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## **Birdstrike, rejected takeoff, and runway overrun, Boeing 737-200, July 8, 1996**

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**Micro-summary:** This Boeing 737-200 experienced a rejected takeoff at Vr, following the ingestion of a bird in the left engine, resulting in an overrun of the runway.

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**Event Date:** 1996-07-08 at 0741 CDT

**Investigative Body:** National Transportation Safety Board (NTSB), USA

**Investigative Body's Web Site:** <http://www.nts.gov/>

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  2. Readers are advised that each report is a glimpse of events at specific points in time. While broad themes permeate the causal events leading up to crashes, and we can learn from those, the specific regulatory and technological environments can and do change. ***Your company's flight operations manual is the final authority as to the safe operation of your aircraft!***
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		NTSB ID: ATL96FA101		Aircraft Registration Number: N53SW	
		Occurrence Date: 07/08/1996		Most Critical Injury: Serious	
		Occurrence Type: Accident		Investigated By: NTSB	
Location/Time					
Nearest City/Place NASHVILLE		State TN	Zip Code 37214	Local Time 0741	Time Zone CDT
Airport Proximity: On Airport		Distance From Landing Facility: 1		Direction From Airport: 210	
Aircraft Information Summary					
Aircraft Manufacturer Boeing		Model/Series 737-200		Type of Aircraft Airplane	
Sightseeing Flight: No			Air Medical Transport Flight: No		
Narrative					
Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:					
<p>HISTORY OF THE FLIGHT</p> <p>On July 8, 1996, about 0741 central daylight time (CDT), a Boeing 737-200, N53SW, received minor damage during a rejected takeoff (RTO) on runway 20C at the Nashville Metropolitan Airport, Nashville, Tennessee. There were 5 crew members, and 122 passengers on board the airplane. None of the crew members were injured, however, one passenger received serious injuries, and 4 passengers received minor injuries. All injuries were incurred during the emergency evacuation. The airplane was operated as a scheduled, domestic, passenger flight, under the provisions of Title 14 CFR Part 121, by Southwest Airlines, Company, as Flight 436. Visual meteorological conditions existed at the time, and an instrument flight rules flight plan was in effect for the flight. The flight was departing Nashville, Tennessee (BNA), with a destination of Chicago, Illinois (MDW).</p> <p>According to the flight crew, a rolling takeoff was performed because the flight was cleared for departure prior to reaching the runway. However, the transcript of radio communications indicated that at 0738:39, the flight was cleared to taxi onto the runway and hold its position, pending the takeoff of another flight on a parallel runway. According to the transcript of communications, Flight 436 was cleared for takeoff one minute and 22 seconds later. Sounds of brake release were heard on the cockpit voice recorder (CVR) after the flight was cleared for takeoff.</p> <p>During the takeoff roll, according to the captain, he observed an object flash past the airplane. The first officer reported he saw a bird on the right of the nose of the airplane. Shortly afterwards, they heard a loud "explosion." Additionally, the captain reported that the airplane yawed left. The flight crew stated that the last airspeed they observed immediately prior to the engine bang was 135 knots, indicated airspeed, and V1 had not been called. The captain reported that the explosion, louder than any compressor stall he had ever experienced, created a shudder in the airplane. He stated he thought that a catastrophic engine failure had occurred. According to the captain, the event occurred about the 3,000 foot runway remaining marker. A high speed rejected takeoff was initiated. The airplane could not be stopped on the runway. The captain stated that because he recalled a failure of an engine on an MD-80 the previous week, which resulted in engine components penetrating the cabin, he elected not to engage reverse engine thrust. As the airplane rolled off the paved surface, the captain steered it around the Instrument Landing System antenna. The airplane was subsequently stopped approximately 750 feet off the departure end of runway 20C, and about 100 feet east of the runway extended centerline.</p> <p>After the airplane had been stopped, the captain reported, he made a public address announcement for the passengers to remain seated. After completing the checklist, he entered the cabin and assured the passengers that fire department assistance had been requested, and ascertained that there was no fire. He returned to the cockpit and noted that the fire department equipment had arrived. An unsuccessful attempt was made to lower the airstairs at the main entry door. The auxiliary power unit was not started because of the lack of information regarding damage</p>					
FACTUAL REPORT - AVIATION					
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## Narrative (Continued)

