National Transportation Safety Board
Office of Aviation Safety
Washington, DC

August 3, 2009

Survival Factors Group Chairman's Factual Report of Investigation

A.	Accident	:	DCA08MA098
	Location	:	Columbia, South Carolina
	Date	:	September 19, 2008
	Time	:	~ 2353 EDT [1]
	Airplane	:	Learjet Model 60, N999LJ
	Operator	:	Global Exec Aviation

B. Survival Factors Group

Chairman	:	Mark H. George National Transportation Safety Board Washington, DC
Member	:	Linda Berkowitz Federal Aviation Administration Atlanta, Georgia
Member	:	Charles M. Henderson Columbia, Metropolitan Airport Columbia, South Carolina

C. Summary

On September 19, 2008, at about 11:53 p.m. EDT, a Learjet Model 60 (N999LJ) operated by Global Exec Aviation as an on-demand passenger flight under 14 CFR Part 135 overran Runway 11 while departing Columbia, South Carolina, enroute to Van Nuys, California. The 2 crewmembers and 2 of the 4 passengers were fatally injured, the other 2 passengers suffered serious injuries. The aircraft was destroyed by extensive post-crash fire. Weather was reported as clear with light winds.

[1] All times are reported in Eastern Daylight Time unless otherwise noted.

Tire debris and portions of airplane components were found on the 8,601 foot runway. According to witnesses the beginning of the takeoff roll appeared normal, then sparks were observed as the airplane travelled along the runway. The airplane continued beyond the runway threshold, through the approximately 1,000 foot runway safety area and impacted airport lighting, navigation facilities, perimeter fence and concrete marker posts. The airplane then crossed a roadway, and came to rest on an embankment on the far side of the road.

D. Details of the Investigation

1.0 Airplane Configuration

The airplane was configured with 8 passenger seating locations and 2 cockpit crew seats. (Figure 1). Seats 1 and 2 were part of a side-facing divan; seat 3 was forward-facing; seats 4 and 5 were aft-facing, seats 6 and 7 were forward-facing, and seat 8 was a side-facing seat located in the lavatory. There was a Type I floor-level passenger boarding door on the left, forward portion of the cabin, and a Type III escape hatch located in the lavatory at the right rear portion of the cabin. Note: Figure 1 shows the front of airplane to the right, and cockpit seats are not shown.

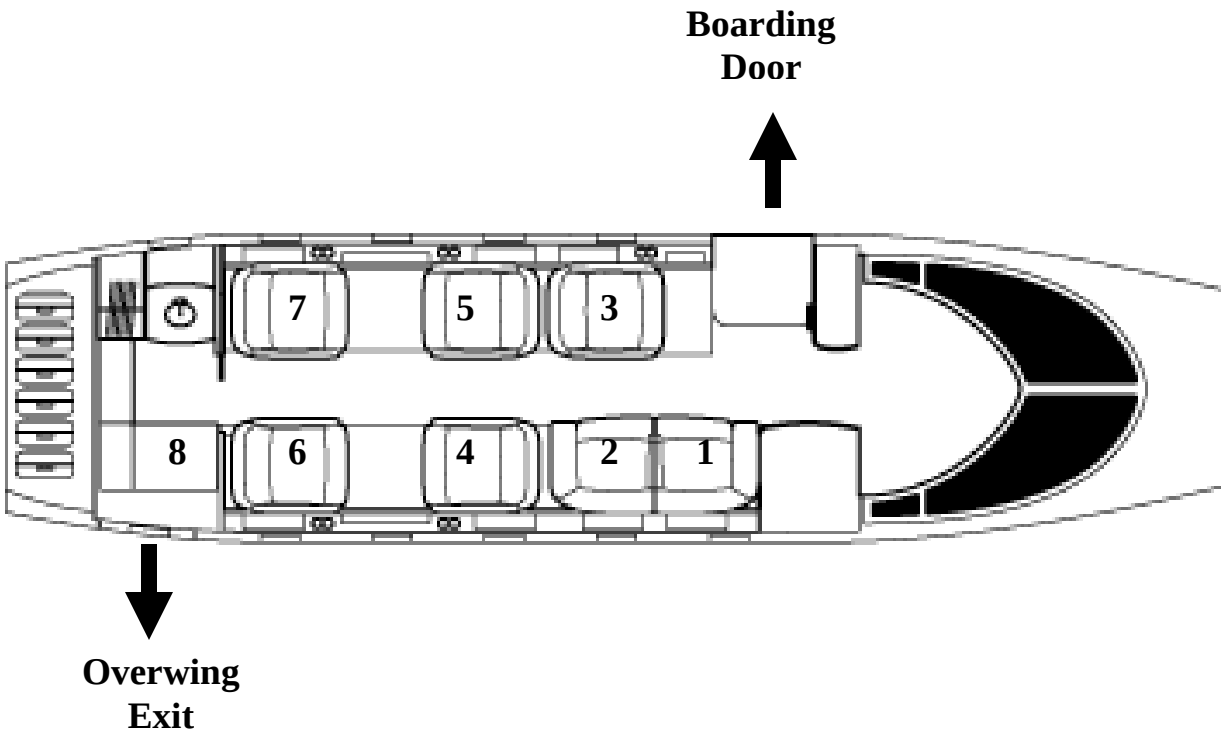

Figure 1. Learjet 60 cabin configuration

2.0 Description of Site

Refer to the Airworthiness Group Chairman's Field Report for a description of the accident site.

3.0 Airplane Documentation

The airplane was severely damaged by the post-crash fire. All interior furnishings including seats and restraints were destroyed. Charred remains of the pocket door separating the lavatory (and aft emergency exit) area from the cabin were found in the open (stowed) position. Remnants of the seats and exits were identified, and are summarized below.

Photo 1. Airplane wreckage

3.1 Exits

The main cabin door was found closed and latched. The aft exit and fuselage area were destroyed by fire, however, the exit handle and one pin-type latch were found in debris. Both were in the open, or unlatched, position.

3.2 Seats and restraints

Documentation of the airplane interior was conducted on September 21, 2008. Assisting with the documentation were Tim Verble, Lear field service representative, and Elias Kontanis, NTSB Transportation Disaster Assistance.

Note: Seat numbers below correspond to locations in the cabin diagram above:

Captain Seat

The only remaining portion of the captain's seat was the base, which was severely fire damaged.

