 yellow tagged patients.

MEMS Unit 305 personnel stated that by 15 to 20 minutes after their arrival (0025-0035) the injured passengers were off the airplane; Within 35-40 minutes (0040-0045) the injured passengers were in the triage area. The also stated that they found 5 or 6 persons in or immediately around the airplane. Of the 2 survivors in the airplane one was yellow tagged and one was red tagged. Of the other 4 persons on the ground on the north side of the airplane, 3 were red tagged and 1 was yellow tagged. Road accesses were difficult, in part because the gate numbering system didn't make sense to them. The Medflight helicopter performed 2 flights transporting 4 people. Lighting was good from the fire equipment. MEMS Unit 305 personnel stated that backboards were hard to get until the Mass Casualty Incident (MCI) truck arrived with supplies which can handle up to 100 patients. The airport MCI truck arrived at least one hour after arrival (about 0110).

Identification and assessment of some survivors was a problem because non-triaged persons were transported on a bus before the MEMS crews could assess them. This required MEMS to establish a separate triage area at the fire station.

MEMS personnel also commented that there were a lot of patients with lower extremity injuries who were placed on backboards. A four hour airport training program of MEMS personnel occurred once a year. They recalled that there were floor lights on in the airplane initially, but later they found them off. In the beginning there was not enough of a medical response, then later they had too many ambulances, but overall they thought the emergency response was satisfactory.

7 Red tags indicate Priority 1 - requiring immediate care
Yellow tags indicate Priority 2 - delayed care
Green tags indicate Priority 3 - minor care

4. 3. Emergency Preparedness

LIT has an FAA approved Airport Emergency Plan (AEP) is accordance with 14 CFR Part 139.325. The LIT AEP, includes a diagram entitled Emergency Access Plan (see Exhibit 16B), which shows emergency vehicle access points. MEMS personnel reported that ambulances were staged along the perimeter road leading to the accident site. According to the LRFD Fire Chief's report, page 13, he described: "The operation continued with some congestion found to be present along the perimeter road in that Gate 33 had not been opened yet. This situation was remedied very shortly. This occurred approximately twenty to thirty minutes post crash from information we were able to obtain. This allowed for a pull-through operation whereby units were able to proceed North on the eastern perimeter road, enter the incident site, receive their patient-load, and exit to the west along the northern edge of the runway end, along the western edge of the runway, back up through Gate 33, a fairly steep incline, then proceed out to the Temple road exit, Gate 32."

4. 4. Driver's Enhanced Vision Systems

According to FAA Advisory Circular (AC) 150/5210-19, *Driver's Enhanced Vision System (DEVS)*, paragraph **1. BACKGROUND**, dated December 23, 1996: "During periods of poor visibility, ARFF response times tend to increase. The Driver's Enhanced Vision System program, in an effort to reduce response times, is aimed at the difficult aspects of poor visibility response: locating the accident, navigating to the accident site, and avoiding obstacles and locating people on the way to the accident site." DEVS subsystems include: 1. a forward looking infrared (FLIR) device; 2. a differential global positioning system; and 3. A tracking system to improve driver, command, and dispatcher situational awareness.

[original signed]

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