



# Aviation Investigation Final Report

|                                |   |                         |                 |
|--------------------------------|---|-------------------------|-----------------|
| <b>Location:</b>               | Headland, Alabama   | <b>Accident Number:</b> | ERA20FA056      |
| <b>Date &amp; Time:</b>        | December 25, 2019, 17:13 Local  | <b>Registration:</b>    | N663SF          |
| <b>Aircraft:</b>               | Bell 407  | <b>Aircraft Damage:</b> | Substantial     |
| <b>Defining Event:</b>         | Medical event   | <b>Injuries:</b>        | 1 Fatal, 2 None |
| <b>Flight Conducted Under:</b> | Part 135: Air taxi & commuter - Non-scheduled - Air Medical (Medical emergency) |                         |                 |

## Analysis

According to the flight nurse and paramedic, the flight was normal until the helicopter suddenly rolled to the left as they approached the helipad during landing. The pilot made no attempt to correct the roll, and the helicopter rolled onto its side and the main rotors contacted the ground. The pilot was immediately observed to be unresponsive and not breathing, and the flight nurse and paramedic began CPR as quickly as they could extricate the pilot from the cockpit.

Autopsy of the pilot revealed severe coronary artery disease that placed him at significant increased risk for sudden death from an acute coronary event. Given the pilot's sudden inability to pilot the helicopter safely, the recognition by certified medical personnel that he was unresponsive and not breathing immediately following the accident, and the fact that he did not suffer enough blunt force trauma to have caused immediate cardiac arrest, it is most likely that the accident occurred because the pilot became incapacitated from an acute cardiac event.

## Probable Cause and Findings

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

Pilot incapacitation by a sudden cardiac event related to severe coronary artery disease, which resulted in a loss of helicopter control.

## Findings

Personnel issues

Cardiovascular - Pilot

# Factual Information

## History of Flight

|                      |                                    |
|----------------------|------------------------------------|
| Approach             | Medical event (Defining event)     |
| Approach             | Loss of control in flight          |
| Uncontrolled descent | Collision with terr/obj (non-CFIT) |

On December 25, 2019, about 1713 central standard time, a Bell 407 helicopter, N663SF, sustained substantial damage when it was involved in an accident near Headland, Alabama. The commercial pilot was fatally injured, and the flight nurse and paramedic were not injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 135 air ambulance flight.

According to the flight nurse, who was seated in the aft right seat, the crew were responding to an accident when the call was cancelled enroute and they turned back to their base. The flight nurse described the flight as normal, and stated that the helicopter was "working beautifully." He said that the pilot approached the helipad slightly faster than normal. As the helicopter neared the helipad, it made an abrupt "roll" to the left. The pilot did not say anything and did not correct for the roll. The helicopter impacted terrain and came to rest on its left side. The flight nurse stated that he and the flight paramedic unbuckled their restraints, exited the helicopter from the aft right door, and immediately tended to the pilot. The flight nurse said his first instinct was that the pilot had some sort of cardiac event. Using his flashlight, he could see that the pilot's face was blue, he was not breathing, and was unresponsive. The engine was still running, so another pilot (who witnessed and responded to the accident) performed an emergency shutdown, and all three of them pulled the pilot out of the helicopter from the windshield and initiated cardiopulmonary resuscitation (CPR).

The flight paramedic stated that, about 10-15 ft above the ground, the helicopter rolled 45° to the left. The flight paramedic said, "It felt if no correction was made and [the helicopter] continued to the ground. I could hear rotors striking the ground." When the helicopter stopped moving, he and the flight nurse exited the aft right door. The engine was still running so it was shut down. The pilot, who was unconscious and not breathing, was pulled from the helicopter and immediately administered CPR.

A witness, who was also a helicopter pilot, saw the accident helicopter making a "shallow approach" to the helipad. He turned his attention away for a moment, but when he looked back at the helicopter, it had impacted the ground and he could see "flying debris and water from the nearby pond."

## Pilot Information

|                                  |   |  |                  |
|----------------------------------|---|--|------------------|
| <b>Certificate:</b>              | Commercial; Flight instructor;<br>Private   | <b>Age:</b>                              | 61, Male         |
| <b>Airplane Rating(s):</b>       | Single-engine land  | <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  | <b>Toxicology Performed:</b>             | Yes              |
| <b>Medical Certification:</b>    | Class 2 With waivers/limitations  | <b>Last FAA Medical Exam:</b>            | April 1, 2019    |
| <b>Occupational Pilot:</b>       | Yes   | <b>Last Flight Review or Equivalent:</b> | December 6, 2019 |
| <b>Flight Time:</b>              | 9455 hours (Total, all aircraft), 391 hours (Total, this make and model), 8793 hours (Pilot In Command, all aircraft) |  |                  |

The pilot was hired by Viking, LLC, on December 2, 2019, and completed training on December 6, 2019. He completed his first 7-day "hitch" with Survival Flight, Inc. between December 10 -17, 2019, then had 7 days off. The day of the accident was the pilot's first day starting his second 7-day "hitch." The operator stated that the pilot's normal duty hours were 0700 to 1900. He flew one flight on the day of the accident before the accident flight. Both the flight nurse and paramedic stated that flight was normal, and they did not observe any medical issues with the pilot prior to the accident flight. The pilot was in a good mood and had not expressed any issues with stress or fatigue.

