National Transportation Safety Board
Aviation Accident Final Report

Location:	GAINESVILLE, GA	**Accident Number:**	MIA99FA267
Date & Time:	09/26/1999, 0935 EDT	**Registration:**	N224SC
Aircraft:	Learjet 24	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	2 Serious, 3 Minor
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

The pilots stated that approach and landing were normal. During landing rollout, about 2,000 feet down the runway, the brakes became ineffective. The aircraft continued to roll off the end of the runway, down an embankment, across a 4 lane road, and came to rest in a drainage ditch. Post-crash examination of the main landing gear brakes showed that 3 out of the 4 brake assemblies were worn beyond allowable limits and all 4 antiskid wheel generators were not producing voltage within the allowable limits. The outboard right main tire had failed during landing roll do to the antiskid becoming inoperative due to the low voltage of the wheel generator. The airplane had received an A-1 through A-6 inspection 2 days before the accident and this was the first flight since the inspection. The A-5 inspection requires inspection of the landing gear brake assemblies for wear, cracks, hydraulic leaks, and release.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The inadequate inspection of the main landing gear brake assemblies, which lead to operation of the aircraft with worn brakes that failed during the landing roll. Contributing factors were the descending terrain, roadway and ditch.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: LANDING - ROLL

Findings
1. LANDING GEAR,NORMAL BRAKE SYSTEM - WORN
2. (C) MAINTENANCE,INSPECTION - INADEQUATE - OTHER MAINTENANCE PERSONNEL
3. LANDING GEAR,NORMAL BRAKE SYSTEM - FAILURE

Occurrence #2: OVERRUN
Phase of Operation: LANDING - ROLL

Occurrence #3: ON GROUND/WATER ENCOUNTER WITH TERRAIN/WATER
Phase of Operation: LANDING - ROLL

Findings
4. (F) TERRAIN CONDITION - DROP-OFF/DESCENDING EMBANKMENT
5. (F) TERRAIN CONDITION - ROADWAY/HIGHWAY
6. (F) TERRAIN CONDITION - DITCH

Factual Information

HISTORY OF THE FLIGHT

On September 26, 1999, about 0935 eastern daylight time, a Learjet 24, N224SC, registered to Dolphin Aviation, Inc., and operated as a Title 14 CFR Part 91 personal flight, overran runway 29 during landing at Lee Gilmer Memorial Airport, Gainesville, Georgia. Visual meteorological conditions prevailed at the time and an instrument flight rules flight plan was filed. The aircraft received substantial damage. The private-rated pilot and one passenger received serious injuries. The commercial-rated copilot and two passengers received minor injuries. The flight originated from Sarasota, Florida, the same day, about 0826.

The pilot stated that the flight was from Sarasota, Florida, to Gainesville, Georgia. Prior to departure, he performed a standard preflight inspection of the aircraft, which included a visual inspection of both the right and left main gear brakes and wheel well. When they were in visual contact with the Lee Gilmer Memorial Airport, the copilot cancelled the instrument flight rules clearance and called the airport UNICOM for local traffic and advisories. After receiving no response, they heard an aircraft announce departure from runway 29. After checking required runway length, the decision was made to use the active runway 29, because the winds favored this runway. They made a normal stabilized approach to runway 29. The Vref speed was 122 and he aimed for touchdown on the end of the runway, in the vicinity of the numbers. After touchdown he applied the brakes and deployed the spoilers. Shortly after applying the brakes, he felt what seemed like a malfunction in the brake system, at which time the brakes became ineffective and the expected decrease in forward motion did not materialize. The aircraft continued moving down the runway and ran off the end.

The copilot stated that the captain made a normal approach and touchdown to Lee Gilmer Memorial Airport. On rollout, 2,000 feet down the runway, the aircraft appeared to stop slowing down. The brakes appeared to become ineffective. The aircraft continued the landing roll off the departure end of the runway. One hundred feet from the end of the runway is a high ravine leading to a four lane highway and then a ditch, which is where the aircraft came to rest.

The passenger seated on the rear bench seat stated that the airplane seemed to be flying low on the downwind leg. From his vantage point, at the very rear of the aircraft, he had a clear view of everything going on in front of the aircraft. The airplane also appeared to be very low in the base leg and final turn and he could not believe how far up the runway they were prior to touchdown. It became apparent, since the forward speed did not significantly decrease that they were not going to stay on the runway. The airplane left the runway at considerable speed, continued across a highway, and seemed to become airborne again as it came to a violent stop, after striking objects, a utility pole among them.