to the airplane. According to the flight crew and the cabin crew, the evacuation slides were disarmed, and the cabin doors were opened to provide ventilation. The captain and the Airport Rescue and Fire Fighting (ARFF) on-scene supervisor stated that they had established voice communications through the captain's open cockpit window. The ARFF supervisor reported to the captain that the tires were smoking and were deflating. According to the airport authority incident report, the right main gear became involved with fire and foam was applied to the wheels. According to the flight attendants located at the forward entry door and the aft entry door, they independently heard a fireman call "fire," which prompted each to initiate an evacuation of the airplane by closing the cabin doors, rearming the evacuation slides by re-engaging the girt bar, and re-opening the doors activating the slides. The captain, who was in his seat in the cockpit, was not notified that an evacuation was being initiated, nor did the flight attendants located at the front and rear cabin entry doors, communicate with each other regarding the conditions, or that an evacuation was being initiated. The captain stated he heard noises in the cabin and noted that an evacuation was being initiated and elected not to change the evacuation order.

During the evacuation, the slides at the forward entry (L1), forward galley (R1) and the aft entry (L2) doors were used. The overwing exits were not used. One passenger sustained a broken leg during his descent on the slide at the aft entry door.

## PERSONNEL INFORMATION

The captain held an airline transport pilot certificate and a B-737 type rating. His last proficiency check flight was January 21, 1996. He possessed a Class 1 medical certificate, with no limitations or waivers, with his last examination for the medical certificate having been conducted on January 12, 1996. According to the captain he had about 6,000 total flight hours, with 3,600 total flight hours in the B-737. The operator's report indicated he had 4,400 hours in the 737 airplane. At the time of the accident, he had 233 flight hours as the pilot in command of the B-737. According to the operator's report of the accident, within the 90 days prior to the accident, the captain had 180 total flight hours, all as captain in the B-737. He had 110 and 6 total flight hours as captain within the previous 30 days and 24 hours, respectively. He stated he had been with Southwest Airlines for about 5 1/2 years. His previous experience was as an Air Force pilot where he flew the T-38, T-37, and F-16. Immediately prior to his hiring at Southwest, he was an F-16 instructor pilot.

During the captain's interview, he stated that he had received Crewmember Resource Management Training (CRM) when initially hired, during a refresher course, and at his captain upgrade in January, 1994. Additionally, he had CRM each year during recurrent ground training or at emergency procedures training. He stated that at one point CRM was conducted with flight attendants, but he did not believe that was currently being done.

The captain also stated that most of the V1 cut training that he had, had resulted in continuing the takeoff. He did not recall how much RTO training he had prior to the accident, and stated that RTO training may be waived. He indicated that he had not previously experienced an RTO, other than in training.

According to the captain's training records, he received the following RTO and CRM training: \* 04/27/91-Rejected Takeoff Anti-skid Operative-Initial cockpit procedures training-first officer \* 05/04/91-Rejected takeoff-initial/upgrade proficiency training-first officer \* 05/08/91-Rejected takeoff-Simulator proficiency check (waived)-first officer \* 05/14/91-Initial CRM Completed \* 04/10/92-Rejected Takeoff-Proficiency Check (waived)-first officer \* 04/30/93-Takeoff Safety Home-Study Guide/Examination-first officer \* 12/03/93-Rejected takeoff-Proficiency Check (waived)-first officer \* 12/23/94-Rejected Takeoff-Proficiency Training-first officer \* 01/03-10/95-Upgrade Training that included one day CRM \* 01/12/95-Rejected Takeoff-Upgrade Proficiency Training-captain \* 01/13/95-Rejected Takeoff-Upgrade Proficiency Training-captain \* 01/14/95-Rejected Takeoff-Upgrade Proficiency Training-captain \* 01/15/95-Rejected