The five-point restraint system buckle was found with four of the five male buckle portions inserted. The crotch-strap (negative z) buckle was not present and was not located in the wreckage.

First Officer Seat

The seat was extensively damaged by fire; the only remaining potion was the seat base.

The five-point restraint system buckle was found with all five male buckle portions inserted.

The cockpit floor was disrupted and the inboard aft seat attach point was not in the seat track. The aft section of the seat was not attached to the seat track.

The inboard lap belt attach point including a fragment of unburned webbing was attached to the seat base.

Seats 1 and 2 (Divan)

The lower fuselage and airplane floor was consumed by fire, and the forward outboard seat track was missing.

The inboard seat track at the forward (right) side of the divan was fractured and rotated outboard. Approximately 10-12 inches of inboard seat track was present, and was fractured at both ends. The inboard, aft seat attach point was fastened in the seat track.

The outboard seat track was fractured approximately 8-10" forward of the divan forward outboard attach point. The outboard seat track along the length of the divan attach points was present.

The forward and aft outboard seat attach points were attached to the seat track. The center outboard seat track attach point was not attached to the track.

The seatbelt attach points for both places (brackets) were present. Belt webbing was not found.

One male end of a lap belt was found near the seat. A divan cushion was found outside the fuselage on right side of aircraft. An upholstery tag had the following information printed on a tag located on the underside of the cushion:

Upholstery Assembly Divan
Part #M60134048-001
Learjet Model L60 S/N: 60-134
MFR-Skandia Inc. Davis Junction IL 60126
MFR DATE: 01/29/2007
Meets Federal Aviation Regulation 25.853(C)
Type A Test Requirements EFF: 2/2/95

Seat 3
The male portion of a seatbelt buckle found on the seat.

The inboard seatbelt attach point was intact. The seat structure was fractured in this area.

The outboard seat track was intact.

Clothing was found under the aft inboard seat attach point (button). The entire seat was detached from the floor, but was still in its original location.

All seat attach points (buttons) on the seat were undamaged.

Seat 4
Inboard seatbelt attach point was attached and intact. The webbing was missing.

The seat pan assembly was detached from the base and was rotated outboard and located outside of the fuselage.

One steel belt adjustor was located in the seat pan.

The seat base was attached to the floor.

The inboard seat track was intact and the inboard seat attach points were intact and in place.

The outboard track was fractured and melted. The forward and aft, outboard seat attachments were in the seat track.

Seat 5
The aft inboard seat track attach mechanism (button) was broken from the seat base structure.

The outboard forward and rear, and inboard forward attach points were in the seat track (confirmed by pulling on the seat), but could not visually assess their condition due to debris.

The seat cushion and back cushion were in place and severely burned/melted.

The inboard and outboard seatbelt attach points were intact; the webbing was missing.

Seat 6
The seat base assembly was present.

The inboard arm rest was in the extended position.

The inboard seatbelt attach point was attached and intact. The webbing was missing.

All four seat attach points were in the seat track.

A flotation device was stowed beneath the seat, and was burned and melted.

Seat 7
A lift-latch buckle was found on the seat cushion. It did not contain a corresponding male belt latch.

All four seat attach points were attached to the seat track.

The seat cushion was in place; the cover and foam was partially melted.

A flotation device was found under the seat and was partially melted.

Seat 8 (toilet)

Not found; area was consumed by fire.

Left forward Boarding Door/Exit (clamshell design)

The boarding door exterior handle was in the closed/locked position. Interior upper door handle was fractured (estimated) 5 inches from the point of rotation (fractured element was not found). The lower interior door handle was intact and in the closed/locked position.

The door pins were in the extended/locked position. A door latch pin in the extended/locked position was recovered under Seat 3.

Fuselage deformation was found at the aft, bottom portion of the door frame. The lower portion of the door could not be opened. The upper portion (forward egress hatch) latch was operable, with effort.

Right Aft Emergency Egress Hatch

One door pin receptacle (component of fuselage framework surrounding exit) was found near the right wing root. Another door pin receptacle was found approximately 6 feet outboard and beneath the leading edge of the right wing.

The exterior emergency hatch handle was found behind the right wing. The door handle mechanism was in the open position. A door pin receptacle was found nearby. No door pins were found.

One of two upper door hinges for the aft emergency egress hatch was found in the baggage compartment.

Miscellaneous

One fragment of webbed belt with an adjustment slide was found on the ground, outside the fuselage, forward of the right wing leading edge. The fragment was thermally damaged, the webbing has melted, and it was approximately five inches in length. The following information was printed on the label:

Schroth Safety Products Corp
Pompano Beach, FL USA
Type 6-G101 B1B-36SNQ
Sub PIN BRIS-G101 B1B-36SNQ
Date M?R 09106
TSO (unreadable) AT06089
SS (unreadable)

One belt adjustor was recovered within the right side of the fuselage forward of the right wing leading edge.

One lift-latch buckle without the male portion was recovered on the ground outside the fuselage, forward of the right wing root.

The cockpit fire extinguisher was found in the cockpit area. The pin was in place, the assembly was severely damaged by fire, and had discharged.

4.0 Medical and Pathological

4.1 Injury Table

Injuries	Flight Crew	Flight Attendants	Passengers	Other	Total
Fatal	2	0	2	0	4
Serious	0	0	2	0	2
Minor	0	0	0	0	0
None	0	0	0	0	0
Total	2	0	4	0	6

4.2 Passenger Injuries

Hospital discharge summaries for the surviving passengers were obtained from Doctors Hospital in Augusta, Georgia. Passenger # 1 was hospitalized from 9-20-2008 until 9-29-2008. Passenger # 2 was hospitalized from 9-20-2008 until 9-23-2008.

