Aviation Investigation Final Report

Location:	Gordonville, Texas	**Accident Number:**	WPR23LA130
Date & Time:	March 18, 2023, 10:00 Local	**Registration:**	N4064X
Aircraft:	Aero Commander 100-180	**Aircraft Damage:**	Substantial
Defining Event:	Sys/Comp malf/fail (non-power)	**Injuries:**	1 Minor, 1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was flying the last airplane to land in a group of six airplanes. During the landing, the main landing gear touched down on the grass runway and the airplane bounced once. When the airplane touched down again, the nose landing gear collapsed, the propeller blades contacted the grass, and the airplane nosed over.

Postaccident examination of the nose landing gear scissor link showed that the fracture face had failed from fatigue, which resulted in a separation of the nose landing gear piston assembly. Based on witness reports, ground scars, and damage to the nosewheel fairing, it's likely the scissor link failed either during the initial touchdown or when the nose wheel touched down after the bounced landing. The strut remained attached to the airplane at the engine mount.

The aircraft logbooks showed that a bushing on the scissor link had been replaced several months before the accident. There was insufficient evidence to determine the source of the fatigue crack and whether a mechanic would have been able to identify the fatigue during a visual inspection.

Probable Cause and Findings

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

A fatigue fracture of the nose landing gear scissor link, which resulted in a separation of the nose landing gear piston assembly.

Findings

Aircraft	Nose/tail gear strut/axle - Fatigue/wear/corrosion
Aircraft	Landing gear steering system - Failure

Factual Information

History of Flight

Landing-flare/touchdown	Sys/Comp malf/fail (non-power) (Defining event)
Landing-flare/touchdown	Landing gear collapse
Landing	Nose over/nose down

On March 18, 2023, about 1000 central daylight time, an Aero Commander 100-180, N4064X was substantially damaged when it was involved in an accident near Gordonville, Texas. The pilot was not injured, and the passenger received minor injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot reported that he was part of a group of 6 airplanes that had departed Wichita Falls, Texas, destined for Gordonville, Texas. According to the pilot, he was landing to the east with a quartering tailwind and was the last one in the group to land. The pilot had established an approach speed of about 80 knots and observed that the wind had ceased after the airplane descended below the trees that bordered the airport. As the main landing gear contacted the runway, the pilot and the passenger heard an unusual loud noise.

Two witnesses reported that the airplane was stabilized during its approach to land. One witness stated that when the nose gear touched down it rebounded and the nosewheel and strut "shot out" from the airplane. The airplane then slid about 30 ft before it nosed over and came to rest inverted.

Photographs from the Federal Aviation Administration showed substantial damage to the fuselage and rudder. In addition, the nose landing gear had separated at the cylinder (strut) and the nose landing gear scissor link was fractured. According to the pilot, the first point of impact was an impression in the grass from the nosewheel fairing followed by two gouges from the nosewheel strut. The strut gouges were followed by propeller striations and a narrow scar that was about 25 ft long that terminated near the airplane wreckage. The pilot also stated that the distance between the first point of impact and the accident site was about 100 yards.

The nosewheel fairing was also cracked at the bottom and was accompanied by a dirt mark.

According to the airplane maintenance manual,

"*The nose landing gear strut outer body is welded to and becomes part of the engine mount assembly. The nose landing gear cylinder and piston fits upward through the strut outer body. An upper and lower strut bearing fits between the strut outer body and the strut cylinder, permitting the strut cylinder to rotate within the outer body…the lower strut bearing fits over the strut cylinder to ride against a machined collar on the cylinder. The cylinder is pulled up against this*

bearing to mate with the lower outer body sleeve…the compression of air and metering of oil through a hole in the top of the piston controls the flow of the oil from the cylinder assembly through the piston, allowing the piston to move through the oil with a resistance to shock loads. The strut cylinder is joined to the landing gear fork boss by the upper and lower scissor links."

A National Transportation Safety Board Materials Laboratory examination revealed evidence of fatigue on the left side of the upper scissor link at the fracture face. There was insufficient evidence to determine the source of the fatigue crack.

The aircraft logbooks showed that on March 15, 2022, a "new torque link upper attachment bushing was installed on the nose strut." According to the illustrated parts catalogue, there is a bushing installed at the bottom of the upper scissor link adjacent to the area that fractured at the ears. However, the bushing and its associated hardware remained attached and secure at the upper torque link.