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takeoff-Proficiency Check-captain

The first officer held an airline transport certificate with a type rating in the B-737 airplane. His last proficiency flight check was on December 13, 1995. He possessed a first class medical certificate with no limitations or waivers. His last examination for a medical certificate was on September 7, 1995. According to the operator's report of the accident, the first officer had 12,262 total flight hours with 3,250 total flight hours in the B-737 airplane. He had 1,365 flight hours as the pilot in command of the B-737. Within the previous 90 days, 30 days, and 24 hours, the first officer had 208,76, and 8 total flight hours, respectively. The first officer stated that, prior to flying for Southwest Airlines, he had flown for Morris Airlines, flying B-737 airplanes as first officer and as captain. Additionally, he had flown the B-727 as flight engineer and as first officer, the A300 as flight engineer, and corporate propeller driven airplanes. The first officer stated that he had received CRM training once with Southwest, when he was newly hired about 15 months prior to the accident. He indicated that there were no flight attendants in the class, which was made up of new hire pilots, only. The first officer said he had not experienced a RTO other than during training in the simulator.

Training records for the first officer indicated the following RTO training: \* 02/13/95 Rejected Takeoff-Initial Proficiency Training \* 02/15/95-Rejected Takeoff-Proficiency Check (waived) \* 12/13/95-Rejected Takeoff-Proficiency Check (waived)

According to the statement by the lead flight attendant, who sat at the L-1 door, he had worked as a flight attendant for Southwest Airlines since 1993. Prior to that he was a flight attendant with America West from 1987 to 1993. He had previous experience as a flight attendant on B-737, 757, and 747 airplanes, plus the Dash 8 and the Airbus A320. His last recurrent training was in October 1995. He indicated that he had not received CRM training. The "A" flight attendant stated that the emergencies he had been involved with previously included an engine failure over the Pacific Ocean, and he had provided cardio-pulmonary resuscitation to a passenger who had suffered a heart attack. His recurrent training had included numerous evacuations with varied circumstances. He stated that he initiated the evacuation because of the following statement in the Flight Attendant Manual: "In that no two emergencies are exactly alike, the procedures given in this Manual are intended primarily as guidelines and in no way should restrict the use of the Flight Attendant's own personal judgment and initiative. The procedures may be modified as you feel necessary."

According to his statement, the L-2 door flight attendant, who was stationed at the rear of the airplane, began working as a flight attendant with Southwest Airlines in September, 1995. He had received initial and one recurrent training session. He stated that there were no pilots in his training classes that included evacuation training. Although the "B" flight attendant had received CRM training during a pilot training class in college, he stated he had not received CRM training during his tenure as a flight attendant. He also stated that he had initial operating experience (IOE) that included training in the cockpit jumpseat. He described this as sitting in the jumpseat and talking to the pilots. He gained an understanding of the sterile cockpit concept during that IOE. The operator's records indicated that the "B" flight attendant had completed recurrent training on February 2, 1996. He stated that he initiated the evacuation because of the following statement in the Flight Attendant Manual: "In that no two emergencies are exactly alike, the procedures given in this Manual are intended primarily as guidelines and in no way should restrict the use of the Flight Attendant's own personal judgment and initiative. The procedures may be modified as you feel necessary."

The R-1 flight attendant indicated in her interview that she had been a flight attendant for Southwest Airlines for 6.5 years and had not worked as a flight attendant previously. Her last recurrent training was completed April 19, 1996, according to the operator's records. She was stationed at the forward galley door, R1, and commented that the slide for that door had deflated after the evacuation.

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## Narrative (Continued)

## AIRCRAFT INFORMATION

N53SW, a B-737-2H4, serial number 21534, was registered to First Security Bank Utah NA Trustee. It was operated by Southwest Airlines Co. The airplane was powered by two Pratt and Whitney JT8D-9 engines, and it was maintained in accordance with a continuous airworthiness program. The airframe total time and time since last inspection was 58,873 and 16 hours, respectively. The left engine, serial number 678086 had 32,992 total flight hours and 36,706 total cycles. The airplane was operated at a takeoff weight of 106,350 pounds for this departure. Maximum operating weight for the airport and conditions was 110,800 pounds.

