Aviation Investigation Final Report

Location:	Apopka, Florida	**Accident Number:**	ERA16LA213
Date & Time:	June 10, 2016, 16:10 Local	**Registration:**	N8943Z
Aircraft:	Cessna 310	**Aircraft Damage:**	Substantial
Defining Event:	Miscellaneous/other	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Flight test		

Analysis

The airline transport pilot reported that the accident flight was the airplane's first flight following completion of an annual inspection. He added that there were no issues with the brakes while taxiing to fuel the airplane or to depart. After performing two touch-and-go landings and a go-around, the pilot approached the runway intending to conduct a full-stop landing. He stated that the airplane touched down at the normal point/location and that he then retracted the flaps during the landing roll but waited to apply brakes until the airplane approached the end of the runway. Upon applying the brakes, the left brake did not work, but the right brake did, which resulted in the airplane drifting right. The pilot realized that the airplane was going to exit the right side of the runway, so he secured the engines and attempted to maintain control while applying right braking in an effort to slow the airplane. The airplane travelled off the right side of the runway and impacted upsloping terrain.

Initial postaccident operational testing of the brakes revealed no discrepancies with the left brake. No brake system leaks were noted, and the fluid levels in both brake master cylinders were at correct levels. However, during subsequent operational testing of the left brake master cylinder, the left brake worked satisfactorily once but failed during subsequent testing.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The intermittent failure of the left brake master cylinder, which resulted in asymmetric braking and the subsequent loss of directional control during the landing roll.

Findings

Aircraft	Master cylinder/brake valve - Damaged/degraded
Aircraft	Master cylinder/brake valve - Failure
Aircraft	Directional control - Attain/maintain not possible

Factual Information

History of Flight

Landing-landing roll	Miscellaneous/other (Defining event)
Landing-landing roll	Abrupt maneuver
Landing-landing roll	Loss of control on ground
Landing-landing roll	Runway excursion
Landing-landing roll	Collision with terr/obj (non-CFIT)

On June 10, 2016, about 1610 eastern daylight time, a Cessna 310G, N8943Z, collided with a berm while landing at Orlando Apopka Airport (X04), Apopka, Florida. The airline transport pilot was not injured, and the airplane was substantially damaged. The airplane was registered to SOFI, LLC, and was operated by a private individual under the provisions of 14 Code of Federal Regulations as a Part 91 local, post maintenance test flight. Visual meteorological conditions prevailed and no flight plan was filed for the flight that departed from X04 at 1515.

The accident flight was the airplane's first flight after an annual inspection. Prior to that flight, it had not been operated in the previous 2 years.

The pilot stated that after release from the inspection, he performed a preflight inspection and noticed several discrepancies, none of which were related to the aircraft's brake system. After the airplane was removed from the hangar, he started the engines and taxied to a place where he fueled the airplane, and during the taxi, he did not indicate any issues with the aircraft's brakes. Following fueling he taxied to runway 33, a 3.987-foot-long asphalt runway where he initiated takeoff and remained in the traffic pattern performing two touch-and-go landings to the same runway.

After the second touch-and-go landing, he remained in the traffic pattern and intended to perform a full-stop landing; however, he had to initiate a go-around because another airplane was on the runway. He returned and reported the touchdown was normal and in the normal/typical location. After touchdown he retracted the flaps and allowed the airplane to slow aerodynamically to the end of the runway. As the airplane approached the end of the runway, the pilot applied the normal brakes; however, the left brake did not function. The airplane started drifting to the right, and as the airplane slowed to a slow taxi speed, the right deviation became more pronounced and he pumped the left brake and applied pressure but it seemed the left brake pedal went to the floor with no pressure or effect. When it became evidence that the airplane would depart the runway he secured the engines, and attempted to maintain control while applying the right brake in an effort to slow the airplane. The airplane went off the right side of the runway at the end and contacted upsloping terrain which caused spar damage to the left horizontal stabilizer.

Operational testing of the pilot's side brakes by a Federal Aviation Administration (FAA) operations inspector following recovery revealed no discrepancies; however, operational testing of the brakes on the copilot's side revealed a discrepancy with the right brake. No brake system leaks were noted and the

fluid levels in both brake master cylinders were at the correct level. The airplane was retained for further examination.

Further examination of each brake master cylinder was performed by an FAA airworthiness inspector. Following removal from the airplane, the left brake worked once but on the second actuation, the actuating rod slowly leaked internally to the bottom. The right brake worked perfectly when removed. Both cylinders had an acceptable fluid level after removal. Disassembly of the brake master cylinders revealed all o-rings were in a reasonable condition with no visible cuts or tears. The left brake had a dark crusty compound and a small washer in the reservoir, while the right brake had the same compound including the washer, but was not as contaminated as the left. It was not possible to determine part numbers or serial numbers of either brake master cylinder as the data plates were damaged by hydraulic fluid.

According to the facility that performed the inspection, they utilized a generic twin-engine checklist to perform the inspection. The owner/general manager of the facility where the inspection was performed stated there were no discrepancies related to the brakes during the engine run-ups prior to the inspection.

Pilot Information

Certificate:	Airline transport; Flight instructor	**Age:**	59,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	May 18, 2016
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	November 28, 2015
Flight Time:	28000 hours (Total, all aircraft), 500 hours (Total, this make and model), 25500 hours (Pilot In Command, all aircraft), 150 hours (Last 90 days, all aircraft), 0 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N8943Z
Model/Series:	310 G	**Aircraft Category:**	Airplane
Year of Manufacture:	1962	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	310G-0043
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	June 10, 2016 Annual	**Certified Max Gross Wt.:**	4990 lbs
Time Since Last Inspection:	1 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	as of last inspection	**Engine Manufacturer:**	CONT MOTOR
ELT:	Installed	**Engine Model/Series:**	IO-470-D
Registered Owner:	On file	**Rated Power:**	260 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	LEE,76 ft msl	**Distance from Accident Site:**	14 Nautical Miles
Observation Time:	15:53 Local	**Direction from Accident Site:**	300°
Lowest Cloud Condition:	Scattered / 6000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	50°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	34°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Apopka, FL (X04)	**Type of Flight Plan Filed:**	None
Destination:	Apopka, FL (X04)	**Type of Clearance:**	None
Departure Time:	15:15 Local	**Type of Airspace:**	

Airport Information

Airport:	Orlando Apopka Airport X04	**Runway Surface Type:**	Asphalt
Airport Elevation:	150 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	33	**IFR Approach:**	None
Runway Length/Width:	3987 ft / 60 ft	**VFR Approach/Landing:**	Full stop;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	28.712223,-81.584999

Administrative Information

Investigator In Charge (IIC):	Monville, Timothy
Additional Participating Persons:	Larry Enlow; FAA/FSDO; Orlando, FL Terry E Jones; FAA/FSDO; Orlando, FL
Original Publish Date:	October 17, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=93375