Aviation Investigation Final Report

Location:	Hubbard, Oregon	**Accident Number:**	WPR15LA228
Date & Time:	August 2, 2015, 16:00 Local	**Registration:**	N234S
Aircraft:	HUDSON ZODIAC CH 601 XLB	**Aircraft Damage:**	Substantial
Defining Event:	Sys/Comp malf/fail (non-power)	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

While approaching the destination airport in the experimental amateur-built airplane, the pilot felt an engine vibration and elected to shut down the engine and conduct a precautionary landing to a nearby field. During the landing sequence, the airplane's left wing collided with a ground sprinkler system, which resulted in substantial damage.

Postaccident examination of the engine revealed no anomalies. The propeller had been removed from the crankshaft flange by the pilot following the accident. Examination of the flange revealed numerous fractures in the threaded alignment holes, and the alignment screws were worn. Additionally, five of the six "lightning" holes displayed cracking. Examination of the propeller spacer revealed that two bores were missing bushings. All six bolts were fitted with two washers; one affixed to each bolt head and a larger washer between the bolt head and the spacer. The larger washers exhibited rotational deformation consistent with contact with the fixed washers. All six bolts were bent, and it could not be determined if the bolts were safety wired at the time of the accident. The bolt bushings appeared to be "homemade" and of different lengths, with bolt holes drilled off-center. It is likely that the irregular, non-standard bushings prevented the proper installation and torqueing of the propeller bolts, which led to the vibration experienced during the accident flight.

Probable Cause and Findings

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

A severe propeller vibration due to the pilot's improper installation of the propeller spacer assembly, which necessitated an engine shutdown, an off-airport landing, and a collision with a sprinkler system.

Findings

Aircraft	Propeller assembly - Incorrect service/maintenance
Personnel issues	Modification/alteration - Owner/builder

Factual Information

History of Flight

Enroute	Sys/Comp malf/fail (non-power) (Defining event)
Landing-landing roll	Collision with terr/obj (non-CFIT)

On August 2, 2015, about 1600 Pacific daylight time, a Hudson Zodiac CH 601 XLB, N234S, experimental amateur-built airplane, was substantially damaged during a precautionary landing after experiencing a severe engine vibration near Hubbard, Oregon. The commercial pilot, sole occupant, was not injured. Visual meteorological conditions prevailed for the personal flight, which was being operated in accordance with 14 Code of Federal Regulations Part 91, and a flight plan was not filed. The local flight had departed the Valley View Airport (5S9), Estacada, Oregon, about 15 minutes prior to the accident, with Lenhardt Airpark (7S9), Hubbard, Oregon, as the planned destination.

In a report submitted to the National Transportation Safety Board (NTSB) investigator-in-charge, the pilot reported that about 10 minutes prior to landing he noticed an [engine] vibration, and when the intensity increased he chose to land in a field. The pilot stated that prior to landing the engine shook violently, which resulted in him shutting the engine down. During the forced landing the airplane's left wing collided with a ground sprinkler system, which resulted in substantial damage to the airplane.

On August 20, 2015, an NTSB air safety investigator, accompanied by two Federal Aviation Administration (FAA) inspectors, examined the airplane at the facilities of Premier Engines, located in Troutdale, Oregon. It was reported by an FAA inspector that the propeller flange was cracked through 5 of the 6 lightning holes in the flange, indicating a vibration in the propeller. The inspector stated that it was apparent that some bolts had lost torque or were not properly torqued, which allowed one blade to "bounce", and subsequently resulted in the reported vibration.

The inspector added that the propeller was mounted on a heavily modified, formerly certified, propeller spacer. The spacer showed evidence of the builder [having attempted] to correct an out-of-track condition by "shaving " the spacer down on one side. The propeller bolt bushings installed in the spacer appeared to be "homemade" and of different lengths, with bolt holes drilled off center, and generally of poor quality.

An examination of the airplane's engine revealed no anomalies that would have precluded normal operation.

Pilot Information

Certificate:	Commercial; Flight instructor; Sport Pilot	**Age:**	68,Male
Airplane Rating(s):	Single-engine land; Multi-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):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	None	**Last FAA Medical Exam:**	January 1, 2004
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	April 25, 2015
Flight Time:	2350 hours (Total, all aircraft), 80 hours (Total, this make and model), 12 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	HUDSON	**Registration:**	N234S
Model/Series:	ZODIAC CH 601 XLB	**Aircraft Category:**	Airplane
Year of Manufacture:	2012	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	7165
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	November 2, 2014 Annual	**Certified Max Gross Wt.:**	1320 lbs
Time Since Last Inspection:	10 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	80 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	C126 installed, activated, aided in locating accident	**Engine Model/Series:**	O-290 G
Registered Owner:	Ralph A Hudson	**Rated Power:**	120 Horsepower
Operator:	Ralph A Hudson	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	UAO,200 ft msl	**Distance from Accident Site:**	
Observation Time:	15:53 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.92 inches Hg	**Temperature/Dew Point:**	27°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Estacada, OR (5S9)	**Type of Flight Plan Filed:**	None
Destination:	Hubbard, OR (7S9)	**Type of Clearance:**	None
Departure Time:	15:45 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	45.18,-122.743614

Administrative Information

Investigator In Charge (IIC):	Little, Thomas
Additional Participating Persons:	Curt Cowley; Federal Aviation Administration; Hillsboro, OR
Original Publish Date:	September 12, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=91688