The airplane was not equipped with autobrakes. According to Boeing Commercial Airplane Group records, it was not delivered with "RTO" (rejected takeoff) autobrakes installed. In response to inquiries by this investigator, Boeing indicated that if RTO autobrake function were available, and selected on, autobrakes would come on as soon as the thrust levers were retarded to idle, if the airplane had accelerated past 90 knots. According to the flight crew, they did not feel the anti-skid function on the brake system cycling during the maximum braking of the rejected takeoff. In the captain's interview, he stated that the anti-skid function lights in the cockpit operated normally, indicating normal operation of the anti-skid system. Subsequent maintenance evaluation of the anti-skid system indicated that it "checked good" in accordance with the maintenance manual requirements. Additionally, an examination of the wheels and brakes following the accident indicated that their condition was "normal" following a high energy rejected takeoff. A review was conducted of the airplane's maintenance discrepancies between June 7, 1996 and August 8, 1996. No abnormal trends in the discrepancies were noted.

According to the manufacturer, Service Bulletin 52-1092R2 had been incorporated on N53SW which deactivated the forward airstair. Boeing also indicated that the airplane's intercommunication system and the public address system are powered by the Hot Battery Bus and the Battery Bus, and would be operable with the battery switch in the ON position, and with the STANDBY POWER switch in the BAT position.

The captain's and first officer's brake pedals in the airplane are slaved. Therefore, if both pilots are applying brakes simultaneously, the pilot exerting the greatest pressure will exert the greatest force to the wheel brakes.

## METEOROLOGICAL INFORMATION

Weather information is contained in this report on page four, under the heading titled Weather Information.

## AERODROME INFORMATION

An examination of the accident circumstances relating to the airport was conducted by an Airport Certification Safety Inspector, Federal Aviation Administration. The report indicated that the emergency measures used were complete and correct, and that the emergency response was in compliance with the requirements of Title 14 CFR Part 139.

The Wildlife Hazard Management Section of the Metropolitan Nashville Airport Authority's Airport Certification Manual was reviewed by the Safety Board's Airport Operations Specialist. He indicated that the manual appeared to conform to the requirements of Title 14 CFR Part 139.327, "Self-inspection program", and 139.337 "Wildlife hazard management." He reported that FAA certification inspection reports and correspondence for the past three years showed no comments regarding bird strikes. However, the airport authority had published a statement in the Airport Facilities Directory: "Bird activity around airport."

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An examination of the bird remains recovered from the left engine on N53SW was conducted by Roxie C. Laybourne, National Museum of Natural History, Smithsonian Institution. She identified the remains as a female American Kestrel (*Falco sparverius*). The average weight of the female American Kestrel is four ounces, she stated.

The flight crew indicated in their interviews, that following the rejected takeoff, their communication with ARFF personnel to ascertain the condition of the airplane and the presence or absence of fire, was by loud conversation through the open cockpit window. During a telephone conversation with the Nashville Airport Operations Manager, subsequent to the accident, he stated that a discrete frequency for incident aircraft to contact ARFF directly, may have prevented this evacuation.

Telephone discussions were held with the Metropolitan Nashville Airport operations manager, following the accident. He stated that prior to this accident, there had been discussions between airport authority personnel and personnel at the Nashville air traffic control tower regarding a discrete radio frequency for accident/incident communications, between ARFF and the incident aircraft. Based on their review of this accident, efforts were increased to establish a discrete frequency for that purpose. Consequently, in order to reduce congestion on the frequency used to control airport traffic, allow air traffic controllers to return to their primary duty of controlling traffic, and to improve the flow of accurate information between the aircraft and ARFF, a discrete frequency was established at Nashville for accident/incident purposes.

