



National Transportation Safety Board Aviation Incident Final Report

Location:	Elyria, OH	Incident Number:	CEN13IA024
Date & Time:	10/17/2012, 1330 EDT	Registration:	N21ZA
Aircraft:	FLIGHT DESIGN CTLS	Aircraft Damage:	Minor
Defining Event:	Landing gear collapse	Injuries:	2 None
Flight Conducted Under:	Part 91: General Aviation - Instructional		

Analysis

The flight instructor reported that the airplane's fixed right main landing gear collapsed during landing. He reported that the landing was "not extraordinarily hard" and that it should have been well within the airplane's typical performance.

Postincident examination of the composite right main landing gear leg revealed several manufacturing defects, including wrinkled layers and layers that terminated at the surface when they should have been continuous, which reduced the landing gear leg's strength and its ability to resist longitudinal cracks. As a result of this investigation, the airplane manufacturer conducted an audit of the subcontractor that manufactured the landing gear legs. The audit revealed that, before the incident, the landing gear manufacturer had become aware of quality issues related to the mold closing process of the landing gear legs during manufacture and had implemented steps to reduce the recurrence of these issues. Based on the available evidence, the manufacturing defects in the composite main landing gear leg likely reduced the leg's load-carrying capacity and resulted in its eventual failure.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: The manufacturing defects in the main landing gear leg, which resulted in its eventual failure.

Findings

Aircraft	Main gear strut/axle/truck - Failure (Cause)
Organizational issues	Equipment manufacture - Manufacturer (Cause)

Factual Information

On October 17, 2012, about 1330 eastern daylight time, a Flight Design GMBH model CTLS, N21ZA, sustained substantial damage while landing on runway 25 at the Lorain County Airport (LPR), Elyria, Ohio. The flight instructor and student pilot were not injured. The airplane sustained minor damage to the landing gear during the mishap. The aircraft was registered to RAS Aviation LLC, Elyria, Ohio, and operated by Zone Aviation, Elyria, Ohio, under the provisions of 14 Code of Federal Regulations Part 91 as an instructional flight. Visual meteorological conditions prevailed for the flight, which was not operated on a flight plan. The local flight originated at an unconfirmed time.

The flight instructor reported that the flight was a training flight and on the first landing the right main landing gear collapsed. He stated that the landing was "not extraordinarily hard". He went on to add that based on his experience in the same model airplane that the landing should have been well within typical performance of the airplane.

During the investigation it was discovered that this same airplane was involved in a landing accident on July 19, 2012 (CEN12LA676). The July accident also resulted in a fracture of the right main landing gear leg.

The damaged right main landing gear leg from this incident was retained for further examination. The main landing gear leg was made of composite material. The fiber reinforcements used in the composite construction included unidirectional glass fibers, glass fiber fabric, and basalt fiber fabric. Flexible plastic tubes extended the length of the legs enclosed within ribbed plastic tubes located near the leading and trailing edges of the leg. Foam filled space between the plastic tubes and a center internal cavity. The legs were manufactured in a mold with the split line at the leading and trailing edges. During the layup process, layers were placed in a mold half representing the upper half of the leg, and layers were wrapped around the internal tubes, foam, center cavity, and preformed layers. The mold was then closed with a mold piece representing the lower half of the landing gear, and the center internal cavity was pressurized during curing. Examination and sectioning of the landing gear leg showed wrinkling of the fibers resulting in their orientation being angled with relation to the surface rather than parallel to the surface. Additionally several layers terminated at the leading and trailing edges. The location of these terminating layers corresponded with the location of longitudinal cracks found along the leading and trailing edges of the landing gear.

As a result of the investigation, the manufacturer of the airplane was contacted regarding the landing gear manufacturing process. The landing gear legs were manufactured by a sub-contractor to the airplane manufacturer. The airplane manufacturer conducted an audit of the sub-contractor and determined that there were some previous quality issues with regard to mold closing during the manufacture of the landing gear legs. It was reported that the landing gear manufacturer had recognized these issues and had implemented steps to reduce the risk of recurrence of these issues. The airplane manufacturer also conducted a search of part requests and difficulty reports related to the main landing gear. This records search showed 3 occurrences which resulted in complete collapse of the landing gear leg out of a fleet of 370 airplanes. All other reported landing gear leg fractures were discovered either during inspection after a hard landing, or during taxi operation when significantly reduced stiffness was encountered.

History of Flight

Landing-landing roll	Landing gear collapse (Defining event)
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Flight Instructor Information

Certificate:	Commercial	Age:	38
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
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 1 Without Waivers/Limitations	Last FAA Medical Exam:	10/04/2011
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	910 hours (Total, all aircraft), 425 hours (Total, this make and model), 135 hours (Last 90 days, all aircraft)		

Student Pilot Information

Certificate:	Student	Age:	23
Airplane Rating(s):	None	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	None	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 3 Without Waivers/Limitations	Last FAA Medical Exam:	10/18/2011
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	30 hours (Total, all aircraft), 30 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	FLIGHT DESIGN	Registration:	N21ZA
Model/Series:	CTLS	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Special Light-Sport	Serial Number:	F-10-09-04
Landing Gear Type:	Tricycle	Seats:	2
Date/Type of Last Inspection:	Unknown	Certified Max Gross Wt.:	1320 lbs
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:		Engine Manufacturer:	ROTAX
ELT:	Installed	Engine Model/Series:	912
Registered Owner:	RAS Aviation LLC	Rated Power:	100 hp
Operator:	Zone Aviation	Operating Certificate(s) Held:	None
Operator Does Business As:	Zone Aviation	Operator Designator Code:	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	LPR, 793 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	1353 EDT	Direction from Accident Site:	0°
Lowest Cloud Condition:		Visibility	8 Miles
Lowest Ceiling:	Overcast / 9000 ft agl	Visibility (RVR):	
Wind Speed/Gusts:	9 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	190°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.77 inches Hg	Temperature/Dew Point:	18° C / 8° C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Elyria, OH (LPR)	Type of Flight Plan Filed:	None
Destination:	Elyria, OH (LPR)	Type of Clearance:	None
Departure Time:	EDT	Type of Airspace:	

Airport Information

Airport:	Lorain County Regional Airport (LPR)	Runway Surface Type:	Asphalt
Airport Elevation:	793 ft	Runway Surface Condition:	Dry
Runway Used:	25	IFR Approach:	None
Runway Length/Width:	5002 ft / 100 ft	VFR Approach/Landing:	Traffic Pattern

Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Minor
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 None	Latitude, Longitude:	41.344167, -82.177778

Administrative Information

Investigator In Charge (IIC):	John M Brannen	Report Date:	12/15/2014
Additional Participating Persons:	Mark Miller; FAA-Cleveland FSDO; Cleveland, OH		
Publish Date:	12/15/2014		
Investigation Docket:	http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=85401		

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