



# Aviation Investigation Factual Report

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<b>Location:</b>	Fresno, California	<b>Accident Number:</b>	WPR23LA004
<b>Date &amp; Time:</b>	October 1, 2022, 09:55 Local	<b>Registration:</b>	N284CA
<b>Aircraft:</b>	Bell 206B	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Sys/Comp malf/fail (non-power)	<b>Injuries:</b>	2 Serious
<b>Flight Conducted Under:</b>	Part 91: General aviation - Other work use		

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## Factual Information

On October 1, 2022, about 0955 Pacific daylight time, a Bell 206B, N284CA, was substantially damaged when it was involved in an accident near Fresno, California. The pilot and passenger were seriously injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 other work use flight.

The pilot and passenger reported that purpose of the flight was to conduct an operational check of the helicopter following recent a maintenance inspection. The passenger stated that at the completion of their operational check items they were returning to the airport when he heard a loud crack/pop sound. The pilot stated that he “experienced a tail rotor failure.” The helicopter began to yaw to the right, and he performed an autorotation to the front yard of a residence. Subsequently, the helicopter impacted a tree, landed hard, and rolled onto its left side.

Postaccident examination of the helicopter found that the No. 4 segmented tail rotor drive shaft and the splined adapter on the forward end of the drive shaft had separated from the drive shaft tube. The area of separation was consistent with a disbond between the splined adapter and the drive shaft tube. The No. 4 segmented tail rotor drive shaft was retained for further examination.

The No. 4 segmented tail rotor drive shaft was shipped to the National Transportation Safety Board Materials Lab for further examination. The lab examination of the No. 4 segmented tail rotor drive shaft found no evidence of anomalous damage within the splined connection. The serial number marking “VN12657” was observed on the outer surface of the splined adapter.

The outer diameter of the splined adapter at the aft end was tapered (the thickness of the outer diameter continuously decreases towards the aft end), while the inner diameter remained constant. The thickness measurements for the tapered wall were below the specified limits. The adhesive material between the drive shaft tube and the splined adapter showed evidence of heating and resolidification. The main wall thickness of the drive shaft tube measured approximately 0.051 inch, which is within the specified thickness. The outer diameter measured approximately 1.004 inch, which was within specified limits. The inner diameter measured approximately 0.9 inch, which was within specified limits.



*Figure 1: The separated splined adapter at the forward end of the No. 4 segmented tail rotor drive shaft. Photo courtesy of Bell Helicopters.*

The Bell 206B maintenance manual required a recurrent inspection of the segmented tail rotor drive shafts during the 100-hour interval, (event No. 3) of the 100-hour progressive inspection, or during event No. 4 of the 300-hour progressive inspection. The inspection criteria for the segmented tail rotor drive shafts was: "Examine long tail rotor driveshaft or segmented driveshafts and aft splined adapter for condition and security. Check aft splined adapter for adequate lubrication and freedom of movement."

Bell ASB Nos. 206-20-139 and 206L-20-184 required an initial and recurring visual inspection and proof-load testing of installed segmented drive shafts with bonded adapters that were either 1.00-inch or 1.25-inch in diameter. The ASB contained two parts. Part I specified that within the next 75 flight hours or 3 months after release of the bulletin, and every 300 flight hours or 12 months thereafter, operators should conduct a visual inspection of the bond line of the bonded adapters, apply an index mark on each bonded adapter, and conduct a proof-load test using a bonded shaft tool.

On June 15, 2022, Transport Canada released AD No. CF-2022-33, which required accomplishment of Bell ASB No. 206-20-139. Subsequently, on March 16, 2023, the FAA released AD No. 2023-06-05, which required compliance with aspects of Transport Canada AD No. CF-2022-33.

Based on the accident helicopter's maintenance records, the last 100-hour inspection was accomplished on September 30, 2022, at an airframe total time (ATT) of 26,191.4 hours (the accident flight was the post-maintenance check flight). On August 11, 2022, at an ATT of 26,113.7 hours, multiple inspections were accomplished, including the 100-hour airframe and engine inspections, the 300-hour airframe and engine inspections, and Part I of ASB No. 206-

20-139. Between the time of the release of ASB No. 206-20-139 until the date of the accident, the operator accomplished Part I of the ASB a total of four times (Table 1). According to helicopter records, about 77.7 hours elapsed between the last accomplishment of Part I of ASB No. 206-20-139 and the time of the accident.