## FLIGHT DATA RECORDER

The flight data recorder (FDR), an Allied Signal model UFDR-GXUS, serial number 4653, was examined at the Safety Board's laboratory, Washington, DC. The flight recorder was not damaged, and showed no evidence of excessive wear. It was noted in the recovered data that the recorder system produced random data anomalies, and the values recorded for the parameter "Control Column Position" were not consistent with the conversion algorithms provided by the operator. The parameters "EPR1 Engine No. 1" and "Longitudinal Acceleration" displayed anomalous values during the rejected takeoff. Corrections were made that brought the anomalies into alignment with adjacent values. Microphone keying events were used to correlate the time between the FDR and the Cockpit Voice Recorder.

The data showed that at 0740:42 the number 1 engine EPR decreased 0.02, from 1.96 to 1.94, at an airspeed of 138 knots. Two seconds later, at 0740:44, the longitudinal acceleration values dropped from 0.115 to 0.054 in 0.125 seconds, and then increased to 0.11 "G" over the next second. During this one second period the EPR values began to decrease from the previously steady values, as the airspeed values continued to increase reaching 151 knots. The peak recorded airspeed, 153 knots, occurred at 0740:46, as the EPR value decreased to 1.46 (left) and 1.65 (right). The longitudinal acceleration values began recording negative values 0.25 seconds prior to the peak recorded airspeed.

## COCKPIT VOICE RECORDER

The airplane was equipped with a Fairchild model A-100 cockpit voice recorder (CVR), serial number 15089. It was forwarded to the Safety Board's laboratory in Washington, DC for examination. The CVR was undamaged with no exterior nor interior evidence of fire. The recording consisted of four channels of good quality audio information. A transcript of the recording was prepared beginning at 0734:15, just as the airplane started to move under its own power from the gate. The recording and transcript continued uninterrupted through the rejected takeoff and ended when electrical power was removed from the CVR at 0741:36.

At 0740:43, during the takeoff roll, the first officer called V1. The FDR recorded airspeed at that time was 142 knots. At 0740:44, the sound of a loud bang was heard. The first officer

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called "rotate" at 0740:45, at an FDR airspeed of 150 knots, simultaneously accompanied by decreasing engine sounds. At 0740:59, the captain stated over the radio, "we're going to go off the end of the runway here." At 0741:25, the CVR transcript records a public address announcement by the captain "folks from the flight deck please keep your seats everything's okay the aircraft is under control."

## WRECKAGE AND IMPACT INFORMATION

The airplane came to rest about 750 feet past the end of runway 20C, on a magnetic heading about 45 degrees right of the runway heading. Tracks in the grass overrun, that connected with black marks on the runway, led to the airplane. According to a Federal Aviation Administration (FAA) inspector at the accident site, the tread marks on the runway began about 2500 feet prior the departure threshold, northeast of the runway end. The center runway end light was broken and the adjacent end light, left of center, was absent. ARFF personnel indicated that the tires deflated as the airplane sat in the overrun area. There was no evidence of fire damage to the tires or the main landing gear.

Bird feathers and bird remains were found in the intake section of the left engine, with one feather found in the tailpipe. An FAA inspector at the scene reported a strong odor of "burned bird" in the tailpipe of the left engine. The same inspector reported that the forward galley slide was deflated upon his arrival at the airplane while both slides on the left side of the airplane were inflated.

## MEDICAL AND PATHOLOGICAL INFORMATION

Toxicological samples were not obtained by the operator.

## FIRE

According to the Metropolitan Nashville Airport Authority incident report, at 0759, the right main landing gear became involved with fire. Foam was immediately applied to the landing gear, extinguishing the fire. An evacuation of the airplane ensued, during which fire erupted from the left main gear, which was also extinguished. After the evacuation had been completed, fire erupted again at both main gear which was extinguished by handlines. Additional agent was used for cooling. The incident report indicates that 1800 gallons of water and 100 gallons of light water (foam) were used.