The passenger seated on the left side of the aircraft just aft of the cabin door stated that the airplane was about 2.5 miles out from the runway at about 1,000 feet on the downwind leg. The airplane was turned onto final approach about 3 miles from the runway. The touchdown was firm and he is positive the airplane touched down about 1/3 down the runway. Touchdown was left main gear first, then right main gear, then nose gear. He looked out the right passenger window and saw the airplane was moving past hangars and airplanes at a very high rate of speed. He briefly remembers the brakes being applied and his father, who was seated on the rear bench seat, stating that they were going off the end of the runway. He observed the

intersection with the other runway go by and the runway markers flash by. At this point the copilot told them to hold on , that they were going off the end of the runway, and that there was a hill. He felt a strain on his seat belt and encountered a negative G effect. The airplane then "slammed" onto and crossed a highway. The main landing gear made a loud crack and snapped off as the airplane hit the curb on the far side of the highway. He remembered the crushing and bending noise of the fuselage as the airplane slammed onto the ground and cut down a utility pole with its lines dropping on top of the airplane.

A witness stated he was working at the front desk of the fixed-base operator, located to the west of runway 4-22 and north of runway 11-29. He observed N224SC rolling out after landing on runway 29. The airplane appeared to be traveling at higher than normal speed and shortly thereafter, he saw smoke trailing from both main landing gear. He observed the airplane go off the end of the runway and disappear over a grassy slope, in a cloud of dust.

PERSONNEL INFORMATION

Records from the Federal Aviation Administration, Airman Certification Branch, Oklahoma City, Oklahoma, show the pilot holds a private pilot certificate with airplane single engine land, airplane multiengine land, and instrument airplane ratings, and type ratings for Cessna 500 and Learjet. The certificate was last issued on August 26, 1994, when the Learjet type rating was added. The pilot holds a FAA Class 3 medical certificate, issued on March 12, 1998, with the restriction that the pilot must wear correcting lenses while exercising the privileges of the certificate. The pilot reported on the NTSB Pilot/Operator Aircraft Accident Report that he received a biennial flight review on June 4, 1999, in a Beech Baron. Documents the pilot supplied to NTSB show he received a 12/24 month pilot proficiency check in the Learjet on February 18, 1999. The pilot reported he has 4,800 total flight hours, with 600 flight hours in the Learjet. He reported he flew 22 total flight hours in the last 90 days, and 8 total flight hours in the last 30 days, all in the Learjet.

Records from the Federal Aviation Administration, Airman Certification Branch, Oklahoma City, Oklahoma, show the copilot holds a commercial pilot certificate with airplane single engine land, airplane multiengine land, airplane single engine sea, and instrument airplane ratings, and a type rating for Learjet. The certificate was last issued on October 3, 1993, when the Learjet type rating was added. The copilot holds a FAA Class 2 medical certificate, issued on September 22, 1999, with the restriction that the pilot must wear correcting lenses while exercising the privileges of the certificate. Documents the copilot supplied to NTSB show he received a biennial flight review and instrument proficiency check on May 2, 1999, and he completed a second in command proficiency check in the Learjet model 25B on June 6, 1999. The copilot reported he has 6,675 total flight hours, with 675 flight hours in the Learjet. He reported he flew 0 total flight hours in the last 90 days and last 30 days.

AIRCRAFT INFORMATION

The aircraft was a Learjet model 24, serial number 100. Records show that at the time of the accident the aircraft had accumulated 12,868 total flight hours and 12,805 cycles. The aircraft was last inspected on September 24, 1999, 1 flight hour before the accident. This inspection was a Phase A-1 through A-6, 300 hour inspection. Phase A-5 calls for inspection of the landing gear brake assemblies for wear, cracks, hydraulic leaks, and release. This item on the inspection was signed off by a mechanic on September 20, 1999. The item was not signed off by an inspector.

At the time of the accident the aircraft was displaying FAA registration number N224SC. Documents in the aircraft showed this registration number was assigned to the aircraft on March 11, 1999, and the FAA Certificate of Aircraft Registration reflected this registration number. The FAA Standard Airworthiness Certificate, last issued on April 1, 1998, reflected the previous FAA registration number, N427LJ.