	Injury Information from Discharge Summaries
Passenger # 1	1) 28% total body surface area burn injury, with 16% being full-thickness, 12% being partial thickness. Mixed second and third degree burns to lower legs, thighs and buttocks; second degree burns on forearms. 2) Rhabdomyolysis. 3) Pleuritic chest pain. 4) Deep venous thrombosis, left femoral vein.
Passenger # 2	1) 14% total body surface area burn injury, affecting the face, left upper extremity, buttocks, and right hand. 2) Inhalation injury; chest wall soreness 3) Deep venous thrombosis 4) Trauma; multiple minor contusions

4.3 Passenger Fatalities

The Lexington County, South Carolina Office of the Coroner provided the following autopsy data. In a telephone conversation on December 3, 2008, Michael J. Panella, M.D., J.D., the pathologist who performed the autopsies, stated that he found no evidence of contact lens usage in either pilot. Toxicological analyses of the flight crew were performed by the FAA Civil Aerospace Medical Institute, and the results indicated that the captain had 20% carboxyhemoglobin saturation, and 1.8 ug/ml cyanide detected in blood. The first officer had 25% carboxyhemoglobin saturation and 2.07 ug/ml cyanide detected in blood.

	Final Necropsy Diagnosis	Cause of Death
Captain FA08-513	1. Diffuse soot of the trachea 2. Whole body 4th degree thermal burns, involving 85-90 % of the whole body surface area 3. Blunt force trauma of the head a. Mild bilateral hemispheric acute subarachnoid hemorrhage b. Mild mandibular fracture 4. Blunt force trauma of the trunk a. Left upper posterior lung lobe contusion, occupying 30% of the parenchyma b. Symphysis pubis pelvic fracture 5. Blunt force trauma of the extremities a. Left distal tibia/fibula fracture b. Right distal radius/ulna fracture	Smoke and fume inhalation/thermal injuries due to airplane accident Contributory factor: Blunt force trauma of the head and trunk
First Officer FA08-514	1. Patchy diffuse soot of trachea 2. Whole body 4th degree thermal burns, involving 99 % of the whole body surface area 3. Blunt force trauma of the head a. Right to mid maxilla fracture b. Right to mid mandible fracture 4. Blunt force trauma of the trunk a. Left lateral 4th - 5th rib fractures b. Symphysis pubis pelvic fracture 5. Blunt force trauma of the extremities a. Dislocated right ankle	Smoke and fume inhalation/thermal injuries due to airplane accident; Contributory factor: Blunt force trauma of the head and trunk
Passenger #3 FA08-515	1. Blunt force trauma of the head: right temporoparietal acute subdural hematoma (~50 cc) 2. Blunt force trauma of the abdomen: a. Right superior hepatic lobe laceration b. Right retroperitoneal hemorrhage (~150 cc) 3. Blunt force trauma of the extremities: a. Right distal radius/ ulna fracture b. Right dislocated ankle c. Left distal tibia fracture 4. Diffuse whole body 4th degree burns, involving 99 % of the total body surface area	Acute subdural hematoma due to blunt force trauma of the head due to airplane accident

	Final Necropsy Diagnosis	Cause of Death
Passenger #4 FA08-516	1. Blunt force trauma of the head and neck: a. Atlanto-occipital dislocation b. C4-C5 anterior vertebral body fractures c. Mild bilateral hemispheric acute subarachnoid hemorrhage (~2 cc) 2. Blunt force trauma of the trunk: a. Right middle and lower lung lobe contusions, occupying 30 % of the parenchyma b. Left retroperitoneal hemorrhage (~ 150 cc) 3. Blunt force trauma of the extremities: a. Left distal tibia/fibula fracture 4. Whole body 4th degree burns, involving 85 % of the total body surface area	Cervical neck fractures due to blunt force trauma of the head and neck due to airplane accident

5.0 Interviews

5.1 Passengers

Passenger # 1
Interview conducted on September 24, 2008 at Augusta Burn Center
Conducted by Mark George, NTSB and Linda Berkowitz, FAA

Passenger # 1 was 32 years old and weighed 130 pounds at the time of the accident. He said that anytime he and his friends used private airplanes he asked his manager to provide background information on the pilots, and asked to see a picture of the airplane.

On the night of the accident, their show was over early, so it was decided to use a private airplane so that they could get home early. When they called about the private jet, they were told that the flight was supposed to leave at 9:00 PM, but it was changed to 11:00 PM. They ended up sitting around the hotel for 2 hours.

When they got to the airport, the airplane was just pulling up. None of the passengers liked to fly so they were all anxious about the trip. Passenger # 1 took a photo of the airplane and sent it to his wife. He talked to the pilot who said she had been flying since she was 14 years of age. She talked to them and tried to make them feel more comfortable. He did not notice either pilot wearing glasses.

When he got in the airplane, the pilots asked if he wanted to ride up in the front for takeoff and he said "no." The captain asked the passengers if they knew where the seat belts were, and told them the fire extinguisher and the snacks were in the back. She told them where the exits were, and said, "You have all done this before." He did not hear the usual safety briefing, just the captain mentioning the seatbelts, exits, etc. He did

not think it sounded very "professional." He travelled often, so he knew what the briefings usually sounded like. He put on his seatbelt, but did not see the other passengers put on their seatbelts. He expected that they did, based on previous experience flying with them. He and his companions used seat belts on every flight because they were not "comfortable" on airplanes. Passenger # 1 said that he was seated in the aft, right seat, Passenger # 2 was seated in the aft, left seat, Passenger # 3 sat on the forward left seat, and Passenger # 4 sat on the divan on the right side of the cabin, toward the front of the airplane. There were two empty aft-facing seats in the row directly forward of Passenger # 1.

It seemed to him that the crew was in a hurry. He "got the feeling" that the captain was not comfortable flying the plane. The pilots started taxiing before everyone was sitting down with their seatbelts on. The pilots started the plane, turned off the cabin lights, and took off quickly. There was almost no taxiing – the airplane started the takeoff roll almost immediately after it began moving. It was as if they were already on the runway. Passenger # 1 heard a wheel fall off and the airplane was scraping on the ground, and he could see sparks. The airplane was shifting and swaying back and forth, all the way down the runway. The airplane tried going up off the ground and then came down and hit the ground. There was more smoke and sparks. The passengers were screaming for the pilots to "stop the airplane." He didn't hear the pilots say anything and didn't see them doing anything. The nose of the airplane came up several times. The airplane tried to go up in the air again. Then the airplane "hit something" and "went up and hit the embankment." The minute they started to take off, it sounded like the tire had come off. He did not hear thrust reversers on the airplane. The airplane felt "out of control" from the start.