## ADDITIONAL INFORMATION

In 1990, the Safety Board conducted a special investigation and published a Special Investigation Report "Runway Overruns Following High Speed Rejected Takeoffs" (NTSB.SIR-90/02). The report noted that the potential for an accident or an incident following a high speed (at or above 100 knots) RTO remains high. The report also noted that evidence from investigations conducted from the late 1960s suggest that pilots faced with unusual or unique situations may perform high speed RTOs unnecessarily or may perform them improperly. As a result of the investigation, the Safety Board issued several recommendations to address the guidance and training of flight crewmembers in the recognition of the need to execute and in the performance of rejected takeoffs. Additionally, the Safety Board recommended that the FAA require operators to require pilots to adopt a policy to use the maximum brake capability of autobrake systems, when installed on the airplane, for all takeoffs in which runway conditions warrant and where minimum stopping distances are available following a rejected takeoff. It was noted that the Southwest Airlines Pilot Operations Manual stated: "The auto brake system is not used in Southwest Airlines operations." The director of flight safety for Southwest stated that not all of the airplanes operated by Southwest Airlines were delivered with an auto brake system installed. The system is not operable in any of the operator's airplanes in order to have a standardized fleet, and because retrofitting auto brake

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systems to airplanes not so equipped would be costly.

Following the Safety Board's Special Investigation Report, Boeing produced a takeoff safety video film that provided instruction regarding the certification process to establish accelerate-stop speeds. Copies of the syllabi used during Initial Pilot Training and captain upgrade training were provided by Southwest. It was noted that the video was included in the both training sessions. Additionally, each pilot was provided with a Takeoff Safety Home-Study Guide/Examination in February 1993. Training records for the captain on flight 436 indicated that he completed that training/examination on April 30, 1993. According to the Operations Manual, each pilot will accomplish proficiency training and a proficiency evaluation, that covers, as a minimum, the training required by Title 14 CFR Part 121, Appendix F, and Southwest Airlines' approved low-altitude windshear flight training program. Each captain and each first officer will receive the training and evaluation, in a simulator, at 12 and 24 month intervals, respectively. The operations manual indicates, in accordance with FAR Part 121, that the rejected takeoff during the proficiency evaluation may be waived. A rejected takeoff during the required proficiency training may not be waived. Regarding rejected takeoffs, the Operations Manual stated: "It is only recommended to reject a takeoff above 80 KIAS for an Engine Failure/Fire Warning or if the airplane is unsafe or unable to fly."

The flight attendant's manual was reviewed regarding evacuations. As pointed out during the flight attendant interviews, under the heading INFLIGHT EMERGENCIES-GENERAL, the manual stated: "In that no two emergencies are exactly alike, the procedures given in this Manual are intended primarily as guidelines and in no way should restrict the use of the Flight Attendant's own personal judgment and initiative. The procedures may be modified as you feel necessary." Under the heading FLIGHT ATTENDANT EXIT RESPONSIBILITIES-SECONDARY EXITS the manual stated "Conditions inside and outside the aircraft must be assessed and will best guide the Flight Attendant on what action to take." The Flight Attendant Manual stated under the heading EVACUATION COMMANDS, "The Captain will give the command - 'Evacuate' or 'Remain Seated'. Flight Attendants should not initiate an evacuation unless the cockpit is incapacitated or conditions dictate." The Unplanned Emergency Evacuation Procedures contained the following action as item 4. "ASSESS CONDITIONS inside and outside the aircraft at your evacuation position." The manual also listed the captain's and first officer's evacuation duties stating, "Evacuation will be initiated by the Captain. After landing, direct Flight Attendants to evacuate or remain seated, use the P.A. system for this command. CAPTAIN WILL ISSUE COMMAND 'EVACUATE'. The evacuation may be initiated by the Flight Attendant only after he/she has ascertained the flight crew is incapacitated." Under a discussion of types of emergency landings, the flight attendant manual provided information regarding a brake fire stating "Use any exits on side opposite fire and advise passengers to stay clear of burning brake and wheel." In their interviews, both the "A" and the "B" flight attendant indicated they were not aware of the location of the fire. They also stated that when a person they believed to be a fireman shouted "fire," they did not notify the captain who, at the time, was seated in the cockpit, nor did they communicate with each other to assess the fire's location or condition. As noted earlier, both doors on the left side of the airplane, as well as the forward right galley door, were used for the evacuation.