METEOROLOGICAL INFORMATION

The Lee Gilmer Memorial Airport, 0953 surface weather observation was clear skies, visibility 10 sm, temperature 68 degrees F, dew point temperature 61 degrees F, wind from 060 degrees at 7 knots, altimeter setting 30.18.

FLIGHT RECORDERS

The aircraft was not equipped with a flight data recorder or a cockpit voice recorder. Title 14 CFR Part 91.609(e), states "Unless otherwise authorized by the Administrator, after October 11, 1991, no person may operate a U.S. Civil registered multiengine, turbine-powered airplane or rotorcraft having a passenger seating configuration of six passengers or more and for which two pilots are required by type certification or operating rule unless it is equipped with an approved cockpit voice recorder...." N224SC was equipped with two individual passenger seats, a potty seat, and a rear bench seat that had seat belts for three passengers, for a total passenger seating capacity of six seats.

WRECKAGE AND IMPACT INFORMATION

The airplane landed on runway 29 and overran the departure end of the runway. After over running the runway, the airplane traveled down an embankment, crossed over 4 lane Aviation Boulevard, and came to rest in a drainage ditch. The GPS position at the point the airplane came to rest was 34 degrees, 16.435 north latitude and 83 degrees, 50.124 west longitude. Elevation at the point the aircraft came to rest was about 1,250 feet, based on the captain's altimeter.

Examination of runway 29 showed that about 1,500 feet from the arrival end, marks are visible from heavy braking of the outboard right main tire and inboard left main tire of N224SC. At 3,000 feet from the arrival end, marks are visible showing the outboard right main tire had gone flat and marks are visible from the other three main tires. The marks continue down the runway and about 500 feet from the departure end of runway 29, the tire marks veer to the left and continue until they go off the runway surface at the left edge of the runway at the end. The marks continue through the grass until the airplane becomes airborne again. The airplane then touches down again in the grass on the east side Aviation Boulevard, travels across Aviation Boulevard, collapses the nose landing gear and separates the right and left main landing gear as it impacts the curb on the west side of Aviation Boulevard, and comes to rest in the drainage ditch, about 30 feet west of Aviation Boulevard.

A small fire occurred on the left main landing gear, where it came to rest aft of and outboard of the left wing. The right main landing gear came to rest in the grass adjacent to the curb on the west side of Aviation Boulevard, aft of the airplane. The nose landing gear was folded aft into the belly of the airplane. The spoilers were in the deployed or up position after the accident. The wing flaps were extended to about 40 degrees or full extension. The left wing tip fuel tank was damaged and had leaked fuel. Both engines had ingested debris while operating. The airplane was not equipped with engine thrust reversers or a drag parachute. All flight control surfaces operated after the accident.

Examination of the cockpit showed the spoiler switch was in the deployed or spoilers extended position. The antiskid switch was off and had sustained impact damage during the accident. The emergency brake handle was stowed. The fuel total quantity remaining read 2,850 pounds. Fuel used read 1,723 pounds. The captains airspeed indicator was set with a Vref speed of 125 knots. The copilot's airspeed indicator was set with a Vref speed of 123 knots. Examination of the cabin and cockpit showed all seats were in place and the seat belts were not damaged. The main cabin contained two individual seats, a potty seat, and a bench seat which had seat belts for 3 passengers.

Examination of the main landing gear showed the outboard right main tire had failed and the tire had a flat spot on it at the point of failure, consistent with dragging on the runway while not rotating. The outboard left main gear tire separated from the rim when the rim failed during impact with the curb during the accident. The tire had no damage from dragging on the runway. The inboard left main gear tire was still on the rim and contained 100 psi of pressure. The tire had no damage from dragging on the runway. The inboard right main tire was still on the rim and had been deflated by recovery personnel. The tire had no damage from dragging on the runway.

After recovery from the scene, about 800 psi of hydraulic pressure was applied to each of the 4 main landing gear brakes and the each brake was measured in accordance with Learjet maintenance procedures. The procedures state that if any brake measures over .200 inches, the brake is worn beyond allowable tolerances. During this examination, the left outboard brake measured .181 inches. The left inboard brake measured .226 inches. The right inboard brake measured .203 inches. The right outboard brake measured .226 inches.

