



Aviation Investigation Factual Report

Location:	Mount Baldy, California	Accident Number:	WPR22LA333
Date & Time:	September 4, 2022, 07:57 Local	Registration:	N687AM
Aircraft:	Bell 407	Aircraft Damage:	Substantial
Defining Event:	Loss of control in flight	Injuries:	1 Serious
Flight Conducted Under:	Part 91: General aviation - Other work use		

Factual Information

On September 4, 2022, at 0757 Pacific daylight time, a Bell 407, N687AM, was substantially damaged when it was involved in an accident near Mount Baldy, California. The pilot was seriously injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 flight.

According to the pilot, the helicopter was being used to shuttle people, water, and equipment in support of a local charity event between a lower LZ at about 4,300 ft mean sea level (msl) and the summit of Mount Baldy, about 4 miles away at 10,064 ft msl. He estimated he would need five flights to complete the mission.

The pilot stated he left the rotor rpm at 100% during the first and second landings and offloads at the summit. After he had dropped off the second load at the summit and was returning to base camp, his intent was to fly down-canyon to lose altitude and set up for a steep approach to the lower LZ. He was slowing from about 60 kts to 40 kts as he turned onto final when he saw the low rotor rpm warning light and heard the low rotor rpm warning horn. He stated that the flight controls were "normal," and he did not hear the engine sputter. He saw the rotor rpm was about 95%, so he lowered the collective and the rotor rpm increased to 100%. He did not recall looking at the throttle before he aborted the approach, turned down a canyon, and made a mayday call to ground personnel to report that he had a partial engine failure and was looking for a place to land.

The pilot then attempted to raise the collective, the low rotor rpm warning light illuminated again, and he heard the aural tone for the warning horn again. He did not attempt to put the Full Authority Digital Engine Controller (FADEC) into Manual mode because he did not want to divert his attention away from looking for a place to land. While looking for a place to land, the pilot noted several obstacles in the area and decided a clearing was his best option for landing. The pilot stated that he did not autorotate and decided to use the power available to try to land. He subsequently overshot the clearing and landed in trees. The helicopter rolled onto its right side upon landing, substantially damaging the main rotor blades.

The engine control unit (ECU) records snapshot data each time an engine parameter is exceeded; incident recorder (IR) data records 10 lines of data every 1.2 seconds before an exceedance and continues recording data for at least 48 seconds following the last exceedance. In this event, the IR recorded measurable data for nearly 62 seconds.

The data showed primary exceedance messages for Torque Rate, followed almost immediately by Primary Hard Fault and Reversionary Hard Fault, which triggered the IR function of the ECU. The data was consistent with the main rotor impact triggering the IR fault

and recording the engine shutting down following the accident. The data contained no additional IR faults or anomalies associated with the accident flight.

The pilot's operating handbook specifies that the throttle should be in the "FLY detent position" before takeoff and landing. It also cautions that failure to position and maintain the throttle in the FLY detent position during normal flight operations can limit available engine power. The pilot has two ways to confirm the throttle is in the FLY position: 1) visually observing that the throttle is in the FLY position according to the bezel marking on the collective stick; or 2) feeling by hand that the throttle remains within the FLY detent. Confirming that the throttle is in the FLY position before landing or takeoff ensures that the engine is being fully governed and, therefore, that full power is available.

The PLA corresponds to the power command sent to the engine via the throttle on the collective stick through the hydromechanical unit (HMU). The IR data indicated PLA values between 48°-50° during the 12 seconds before the IR was activated. The normal PLA value when the throttle is in the FLY position is 70°. However, the FADEC provides full governing (that is, full fuel flow) down to 62° PLA. The data further showed that, even at the lower PLA setting, the engine was performing normally.

A postaccident engine run and test of the engine and ECU to new engine production standards showed that the engine ran satisfactorily at all measured test points and responded properly to all throttle commands.

Postaccident examination of the helicopter verified control continuity from the twist grip throttle to the HMU before removal of the engine for the engine run. The twist grip was manipulated through various positions (Off, Idle, FLY, Max Ng, 48 PLA); the corresponding HMU pointer positions and the PLA 1 sensor reading on the ECU indicated the throttle was rigged correctly.

