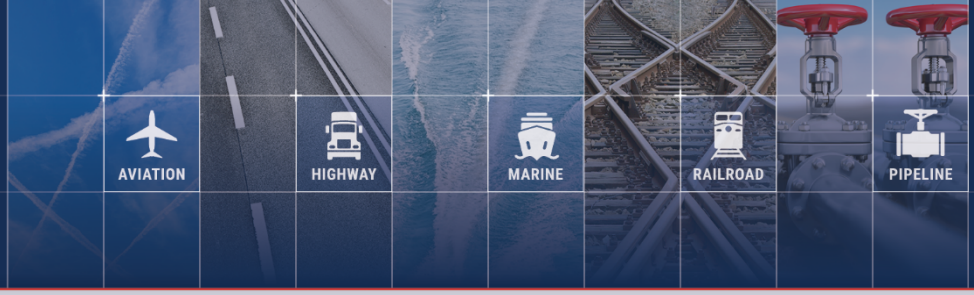

Aviation Investigation Final Report

Location:	Charlotte, North Carolina	**Accident Number:**	ERA23FA070
Date & Time:	November 22, 2022, 11:57 Local	**Registration:**	N7094J
Aircraft:	ROBINSON HELICOPTER R44	**Aircraft Damage:**	Substantial
Defining Event:	Sys/Comp malf/fail (non-power)	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Aerial observation		

Analysis

The purpose of the flight was to provide video training for a local staff meteorologist over a simulated news scene. About 5 minutes into the flight, the pilot began a series of left, 360° orbits over an interstate highway. During the third orbit, helicopter control was lost and the helicopter entered a steep descent until it impacted a grassy area adjacent to the highway. The pilot made a radio call before impact stating that they were “going down.” The helicopter impacted a grassy area adjacent to an interstate highway. There was no postaccident fire.

An examination of the helicopter’s flight controls after the accident revealed the forward left control rod end that should have been connected to the stationary swashplate on the main rotor was disconnected and the connecting hardware was missing. A metallurgical examination of the remaining components suggested that the connecting hardware, including a threaded bolt, nut, palnut, two washers, and two hat-shaped spacers were loose and backed out during the flight. It is unlikely that the hardware was secure before the flight and may have been loose for multiple flights before the accident.

Additional examination of the remaining hardware revealed that one of the two spacers was installed backwards, most likely during the field overhaul of the helicopter about three years before the accident. The subject hardware was required to be inspected for security by the pilot during each preflight inspection and by maintenance personnel at each 100-hour/annual inspection.

The pilot tested positive for quinine and the pain reliever tramadol and was under a physician’s care for arthritis and polyarthralgia that was unreported to the Federal Aviation Administration. However, based on the mechanical issues and the actions of the pilot immediately before the

accident, performance impairments were not an issue. Thus, it is unlikely that the effects from the pilot's use of quinine and tramadol were factors in this accident.

Probable Cause and Findings

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

The inadequate inspections of the forward left control rod end attachment hardware to the stationary swashplate by the pilot and by maintenance personnel, resulting in an eventual loosening and backing out of the hardware and subsequent loss of helicopter control.

Findings

Aircraft	Main rotor control - Inadequate inspection
Aircraft	Main rotor control - Incorrect service/maintenance
Personnel issues	Preflight inspection - Pilot
Personnel issues	Scheduled/routine inspection - Maintenance personnel

Factual Information

History of Flight

Maneuvering	Sys/Comp malf/fail (non-power) (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On November 22, 2022, at 1157 eastern standard time, a Robinson Helicopter R44, N7094J, was substantially damaged when it was involved in an accident at Charlotte, North Carolina. The commercial pilot and one passenger were fatally injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 aerial observation flight.