The aircraft mechanic who performed the last annual inspection on the accident airplane and the replacement of the bushing stated that the scissor link holds the cylinder and piston to the strut. If the scissor link is disconnected, the nosewheel cylinder and fork will separate from the strut. The manual does not show any requirements for an inspection of the nose landing gear scissor link. However, appendix D to Title 14 *Code of Federal Regulations* Part 43 (the requirements for an annual/100hour inspection) states,

"*Each person performing an annual or 100-hour inspection shall inspect the following components of the landing gear group:*

(3) Linkages, trusses and members – for undue and excessive wear fatigue, and distortion"

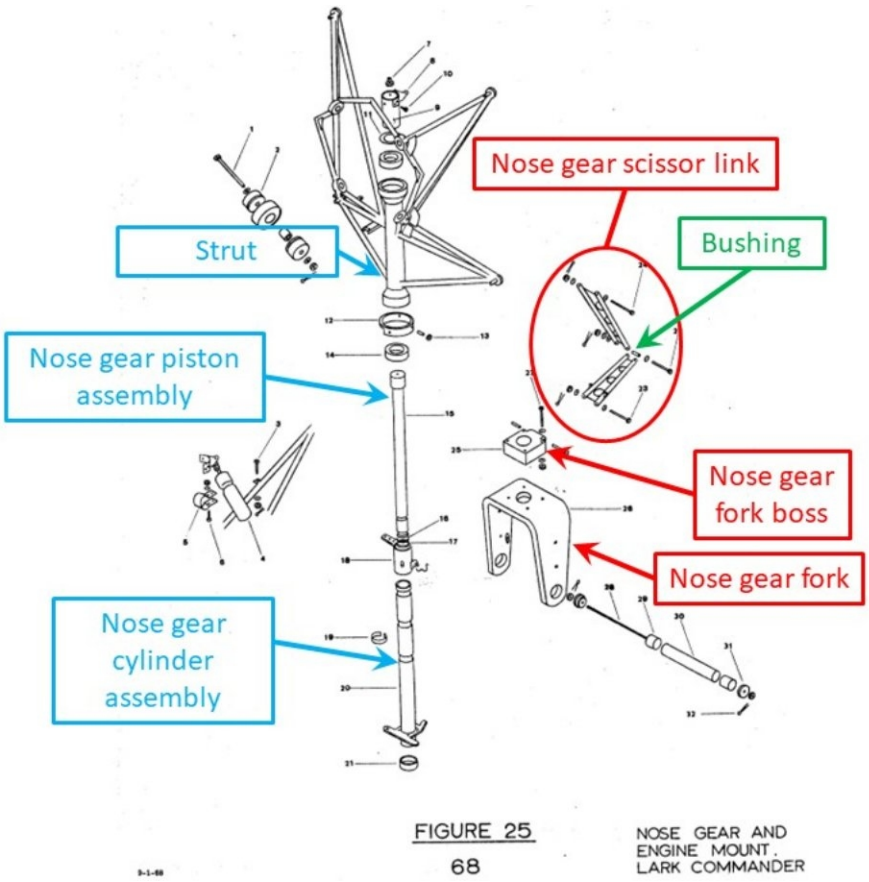

Figure 1. Nose gear assembly from illustrated parts catalogue

Pilot Information

Certificate:	Private	**Age:**	65,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	None	**Second Pilot Present:**	
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	April 25, 2022
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	March 17, 2023
Flight Time:	265.9 hours (Total, all aircraft), 14 hours (Total, this make and model), 213.3 hours (Pilot In Command, all aircraft), 2.2 hours (Last 90 days, all aircraft), 2.2 hours (Last 30 days, all aircraft), 2.2 hours (Last 24 hours, all aircraft)		

Passenger Information

Certificate:		**Age:**	
Airplane Rating(s):		**Seat Occupied:**	Right
Other Aircraft Rating(s):		**Restraint Used:**	Lap only
Instrument Rating(s):		**Second Pilot Present:**	
Instructor Rating(s):		**Toxicology Performed:**	
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Aero Commander	**Registration:**	N4064X
Model/Series:	100-180	**Aircraft Category:**	Airplane
Year of Manufacture:	1970	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	5164
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	October 11, 2022 Annual	**Certified Max Gross Wt.:**	2475 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	5129 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	C91 installed, not activated	**Engine Model/Series:**	O-360-A2F
Registered Owner:	On file	**Rated Power:**	145 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:	KGYI,749 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	10:50 Local	**Direction from Accident Site:**	138°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	14 knots / 20 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	360°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.43 inches Hg	**Temperature/Dew Point:**	7°C / -4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Iowa Park, TX (KF14)	**Type of Flight Plan Filed:**	None
Destination:	Gordonville, TX	**Type of Clearance:**	None
Departure Time:	09:00 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	CEDAR MILLS 3T0	**Runway Surface Type:**	Grass/turf
Airport Elevation:	640 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	07/25	**IFR Approach:**	None
Runway Length/Width:	3000 ft / 60 ft	**VFR Approach/Landing:**	Full stop;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Minor	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 Minor, 1 None	**Latitude, Longitude:**	33.839346,-96.810069(est)

Administrative Information

Investigator In Charge (IIC):	Stein, Stephen
Additional Participating Persons:	David Preston; Federal Aviation Administration; Irving, TX
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=106914