Aviation Investigation Final Report

Location:	Santa Monica, California	**Accident Number:**	WPR23LA216
Date & Time:	June 5, 2023, 15:17 Local	**Registration:**	N819KS
Aircraft:	Cessna 172R	**Aircraft Damage:**	Substantial
Defining Event:	Sys/Comp malf/fail (non-power)	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Flight test		

Analysis

The pilot was completing a maintenance flight to determine that the airplane was airworthy after repairs following a collision with a fuel truck that had taken place one month before the accident. The high-speed taxi test and subsequent flight in the airport traffic pattern were uneventful. However, when the pilot landed the airplane, the nosewheel began a shimmy that intensified as the airplane slowed. The airplane began to veer left, and the pilot attempted to correct the movement with right rudder, aerodynamic braking, and then both brakes, but the airplane nosed over and came to rest inverted, which resulted in substantial damage to the rudder.

A bolt from the upper portion of the nose torque link was found on the runway and a poastaccident material analysis revealed that the bolt had separated from shear overstress. The investigation also found that the bolt had been damaged and was not replaced as part of the repairs made to prepare the airplane for the ferry flight following the previous collision with the fuel truck.

The accident was the result of a failure of the upper torque link during landing. The link failed due to a bolt that had unaddressed fractures originating from when the airplane collided with the truck. This resulted in a loss of steering control and a subsequent loss of directional control on the ground. A video provided by the airplane owner of the airplane showing the damage on the airplane following the collision with the fuel truck clearly shows the bent upper torque link bolt.

Probable Cause and Findings

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

A failure of the nose wheel upper torque link bolt, which resulted in a loss of steering control. Contributing to the accident were maintenance personnel's failure to inspect and replace the fractured bolt and the pilot's oversight of the bolt during his preflight inspection.

Findings

Aircraft	Nose/tail gear attach section - Failure
Aircraft	Nose/tail gear attach section - Inadequate inspection
Aircraft	Directional control - Attain/maintain not possible
Personnel issues	Replacement - Maintenance personnel
Personnel issues	Preflight inspection - Pilot

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Landing-landing roll	Sys/Comp malf/fail (non-power) (Defining event)
Landing-landing roll	Loss of control on ground

On June 5, 2023, about 1517 Pacific daylight time, a Cessna 172R, N819KS, was substantially damaged when it was involved in an accident near Santa Monica, California. The pilot was not injured. The airplane was operated as a Title 14 *Code of Federal Regulations Part* 91 test flight.

The pilot stated that he was performing a maintenance test flight (the airplane's first flight) following a repair for a collision with a fuel truck that occurred about one month earlier. On the day of the accident, he inspected the nose landing gear assembly and "saw nothing out of sorts" that would have caused him to cancel the flight. After a high-speed taxi he determined that the airplane was safe to fly in the airport traffic pattern. The pilot departed runway 21, remained within the airport traffic pattern, and touched down normally on the departure runway. During landing roll, as the nose landing gear contacted the runway, it began to shimmy. The pilot applied back pressure to the control yoke to keep the airplane's weight off the nosewheel; however, once the airplane slowed the nose wheel shimmy intensified. Subsequently, the pilot heard a sound that resembled a piece of metal strike the lower engine cowling.

The airplane veered left despite the pilot's attempts to correct the movement with right rudder. His attempt to apply the brakes also exacerbated the turn and he continued to use aerodynamic braking with back pressure on the control yoke. The airplane then veered left aggressively and, when the pilot attempted to reapply the brakes, the right wing dipped and collided with the ground. The airplane nosed over and came to rest inverted, which resulted in substantial damage to the rudder.

A bolt from the nose wheel torque link assembly was found on the runway during a sweep for foreign object debris following the accident. In addition, the torque link had separated from the nose wheel steering arm assembly at the upper bolt (see Figure 1). According to the airplane maintenance manual,

"*The torque links give a mechanical link between the top and bottom parts of the shock strut and help keep the nosewheel aligned with the airframe.*"

The illustrated parts catalogue shows that the upper torque link connects to the nose gear steering arm assembly and the lower torque link connects to the nose wheel fork.