The purpose of the flight was to provide video training for the WBTV staff meteorologist over a simulated news scene. Radar, automatic dependent surveillance - broadcast (ADS-B) data, and surveillance video revealed that the helicopter departed the WBTV heliport at 1150 and proceeded southbound for about 5 minutes until the flight was over Interstate 77 (I-77). The pilot then initiated a series of left, 360° turns over I-77. During the third turn, the helicopter entered a rapid descent and impacted a grassy area adjacent to the southbound lanes of I-77. The pilot was in contact with Charlotte (CLT) air traffic control tower at the time; however, a review of the communication recordings did not reveal any calls of distress. Communications were recorded on the local helicopter common frequency (123.025 MHz) and were forwarded to the NTSB investigator-in-charge (IIC). A review of the audio revealed that the pilot appeared to call out, “Three’s going down Sky Three’s going down” before the helicopter impacting the ground.

Several witnesses provided statements after the accident. One witness reported that there was something strange with the sound of the rotors before the accident. A few seconds later, the helicopter made a quick pitch change to the left, and then a second pitch change to the left that was more severe than the first, greater than a 45° left roll. The helicopter then went behind some trees, descended abruptly, and impacted the ground. Another witness observed the helicopter circling, and on the second or third turn, it “turned sideways 90 degrees,” and then rapidly descended.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	57,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):	Helicopter; Instrument helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	June 30, 2022
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	May 24, 2021
Flight Time:	(Estimated) 3759 hours (Total, all aircraft), 3159 hours (Total, this make and model), 69 hours (Last 90 days, all aircraft), 19 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	ROBINSON HELICOPTER	**Registration:**	N7094J
Model/Series:	R44	**Aircraft Category:**	Helicopter
Year of Manufacture:	1999	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	0600
Landing Gear Type:	Skid	**Seats:**	3
Date/Type of Last Inspection:	October 16, 2022 100 hour	**Certified Max Gross Wt.:**	2400 lbs
Time Since Last Inspection:	23 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	13560 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Not installed	**Engine Model/Series:**	O-540-F2B5
Registered Owner:	METRO NETWORKS COMMUNICATIONS INC	**Rated Power:**	235
Operator:	Total Traffic & Weather Network	**Operating Certificate(s) Held:**	None

The most recent maintenance on the helicopter was recorded on October 21, 2022, at 13,541.1 hours total aircraft time. A damaged main rotor pitch link was replaced on blade “A.” The most recent inspection was a 100/300-hour annual inspection that was completed on October 16, 2022. A field overhaul of the helicopter was completed on August 15, 2019. During that overhaul, the Lycoming O-540-F1B5 engine was replaced.

A review of company records revealed that the helicopter was operated on 26 flights, including the accident flight, after the 100-hour inspection on October 16, 2022. All flights were conducted with the accident pilot at the controls.

The operator's Director of Maintenance confirmed that the forward left control rod end to the stationary swashplate (Robinson Helicopter Company part number D 173-1), along with the other two adjacent upper rod ends, were replaced during the field overhaul of August 15, 2019. The lower rod ends were also replaced during that overhaul.

Inspection of the attaching hardware of the rod ends to the stationary swashplate was required by the pilot during each preflight inspection and during the most recent 100-hour inspection, on October 16, 2022.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KCLT,730 ft msl	**Distance from Accident Site:**	5 Nautical Miles
Observation Time:	16:52 Local	**Direction from Accident Site:**	324°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Broken / 13000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots / None	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	340°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.38 inches Hg	**Temperature/Dew Point:**	14°C / -4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Charlotte, NC (NC90)	**Type of Flight Plan Filed:**	IFR
Destination:	Charlotte, NC (NC90)	**Type of Clearance:**	IFR
Departure Time:	11:50 Local	**Type of Airspace:**	Class B

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	35.15407,-80.89333(est)

The helicopter came to rest about 20 ft from the point of initial impact and was oriented on a heading of 015°. There was no postaccident fire. Fractured portions of the landing gear were found within the initial impact crater. All the primary structural components and rotor blades were located within the confines of the main wreckage.

The wreckage was recovered to a salvage facility where an additional examination was performed.

The cabin area was completely collapsed downward with a flat upward crushing of the entire lower fuselage. The rotor, transmission, and rotor mast were attached to the airframe but displaced forward 90°, rotated about the base of the transmission. The transmission/rotor mast assembly remained intact. The pilot and copilot seats and their seat supports were collapsed downward.

