Aviation Investigation Final Report

Location:	Gulfport, Mississippi	**Accident Number:**	CEN22LA138
Date & Time:	March 6, 2022, 21:30 Local	**Registration:**	N8170J
Aircraft:	Beech 200	**Aircraft Damage:**	Substantial
Defining Event:	Sys/Comp malf/fail (non-power)	**Injuries:**	5 None
Flight Conducted Under:	Part 91: General aviation - Business		

Analysis

The airplane was on an instrument approach when the pilot attempted to extend the landing gear. During the gear extension process, the passengers heard a “loud bang” under the floor panels, and the pilot reported that the gear would not extend. The pilot diverted to another airport and attempted to extend the landing gear manually, which was unsuccessful as the landing gear system was jammed. The pilot landed with the gear retracted and the airplane sustained substantial damage to the fuselage and empennage.

A postaccident examination of the landing gear revealed that the gear was still jammed and could not be actuated with the gear handle or by manual extension. The right landing gear drive shaft was unable to rotate and exhibited a binding during the rotation attempt. The examination and disassembly of the right main landing gear actuator revealed that the initial failure originated between the bevel gear set. The pinion gear and driven gear exhibited damage and fractures of their respective teeth. The cracked teeth and pitch line pitting present on the pinion gear indicate that it exhibited fatigue wear prior to the failure of the bevel gears. The final surface of the driven gear was significantly smeared, which obstructed the examination and analysis of the surfaces for fatigue-like cracks and wear patterns. Although the failure was within the bevel gear set, the initiating gear failure could not be determined due to the damage.

The pinion gear had effective case depth but did not meet the drawing requirements for minimum case hardness. The driven gear did not show evidence of case hardening and did not meet the drawing requirements for both effective case depth and minimum case hardness. Since the bevel gear set were operational for more than 12,000 cycles, it is likely that the case hardness did not contribute to the gear failure.

Probable Cause and Findings

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

The failure of the right main landing gear actuator, which led to a gear-up landing.

Findings

Aircraft	Landing gear actuator - Failure

Factual Information

History of Flight

Landing	Sys/Comp malf/fail (non-power) (Defining event)
Post-impact	Fire/smoke (post-impact)

On March 6, 2022, about 2130 central standard time, a Beech 200 airplane, N8170J, was substantially damaged when it was involved in an accident at Gulfport-Biloxi International Airport (GPT), Gulfport, Mississippi. The pilot and four passengers were not injured. The flight was operated as a Title 14 *Code of Federal Regulations* Part 91 business flight.

The pilot reported that while on an instrument approach to Stennis International Airport (HAS), Bay St Louis, Mississippi, he attempted to extend the landing gear but it would not extend. He requested to hold while he attempted to manually extend the gear, but the manual extension handle was jammed. He diverted to GPT and again attempted to extend the landing gear without success, so he made a gear-up landing.

According to the Federal Aviation Administration (FAA) inspectors, the airplane was on approach to HAS when the pilot attempted to extend the landing gear. During the gear extension process, the passengers heard a “loud bang” under the floor panels and the pilot reported that the gear would not extend. The pilot diverted to GPT and attempted to extend the landing gear manually, which was unsuccessful as the landing gear system was jammed. The pilot landed with the gear retracted and the airplane sustained substantial damage to the fuselage and empennage. After landing, there was a small fire under the right engine nacelle.

Postaccident examination of the landing gear by the FAA revealed that the gear was still jammed and could not be actuated with the gear handle or by manual extension. They cut the landing gear drive shafts to the left and right gear actuators. The left drive shaft was successfully rotated using channel lock pliers. The right drive shaft would barely move and exhibited a binding sound and feel during the rotation attempt. The airplane was relocated to the recovery facility where the right main landing gear actuator was removed and shipped to the FAA aircraft certification office (ACO) in Wichita, Kansas.