First, there was an explosion toward the front of the airplane. There was "stuff flying around." When the airplane stopped, there was a fire in the cabin right in front of him (indicated about 6 feet). He was on fire. He had been told there was an exit near him, and he remembered it. He turned around and went to the exit and "did what it said to do." He did not remember if there were instructions or arrows on the exit that showed how to open it, but it was not difficult.

When he opened the door he saw "a lot more" fire. He had jet fuel on him inside the airplane, and was on fire before he opened the door. He jumped out onto the wing of the aircraft, went through the fire, and ran away from the airplane. Within 5 seconds, the airplane burst into "bigger flames." As he was running he pulled off his burning clothes. Passenger # 2 was outside the airplane, too, but Passenger # 1 did not know how Passenger # 2 got out. Passenger # 2 made a cell phone call, screamed for help, and then he helped Passenger # 1 get his burning clothes off.

At first there were no people around, and then they started showing up. He was crying and begging for someone to take care of him and get him some water. People seemed "scared of him," and just stared like he was an "alien." Finally, one man came over and really took care of him. Paramedics didn't arrive until about 45 minutes later. He saw a fire truck on scene as he left.

Passenger # 1 had third degree burns on his feet and legs. He also had second degree burns on his arms, hands, buttocks, and down the back of his legs. He did not know if he had any other injuries.

Passenger # 2
Interview conducted on November 21, 2008 via telephone by Mark George, NTSB, and Linda Berkowitz, FAA. Matthew McNicholas, attorney for Passenger # 2, was also on the call.

Passenger # 2 was 35 years old at the time of the accident, and weighed 183 pounds. The flight was originally scheduled to depart at about 09:00 - 09:30 PM, but was delayed. The four passengers arrived at the airport at about 10:30 - 10:45 PM, and were told to wait in the passenger lounge. After the airplane arrived they were told several times by the pilots to wait before getting on board, because the airplane wasn't ready. Passenger # 2 had a backpack and a small piece of wheeled luggage that was loaded onto the airplane by the captain. He estimated that the wheeled piece of luggage may have weighed as much as 40 -50 pounds, but probably less. The other passengers each had one backpack or tote, although Passenger # 1 may have had a second bag.

When they boarded the airplane, Passenger # 2 sat in the aft, left seat, Passenger # 1 sat in the aft, right seat, Passenger # 3 sat on the forward left seat, and Passenger # 4 sat on the divan on the forward, right side of the cabin. There was one empty seat directly in front of Passenger # 2 and another empty seat in front of Passenger # 1. Passenger # 2 did not see anyone else put on their seatbelt, but he wore his own, although, it "wasn't all that tight." Neither of the pilots asked any off the passengers their weights, not were they weighed prior to the flight. After they boarded, the pilots did not give the passengers a safety briefing, although one of them said something like, "You've all flown before…" Passenger # 2 interpreted this to mean that the pilots regarded the passengers as frequent flyers, and had heard safety briefings "tons of times." He did not remember hearing specific language about the location of the exits.

Passenger # 2 planned to sleep during the flight, but was awake prior to the crash. The airplane taxied a "long time," and when they got to the runway, a pilot asked the passengers, "Are you ready?" The airplane accelerated, went faster and faster, and he wondered why they had not yet taken off. All of a sudden, it felt like the airplane "blew a tire," and the airplane leaned to the right, "almost like the wing had touched the ground." The airplane sped up, "like the pilots were trying to take off." The airplane got off the ground a little and then came back down and hit the ground "hard." Passenger # 1 began yelling at the pilots to "stop." The airplane went up again, and came back down. He heard a "scraping" noise, and the airplane tried to go up again. For a few seconds, he heard no noise at all – dead silence, and he saw flames outside the airplane. Then, the airplane impacted the ground "very, very hard." He never heard anything from the pilots. Before the final impact, Passenger # 2 saw "something, or someone, fly up and hit the ceiling" in the forward cabin.

Passenger # 2 “may have been slightly unconscious” for a few seconds, then Passenger # 1 got up and began yelling, “We gotta go! We gotta go!” He saw flames outside the airplane toward the cockpit, on the right side. Passenger # 2 did not know there was an exit behind him, but Passenger # 1 “went right to it,” tugged twice on the emergency exit, and it came open. Passenger # 1 leapt “straight out into a wall of flames.” Passenger # 2 jumped out to the left, to try to avoid the fire. He landed on the ground, on fire, and began rolling to put himself out. He knew he needed to get away from the airplane. He saw Passenger #1 on fire, “running and jumping around,” trying to “shake” the fire off. He told him to roll on the ground, and once he was down, Passenger # 2 tried to “pat out” the fire. Passenger # 1 stripped off all of his burning clothes. Passenger # 2 took off his jeans and gave them to Passenger # 1.

Automobiles began pulling up, and Passenger # 2 used his phone to call his manager and his mother to let them know about the crash. Fire and rescue crews began to arrive. He told them to that there were four people still on the airplane. The emergency crews “couldn’t believe” that two people survived the crash. He told them to “get an ambulance down here.” He looked at his arm, and saw that “the skin was burned off.” He saw fire trucks arrive, but did not remember seeing them discharge water onto the fire. The ambulance finally arrived, and he and Passenger # 1 were put on stretchers and loaded. A paramedic administered painkillers, and Passenger # 2 recalled waking up in the hospital emergency room. .

5.2 Witness Interviews

Curtis E. Parham
Driver for UPS for 20 years
Interviewed September 23, 2008 by Mark George, NTSB; and Linda Berkowitz, FAA

He was sitting in his car, parked in the UPS employee parking lot. There was a fence separating the parking lot from the runway. He was parked approximately 150-200 yards from the area where he later encountered the two survivors.

While sitting in his car, he heard a sound like “grinding metal” and saw the airplane skidding on the runway at a high rate of speed (120 – 130 miles per hour), with sparks flying. He did not remember hearing the engines. The airplane passed his location and ran off the end of the runway and through the fence. He saw dust, smoke and then fire. He called 911 and ran to the airplane to see if he could help. He saw two men walking near the airplane and heard them yelling, “Oh, my god… oh, my god”.

He first thought they might have been driving on the road and got struck by the airplane, but then he smelled jet fuel on them. One man was wearing a light or white colored shirt, pants or shorts, and shoes. The other man was wearing pants, socks and a stocking-type cap. He noticed that the socks were melted on his feet. He had a flash light and put the light on the man’s feet to see what was going on and the man said, “No I don’t want to see it.” He had a gaping wound on the ball of his left foot and the skin was

peeling off. One leg was burned and scraped, and skin was peeled back on the right outside calf.