MEDICAL AND PATHOLOGICAL

The pilot and one passenger received serious injuries. The copilot and two passengers received minor injuries. Toxicology testing was performed by the Federal Aviation Administration, Accident Research Laboratory, Oklahoma City, Oklahoma, on specimens obtained from the pilot and copilot during hospital treatment after the accident. The tests on the pilot's specimens were negative for ethanol and positive for lidocaine, salicylate, ephedrine, pseudoephedrine, and phenylpropanolamine. No other drug findings were reported. The substances identified in the pilot's specimens were either administered during treatment at a hospital after the accident or were over the counter medications. The tests on the copilot's specimens were negative for ethanol and positive for diazepam, nordiazepam, lidocaine, oxazepam, and temazepam. No other drug findings were reported. Lidocaine was administered to the copilot during treatment after the accident. A review of emergency medical service and hospital records show no indication that diazepam was administered to the copilot after the accident. The copilot supplied NTSB with records that show he was prescribed diazepam by a Doctor on or about August 28, 1999.

TESTS AND RESEARCH

The main landing gear brakes, wheels, tires, antiskid valves, antiskid transducers, gear squat switches, antiskid control box, and antiskid switch panel were transported to Learjet, Wichita, Kansas, for further examination and testing under NTSB supervision. The brake assemblies were cleaned and again tested. The measurements obtained were, left outboard .175 inches, left inboard .232 inches, right inboard .233, and right outboard .222 inches. The maximum allowable measurement is .200. During this examination, the left inboard brake was

also found to have a crack in the brake housing which extended about half way around the housing. Foreign material was built up in the crack showing it was preexisting at the time of the accident.

The antiskid valves were tested in accordance with Learjet procedures and each of the four valves operated within specifications. The antiskid control box, or computer, was tested in accordance with Learjet procedures. The circuit board would not test while installed in the crushed box. The circuit board was removed from the box and tested. After 7 minutes, the circuit board started working and operated within specifications.

The antiskid wheel speed generators, or transducers, were bench checked using a variable speed drill motor and a strobe light to determine RPM. The voltage requirement per the Goodyear Aviation Products Overhaul Manual is 20.8 (+ or - 1.04) volts DC per 1,000 RPM from 100 to 3,600 RPM. All four antiskid transducers produced output voltages that were below the specified tolerances. Learjet maintenance procedures list instructions to manually spin the individual anti-skid generator shafts in the direction of rotation. The cut-in voltage for the antiskid circuit board is between 2.0 and 2.8 volts. The right outboard antiskid transducer generated an average of 2.5 volts when spun by hand, which was the least output of the 4 transducers. Learjet personnel stated the antiskid system should have operated, even with the low voltage output of the transducers. The Learjet 24 Flight Manual states the antiskid system switch remains on at all times and that the system is tested before engine start and before landing.

Examination of the wheel hub caps and wheel bearings showed that there was a mix of old style hub caps and new style wheel bearings, which is not authorized by Learjet procedure.

Learjet personnel calculated the performance information for N224SC, based on the aircraft weight, configuration, runway used, and weather at the time of the accident. The Landing Approach Speeds chart in the Airplane Flight manual showed the Vref speed for the approach to landing on runway 29 was 123 knots indicated airspeed and that 8 knots would have to be added due to the airplane not having AMK 83-4 installed. This would make actual Vref 131 knots. The pilot stated he used 122 knots as the Vref speed.

The actual landing field length required at the Vref speed of 131 knots, flaps extended 40 degrees, spoilers deployed, antiskid operative, and 4 effective brakes, would have been 3,872 feet. Runway 29 is 4,001 feet. At Vref speed of 120 knots, flaps extended 40 degrees, spoilers deployed, antiskid inoperative or not used, and four effective brakes, a total landing distance of 4,100 feet would be needed. At Vref speed of 120 knots, flaps extended 40 degrees, spoilers deployed, antiskid operative, and 1 effective brake, the total landing distance would be 8,000 feet.