The FAA amended Title 14 CFR Part 121.421 Flight attendants: initial and transition ground training, and Part 121.427 Recurrent Training, to require CRM training for flight attendants. The effective date for the new requirement was March 19, 1996, with full compliance by March, 1999. However, the regulation continued and stated that the recurrent CRM training requirement does not apply until a person has completed the applicable initial CRM training required by Sections 121.419, 121.421, or 121.422. The regulation required 12 hours of Recurrent training for Group II airplanes (turbojet powered), unless reduced to 10 hours in accordance with Part 121.405.

The Southwest Airlines Flight Attendant Training Manual -Reissue-December 20, 1996 was reviewed. The manual had been approved by the operator's Principal Operations Inspector on December 23, 1996. The initial new hire flight attendant training was listed as follows: 1. Basic

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Indoctrination 40 hours. 2. Initial Training/Competency Check 16 hours 3. Initial Security Training/HazMat 4 hours 4. Emergency Training 16 hours 5. Initial Operating Experience (IOE) 5 hours Within the 16 hours of Initial Training, one hour was devoted to Crewmember Resource Management. Within the 16 hours of Emergency Training, one hour was devoted to ditching and other evacuations that included how, when, and where to evacuate, and the command to evacuate. Additionally, following the IOE, one flight segment with the flight attendant in the cockpit jumpseat was required.

The Flight Attendant Training Manual indicated that recurrent training consisted of 8 classroom hours and 2 hours of home study. The manual indicated that the recurrent training included a "Review and update as applicable to present year policies and procedures to include:

1. Crew communication/coordination
2. FAR 91.3
3. Crew Resource Management.

Guidelines for implementing CRM are contained in Advisory Circular (AC) 120-51. While the advisory circular does not address a specific curriculum or specify training hours, it does indicate that indoctrination/awareness of CRM principles are accomplished by a combination of training methods including lectures, audiovisual presentations, discussion groups, role-playing exercises, computer-based instruction, and videotaped examples of good and poor team behavior. Additionally, the advisory circular states that recurrent training should include refresher practice and feedback exercises such as role-playing in flight training device and taped feedback. The AC states that CRM training should focus on the functioning of crewmembers, including cabin crew, as teams and should instruct crewmembers how to behave in ways that foster crew effectiveness. The AC also states that CRM training exercises should include all crewmembers functioning in the same roles they normally perform in flight.

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<b>Landing Facility/Approach Information</b>					
Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
NASHVILLE INTERNATIONAL	BNA	599 Ft. MSL	20C	8000	150
Runway Surface Type: Concrete					
Runway Surface Condition: Dry					
Type Instrument Approach: NONE					
VFR Approach/Landing: None					
<b>Aircraft Information</b>					
Aircraft Manufacturer		Model/Series		Serial Number	
Boeing		737-200		21534	
Airworthiness Certificate(s): Transport					
Landing Gear Type: Retractable - Tricycle					
Homebuilt Aircraft? No	Number of Seats: 130	Certified Max Gross Wt.	115500 LBS	Number of Engines: 2	
Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:		
Turbo Fan	P&W	JT8D-9	14500 LBS		
- Aircraft Inspection Information					
Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time		
Continuous Airworthiness		16 Hours	58873 Hours		
- Emergency Locator Transmitter (ELT) Information					
ELT Installed? No	ELT Operated?	ELT Aided in Locating Accident Site?			
<b>Owner/Operator Information</b>					
Registered Aircraft Owner		Street Address			
SOUTHWEST AIRLINES		PO BOX 36611 DALLAS LOVE FIELD			
		City	State	Zip Code	
		DALLAS	TX	75235	
Operator of Aircraft		Street Address			
Same as Reg'd Aircraft Owner		Same as Reg'd Aircraft Owner			
		City	State	Zip Code	
Operator Does Business As:			Operator Designator Code: SWAA		
- Type of U.S. Certificate(s) Held:					
Air Carrier Operating Certificate(s): Flag Carrier/Domestic					
Operating Certificate:			Operator Certificate:		
Regulation Flight Conducted Under: Part 121: Air Carrier					
Type of Flight Operation Conducted: Scheduled; Domestic; Passenger Only					
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<b>First Pilot Information</b>				
Name On File	City On File	State On File	Date of Birth On File	Age 36