Mr. Parham asked the men how many people were on the airplane, and they said, "six; there were 2 pilots and 4 passengers." He was told that the men had been sitting in the back of the airplane. Another man arrived on scene and came over to help. Mr. Parham and the other man covered the survivors with sheets. He asked the survivors if they knew what had happened and they said that they thought the airplane had blown a tire. They told Mr. Parham that they tried to get the pilots to stop the airplane. Both survivors were burned and in pain. The survivors did not mention how they got out of the airplane. One survivor was bleeding from his head and his hair was singed. He was pacing around holding his abdomen and leaning over.

The EMTs took "a while" to get there because they came from I-26 to 302. They were on the other side of the fire. Fuel was leaking on the road and was ablaze. The ambulance had to go around.

Initially, no fire trucks were on his side [south] of the aircraft fire. He saw fire trucks up on the embankment by the airport fence. They were spraying water but had no luck putting out the fire. He didn't remember seeing hoses or any other attempt to get the fire out.

Approximately 6-8 minutes after the fire trucks arrived, the first off-airport responders arrived. He saw yellow fire trucks on his side of the fire. He thought they came from Lexington County.

Another person driving by on 302 stopped to help. He was wearing a plaid fleece jacket and he gave it to the man without the shirt. He then asked the ambulance driver what hospital they were going to and left. He left before the ambulance did.

The responders who got there first were in a box-type van and they sat the two survivors on the tailgate of the truck. One of the survivors said that his eyes were burning. Mr. Parham got some water out of the truck and the survivor used it to rinse his eyes, and then drank some. The first responder was dressed in fire gear pants and boots but no fire jacket. The firemen finally got the fire out on the road and the ambulance was able to get across. The ambulance arrived approx. 10-12 minutes after the crash but they were on 302 on the other side [north] of the fire. It took approximately 20 minutes before the ambulance could get to the survivors.

Another UPS employee showed up at the scene. He was an automotive mechanic, and he gave Mr. Parham a yellow vest to wear. The UPS mechanic climbed the hill behind the crashed airplane to look for other victims, but came back down after the firefighters arrived.

EMTs cut all the clothes off of the survivors. Mr. Parham gathered the clothes and put them near the concrete island (median). He helped get the two survivors onto

back boards. The EMTs put a neck brace on one of the survivors, but he did not like having his head strapped down. The other survivor's forearms were burned badly. The ambulance took the survivors to Richland Memorial Hospital.

Mr. Parham stayed on scene watching the fire fighters extinguish the fire. He left at about 2:15-2:30 AM.

Steve Yenkala
Installer for Custom Communications, Inc.
Interviewed by telephone November 28, 2008 by Mark George, NTSB.

Mr. Yenkala was 42 years old at the time of the accident. He was driving north on Highway 302 when he saw "flames ignite and spread across the road" in front of him. He initially thought a fuel truck had crashed. He drove toward the fire, as close as he could, and rolled down the driver's side window. He heard someone to his left yell, "Help! Why is no one helping us?" He parked his truck and walked to the curb. There were two men there, one wearing pants and a stocking cap, and the other wearing shorts and a shirt. They were both in pain, and told him that they had friends on the burning airplane. They started toward the airplane, and he restrained them and told them to stay away. The shirtless passenger said that while the airplane was taking off, he thought a "tire blew." Then, the passengers yelled to the pilots, "Don't take off!"

Both survivors appeared to be "in shock" and the shirtless passenger began "shaking violently." Mr. Yenkala retrieved a plaid fleece jacket from his truck and wrapped it around the shirtless passenger. The other passenger denied any injuries, but Mr. Yenkala saw that he had a cut on his head, and his arm was burned. The passenger was "walking in circles", saying, "I can't believe this." The shirtless passenger had burns on his feet, legs, and posterior, and was unable to either sit or stand. Mr. Yenkala hugged him around the chest to help support his weight. The passengers wanted to use a cell phone to call family, but could not find one. Mr. Yenkala retrieved what he thought was a cell phone in the pants pocket of the shirtless passenger. Instead, it was a video recorder that was about the same size as a cell phone. The shirtless passenger did not want it put back in his pocket because of the pain from his burns, so Mr. Yenkala stuck it in his own back pocket, and forgot about it.

Several police cars arrived, as well as a fire/rescue vehicle that looked like an ambulance. The vehicle was not an ambulance, had no medical supplies, and was staffed by fire fighters. Mr. Yenkala told a police officer what he had seen and heard. There was another person there wearing a UPS jacket who got a bottle of water from his vehicle and gave it to the passengers. Firefighters put out the fire in the street, and an ambulance was then able to drive over to where the passengers were. EMTs laid out stretchers and put the passengers on them, then covered the passengers with "burn blankets." Mr. Yenkala heard the EMTs say they were going to Richland Medical Center. Mr. Yenkala left the scene just before the ambulance left for the hospital.

After Mr. Yenkala got home he remembered the video recorder in his pocket. He plugged it into his computer and downloaded twenty-three video clips. Some of the video clips showed the airplane and passengers prior to the flight, and some showed the interior of the airplane as it was taking off. Mr. Yenkala drove to Richland Hospital to return the camera, but was told by the emergency room receptionist that the passengers were not there. He left his contact information with her, and drove home. Later that night, a representative of the passengers called Mr. Yenkala, then came to his house and retrieved the camera.

Starr Dillon
Driver, Aiken Limousine and Transportation
Telephone interview conducted on November 17, 2008 by Mark George, NTSB.

Ms. Dillon drove the limousine that delivered the passengers to CAE for the flight. She personally unloaded their bags from the limo, and remembered that all of the passengers had backpacks which she characterized as "pretty light." She also thought that Passenger # 2 had an additional small piece of wheeled luggage, like a roll-aboard, and remembered that it, too, was "pretty light." The limo was parked near the airplane, and the airplane captain took the luggage from the tarmac and put it on the divan inside the airplane. Ms. Dillon looked inside the airplane and saw the luggage on the divan. She did not see anything loaded into the airplane through the exit on the right side. Ms. Dillon also remembered that Passenger # 2 walked around and took pictures of the airplane with his camera phone.