The cockpit instrument panel was detached from the airframe but remained in the forward cabin area. The tail boom was attached to the aft airframe structure and extended 7 ft to a separation at the aft section of tail boom bay 4. The tail rotor drive shaft and tail rotor control rod had been cut by recovery personnel at the same location. The separated section of tail boom (approximately 6 ft) had the vertical and horizontal stabilizers attached, along with the tail rotor gear box and tail rotor assembly.

Both main and auxiliary fuel tanks had separated from the fuselage. Both tanks had bladders installed, both contained some fuel, and both fuel caps were in place.

The engine remained within the engine compartment, but the engine mounts were fractured and the engine was restrained by the drive belts. The drive sheave and fan were attached to the engine and the associated baffling was in place. The four drive belts were present; however, they had shifted off their respective grooves on the sheave. The engine starter ring had cut into the nearby metal baffling.

The Lycoming O-540-F1B5 engine was examined. The engine was removed from the airframe and suspended for examination. The crankshaft was rotated by hand; compression and suction were observed on all 6 cylinders. All 6 upper spark plug electrodes and lower spark plugs from cylinder Nos. 2, 4, and 6, were light gray in color with no mechanical damage observed. The lower spark plugs from cylinder Nos. 1, 3, and 5 were oil-soaked with no mechanical damage observed. The oil sump suction screen was clear. Fuel was observed in the carburetor bowl and the carburetor finger screen was clear. The gascolator contained fuel; it tested negative for water using water detection paste. The left magneto sparked when turned by hand; the right magneto was impact damaged. The oil filter was cut open and no metallic particles were identified within the filter element folds.

Further examination of the transmission, main rotor drive, main rotor, and tail rotor did not reveal evidence of a mechanical malfunction or anomaly that would have prevented normal operation of the helicopter.

Cyclic and collective control continuity was established from the cockpit aft to the stationary swashplate through multiple breaks in the control tubes. All bell cranks and control tube rod end connections were present except for the upper, forward left control rod to the swashplate flange. The forward left control rod end connection to the stationary swashplate flange was not connected (figure 1) and the fastening hardware was missing (threaded bolt, nut, palnut, two washers, and two hat-shaped spacers). The rotating swashplate had witness marks on the forward rotating face and the underside in line with the forward left control tube rod end. The control tube rod end had witness marks on its outer diameter, the palnut fastener was not present, and the rod end was extended (unscrewed) ¾-inch from the control rod. The upper forward portion of the rotor mast fairing and control rod had damage consistent with the control rod repeatedly impacting the interior of the fairing.

