Aviation Investigation Final Report

Location:	Camden, Alabama	**Accident Number:**	ERA15LA296
Date & Time:	August 3, 2015, 16:00 Local	**Registration:**	N4002G
Aircraft:	Bell 47G 3B 1	**Aircraft Damage:**	Substantial
Defining Event:	Sys/Comp malf/fail (non-power)	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

The airline transport pilot was repositioning the helicopter in preparation for spraying operations the next day. He reported that, about 1/2 mile from the intended off-airport landing area, while at an altitude of 300 ft above ground level, the helicopter's cyclic control became very stiff, consistent with a hydraulic system failure. He continued the approach to the landing zone, which was a cleared area of forest that contained brush, fallen trees, and dirt mounds. During the approach, he unsuccessfully attempted to follow the procedure to relieve hydraulic system control pressure, which included turning off the hydraulic system switch, but was unable to remove his hands from the controls and also maintain control of the helicopter. He ultimately elected to land without turning off the hydraulic system switch. During the landing, a portion of the helicopter's agricultural spray boom contacted the trees and brush, and the helicopter yawed to the left. The helicopter then began to oscillate as its skids contacted the uneven ground and obstructions before it ultimately rolled over, impacted the ground and caught fire. Fire damage to the engine and hydraulic system components precluded a postaccident examination, and its mode of failure could not be determined.

Probable Cause and Findings

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

A failure of the helicopter's hydraulic flight control systems for reasons that could not be determined due to the fire damage, and the pilot's inability to turn off the hydraulic system to relieve control pressure.

Findings

Aircraft	Hydraulic, main system - Malfunction
Personnel issues	Use of equip/system - Pilot
Personnel issues	Decision making/judgment - Pilot

Factual Information

History of Flight

Approach	Sys/Comp malf/fail (non-power) (Defining event)
Landing-flare/touchdown	Loss of control on ground
Landing-flare/touchdown	Dynamic rollover
Post-impact	Fire/smoke (post-impact)

On August 3, 2015, about 1600 central daylight time, a Bell 47G-3B-1, N4002G, operated by Ewing Flying Services LLC, was substantially damaged during a loss of control on landing near Camden, Alabama. Visual meteorological conditions prevailed, and no flight plan was filed for the flight which originated in Thomaston, Alabama and was destined for Oak Hill, Alabama. The helicopter was operated under the provisions of 14 Code of Federal Regulations Part 91 as a positioning flight.

The pilot was repositioning the helicopter for spraying operations scheduled to take place the following day. He has been airborne for approximately 20 minutes, and had used 10 gallons of fuel out of the 42 gallons he reported carrying. When he was at 300 feet altitude and about a half a mile out on approach to the off-airport landing zone, the hydraulic system augmenting the controls failed and the cyclic controls became stiff. He braced his left leg under the collective pitch control and grabbed the cyclic with his left hand, but he was unable to cycle the hydraulic system switch with his right hand because the collective control had drifted down, increasing his descent rate. The pilot responded by grabbing the collective and cyclic controls and left the hydraulic switch in the on position.

He continued the approach into the landing zone, which was a large clearing in a forest. Just prior to touchdown, the agricultural spray boom made contact with trees and brush, and yawed the helicopter to the left. During the touchdown, the heel of the left skid struck a dirt mound, rocking the helicopter forward. Subsequently the toe of the right skid struck the ground, the helicopter began to oscillate, and rolled to the left. The pilot attempted to correct, but the helicopter continued to rollover until it impacted the ground, coming to rest on the left side. After the impact, the pilot evacuated as fuel poured out of the right tank directly into the engine and cockpit area. The fuel ignited and the fire consumed the fuselage and caused significant damage to the transmission, engine and components. The hydraulic pump was extensively damaged by the fire and unable to be inspected.