6.0 Passenger Briefing

According to Global Exec Aviation's Operations Manual, Section 6, Part 2, it is the responsibility of the pilot-in-command to assure that all passengers are given an oral briefing as soon as possible after passenger loading, and before takeoff. The manual also states that the passenger briefing will contain the information required by FAR 135.117,[2] and lists some of the required items. The Director of Operations at Global Exec Aviation stated that the company does not "specify a verbatim briefing." The passenger briefing card is in Attachment 1.

The early portion of the cockpit voice recording (CVR) was not of sufficient quality to determine if the pilots performed an oral safety briefing, however, during a later portion of the tape, the preflight checklist is audible, and captured dialogue indicating that the passenger briefing had been accomplished (see CVR Factual Report).

[2] *Briefing of Passengers before Flight*. The regulation specifies that the following information be included in the briefing: prohibition of smoking, use of safety belts, seatback position for takeoff and landing, location and means for opening passenger entry door and emergency exits, location of survival equipment, use of overwater equipment, supplemental oxygen, and the location and use of fire extinguishers.

7.0 Airport Information

Columbia Metropolitan Airport (CAE) was in West Columbia, SC. Columbia Metropolitan Airport was owned by Richland-Lexington Airport District and operated by a twelve-member Airport Commission. The airport was located in the County of Lexington at 3000 Aviation Way, West Columbia, SC. CAE was an air carrier airport holding an Airport Operating Certificate for 14 CFR Part 139, Index C. They had a total of 97,674 aircraft operations for a period of 12 months ending December 2007. They had a total of 87 based aircraft for the same time period.

Photo 2. Airplane wreckage in foreground, Highway 302 in center, with airport and departure runway at the top of the photo.

CAE had two air carrier runways: Runway 05/23 and Runway 11/29. Runway 05/23 was 8,001 feet in length and 150 feet in width. There was a 1,000 feet displaced threshold on the Runway 23 end. Runway 11/29 was 8601 feet in length and 150 feet in width. The runway safety areas (RSAs) for both air carrier runways extended 1,000 feet beyond the thresholds and were 500 feet in width.

Runway 5/23 was a grooved asphalt-concrete surface. Runway 23 was equipped with a REIL system and a four-box Visual Approach Slope Indicator (VASI). Runway 5 was a Category I ILS, a four-box PAPI light system and a MALSR approach light system. This runway was closed due to construction. The construction started on May 12, 2008, for Phase I of a total rehabilitation of pavement. At the time of the accident, Runway 5/23 was closed except for the portion that intersected RW 11/29 - 280 feet from centerline of RW 11/29 each side. Planned completion of the project was 11/26/2008. The construction for new pavement in the intersection of the two runways was completed at the beginning of the project as part of Phase 1.

Runway 11/29 was a grooved asphalt surface. Critical aircraft data for this runway was the approach category D and design group V. It was a precision runway with an ILS for RW 29 and ALSF2 approach lighting system for RW 11. Runway lighting was high intensity with 5 steps. There were edge lights, in-pavement runway centerline and touchdown zone lighting. Runway 11 was equipped with a Category III Instrument Landing System (ILS), an ALSF-2 approach light system, runway touchdown zone lights and outer, middle and inner marker beacon transmitters. Runway 29 was equipped with a Category I ILS and a MALSR approach light system. RW 11/29 had runway markings meeting the specifications for the approach authorized for each runway. There was a 4-box PAPI for RW 11 at approx. 1050 feet on the left side of the runway and there was a 4-box PAPI for RW 29 at approx. 1050 feet on the left side of the runway.

No discrepancies were noted during the most recent three years of annual 14 CFR Part 139 certification inspections. These three inspections were conducted by two different FAA inspectors.

The FAA-required airport self inspection records were reviewed for the two week period preceding the accident. Two airfield inspections were conducted each day. Airfield inspections were recorded and kept for the previous six month period. Airfield inspection reports typically record items that don't meet FAA standards (i.e., light outages, sign outages, FOD, wildlife, continue of markings, pavement conditions). An inspection was conducted on September 19 at 0900 and no discrepancies were noted. The inspection report for September 18 noted that two inspections were conducted that day. One inspection was conducted in the morning and one in the evening. Discrepancies noted were 1) a sign that was out of service and 2) light bulbs that were out. All were noted: "corrected."

