Aviation Investigation Final Report

Location:	San Carlos, California	**Incident Number:**	WPR15IA105
Date & Time:	February 15, 2015, 11:45 Local	**Registration:**	N3WB
Aircraft:	EVO13 LLC LANCAIR EVOLUTION	**Aircraft Damage:**	Minor
Defining Event:	Landing gear collapse	**Injuries:**	3 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot reported that, during the landing roll, the nose landing gear (NLG) began to shimmy, which quickly became severe. The pilot applied back pressure on the control stick to reduce the weight on the NLG; however, the NLG collapsed about 2 to 3 seconds later. The airplane then skidded on the runway for about 1,000 ft before coming to a stop upright.

A postincident examination of the NLG revealed that the right trunnion pin had separated at the base of the pin where it connected to the NLG strut arm. The fracture surface had unified crack fronts, consistent with fatigue crack progression. The fatigue cracks initiated from multiple origins on opposite sides of the trunnion pin, consistent with reverse-bending fatigue. Although the reverse bending could have resulted from the exceedance of the lateral limits of the tow bar parameters during ground towing operations, it could not be determined if such an exceedance occurred before the incident. The event that precipitated the reverse bending could not be determined.

Probable Cause and Findings

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

The collapse of the nose landing gear (NLG) due to the separation of the right trunnion pin from the NLG strut as a result of reverse-bending fatigue.

Findings

Aircraft	Nose/tail landing gear - Fatigue/wear/corrosion

Factual Information

History of Flight

Landing-landing roll	Landing gear collapse (Defining event)
Landing-landing roll	Runway excursion

On February 15, 2015, about 1145 Pacific standard time, an EVO113 LLC Lancair Evolution, N3WB, sustained minor damage as a result of a nose landing gear collapse while on landing roll at the San Carlos Airport (SQL), San Carlos, California. The commercial pilot and two passengers were not injured. Visual meteorological conditions prevailed for the personal cross-country flight, which was being operated in accordance with 14 Code of Federal Regulations Part 91, and an instrument flight rules (IFR) flight plan was filed and active. The flight departed Gillespie Field (SEE), San Diego, California, at 1000, with SQL as the planned destination

According to a report submitted to the National Transportation Safety Board investigator-in-charge, the pilot reported that after touching down on both main landing gear, the nose wheel was lowered, followed by the power lever retarded aft into the BETA position to slow the airplane. The pilot stated that this was followed by an immediate shimmy, which quickly became severe. The control stick was then pulled back to alleviate pressure on the nose gear, but the nose gear collapsed about 2 to 3 seconds later. The airplane then skidded for about 1,000 feet on the runway surface before it veered to the right onto the grass adjacent to the runway. The aircraft then slid for about another 70 feet, after which it came to rest upright. An examination of the airplane failed to reveal any structural damage as a result of the gear collapse.

At the request of the National Transportation Safety Board (NTSB) investigator-in-charge (IIC), on March 3, 2015, a Federal Aviation Administration aviation safety inspector supervised the removal of the right hand bearing block, serial number 111-0003, and the nose landing gear strut, serial number 432-0008. On March 17, 2015, both parts were shipped to the NTSB Materials Laboratory, Washington, D.C. for examination by a Materials Engineer. As a result of the examination, the engineer reported that the nose landing gear strut was submitted with a separated right trunnion pin, the separation having occurred at the base of the trunnion pin where it connected to the strut arm. The engineer further reported that the fracture surface of the portion of the trunnion pin that remained on the strut had extensive damage that obscured most of the fracture surface features. The engineer stated that there were 2 areas on the trunnion pin fracture surface that were generally flat, with a finely textured appearance and unified crack fronts consistent with fatigue crack progression. The fatigue cracking appeared to initiate from multiple origins on opposed sides of the trunnion pin, which is consistent with reversed bending fatigue. The fatigue cracking had propagated through approximately 35% of the cross-section from each side of the trunnion pin. Overstress separation covered the remaining 30% of the trunnion pin fracture surface between the two fatigue crack fronts. The size and shape of the fatigue crack areas were typical of reversed bending fatigue cracking in the presence of what is identified as a severe stress concentration. The engineer added that this was consistent with the fact that the separation of the trunnion pin occurred at the location where the trunnion pin attached to the strut arm. The mode operation which precipitated the reverse bending during towing, takeoff, or landing, was not determined

during the investigation. (Refer to the NTSB Materials Laboratory Factual Report No. 15-079, which is appended to the docket for this report.)

The airplane's Pilot's Operating Handbook states under Landing Gear, "Nose gear rotation is limited to 50 degrees either side of center."

Pilot Information

Certificate:	Commercial	**Age:**	55,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	June 11, 2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	June 14, 2014
Flight Time:	1532 hours (Total, all aircraft), 108 hours (Total, this make and model), 1532 hours (Pilot In Command, all aircraft), 39 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	EVO13 LLC	**Registration:**	N3WB
Model/Series:	LANCAIR EVOLUTION	**Aircraft Category:**	Airplane
Year of Manufacture:	2013	**Amateur Built:**	Yes
Airworthiness Certificate:	Normal; Experimental (Special)	**Serial Number:**	EVO-113
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	August 21, 2014 Annual	**Certified Max Gross Wt.:**	4330 lbs
Time Since Last Inspection:	84 Hrs	**Engines:**	1 Turbo prop
Airframe Total Time:	182.5 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney
ELT:	C126 installed, not activated	**Engine Model/Series:**	PT6A-135A
Registered Owner:	WR Brody, LLC	**Rated Power:**	750 Horsepower
Operator:	WR Brody, LLC	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	SQL,5 ft msl	**Distance from Accident Site:**	
Observation Time:	11:47 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 20000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	19°C / 13°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	San Diego, CA (SEE)	**Type of Flight Plan Filed:**	IFR
Destination:	San Carlos, CA (SQL)	**Type of Clearance:**	IFR
Departure Time:	10:00 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	San Carlos SQL	**Runway Surface Type:**	Asphalt
Airport Elevation:	5 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	30	**IFR Approach:**	None
Runway Length/Width:	2600 ft / 75 ft	**VFR Approach/Landing:**	Straight-in

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Minor
Passenger Injuries:	2 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 None	**Latitude, Longitude:**	37.509166,-122.246391

Administrative Information

Investigator In Charge (IIC):	Little, Thomas
Additional Participating Persons:	Michael Arraiz; Federal Aviation Administration; San Jose, CA Gregory R Wilt; San Diego, CA Robert Wolstenholme; Lancair International; Redmond, OR
Original Publish Date:	January 21, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this incident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=90741