The twist grip throttle uses a ball plunger to assist in maintaining the FLY throttle position by engaging in a detent within the twist grip assembly. During the postaccident examination, when the throttle was manipulated by hand from the IDLE position to the FLY detent, the detent could be felt when it was reached. When the throttle was rolled from FLY to Max Ng, it could be felt going out of the detent. When the throttle was rolled from the FLY position toward IDLE, there was perceivably less tactile resistance as the ball plunger moved out of the detent.

The collective assembly was removed from the helicopter and examined at a Bell Helicopters laboratory under the supervision of a Federal Aviation Administration inspector. The frictional force required to change throttle positions was measured at different throttle positions. The force required to rotate the throttle and move the ball plunger from IDLE to the FLY detent measured 4 lb. The force required to rotate the ball plunger out of the FLY detent to IDLE measured 4 lb. The force required to rotate the ball plunger out of the FLY detent to MAX Ng measured 5 lb.

The collective stick was disassembled, and the throttle assembly was examined. Wear was evident where the ball plunger in the throttle control engaged the detent bracket (Figure 1). No other preimpact anomalies were found with the engine or airframe systems.

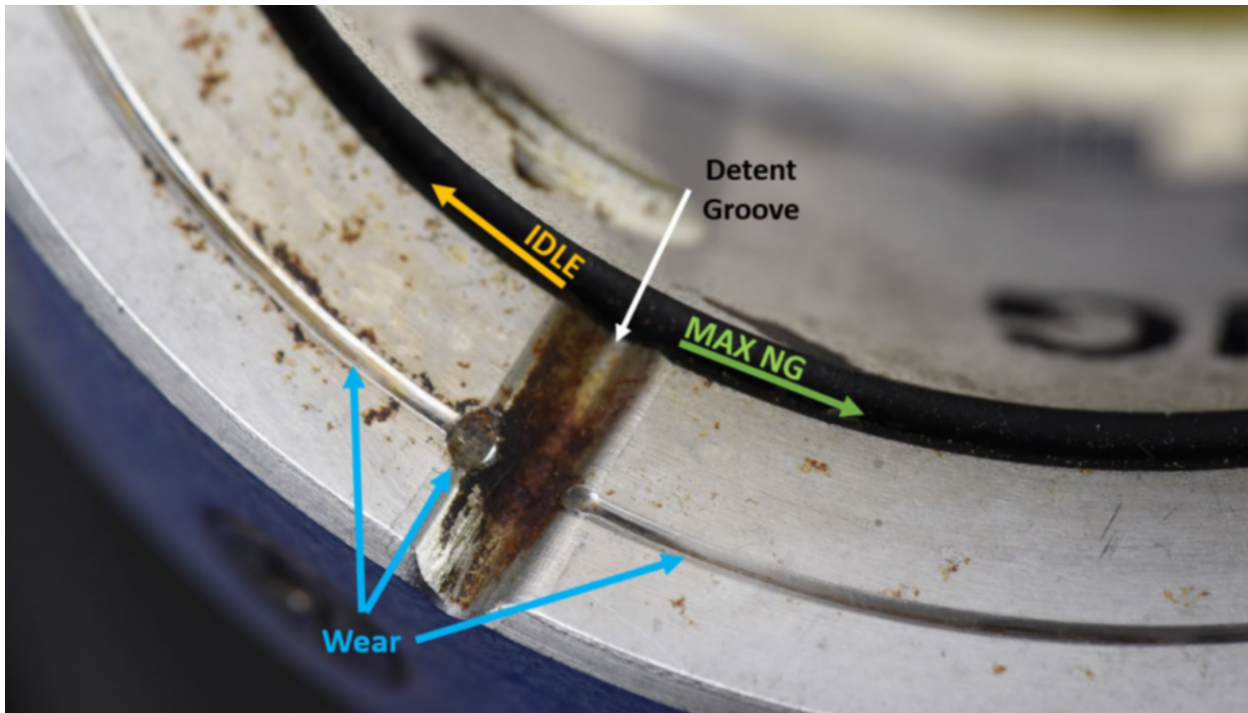


Figure 1. Collective detent bracket wear. (Source: Bell)

