Aviation Investigation Final Report

Location:	Tampa, Florida	**Accident Number:**	ERA19FA142
Date & Time:	April 4, 2019, 14:16 Local	**Registration:**	N4046J
Aircraft:	Robinson R44 II	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Fatal, 1 Serious, 2 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

About 5 days before the accident, the helicopter's engine lost power and the owner performed an off-airport landing to a field. The helicopter was not damaged during the landing, and several days later, maintenance personnel examined the helicopter while still in the field. The mechanics examined the helicopter's fuel system, replaced a fuel servo, and after a successful test run of the engine, the commercial pilot departed with one of the mechanics on board for the accident flight in order to reposition the helicopter from the field to a maintenance facility. About 15 minutes into the flight, the engine lost power, and the pilot performed an autorotation to a roadway. After touchdown, the helicopter slid on the roadway, the main rotor contacted a telephone pole, and a 2.5-ft piece of a main rotor blade separated and impacted a truck driving on the roadway, fatally injuring the passenger and seriously injuring the driver of the truck.

Postaccident examination of the helicopter's engine revealed that the air induction inlet duct was partially collapsed. The inner rubberized fabric liner of the duct had partially delaminated and separated from the outer rubberized fabric, obstructing the interior volume of the duct. The wire stiffener between the two layers of fabric was displaced in two locations near the center of the duct length at a 90° bend. Further examination of the duct found a liquid residue in some areas of the duct that was consistent with castor oil, which was normally used in the assembly and curing of the duct during its manufacture. Given this information, it is likely that during the duct's manufacture, castor oil was inadvertently introduced between the duct's two fabric layers, interfering with the bond between the them. It is also likely that the duct then partially collapsed, which restricted airflow to the helicopter's engine and resulted in the losses of engine power that occurred both before and during the accident flight.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: Contamination of and an inadequate bond between the two layers of fabric comprising the helicopter engine's air induction inlet duct, which resulted a partial collapse of the duct, obstruction of the airflow into the engine, and a total loss of engine power.

Findings

Aircraft	Hoses and tubes - Not specified

Factual Information

History of Flight

Enroute	Loss of engine power (total) (Defining event)
Autorotation	Hard landing
After landing	Collision with terr/obj (non-CFIT)
After landing	Part(s) separation from AC

On April 4, 2019, about 1416 eastern daylight time, a Robinson R44 II helicopter, N4046J, was substantially damaged during a forced landing to a roadway near Tampa, Florida. The pilot and the passenger were not injured, but a passenger in a nearby vehicle was fatally injured, and the driver of the vehicle sustained serious injuries. Visual meteorological conditions prevailed, and no flight plan was filed for the positioning flight, which was destined for Sarasota/Bradenton International Airport (SRQ), Sarasota, Florida. The positioning flight was conducted under the provisions of Title 14 *Code of Federal Regulations* Part 91.

The owner of the helicopter reported that, 5 days before the accident, he had flown the helicopter for about 1 hour at an altitude of 1,000 ft mean sea level when the engine lost total power. He located a field for landing and performed an autorotation to the ground. The helicopter was not damaged during the landing. The owner further stated that he restarted the engine and that it ran at idle for several minutes before he pulled on the collective and the engine lost power again. The owner restarted the engine and kept the main rotor disengaged while he ran the engine up to 100% power without a load; the owner reported that the engine ran well but that, when he engaged the main rotor and started to pull on the collective, the engine lost power another time. The owner shut down the engine and contacted the helicopter manufacturer about repairing the helicopter.

A Federal Aviation Administration (FAA) inspector contacted the pilot on the morning of the accident and told him that work on the helicopter was being performed by two mechanics from Florida Suncoast Helicopters. According to the FAA inspector, he observed the Florida Suncoast Helicopters mechanics as they performed maintenance on the helicopter in the field where the helicopter had previously landed. The mechanics told the inspector that they had cleaned the fuel screen and looked for contamination. A pilot employed by Florida Suncoast Helicopters then started the engine and let it warm up. The pilot subsequently pulled on the collective, and the engine lost total power. After discussion with the helicopter manufacturer, the mechanics replaced the fuel servo unit with a new one. The FAA inspector then departed and asked the mechanics to call after the repairs were complete, and to tell him what was repaired.

According to the mechanics and the pilot employed by Florida Suncoast Helicopters, after the fuel servo unit was changed, the pilot performed a test run of the engine and hovered the helicopter for several minutes. No problems were noted. The pilot and one of the mechanics boarded the helicopter and departed the field about 1401 with the intent of repositioning the helicopter to SRQ, where the company's maintenance facility was located. About 15 minutes later, the engine lost total power, and the

pilot performed an autorotation to a roadway.

After touchdown on the roadway, the helicopter slid on the pavement due to its forward momentum. The helicopter then slid sideways, and the main rotor blades contacted a telephone pole, and a 2.5-ft-long piece of a main rotor blade separated and impact the windshield of a truck driving on the roadway.