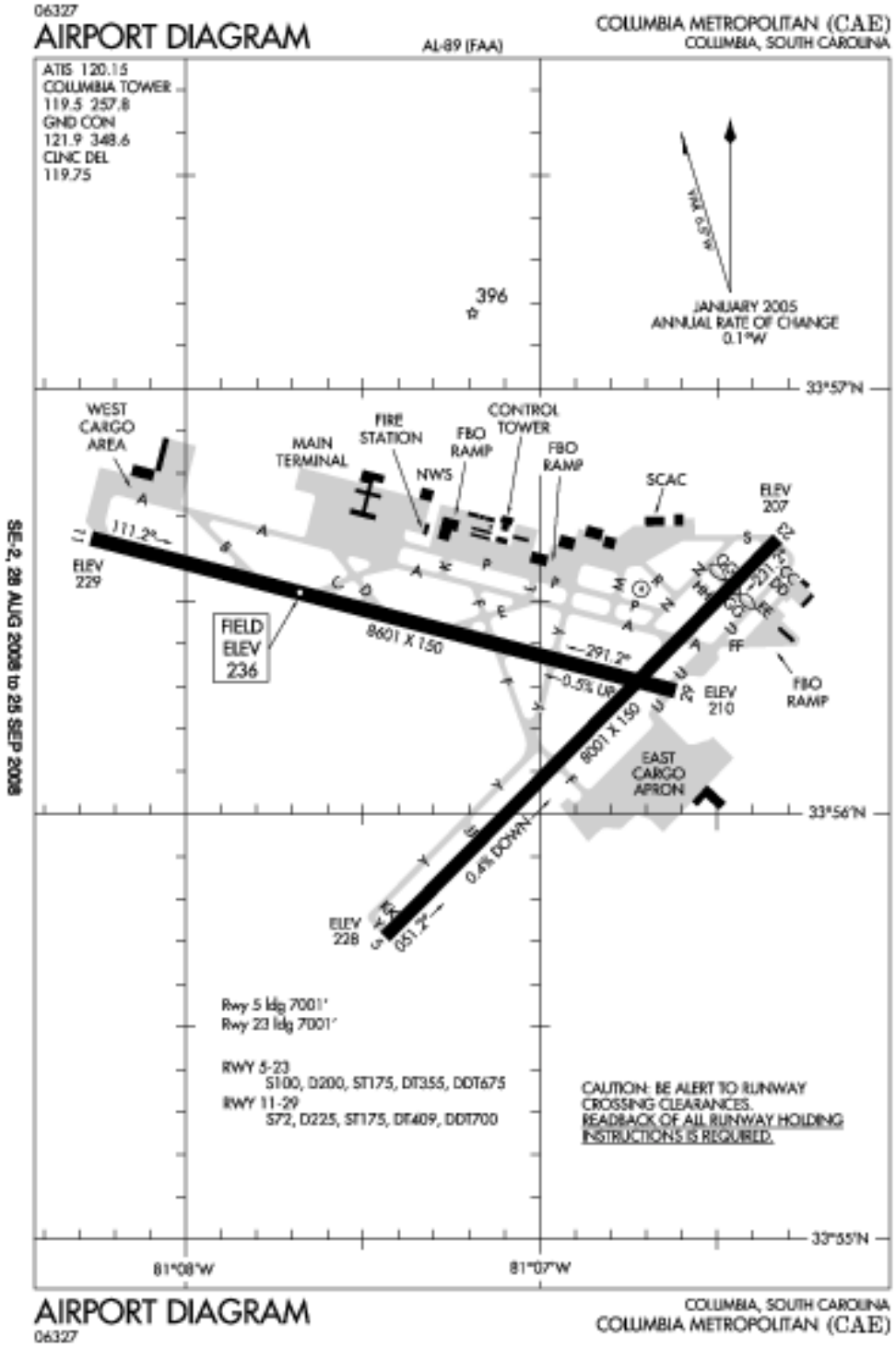

Figure 2. CAE Airport Diagram

CAE issued NOTAMs by calling Lockheed Martin DCA AFSS in Ashburn, VA. CAE used a specific form to record and distribute the reason for the NOTAM. The form included a pictorial representation of the portion of the airfield that was addressed in the upper right hand corner to help identify and clarify the NOTAM. CAE routinely faxed this form to all tenants, and retained notification that the NOTAM was received. If no notification that the tenants received the NOTAM was received, Airport Operations called the tenants to confirm. The NOTAMs in effect at the time of the accident were:

- September 20, 2008 – A NOTAM was issued effective 0050L: CAE is officially closed due to an aircraft incident. This NOTAM was cancelled on 9/20/08 at 2237 L.
- Effective at 0433L on Sunday, August 17, 2008, the lighting on the ILS critical hold sign on TW U north side of Runway 29 is out of service.
- Effective Wednesday, July 16, 2008, from 0700L UFN People and Equipment Working (PAEW) in the following taxiway safety areas: the intersection of taxiway S and Runway 05/23 between TW U and RW 05/23, and the intersection of TW F and RW 05/23.
- Effective Wednesday, July 9, 2008 at 1600L the following closures will be in effect UFN; TW JJ, TW KK, a portion of TW Y south of TW F. All closed areas will be marked with lighted barricades. This NOTAM was cancelled on 9/22/08 at 0954L.
- Effective Thursday, July 10, 2008 at 1030L UFN the following closures will be in effect for pavement maintenance: RW 05/23, TW HH, TW GG and TW A between TW N and TW U. PAEW in closed areas north of RW 11/29. TW closures will be marked with lighted barricades. RW closures will be identified with lighted X's over the runway designators.

The Airport Facilities Directory (AFD) entry for CAE included the remark: "180 degree turns on grooved area not authorized." The same remark was included in the Jeppesen chart for CAE, and was present on the Airnav website; however, the remark was not included in the FAA Form 5010 Airport Master Record. The remark was added to the FAA Form 5010 in November of 2008. Historical records indicate that the remark has been in the Airport Facilities Directory at least as far back as 1992. In addition, a letter from CAE to the FAA air traffic control tower (Attachment 5) from October 1984 directs tower personnel to "ensure that aircraft above the weight limit listed above (12,500 lbs.) are not allowed to make 180 degree turn on either of the runways."

7.1 Aircraft Rescue and Firefighting (ARFF)

CAE met the requirements for Index C as specified in 14 CFR Part 139, serving air carrier aircraft at least 126 feet but less than 159 feet in length. The CAE ARFF facilities were owned and operated by the airport. CAE maintained four firefighting personnel on duty 24 hours a day. There were three shifts per day, each shift working 24 hours on, and 48 hours off. CAE had three ARFF vehicles: Redbird 6, 9. and 12. Each vehicle was a 1500 series crash truck with at least 1500 gallons of water and 200 gallons

of AFFF concentrate on each truck. Redbird 12 had the addition of 700 lbs of Purple K dry chemical agent. According to paperwork supplied by CAE, all 14 CFR part 139 required fire training had been conducted. The most recent FAA annual inspection was conducted on June 5, 2008. Firefighters at CAE were required to attend live fire training once per year. [3]

The ATC tower was alerted by the crew of the accident airplane that ARFF would be needed. Then, after witnessing the crash, the tower initiated the response via the crash phone to the fire station. There were 4 fire fighters on duty, and three trucks responded. Redbird 9 and Redbird 6 each had one firefighter on board; Redbird 10 had two fire fighters onboard.

CAE conducted a debrief and critique of the emergency response on October 13, 2008. Airport fire, police, and mutual aid organizations were in attendance.

7.2 ARFF Interviews

Engineer Torian Roseboro – Redbird 9
Interviewed conducted on September 23, 2008
In attendance: Mark George, NTSB; Linda Berkowitz, FAA; and Chuck Henderson, CAE

Firefighter Roseboro was an Engineer II with 12 years as a fire fighter. He had 8 years working at the airport and 4 years in the Air Force. He was awake when he heard the crash phone. The crash phone rings from the ATCT to the airport dispatcher. He was notified of an Alert 3 "LearJet on fire." He remembered hearing that it was off of the approach end of Runway 11. Three trucks immediately rolled out of the firehouse. Redbird 10 went to the left and went down to Highway 302. He went to the right and Redbird 6 followed him.

