



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	COLUMBUS, OH	<b>Accident Number:</b>	NYC99LA051
<b>Date &amp; Time:</b>	01/22/1999, 1520 EST	<b>Registration:</b>	N782QS
<b>Aircraft:</b>	Cessna 650	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>		<b>Injuries:</b>	4 None

**Flight Conducted Under:** Part 91: General Aviation - Instructional

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## Analysis

While landing on runway 28L, the airplane's right main landing gear collapsed. The airplane veered off the right side of the runway and impacted a taxiway sign. Examination of the landing gear system did not reveal any malfunctions or internal component failures. Further testing revealed it was possible for the airplane's side brace actuator to unlock mechanically by repeated cyclic compressive loading. When the compressive load was cycled between near zero, up to values ranging from 1/2 the maximum limit value to near the maximum limit value, the side brace actuator could be induced to unlock in a minimum of 50 cycles. Winds reported at the airport about 30 minutes prior to the accident were from 170 degrees at 14 knots, with 19 knot gusts.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The collapse of the airplane's right main landing gear due to inadequate design by its manufacturer.

## Findings

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Occurrence #1: MAIN GEAR COLLAPSED

Phase of Operation: LANDING - ROLL

Findings

1. WEATHER CONDITION - CROSSWIND
2. (C) LANDING GEAR,MAIN GEAR - COLLAPSED
3. (C) ACFT/EQUIP,INADEQUATE DESIGN - MANUFACTURER

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Occurrence #2: ON GROUND/WATER COLLISION WITH OBJECT

Phase of Operation: LANDING - ROLL

Findings

4. OBJECT - AIRPORT SIGN/MARKER

## Factual Information

On January 22, 1999, about 1520 eastern standard time, a Cessna 650 "Citation VII", N782QS, was substantially damaged when the right main landing gear collapsed during landing at the Port Columbus International Airport (CMH), Columbus, Ohio. The flight was operated by Executive Jet Aviation, Inc. (EJA), and conducted under 14 CFR Part 91, as a training flight. The two certificated airline transport pilots, a company pilot, and a company intern, were not injured. Visual meteorological conditions prevailed and an instrument flight plan had been filed for the flight which departed the Cincinnati Municipal/Lunken Field Airport.

The pilot receiving instruction was performing an instrument approach to runway 28L, a 10,250 foot long, 150 foot wide, asphalt runway. In a written statement, he said:

"...At approximately 220 feet, [the instructor pilot] pulled my hood off and told me to land. By this point we were at Vref + 10 or so and held that speed until the flare. I initiated the flare to arrest the sink rate, our lineup was good as I brought the power back. The main gear touched down and I brought the nose down...[the airplane] bounced slightly. At that point we heard a loud pop and the right wing started to dip. We realized that we had lost the right main gear..."

The airplane veered off the right side of runway 28L, and then impacted the "C4" taxiway sign located about 7,650 feet from the approach end of the runway.

Winds reported at CMH, at 1451, were from 170 degrees at 14 knots, with 19 knot gusts; however, while the airplane was on approach, the CMH Air Traffic Control Tower reported that the winds were from 180 degrees at 10 knots.

The pilot reported 3,208 hours of total flight experience, and was type rated in CE-500, and CE-650 airplanes. He had accumulated 1.4 hours of flight experience in the CE-650, prior to the accident flight, which included a landing he performed on January 21, 1999. Additionally, he had accumulated 24 hours of CE-650 simulator experience, which included 29 landings.

Examination of the wreckage was performed by a Federal Aviation Administration (FAA) Inspector. The airplane was moved to a hanger and raised. When the right main landing gear was extended by hand, it locked into place. After a new right main gear actuator and right side brace actuator were installed, the landing gear was cycled several times and the main landing gear performed satisfactorily. The nose landing gear had sustained impact damage which precluded its operation. The airplane's right and left main gear actuators and right and left side brace actuators were removed and retained for further examination. The airplane's landing gear hydraulic manifold was also retained.

According to the airplane's maintenance manual, "...The main gear locking side brace incorporates a locking mechanism which locks the side brace in the extended position to prevent the main landing gear from collapsing when fully extended. The side brace locking mechanism is unlocked when hydraulic pressure is applied to retract the gear. Maintenance of the left and right locking side brace is identical..."

Examination of the landing gear components removed from N782QS was conducted at the Cessna Aircraft Company (Cessna), Wichita, Kansas, under the supervision of representatives from the local FAA Aircraft Certification Office. Present during the

examinations were representatives from Cessna, EJA, and Teijin Seiki Co., which manufactured the airplane's main landing gear actuators, and side brace actuators.