Sex: M	Seat Occupied: Left	Principal Profession: Civilian Pilot	Certificate Number: On File
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Certificate(s): Airline Transport

Airplane Rating(s): Multi-engine Land

Rotorcraft/Glider/LTA: None

Instrument Rating(s): Airplane

Instructor Rating(s): None

Type Rating/Endorsement for Accident/Incident Aircraft? Yes

Current Biennial Flight Review?

Medical Cert.: Class 1	Medical Cert. Status: Valid Medical--no waivers/lim.	Date of Last Medical Exam: 01/1996
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- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Multi-Engine	Night	Instrument		Rotorcraft	Glider	Lighter Than Air
						Actual	Simulated			
Total Time	6000	4400	1450	4550	1000	1500				
Pilot In Command(PIC)	1633	233	1400	233	40	350				
Instructor										
Last 90 Days	180	180		180	25	15				
Last 30 Days	110	110		110	14	5				
Last 24 Hours	6	6		6						

Seatbelt Used? Yes	Shoulder Harness Used? Yes	Toxicology Performed? No	Second Pilot? Yes
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**Flight Plan/Itinerary**

Type of Flight Plan Filed: IFR	
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Departure Point Same as Accident/Incident Location	State	Airport Identifier BNA	Departure Time 0740	Time Zone CDT
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Destination CHICAGO	State IL	Airport Identifier MDW	
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Type of Clearance: IFR

Type of Airspace: Class C

**Weather Information**

Source of Briefing:  
Company

Method of Briefing:

 <p><b>National Transportation Safety Board</b> <b>FACTUAL REPORT</b> <b>AVIATION</b></p>	NTSB ID: ATL96FA101
	Occurrence Date: 07/08/1996
	Occurrence Type: Accident

<b>Weather Information</b>					
WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
BNA	0753	CDT	599 Ft. MSL	1 NM	20 Deg. Mag.
Sky/Lowest Cloud Condition: Unknown			0 Ft. AGL	Condition of Light: Day	
Lowest Ceiling: Broken		900 Ft. AGL		Visibility: 10 SM	Altimeter: 29.00 "Hg
Temperature: 23 °C	Dew Point: 21 °C	Wind Direction: 220		Density Altitude: Ft.	
Wind Speed: 9	Gusts:	Weather Conditions at Accident Site: Instrument Conditions			
Visibility (RVR): 0 Ft.	Visibility (RVV) 0 SM	Intensity of Precipitation: Unknown			
Restrictions to Visibility: None					
Type of Precipitation: None					

<b>Accident Information</b>		
Aircraft Damage: Minor	Aircraft Fire: Ground	Aircraft Explosion: None

Classification: U.S. Registered/U.S. Soil					
<b>- Injury Summary Matrix</b>	Fatal	Serious	Minor	None	TOTAL
First Pilot				1	1
Second Pilot				1	1
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer					
Cabin Attendants				3	3
Other Crew					
Passengers		1	4	117	122
- TOTAL ABOARD -		1	4	122	127
Other Ground	0	0	0		0
- GRAND TOTAL -	0	1	4	122	127

National Transportation Safety Board

**FACTUAL REPORT**

**AVIATION**



NTSB ID: ATL96FA101

Occurrence Date: 07/08/1996

Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

PRESTON E. HICKS

Additional Persons Participating in This Accident/Incident Investigation:

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NASHVILLE, TN 37217

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