He was in Redbird 9 and was out of the firehouse first. Behind him was Redbird 6. Redbird 10 was communicating with ATCT. After the initial response, he saw the fire and smoke coming from the end of Runway 29. He could see the fire but couldn't tell if it was inside the fence or outside the fence. He went to the right down Taxiway A and confirmed he had clearance to cross the hold position. He immediately received clearance and went Taxiway U and responded to the end of the fence. He was in the truck alone. He applied agent but it wasn't reaching the fire. The aircraft crashed through the perimeter fence across from Highway 302.

Redbird 10 told him to relocate to Highway 302. He drove to the UPS gate and the gate was blocked by a UPS vehicle, so he drove across the parking lot to a temporary construction gate and was able to get onto the highway. He positioned his truck approximately 20 – 25 feet from the accident site down wind. He could see that the airplane was "burned up bad."

[3] 14 CFR Part 139 requires ARFF crews to receive live fire training once every twelve months.

He saw an injured person beyond the police vehicles, and another fire truck from the City of Cayce. Redbird 6 knocked down the fire using a roof turret sweeping from left to right. Firefighter Roseboro did not remember seeing fire coming out of the windows. The main fire was knocked down. The #2 engine was still on fire. Captain Ward eventually brought a foam supply to the site so they could re-supply the trucks.

An off duty airport firefighter arrived at the scene and pulled a hand line to the nose of the aircraft. It looked like they were trying to see if they could rescue someone. That was maybe 10-15 minutes after Mr. Roseboro got there and he stayed in position for approximately 1 hour. He repositioned truck at one point to put out a hot spot.

They do not have a discrete frequency for use by ARFF at CAE.

Engineer Dave Shillibeer - Redbird 10
Interviewed conducted on September 23, 2008
In attendance: Mark George, NTSB; Linda Berkowitz, FAA; and Chuck Henderson, CAE

He was Fire Engineer II and had been working at the airport for 4 years. He have been in ARFF for 18 years, and had 27 years total, counting Air Force time.

He was in bed sleeping when the Alert 3 came in. The lights came on and the crash phone went off. ATC started talking about an aborted take off at the departure end of 11 through the fence and the aircraft was on fire. He looked out the window in the bunk room and saw flames. He was assigned to Redbird 10, and took Taxiway A to F and heard ATCT speaking to another aircraft. He turned on to Taxiway U to CAE Aviation to the access road. There was a lot of fire. He pulled up approximately on the centerline of the road.

Firefighter Shillibeer used the bumper turret, swept the fire, and knocked the fire down. He then hit the fire on the road and knocked it down. The aircraft top was opened and the whole back of the aircraft was gone and full of smoke. He used the County radio to call Cayce's engineer truck to come up. He remembered thinking that no one could have gotten out of the aircraft alive.

Redbird 9 and 6 needed water. Lexington County had agent and came out with hand lines. He heard that there were 2 survivors. He got on Redbird 8 for more water to re-supply Redbird 9. ARFF assisted in body recovery at 5:15 AM. He would not have changed a thing because everything worked out well. ARFF had a good response time and knocked the fire down quickly.

Captain Andy Boan – Redbird 10
Interviewed conducted on September 23, 2008
In attendance: Mark George, NTSB; Linda Berkowitz, FAA; and Chuck Henderson, CAE

Captain Boan had been a captain for approximately 6 years and had worked for the airport approximately 28 years. He was sleeping when notified of the Alert 3. Operations Department repeated the information from Air Traffic Control. He heard the crash was on the end of Runway 29. He went with Engineer Shillibeer. He was driving Redbird 10 off the main ramp and asked for clearance. He was talking on the radio. In route, he asked for a Structural response and a department recall. A department recall is when they call all off-duty fire fighters to the airport. He got to the end of Runway 29 and took Taxiway A and went out though CAE Aviation. When he got on scene, he established command.

There were visible flames on Highway 302 and he could see most of the fuselage on the left. He instructed Engineer Roseboro in Redbird 9 to relocate to Highway 302. He used dry chemical as a quick knock down and then followed with foam. The fire knocked down quickly.

The aircraft from bow to stern was totally engulfed in flames. After the fire was knocked down, there were still hot spots in the engine.

Lexington County EMS unit arrived and they attended to two out of the six people on the plane. Captain Boan thought that no one could be alive from the plane because of the extent of the fire.

Fire Chief Baxter arrived on scene when the bulk of the fire was out. Captain Boan was still watching the hot spots. Fire Chief Baxter assumed command and transferred Captain Boan to Fire-Ground Operations. Visibility was good at that time, since the fire was out, but there was some fire running on the ground.

Lieutenant Eddie Martin- Redbird 6
Interviewed conducted on September 23, 2008
In attendance: Mark George, NTSB; Linda Berkowitz, FAA; and Chuck Henderson, CAE

Lieutenant Martin had been a fire fighter at CAE for 13 years, and in the Marine Corps for 6 years for a total of 19 years as a fire fighter.

He had gone to bed at 9:40, and woke up when the crash phone and lights went on. He was on Redbird 6 which was the 3rd truck out of the fire house. He saw a fireball but didn't know if it was inside or outside the fence.

Captain Boan was in command. He went down the runway and didn't see anything unusual. Redbird 10 went out the gate. Redbird 6 had a better reach. He went past where the fence was down and went up the embankment a little bit. He used the bumper and roof turret to and reached the front of the plane. He was hitting the tail but

not the front. Within 5 minutes, a Lexington County fire truck was on site with 1000 gallons of water and resupplied his truck with water, although he still had foam. Lexington County had more trucks arriving. The foam trailer came out to refill the trucks.

Redbird #9 went down to the road early on and went on the right side of the aircraft. After the fire was pretty much out, Lieutenant Martin walked behind his truck looking for victims. Then he did whatever was needed. Captain Boan called for mutual aid backup just about immediately after leaving the station. The airplane was fully evolved in fire. The engines burned for the longest time. It looked like the fire started when the airplane went through the fence.

8.0 Attachments

1. Passenger Briefing Card
2. NOTAMs
3. Runway Safety Area Data Sheet (May 2008)
4. Runway Friction Survey
5. Letter from CAE to FAA ATC
6. ARFF Report and Firefighter Statements