## Aircraft and Owner/Operator Information

|                                      |   |                                       |                          |
|--------------------------------------|---|---------------------------------------|--------------------------|
| <b>Aircraft Make:</b>                | Bell  | <b>Registration:</b>                  | N663SF                   |
| <b>Model/Series:</b>                 | 407 No Series   | <b>Aircraft Category:</b>             | Helicopter               |
| <b>Year of Manufacture:</b>          | 2000  | <b>Amateur Built:</b>                 |                          |
| <b>Airworthiness Certificate:</b>    | Normal  | <b>Serial Number:</b>                 | 53438                    |
| <b>Landing Gear Type:</b>            | N/A; High skid  | <b>Seats:</b>                         | 5                        |
| <b>Date/Type of Last Inspection:</b> | October 11, 2019 AAIP                                       | <b>Certified Max Gross Wt.:</b>       | 5501 lbs                 |
| <b>Time Since Last Inspection:</b>   |   | <b>Engines:</b>                       | 1 Turbo shaft            |
| <b>Airframe Total Time:</b>          | 2543.7 Hrs at time of accident                              | <b>Engine Manufacturer:</b>           | Rolls Royce              |
| <b>ELT:</b>                          | C126 installed, activated, did not aid in locating accident | <b>Engine Model/Series:</b>           | M250-C47B                |
| <b>Registered Owner:</b>             | On file   | <b>Rated Power:</b>                   | 700 Horsepower           |
| <b>Operator:</b>                     | On file   | <b>Operating Certificate(s) Held:</b> | On-demand air taxi (135) |
| <b>Operator Does Business As:</b>    | On file   | <b>Operator Designator Code:</b>      | 2VKA                     |

## Meteorological Information and Flight Plan

|   |                                  |   |                  |
|---|----------------------------------|---|------------------|
| <b>Conditions at Accident Site:</b>     | Visual (VMC)                     | <b>Condition of Light:</b>                  | Dusk             |
| <b>Observation Facility, Elevation:</b> | 0J6,358 ft msl                   | <b>Distance from Accident Site:</b>         | 0 Nautical Miles |
| <b>Observation Time:</b>                | 16:53 Local                      | <b>Direction from Accident Site:</b>        | 0°               |
| <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>                | 4 knots /                        | <b>Turbulence Type Forecast/Actual:</b>     | None / None      |
| <b>Wind Direction:</b>                  | 90°                              | <b>Turbulence Severity Forecast/Actual:</b> | N/A / N/A        |
| <b>Altimeter Setting:</b>               | 30.09 inches Hg                  | <b>Temperature/Dew Point:</b>               | 16°C / 8°C       |
| <b>Precipitation and Obscuration:</b>   | No Obscuration; No Precipitation |   |                  |
| <b>Departure Point:</b>                 | Headland, AL (0J6 )              | <b>Type of Flight Plan Filed:</b>           | Company VFR      |
| <b>Destination:</b>                     | Headland, AL (0J6 )              | <b>Type of Clearance:</b>                   | Unknown          |
| <b>Departure Time:</b>                  | 16:54 Local                      | <b>Type of Airspace:</b>                    | Class G          |

## Airport Information

|                             |                        |                                  |                       |
|-----------------------------|------------------------|----------------------------------|-----------------------|
| <b>Airport:</b>             | Headland Municipal 0J6 | <b>Runway Surface Type:</b>      | Concrete              |
| <b>Airport Elevation:</b>   | 358 ft msl             | <b>Runway Surface Condition:</b> | Dry                   |
| <b>Runway Used:</b>         |                        | <b>IFR Approach:</b>             | None                  |
| <b>Runway Length/Width:</b> |                        | <b>VFR Approach/Landing:</b>     | Full stop;Straight-in |

## Wreckage and Impact Information

|                            |                 |                             |                         |
|----------------------------|-----------------|-----------------------------|-------------------------|
| <b>Crew Injuries:</b>      | 1 Fatal, 2 None | <b>Aircraft Damage:</b>     | Substantial             |
| <b>Passenger Injuries:</b> |                 | <b>Aircraft Fire:</b>       | None                    |
| <b>Ground Injuries:</b>    |                 | <b>Aircraft Explosion:</b>  | None                    |
| <b>Total Injuries:</b>     | 1 Fatal, 2 None | <b>Latitude, Longitude:</b> | 31.364166,-85.3125(est) |

The helicopter impacted level, soft grass about 120 ft west-northwest of the helipad. It came to rest on its left side on a heading of about 103° in about 3 to 6 inches of standing water from recent rainfall. There was no postimpact fire.