Review of aircraft logbook records for N224SC, showed that the left main gear outboard brake assembly was installed on the airplane after overhaul on May 5, 1997, at airplane total time 12,543 hours and 12,534 cycles, and had accumulated 326 flight hours and 261 cycles since overhaul. A overhaul tag for this brake assembly was found in the aircraft records. No record was found in the airplane logbook as to when the removed worn brake assembly was installed on the airplane. The left main gear inboard brake assembly was installed on the airplane after overhaul on May 5, 1997, at airplane total time 12,543 hours and 12,534 cycles, and had accumulated 326 flight hours and 261 cycles since overhaul. The logbook records show this brake was installed on the right main landing gear outboard position. This brake was

found on the left main gear inboard position after the accident. No record was found in the airplane logbook as to when the removed worn brake assembly was installed on the airplane.

The right main gear inboard brake assembly was installed on the airplane on June 3, 1997, at airplane total time 12,587 hours and 12,561 cycles, and had accumulated 282 flight hours and 243 cycles. This brake was identified in the logbook records as "owner supplied overhaul exchange brake assembly." No overhaul tag for this brake assembly was found in the airplane records. The removed worn brake was installed on the airplane on January 24, 1997, at airplane total time 12,367 and total cycles 12350. The removed worn brake assembly was identified as "customer supplied overhaul exchange" at the time of installation, and had accumulated 220 flight hours and 211 cycles. The right main gear outboard brake assembly was installed on the airplane on June 3, 1997, at airplane total time 12,587 hours and 12,561 cycles, and had accumulated 282 flight hours and 243 cycles. This brake was identified in the logbook records as "owner supplied overhaul exchange brake assembly." No overhaul tag for this brake assembly was found in the airplane records. No record was found in the airplane logbook as to when the removed worn brake assembly was installed on the airplane.

ADDITIONAL INFORMATION

The aircraft wreckage was released by NTSB to Atlanta Air Salvage on September 28, 1999. Components retained by NTSB for further examination and testing were returned to Atlanta Air Salvage on June 5, 2000.

Pilot Information

Certificate:	Private	**Age:**	61, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Valid Medical--w/ waivers/lim.	**Last FAA Medical Exam:**	03/12/1998
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	4830 hours (Total, all aircraft), 580 hours (Total, this make and model), 4830 hours (Pilot In Command, all aircraft), 25 hours (Last 90 days, all aircraft), 8 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Learjet	**Registration:**	N224SC
Model/Series:	24 24	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Transport	**Serial Number:**	100
Landing Gear Type:	Retractable - Tricycle	**Seats:**	8
Date/Type of Last Inspection:	09/24/1999, AAIP	**Certified Max Gross Wt.:**	13000 lbs
Time Since Last Inspection:	2 Hours	**Engines:**	2 Turbo Fan
Airframe Total Time:	12869 Hours	**Engine Manufacturer:**	GE
ELT:	Not installed	**Engine Model/Series:**	CJ610-4
Registered Owner:	DOLPHIN AVIATION, INC.	**Rated Power:**	2850 lbs
Operator:	DOLPHIN AVIATION, INC.	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	GVL, 1275 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	0953 EDT	**Direction from Accident Site:**	110°
Lowest Cloud Condition:	Clear / 0 ft agl	**Visibility**	10 Miles
Lowest Ceiling:	None / 0 ft agl	**Visibility (RVR):**	0 ft
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	60°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	20°C / 16°C
Precipitation and Obscuration:			
Departure Point:	SARASOTA, FL (SRQ)	**Type of Flight Plan Filed:**	IFR
Destination:	(GVL)	**Type of Clearance:**	None
Departure Time:	0835 EDT	**Type of Airspace:**	Class G

Airport Information

Airport:	LEE GILMER MEMORIAL (GVL)	**Runway Surface Type:**	Asphalt
Airport Elevation:	1275 ft	**Runway Surface Condition:**	Dry
Runway Used:	29	**IFR Approach:**	
Runway Length/Width:	4001 ft / 100 ft	**VFR Approach/Landing:**	Straight-in

Wreckage and Impact Information

Crew Injuries:	1 Serious, 1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious, 2 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Serious, 3 Minor	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	JEFFREY L KENNEDY	**Report Date:**	03/09/2001
Additional Participating Persons:	RON RUDD; ATLANTA, GA SUSAN MEADORS; ORLANDO, FL RALPH WITZKE; FORT LAUDERDALE, FL JIM TIDBALL; WICHITA, KS		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		