According to the Federal Aviation Administration (FAA) airworthiness and maintenance records, the helicopter was equipped with a supplemental type certificate for the Soloy Allison 250-CID turbine engine conversion. In addition, the helicopter was equipped with an agricultural spray boom that was mounted under the forward fuselage above the skid and aft of the skid toe. It was approximately 30 feet in length and extended about 12 feet from both sides of the cockpit. The helicopter's most recent 100 hour inspection was performed on February 19, 2015. At the time of the inspection, the airframe had accumulated 13,719.2 hours total time and the engine total time was 2,906.7hours. Additionally, mast, bearing, hub and swashplate maintenance was performed on July 9, 2015 at 13,764.2 hours total time and engine total time of 2951.7.

According to FAA records, the pilot held commercial and airline transport pilot certificates, with ratings for airplane single engine land, airplane multi engine land, and rotorcraft helicopter. His last flight review was conducted on July 5, 2015 in the same make and model as the accident helicopter, and his most recent second-class medial was issued on May 14, 2015. He reported over 20,000 hours of total flight time, of which, 15,000 hours were in helicopters, and 1,080 in the same make and model as the accident helicopter.

An FAA inspector examined the helicopter at the accident site. According to the inspector, the fuselage, main rotor blades, and tail boom were substantially damaged during the accident sequence and fire consumed the fuselage and damaged the engine and components. The accident site was a forested clearing. The ground in the immediate vicinity was burned, but remnants under the helicopter and in the area around the accident site contained brush, 1-inch diameter branches and immature saplings. In addition, several larger diameter fallen pine trees were near the helicopter. A dirt mound approximately 14 to 18 inches tall and several feet long was 3 feet to the left of the helicopter near the main rotor head.

According to the Bell Helicopter Flight Manual Model 47, Section 2 Operating Procedures, "Hydraulic boost failure will be evident by feedback forces being transmitted to the cyclic stick when a control motion is made. Feedback forces may not be present or are negligible when the cyclic stick is held fixed or during autorotation. Feed-back forces encountered when moving the cyclic stick will be proportionate in intensity to an envelope of factors directly affected by airspeed, gross weight and climatic turbulence. When hydraulic boost power loss is detected, reduce cyclic control motions to the minimum required to complete the flight…" It also stated, "If jamming of the controls or a condition of the controls tending to override the pilot is experienced, the HYD (hydraulic) SYSTEM switch, located on the instrument panel, should be immediately moved to OFF to relieve hydraulic pressure…"

According to the FAA Helicopter Flying Handbook; FAA-H-8083-21A, under System Malfunctions & Hydraulic Failure, it states "If hydraulic power is not restored, make a shallow approach to a running or roll-on landing. This technique is used because it requires less control force and pilot workload."

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	70,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	May 14, 2015
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	July 5, 2015
Flight Time:	(Estimated) 20000 hours (Total, all aircraft), 1080 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	**Registration:**	N4002G
Model/Series:	47G 3B 1	**Aircraft Category:**	Helicopter
Year of Manufacture:	1966	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	6529
Landing Gear Type:	N/A; High skid	**Seats:**	2
Date/Type of Last Inspection:	February 19, 2015 100 hour	**Certified Max Gross Wt.:**	2950 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:	13719.2 Hrs at time of accident	**Engine Manufacturer:**	Allison
ELT:	Installed, not activated	**Engine Model/Series:**	250-CID
Registered Owner:	EWING FLYING SERVICE LLC	**Rated Power:**	
Operator:	EWING FLYING SERVICE LLC	**Operating Certificate(s) Held:**	Agricultural aircraft (137)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KSEM,166 ft msl	**Distance from Accident Site:**	20 Nautical Miles
Observation Time:	21:00 Local	**Direction from Accident Site:**	200°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	330°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.88 inches Hg	**Temperature/Dew Point:**	36°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Thomaston, AL (NONE)	**Type of Flight Plan Filed:**	None
Destination:	Oak Hill, AL (NONE)	**Type of Clearance:**	None
Departure Time:	15:00 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	Forrested Clearing NONE	**Runway Surface Type:**	
Airport Elevation:	313 ft msl	**Runway Surface Condition:**	Rough;Vegetation
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Straight-in

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	31.8875,-87.055831(est)

Administrative Information

Investigator In Charge (IIC):	Mccarter, Lawrence
Additional Participating Persons:	Edgar Martha; FAA/FSDO; Birmingham, AL
Original Publish Date:	August 28, 2017
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=91707

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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.