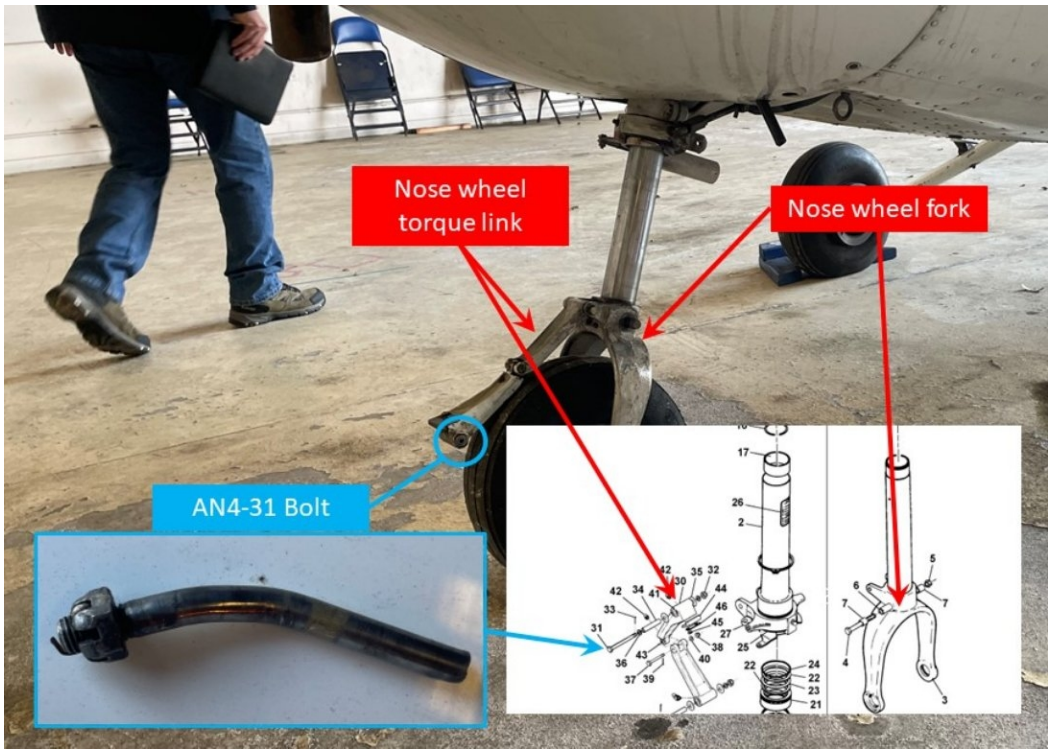

Figure 1: Nose wheel torque link and bolt from accident

Bolt Examination

A National Transportation Safety Board Materials Laboratory examination found that both the upper and lower torque link bolt measurements and thread profiles were consistent with the proper bolt for the installation. The bolthead had separated from the bolt shank, but the corresponding castellated nut and cotter pin were secure in place. The fracture surface had directional dimples consistent with shear overstress.

Prior Damage

In May 2023 the airplane collided with a fuel truck as it was being towed by the operator. The airplane owner videotaped the damage to the airplane, which showed a bent tow point and a curved bolt with a castellated nut protruding from the upper torque link to nose gear steering arm assembly connection. According to an invoice, the damage was inspected and 10 shock mounts on the cowling were replaced to prepare the airplane for a ferry flight as the damage, including the strut, was going to be repaired by another maintenance facility. The operator stated that the instructor was then asked to complete the maintenance flight (accident flight) after the airplane was serviced to ensure it was airworthy before the ferry flight.