An examination and disassembly of the right main landing gear actuator was completed by Textron Aviation under the supervision of the FAA ACO. The examination concluded the following:

1. The initial component failure originated between the straight bevel gear set.

2. Breakage of the teeth from the pinion gear varied in fracture surface and location. The individual teeth that broke off have different features in comparison to the six adjacent teeth that were broken.

    a. The individual broken teeth show cracking features that would have developed progressively before failure.

    b. The group of adjacent broken teeth have evidence of shear overload and tensile overload, indicating the failure was abrupt and possibly related to shock overloading.

    c. Smearing that occurred during the final stages of mechanical failure obscures additional evidence to the failure modes present.

3. The broken pinion gear teeth exhibited internal secondary cracks.

4. The driven gear teeth were plastically deformed and cracked along the tip of the addendum as it smeared against the broken section of pinion teeth. Additional cracks were observed near the root of the driven gear but could not be confirmed as either a result of fatigue or overload cracking.

5. The appropriate grease was used and abundant within the housing.

6. Both the pinon and driven gears were confirmed to be the correct alloy per the drawing requirements.

7. The pinion gear had effective case hardening to the appropriate depth but did not meet the drawing requirements for minimum case hardness.

8. The driven gear did not have evidence of case hardening and did not meet the drawing requirements for both effective case depth and minimum case hardness.

A review of the maintenance record revealed that on January 6, 2015, the right main landing gear actuator was overhauled and later reinstalled on the airplane. As of the accident date, the right main landing gear actuator was to be overhauled or replaced every 8,000 cycles, which was due in 7,429 cycles. On October 20, 2021, during a maintenance phase inspection, the main landing gear mechanical actuators were inspected per the aircraft maintenance manual with no defects noted. This inspection was completed at 12,449 total cycles. As of the accident date, the right main landing gear actuator was to be inspected every 1,000 cycles, which was due in 945 cycles.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	72,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	October 5, 2021
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	September 17, 2021
Flight Time:	16726 hours (Total, all aircraft), 5179 hours (Total, this make and model), 16431 hours (Pilot In Command, all aircraft), 95 hours (Last 90 days, all aircraft), 24 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N8170J
Model/Series:	200	**Aircraft Category:**	Airplane
Year of Manufacture:	1980	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	BB728
Landing Gear Type:	Retractable - Tricycle	**Seats:**	9
Date/Type of Last Inspection:	October 20, 2021 Continuous airworthiness	**Certified Max Gross Wt.:**	12500 lbs
Time Since Last Inspection:	70.2 Hrs	**Engines:**	2 Turbo prop
Airframe Total Time:	13164.3 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney
ELT:	C126 installed, not activated	**Engine Model/Series:**	PT6-41
Registered Owner:	HLAF AETA LLC	**Rated Power:**	850 Horsepower
Operator:	HLAF AETA LLC	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	KGPT,28 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	21:24 Local	**Direction from Accident Site:**	304°
Lowest Cloud Condition:		**Visibility**	7 miles
Lowest Ceiling:	Broken / 600 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	12 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	140°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.08 inches Hg	**Temperature/Dew Point:**	21°C / 20°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Borger, TX (BGD)	**Type of Flight Plan Filed:**	IFR
Destination:	Gulfport, MS (GPT)	**Type of Clearance:**	IFR
Departure Time:	18:15 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	Gulfport-Biloxi International Airport GPT	**Runway Surface Type:**	Asphalt;Concrete
Airport Elevation:	28 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	14	**IFR Approach:**	ILS
Runway Length/Width:	9002 ft / 150 ft	**VFR Approach/Landing:**	

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	4 None	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	5 None	**Latitude, Longitude:**	30.407954,-89.073991

Administrative Information

Investigator In Charge (IIC):	Lindberg, Joshua
Additional Participating Persons:	Brooks "Chip" Vaughn; Federal Aviation Administration; Jackons, MS Jennifer Barclay; Textron Aviation; Wichita, KS
Original Publish Date:	March 28, 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=104754

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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.