



# Aviation Investigation Final Report

<b>Location:</b>	Windom, Minnesota	<b>Accident Number:</b>	CEN23LA110
<b>Date &amp; Time:</b>	February 18, 2023, 12:15 Local	<b>Registration:</b>	N9168P
<b>Aircraft:</b>	Titan TORNADO II	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Sys/Comp malf/fail (non-power)	<b>Injuries:</b>	1 None
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

## Analysis

The pilot stated that while taking off on a frozen lake with hard-packed snow, the right main landing gear separated from the airplane. He continued the takeoff and landed the airplane without further incident on a snow-covered lake near his home. The airplane sustained substantial damage to the vertical stabilizer due to impact from the right main landing gear.

A metallurgical examination of the right main landing gear leg assembly revealed that bilateral fatigue cracks originated from the inner wall of a cross-drilled hole near the right gear leg socket. Eventually, overload and bending stresses in the direction of the fatigue cracks resulted in the right gear leg separating. It was unclear why the hole was drilled. There is an identical hole in the same spot on the left landing gear leg.

## Probable Cause and Findings

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

The fatigue failure of the right landing gear leg that resulted in its separation from the airplane during takeoff.

## Findings

Aircraft	Main landing gear - Fatigue/wear/corrosion
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# Factual Information

## History of Flight

Takeoff	Sys/Comp malf/fail (non-power) (Defining event)
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On February 18, 2023, about 1215 central standard time, a Titan Tornado II, N9168P, was substantially damaged when it was involved in an accident near Windom, Minnesota. The pilot was not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot reported that he departed Cloquet Airport (COQ) near Cloquet, Minnesota, and flew south to Fish Lake, near Windom, Minnesota, to attend an event. After the event was over, he taxied to an area of the lake where the “snow was hardpacked with no bumps, ruts, or [snow] chunks visible” to take off. After reaching rotation speed, the right main landing gear leg sheared off and struck the vertical stabilizer. The pilot was able to control the airplane with aileron and safely became airborne. The pilot flew back to COQ and advised Duluth Air Route Traffic Control Center that he was going to land on Big Lake, Minnesota, about five miles west of COQ, to prevent any further airplane damage from landing on asphalt. During the landing, he applied full left aileron input and touched down on the left main landing gear wheel first and then lowered the nosewheel. The right wing dropped and slid along the ice. He counteracted with left rudder, spun 90° to the right, and came to a full upright stop.

Postaccident examination revealed that the airplane sustained substantial damage to the vertical stabilizer from the impact of the right gear leg after it separated from near the fuselage gear leg socket. An examination of the landing gear revealed that bilateral fatigue cracks originated from the inner wall of a cross-drilled hole near the right gear leg socket. Eventually, overload and bending stresses in the direction of the fatigue cracks resulted in the right gear leg separating. There was an identical hole drilled in each landing gear strut. The purpose of the hole is unknown. The pilot stated the hole was covered by a zip tie that was used to secure the brake line.

## Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	66,Male
<b>Airplane Rating(s):</b>	Single-engine land	<b>Seat Occupied:</b>	Front
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	
<b>Medical Certification:</b>	Class 3 With waivers/limitations	<b>Last FAA Medical Exam:</b>	February 16, 2023
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	1248.2 hours (Total, all aircraft), 1069.6 hours (Total, this make and model), 1198 hours (Pilot In Command, all aircraft), 10.4 hours (Last 90 days, all aircraft), 4.1 hours (Last 30 days, all aircraft), 1.9 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Titan	<b>Registration:</b>	N9168P
<b>Model/Series:</b>	TORNADO II	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	2007	<b>Amateur Built:</b>	Yes
<b>Airworthiness Certificate:</b>	Experimental light sport (Special)	<b>Serial Number:</b>	D00912COHK0376
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	2
<b>Date/Type of Last Inspection:</b>	October 1, 2022 Condition	<b>Certified Max Gross Wt.:</b>	1000 lbs
<b>Time Since Last Inspection:</b>	14.7 Hrs	<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	1212.8 Hrs at time of accident	<b>Engine Manufacturer:</b>	Rotax
<b>ELT:</b>	C91A installed, not activated	<b>Engine Model/Series:</b>	912 ULS
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	100 Horsepower
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KCOQ	<b>Distance from Accident Site:</b>	7 Nautical Miles
<b>Observation Time:</b>	12:15 Local	<b>Direction from Accident Site:</b>	90°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	9 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	210°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	29.96 inches Hg	<b>Temperature/Dew Point:</b>	-1°C / -6°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Fredenberg Township , MN (NA)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Cloquet, MN (KCOQ)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	12:15 Local	<b>Type of Airspace:</b>	Class G

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 None	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	N/A	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 None	<b>Latitude, Longitude:</b>	46.713346,-92.491301

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Abraham, Laura
<b>Additional Participating Persons:</b>	Gregory Thurston; FAA; Minneapolis FSDO, MN
<b>Original Publish Date:</b>	April 18, 2024
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class 3</a>
<b>Note:</b>	The NTSB did not travel to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=106748">https://data.nts.gov/Docket?ProjectID=106748</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).