Date	ATT	Event
October 1, 2022	26,191.4	Accident date
August 11, 2022	26,113.7	Accomplished Part I of ASB No. 206-20-139
January 20, 2022	25,830.7	Accomplished Part I of ASB No. 206-20-139
April 14, 2021	25,547.3	Accomplished Part I of ASB No. 206-20-139
September 29, 2020	25,255.6	Accomplished Part I of ASB No. 206-20-139
July 21, 2020	25,078.9	Release of ASB No. 206-20-139

Table 1. The historical accomplishment of ASB No. 206-20-139 on the accident helicopter.

The segmented drive shafts are not life limited and therefore are not required to be tracked after manufacture. Thus, the accident No. 4 segmented tail rotor drive shaft’s time in service could not be determined. Additionally, Bell could not find a record of the “VN12657” serial number observed on the splined adapter. Therefore, the manufacture date for the accident No. 4 segmented drive shaft could not be estimated.

The operator’s director of maintenance stated that they used a bonded shaft tool from a commercially available source to accomplish Part I of ASB No. 206-20-139. Additionally, a second tool, containing internal splines, was installed on the oil cooler drive shaft to hold the tail rotor drive in-line while the bonded shaft tool was used to apply the proof load. Examination of the bonded shaft tool used by the operator found the dimension between the square drive to the centers of the bolt holes was about 3.019 inches. According to Bell ASB No. 206-20-139 and 206L-20-184, the bonded shaft tool may be ordered or locally manufactured. The ASB provided the dimensions of the bonded shaft tool for local manufacture, which was to have a 3.00-inch distance between the square drive to the centers of the bolt holes.

According to Bell, for the 206A and 206B, from 1986 to 2023 there have been 16 known occurrences of an in-service disbond of the segmented tail rotor drive shaft with bonded adapters, to include the N284CA accident. Of the 16 occurrences, 11 did not have a known cause for the disbond, primarily due to damage to the bond surfaces after the disbond occurred, which precluded identification of a failure mode. For the remaining 5 disbond occurrences, 3 were attributed to the reuse of a segmented drive shaft after a known tail rotor sudden stoppage, 1 was attributed to damage to the adhesive due to media blasting of the tail rotor drive shaft, and 1 was attributed to inadequate adhesive on the bond surfaces at the time of manufacture.

## Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	46, Male
<b>Airplane Rating(s):</b>	None	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>	Helicopter	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	Helicopter; Instrument helicopter	<b>Toxicology Performed:</b>	
<b>Medical Certification:</b>	Class 2 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	March 1, 2022
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	December 9, 2020
<b>Flight Time:</b>	3811 hours (Total, all aircraft), 2119 hours (Total, this make and model), 88 hours (Last 90 days, all aircraft), 40 hours (Last 30 days, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Bell	<b>Registration:</b>	N284CA
<b>Model/Series:</b>	206B	<b>Aircraft Category:</b>	Helicopter
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	1578
<b>Landing Gear Type:</b>	None; Skid	<b>Seats:</b>	5
<b>Date/Type of Last Inspection:</b>		<b>Certified Max Gross Wt.:</b>	
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Turbo shaft
<b>Airframe Total Time:</b>		<b>Engine Manufacturer:</b>	Rolls Royce
<b>ELT:</b>		<b>Engine Model/Series:</b>	250-C20
<b>Registered Owner:</b>	ORGAN MOUNTAIN AVIATION CO LLC	<b>Rated Power:</b>	
<b>Operator:</b>	Lasen	<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>	KFAT,334 ft msl	<b>Distance from Accident Site:</b>	4 Nautical Miles
<b>Observation Time:</b>	09:53 Local	<b>Direction from Accident Site:</b>	358°
<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>	5 knots /	<b>Turbulence Type Forecast/Actual:</b>	None / None
<b>Wind Direction:</b>	120°	<b>Turbulence Severity Forecast/Actual:</b>	N/A / N/A
<b>Altimeter Setting:</b>	29.82 inches Hg	<b>Temperature/Dew Point:</b>	25°C / 11°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Fresno, CA	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Fresno, CA	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>		<b>Type of Airspace:</b>	Class C

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Serious	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	1 Serious	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>		<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	2 Serious	<b>Latitude, Longitude:</b>	36.708971,-119.72895(est)

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Cawthra, Joshua
<b>Additional Participating Persons:</b>	Ryan D. Smith; Federal Aviation Administration; Fresno, CA
<b>Report Date:</b>	
<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.ntsb.gov/Docket?ProjectID=106044">https://data.ntsb.gov/Docket?ProjectID=106044</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](#).