Examination of the components did not reveal any internal failures or malfunctions. A test plan was developed to explore a condition, or conditions that would cause the main landing gear side brace actuator to unlock without applying pressure higher than the normal hydraulic system return pressure to the actuator's retract port.

Testing revealed it was possible for the side brace actuator to unlock mechanically by repeated cyclic compressive loading. The compressive load was cycled between near zero, up to values ranging from 1/2 the maximum limit value to near the maximum limit values. During testing, it required a minimum of 50 cycles before the side brace actuator could be induced to unlock.

On October 9, 1997, a Cessna 650, of Taiwan registration B-4106, sustained minor damage when it's left landing gear collapsed while landing at Harbin Airport, Harbin, China. The incident was investigated by the Government of China, with assistance from the Cessna Aircraft Company (Cessna), Wichita, Kansas. Testing performed on the airplane's landing gear system did not reveal any mechanical malfunctions of the main gear and side brace actuators.

As of the date of this report, Cessna was testing "in-house" modified components and a modified hydraulic system to reduce the possibility of an inadvertent unlocking of the side brace actuator. According to a representative of Cessna, Cessna Engineering was waiting for the designer and manufacturer of the side brace actuator, to design, build and provide the modified parts. When made available, the modified parts will be implemented into the tests, and an FAA certification program. After certification, a mandatory service bulletin will be written and FAA approved for incorporation on new production, and "field" airplanes.

## Pilot Information

<b>Certificate:</b>	Airline Transport; Commercial	<b>Age:</b>	35, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane Multi-engine; Instrument Airplane	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 Valid Medical--w/ waivers/lim.	<b>Last Medical Exam:</b>	10/04/1998
<b>Occupational Pilot:</b>	<b>Last Flight Review or Equivalent:</b>		
<b>Flight Time:</b>	5500 hours (Total, all aircraft), 267 hours (Total, this make and model), 4350 hours (Pilot In Command, all aircraft), 44 hours (Last 90 days, all aircraft), 14 hours (Last 30 days, all aircraft), 6 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

Aircraft Manufacturer:	Cessna	Registration:	N782QS
Model/Series:	650 650	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	7082
Landing Gear Type:	Retractable - Tricycle	Seats:	10
Date/Type of Last Inspection:	01/22/1999, AAIP	Certified Max Gross Wt.:	22650 lbs
Time Since Last Inspection:	2 Hours	Engines:	2 Turbo Fan
Airframe Total Time:	2 Hours	Engine Manufacturer:	Garrett
ELT:	Installed, not activated	Engine Model/Series:	TFE731-4R-2S
Registered Owner:	EXECUTIVE JET SALES, INC	Rated Power:	4080 lbs
Operator:		Air Carrier Operating Certificate:	None
Operator Does Business As:		Operator Designator Code:	DXTA

## Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	CMH, 815 ft msl	Observation Time:	1451 EST
Distance from Accident Site:	0 Nautical Miles	Direction from Accident Site:	0°
Lowest Cloud Condition:	Scattered / 10000 ft agl	Temperature/Dew Point:	21 °C / 12 °C
Lowest Ceiling:	Broken / 25000 ft agl	Visibility	10 Miles
Wind Speed/Gusts, Direction:	14 knots/ 19 knots, 170°	Visibility (RVR):	0 ft
Altimeter Setting:	29 inches Hg	Visibility (RVV):	0 Miles
Precipitation and Obscuration:			
Departure Point:	CINCINNATI, OH (LUK)	Type of Flight Plan Filed:	IFR
Destination:	(CMH)	Type of Clearance:	IFR
Departure Time:	1500 EST	Type of Airspace:	Class C

## Airport Information

Airport:	PORT COLUMBUS INT'L (CMH)	Runway Surface Type:	Asphalt
Airport Elevation:	815 ft	Runway Surface Condition:	Dry
Runway Used:	28L	IFR Approach:	Practice
Runway Length/Width:	10250 ft / 150 ft	VFR Approach/Landing:	Full Stop

## Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Substantial
Passenger Injuries:	2 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	4 None	Latitude, Longitude:	

## Administrative Information

Investigator In Charge (IIC):	LUKE SCHIADA	Adopted Date:	06/22/2000
Additional Participating Persons:	MARK HARDEN; COLUMBUS, OH SHANE BERTISH; WICHITA, KS TOM MOODY; WICHITA, KS TOM FULLERTON; COLUMBUS, OH		
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 <a href="mailto:pubinq@ntsb.gov">pubinq@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

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