Examination of the helicopter revealed that all four main rotor blades had separated from the main rotor at the hub and came to rest adjacent to the wreckage. All four blades exhibited extensive impact damage and pieces of composite blade material were strewn around the wreckage area. The left skid was displaced inward.

The fuselage sustained minor damage and all occupied seats remained securely attached to their respective floor fittings. The pilot's four-point seatbelt/shoulder harness was securely attached to the airframe and was found unbuckled, but when manually tested, it functioned normally. The inertial reel also functioned normally (locked) when tested. Both the flight nurse and paramedic's three-point seatbelt/shoulder harness (inertial reel) systems were secure to their respective airframe attach points and functioned normally when tested. No mechanical issues were noted with the seats or restraint systems.

The tail boom was fractured about 12 to 15 inches aft of the tail boom-to-fuselage attachment point. The tail rotor drive shaft was severed in three locations due to impact; however, continuity was established to the tail rotor. The tail rotor gearbox and both blades were intact, but one blade exhibited some impact damage. The gearbox chip detector was absent of debris. The right stabilator was undamaged and the left hand stabilator sustained impact damage. The top vertical fin exhibited minor leading-edge impact damage.

Flight and engine control continuity were established for the engine, main rotor, and tail rotor system, by manual manipulation of the anti-torque pedals, collective and cyclic in the cockpit. No mechanical issues were observed that would have precluded normal operation at the time of impact.

Examination of the engine revealed that it was secure to its respective mounts and did not sustain any impact damage. There was evidence of engine and drive train rotation at the time of impact and continuity was established for both N1 and N2 rotors. The upper and lower chip detectors were removed and absent of ferrous metal debris. The helicopter was equipped with an engine control unit (ECU), which was removed and downloaded. The ECU data indicated the engine was performing normally prior to the accident sequence. All relevant engine parameters (torque, Ng/Np speeds, fuel flow, and temperature) were normal prior to the accident and responded as expected during the accident sequence. No mechanical issues were observed with the engine that would have precluded normal operation at the time of impact.

## Medical and Pathological Information

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An autopsy of the pilot was conducted by the Alabama Department of Forensic Science, Montgomery, Alabama. The cause of death was determined to be hypertensive and arteriosclerotic cardiovascular disease complicated by blunt force injuries and the manner of death was accident.

The pilot's heart was enlarged at 510 grams (average for a man of his weight is 367 gm with a range of 278-484 gm). In addition, coronary artery disease, including 70%-80% stenosis of the left main, 80-90% stenosis of the left anterior descending, 70-80% stenosis of the circumflex, and 40-50% stenosis of the right coronary, was identified. Wall thickness was not described. The visual inspection of the heart muscle was unremarkable; histology was not performed. In addition, the pathologist reported the presence of hypertensive cardiovascular disease based on the appearance of the kidneys.

Toxicology testing performed by the Alabama Department of Forensic Sciences identified only naproxen in femoral blood. Naproxen is a mild anti-inflammatory analgesic available over the counter and often marketed with the names Naprosyn and Aleve. It is not considered impairing.

Toxicology testing performed by the FAA's Forensic Science Laboratory identified lansoprazole, ranitidine, and lidocaine in femoral blood and liver tissue. Dexlansoprazole is metabolized to lansoprazole and is used to treat GERD. It is often marketed with the name Dexilant and is not considered impairing. Ranitidine is an over-the-counter medication also used to treat symptoms of heartburn; it is commonly marketed as Zantac and is not considered impairing. Lidocaine is an anesthetic and available over the counter in patches, gels, or creams for topical use of local pain. Used this way, it is not considered impairing. When used intravenously, lidocaine is also an anti-arrhythmic drug that may be used in the treatment of cardiac arrest.

## Administrative Information

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|--|---|
| <b>Investigator In Charge (IIC):</b>     | Read, Leah  |
| <b>Additional Participating Persons:</b> | Ken Lancaster; FAA/FSDO ; Birmingham, AL<br>Nicholas Shepler; Rolls Royce; Indianapolis, IN<br>Benoit Albert; Bell Textron; Mirabel, OF |
| <b>Original Publish Date:</b>            | April 18, 2022  |
| <b>Last Revision Date:</b>               |   |
| <b>Investigation Class:</b>              | <a href="#">Class 3</a>   |
| <b>Note:</b>                             | The NTSB traveled to the scene of this accident.  |
| <b>Investigation Docket:</b>             | <a href="https://data.nts.gov/Docket?ProjectID=100726">https://data.nts.gov/Docket?ProjectID=100726</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](#).