The Bell 407 maintenance manual specifies required recurrent inspections of the twist grip throttle within the progressive inspection program (Event No. 3) or the airframe periodic inspections. During these inspections, the throttle friction is checked using Bell maintenance manual procedure DMC-407-A-76-04-00-00A-280A-A, THROTTLE/FLY DETENT Friction Check. This procedure specifies $14-15 \pm 0.5$ lb of force should be required to move the ball plunger through the detent groove. If the throttle does not meet the friction standards specified, maintenance personnel are to adjust the throttle friction in accordance with Bell maintenance manual procedure DMC-407-A-76-04-00-00A-271A-A, THROTTLE/FLY DETENT Friction Adjustment.

The throttle friction adjustment procedures direct maintenance personnel to adjust the throttle friction by verifying the condition of the ball plunger and adjusting the depth of the ball plunger to apply pressure to the throttle bracket at the detent to achieve the specified friction. Neither the throttle Friction Check nor the throttle Friction Adjustment procedure specifies a check for wear at the FLY detent position.

According to the helicopter's maintenance records, the last Event No. 3 inspection was accomplished May 10, 2022, at a helicopter total time of 6,873.8 hrs. The operator's checklist for the Event No. 3 inspection included the throttle Friction Check and the throttle Friction Adjustment. The employee who performed the last Event No. 3 inspection was no longer

employed with the operator and was not available to verify which maintenance actions they may have performed regarding the throttle friction checks.

Pilot Information

Certificate:	Commercial; Flight instructor; Private	Age:	58, Male
Airplane Rating(s):	Single-engine sea	Seat Occupied:	Right
Other Aircraft Rating(s):	Helicopter	Restraint Used:	4-point
Instrument Rating(s):	Helicopter	Second Pilot Present:	No
Instructor Rating(s):	Helicopter	Toxicology Performed:	
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	June 14, 2022
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	October 11, 2021
Flight Time:	3447 hours (Total, all aircraft), 264 hours (Total, this make and model), 3309 hours (Pilot In Command, all aircraft), 28.3 hours (Last 90 days, all aircraft), 8 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	Registration:	N687AM
Model/Series:	407	Aircraft Category:	Helicopter
Year of Manufacture:	2001	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	53497
Landing Gear Type:	Skid	Seats:	4
Date/Type of Last Inspection:	August 30, 2022 AAIP	Certified Max Gross Wt.:	5250 lbs
Time Since Last Inspection:	42 Hrs	Engines:	1 Turbo shaft
Airframe Total Time:	6943 Hrs as of last inspection	Engine Manufacturer:	ALLISON
ELT:	C126 installed, not activated	Engine Model/Series:	M250-C47B
Registered Owner:	AIR METHODS CORP	Rated Power:	650 Horsepower
Operator:	AIR METHODS CORP	Operating Certificate(s) Held:	On-demand air taxi (135)
Operator Does Business As:		Operator Designator Code:	QMLA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KCCB,1439 ft msl	Distance from Accident Site:	8 Nautical Miles
Observation Time:	08:15 Local	Direction from Accident Site:	192°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	/	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.95 inches Hg	Temperature/Dew Point:	31°C / 16°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Mount Baldy , CA	Type of Flight Plan Filed:	Company VFR
Destination:	Mount Baldy , CA	Type of Clearance:	None
Departure Time:		Type of Airspace:	Class G

Wreckage and Impact Information

Crew Injuries:	1 Serious	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	1 Serious	Latitude, Longitude:	34.243,-117.654(est)

Administrative Information

Investigator In Charge (IIC):	Baker, Daniel
Additional Participating Persons:	Jason Trask; Air Methods; Denver, CO Benny Kim; FAA; Riverside, CA Nick Shepler; Rolls-Royce; Indianapolis, IN Beverly Harvey; Transportation Safety Board of Canada Kevin Drew; Air Methods Corp; Greenwood Village, CO
Report Date:	
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=105859

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](#).