Pilot Information

Certificate:	Commercial	**Age:**	39,Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	3-point
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Instrument helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 None	**Last FAA Medical Exam:**	March 20, 2019
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	658 hours (Total, all aircraft), 296 hours (Total, this make and model), 581.7 hours (Pilot In Command, all aircraft), 129 hours (Last 90 days, all aircraft), 57.9 hours (Last 30 days, all aircraft), 2.7 hours (Last 24 hours, all aircraft)		

Passenger Information

Certificate:		**Age:**	21,Male
Airplane Rating(s):		**Seat Occupied:**	Right
Other Aircraft Rating(s):		**Restraint Used:**	3-point
Instrument Rating(s):		**Second Pilot Present:**	No
Instructor Rating(s):		**Toxicology Performed:**	No
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

The pilot held a commercial pilot certificate with a rating for rotorcraft-helicopter. He held an FAA-issued second-class medical certificate, dated March 20, 2019. According to the pilot's logbook, he had a total of 657.9 hours of flight experience.

Aircraft and Owner/Operator Information

Aircraft Make:	Robinson	**Registration:**	N4046J
Model/Series:	R44 II No Series	**Aircraft Category:**	Helicopter
Year of Manufacture:	2019	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	14282
Landing Gear Type:	Skid	**Seats:**	4
Date/Type of Last Inspection:	January 5, 2019 Annual	**Certified Max Gross Wt.:**	2500 lbs
Time Since Last Inspection:	81 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	81 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Not installed	**Engine Model/Series:**	IO-540-AE1A5
Registered Owner:	On file	**Rated Power:**	260 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The four-seat helicopter was manufactured in 2019. It was powered by a Lycoming IO-540-AE1A5, 260-horsepower engine. At the time of the accident, the airframe and engine total time was 81.34 hours.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KTPF,8 ft msl	**Distance from Accident Site:**	3 Nautical Miles
Observation Time:	18:15 Local	**Direction from Accident Site:**	237°
Lowest Cloud Condition:	Scattered / 4500 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Overcast / 9500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	80°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.21 inches Hg	**Temperature/Dew Point:**	29°C / 18°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Tampa, FL	**Type of Flight Plan Filed:**	None
Destination:	Sarasota, FL (SRQ)	**Type of Clearance:**	None
Departure Time:	14:01 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	1 Fatal, 1 Serious	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 1 Serious, 2 None	**Latitude, Longitude:**	27.943332,-82.401947(est)

The helicopter came to rest along a heading of 180 next to a telephone pole that had been cut in half. Both main rotor blades were fractured at the tips and had cable cuts along the blades. The skids on the helicopter were damaged, consistent with a hard landing, and the skids' rear cross- tube was fractured. The tailcone was buckled on the top located at the second bay. One pitch link for the rotor blade had fractured and separated. The vertical firewall was wrinkled at the lower right corner.

Examination of the engine revealed that the induction air inlet duct was partially collapsed. The inner rubberized fabric liner of the duct had partially delaminated and separated from the outer rubberized fabric, obstructing the interior volume of the duct. The wire stiffener between the two layers of fabric was displaced in two locations near the center of the duct length, at the 90° bend. No other discrepancies of the airframe or engine were noted.

The induction air inlet duct was provided to the National Transportation Safety Board's Materials Laboratory for further investigation. The duct was dissected to examine the internal surfaces. A liquid residue was observed in some areas of the duct. The residue was analyzed, and the best matches were several oxidized vegetable oils, including castor oil, which was used by the duct manufacturer, along with a water-based release agent, in the assembly and curing of the air inlet duct.

Additional Information

Construction of the Duct

The helicopter engine's induction air inlet duct consisted of a tube section with an inner layer made from fiberglass cloth that was impregnated with a silicone rubber. A corrosion-resistant steel wire was wound in a helix over the top of the inner layer and an outer layer of rubberized silicone cloth was wrapped over the top of the wire, thereby embedding the wire in between two layers of rubberized cloth. Two fiberglass cords were then wrapped around the outside of the tube, one cord on either side of the helical steel wire. Each end of the duct was terminated by a rubberized fiberglass cloth cuff. The duct was manufactured by using partially-cured sheets of rubberized cloth and assembling the tube components on a mandrel. The assembled tube was then cured in an oven, thereby co-curing the inner and outer layers.

Post-Accident Safety Actions

As a result of this accident, Robinson Helicopter issued Service Bulletin (SB)-97, dated April 11, 2019, pertaining to the inspection of air induction hoses with part No. A785-31 on specific R44 II helicopters. The SB advised R44 II helicopter owners, operators, and maintenance personnel to, within 1 flight hour, "visually inspect inside of hose to verify no separation between outer and inner layers." The SB also advised "flex the hose and listen for a crinkling sound, which is an indication of separation" and "prior to further flight, replace any hose with an indication of separation."

Robinson Helicopter also issued SB-100, dated July 3, 2019, expanding the inspections to other R44 II helicopters and spare A785-31 air induction hoses that shipped through March 2019.

The FAA issued Airworthiness Directive 2019-12-18, effective July 5, 2019, requiring inspection of the air induction hose, within 10 hours time in service, on specific R44 II helicopters, including those with an A785-31 hose installed after April 30, 2018. The airworthiness directive indicated that, "if there is any separation or crinkling sound, replace the hose before further flight"; otherwise, the hose could be replaced within 50 hours time in service.

Administrative Information

Investigator In Charge (IIC):	Boggs, Daniel
Additional Participating Persons:	Mark Keefer; FAA; Tampa, FL Mike Childers; Lycoming Engines; Atlanta, GA Ken Martin; Robinson Helicopters; Los Angeles, CA Thad Bogle; HBD/Thermoid Inc.; Chanute, KS
Original Publish Date:	August 11, 2020
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=99224