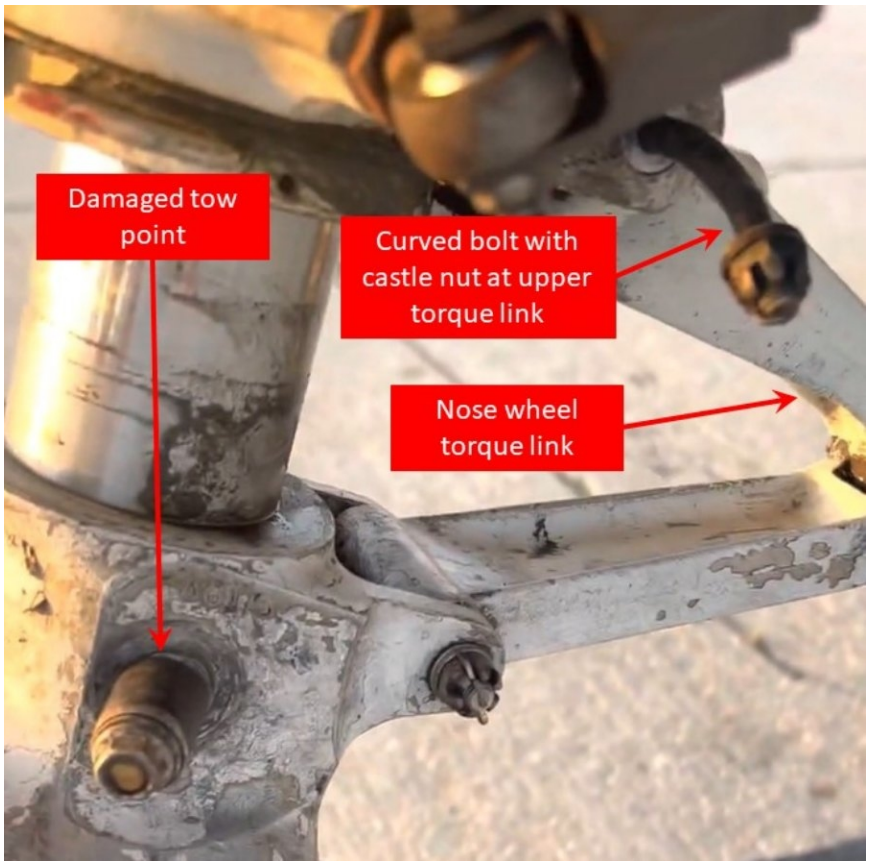

Figure 2: Damage to nose gear after collision with truck (May 2023)

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	36,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	April 10, 2023
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	April 28, 2022
Flight Time:	730.9 hours (Total, all aircraft), 591.5 hours (Total, this make and model), 574.5 hours (Pilot In Command, all aircraft), 132.4 hours (Last 90 days, all aircraft), 30.7 hours (Last 30 days, all aircraft), 1.7 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N819KS
Model/Series:	172R	**Aircraft Category:**	Airplane
Year of Manufacture:	2000	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	17280914
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	March 30, 2023 Annual	**Certified Max Gross Wt.:**	2550 lbs
Time Since Last Inspection:	47.8 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	8756.3 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Installed	**Engine Model/Series:**	IO-360-L2A
Registered Owner:	PLANELEASE LLC	**Rated Power:**	180
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:	KSMO,175 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	15:18 Local	**Direction from Accident Site:**	35°
Lowest Cloud Condition:	Few / 1500 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Overcast / 3100 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	230°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.91 inches Hg	**Temperature/Dew Point:**	17°C / 10°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Santa Monica, CA (SMO)	**Type of Flight Plan Filed:**	None
Destination:	Santa Monica, CA	**Type of Clearance:**	VFR;Traffic advisory
Departure Time:	15:12 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	SANTA MONICA MUNI SMO	**Runway Surface Type:**	Asphalt
Airport Elevation:	169 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	21	**IFR Approach:**	None
Runway Length/Width:	3500 ft / 150 ft	**VFR Approach/Landing:**	Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	34.015822,-118.4513

Administrative Information

Investigator In Charge (IIC):	Stein, Stephen
Additional Participating Persons:	Richard Lewandowski; Federal Aviation Administration; Los Angeles, CA Henry Soderlund; Textron Aviation; Wichita, KS
Original Publish Date:	June 20, 2024
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=192319