Aviation Investigation Final Report

Location:	Floresville, Texas	**Accident Number:**	ERA18LA270
Date & Time:	September 11, 2018, 16:37 Local	**Registration:**	N969AW
Aircraft:	Maule M7	**Aircraft Damage:**	Substantial
Defining Event:	Landing gear collapse	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The flight instructor and the private pilot-rated student, who was in the left seat and was also the airplane owner, were practicing approaches. Upon landing, the pilots heard a loud popping noise, and the instructor then initiated a go-around. Subsequently, the pilot felt vibration under the floorboard. The pilots thought that a tire might have blown. The instructor flew the approach and conducted a three-point landing, and just before the airplane came to a stop, the left main landing gear (MLG) collapsed, which resulted in substantial damage to the left wing.

An examination of the left MLG revealed that its inboard attachment bolt and nut were missing. After the accident, the bolt was found along the path of the landing rollout. Examination of the attachment bolt revealed that the bolt threads were undamaged. The attachment nut was not found. The right MLG's inboard attachment bolt and nut were found still attached; however, they were loose, with only two to three threads visible past the nut.

The inboard attachment bolts were upgraded high-strength bolts. The airframe manufacturer had issued a service letter (SL) that stated that, when using the high-strength bolts, the outboard attachment bolts required the same amount of torque as indicated in the airplane maintenance manual but that the inboard attachment bolts required a higher torque amount than the standard bolts. However, a review of the maintenance manual revealed that it did not include the new, higher torque requirements specified in the SL. Therefore, mechanics who only follow the maintenance manual may not be aware that higher torque values are required.

A review of the airplane maintenance records revealed that its last annual inspection was completed about 6 months before the accident. The mechanic who performed the inspection reported that he did not

verify the torque on the bolts, that he only used his hands to confirm that they were secure, and that he did not reference the SL during the inspection. It could not be determined whether the mechanic's failure to verify the torque on the bolts or the insufficient torque values in the MM led to the torque on the left inboard MLG attachment bolt being insufficient and the resultant collapse of the left MLG.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The separation of the left inboard main landing gear (MLG) attachment bolt due to insufficient torque, which resulted in the collapse of the left MLG.

Findings

Aircraft	Main landing gear attach sec - Incorrect service/maintenance
Aircraft	Scheduled maint checks - Related maintenance info
Personnel issues	Scheduled/routine maintenance - Other
Personnel issues	Use of available resources - Other

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Landing-landing roll	Part(s) separation from AC
Landing-landing roll	Landing gear collapse (Defining event)

On September 11, 2018, about 1637 central daylight time, a Maule M-7-235C, N969AW, was substantially damaged after the left, main landing gear collapsed at a private, grass airstrip near Floresville, Texas. The flight instructor and a private pilot-rated student were not injured. The airplane was operated by an individual under the provisions of 14 *Code of Federal Regulations* Part 91 as an instructional flight. Visual meteorological conditions prevailed, and no flight plan was filed for the local flight that originated at Floresville about 1600.

According to an inspector with the Federal Aviation Administration (FAA), the flight instructor and his student were practicing approaches. Upon landing, the pilots heard a loud popping noise, and the flight instructor performed a go-around. The student in the left seat could feel vibration under the floor board. Suspecting a blown tire, the pilots discussed how the airplane might handle during the next landing. The instructor flew the approach and landing. After a normal 3-point landing, and just before the airplane came to a stop, the left main landing gear collapsed.

The FAA inspector responded to the accident site and examined the wreckage. He reported that the left wing sustained structural damage during the landing. The propeller struck the ground after the gear collapsed. The inspector observed that the left main landing gear inboard attachment bolt was missing. The bolt was later found along the path of the landing rollout. The bolt threads were undamaged, and the attaching nut was not located. The right inboard attachment bolt and nut were still attached; however, they were untorqued and loose, with only 2-3 threads visible past the nut.

The 100-hr/annual inspection procedures in the M7-235C Maintenance Manual (MM) stated that, under the main landing gear inspection procedures, "The torque on the inboard attach bolts must be 240-300 inch pounds and on outboard clamp bolts 160-190 inch pounds." The airplane was fitted with upgraded high strength attach bolts. Maule Service Letter (SL) No. 66, revision B, dated May 2, 2006, addressed the installation of the high strength bolts. According to the SL, the torque for the outboard clamp bolts was the same as the MM inspection guide (160-190 inch pounds); however, the torque for the inboard attach bolts increased to 450-500 inch pounds. Service Letter No. 66 also stated, "Retorque bolts after 25 hours and per Maintenance Manual thereafter." The MM did not incorporate the new torque requirements for the inboard bolts. Following the MM only, this allowed the inboard bolts to be torqued to 240-300 inch pounds, or about 200 inch pounds lower than the requirement in SL No. 66.

A review of the aircraft maintenance records revealed that the most recent annual inspection was completed in April, 2018. The mechanic who performed the inspection reported that he did not retorque the attachment bolts; he checked them by feeling them with his hands only. He did not reference SL No. 66 during the annual inspection.

Flight instructor Information

Certificate:	Commercial; Flight instructor	**Age:**	31,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	December 27, 2017
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	5100 hours (Total, all aircraft)		

Student pilot Information

Certificate:	Private	**Age:**	51,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	January 19, 2018
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	515 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Maule	**Registration:**	N969AW
Model/Series:	M7 235C	**Aircraft Category:**	Airplane
Year of Manufacture:	2003	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	25093C
Landing Gear Type:	Tailwheel	**Seats:**	4
Date/Type of Last Inspection:	April 30, 2018 Annual	**Certified Max Gross Wt.:**	2500 lbs
Time Since Last Inspection:		**Engines:**	Reciprocating
Airframe Total Time:	1975 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:		**Engine Model/Series:**	IO-540 Series
Registered Owner:		**Rated Power:**	235
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:	SSF,577 ft msl	**Distance from Accident Site:**	20 Nautical Miles
Observation Time:	16:53 Local	**Direction from Accident Site:**	290°
Lowest Cloud Condition:	Scattered / 3300 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 5500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	360°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	29.87 inches Hg	**Temperature/Dew Point:**	28°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Floresville, TX (N/A)	**Type of Flight Plan Filed:**	None
Destination:	Floresville, TX (N/A)	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	Class G

Airport Information

Airport:	Private N/A	**Runway Surface Type:**	
Airport Elevation:	661 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Full stop;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	29.129722,-98.75(est)

Administrative Information

Investigator In Charge (IIC):	Hicks, Ralph
Additional Participating Persons:	Robert Thomason; FAA/FSDO; San Antonio, TX
Original Publish Date:	April 20, 2020
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=98458