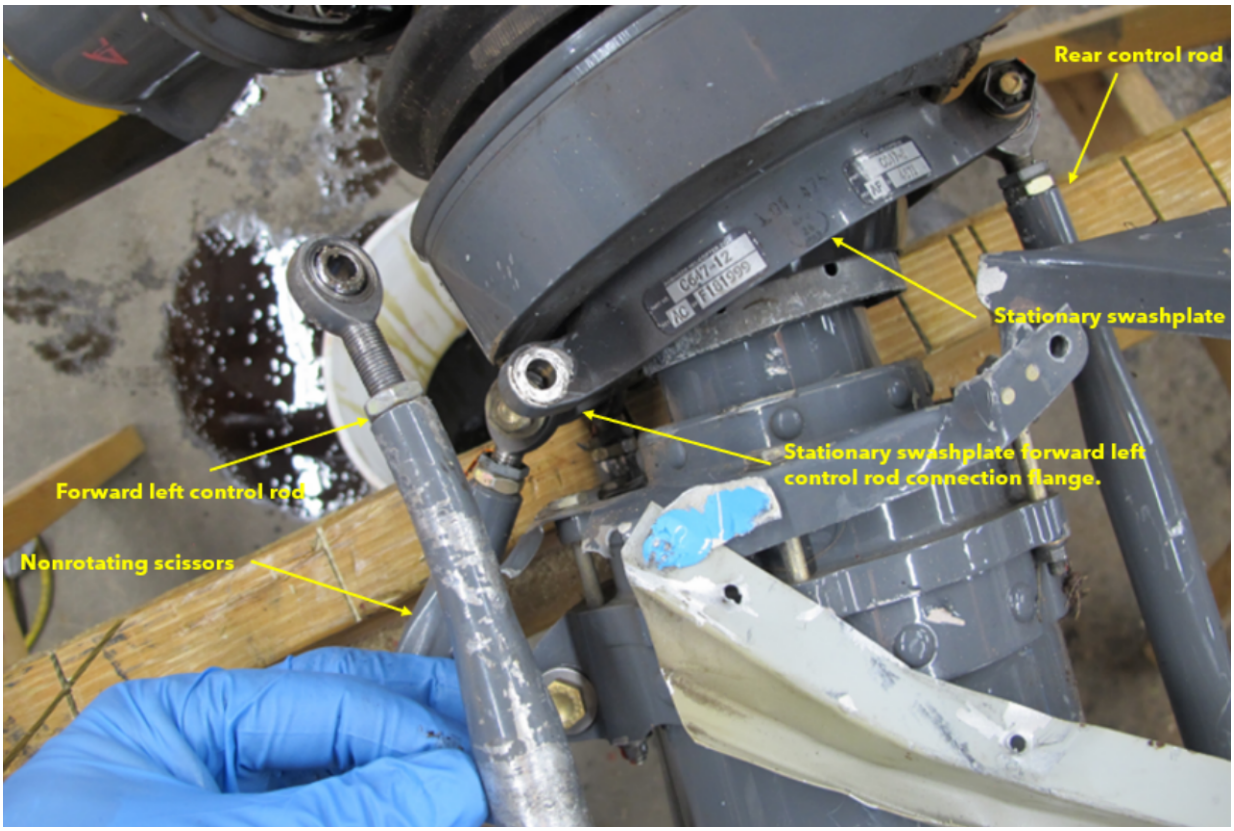

Figure 1 - Photo of the upper controls showing the disconnected forward left control rod from the stationary swashplate

The stationary swashplate with attached pitch change link and yoke assemblies, main rotor blade pitch horn piece, and two forward upper flight control tube assemblies were forwarded to the NTSB Materials Laboratory for additional examination.

Although the attachment hardware for the forward left control rod end connection to the stationary swashplate flange was not located after the accident, the swashplate forward left lug and the associated rod end were examined. Bolt thread contact marks were observed on

the end fitting bearing outer race, bolt thread wear marks were observed in the swashplate lug bore hole, and rubbing contact damage was observed on the contact face of the swashplate lug. Also, witness marks found on the lug and rod end were consistent with one of the two hat-shaped spacers being installed backwards.

Further examination of maintenance records revealed that Robinson Helicopter Company Service Letter (SL) 50 had not been complied with. The SL instructed operators to replace certain cadmium-plated nuts (MS21042L4) with D210-series nuts due to corrosion and cracking issues. The D-210-series nuts should have been replaced during the field overhaul in August 2019 (a complete set of D-210 nuts were included in the overhaul kit). A mixture of MS21042L4 and D-210 nuts were found throughout the flight controls on the accident helicopter. The type of nut that liberated from the forward left control rod/stationary swashplate could not be determined.

Medical and Pathological Information

According to the autopsy report from the Mecklenburg County, North Carolina, Medical Examiners' Office, the cause of death of the pilot was blunt force injuries due to the helicopter crash.

Toxicology testing by the FAA Forensic Sciences Laboratory detected tramadol in the pilot's urine at 19,593 nanograms per milliliter (ng/mL) and in his liver tissue. Tramadol's metabolites, o-desmethyltramadol and n-desmethyltramadol, were detected in his urine at 5,199 ng/mL and 3,737 ng/mL, respectively; both metabolites were also detected in his liver tissue. Quinine was also detected in the pilot's urine and liver tissue. No blood specimens were available for analysis.

During the pilot's most recent FAA medical examination on June 30, 2022, he reported that he was taking no medications and he had a history of hay fever. His personal medical records were then obtained and reviewed. They revealed that the pilot was prescribed methotrexate, an injectable biologic, prednisone, and tramadol by a rheumatologist as part of a treatment plan for psoriatic arthritis and polyarthralgia.

Administrative Information

Investigator In Charge (IIC):	Hicks, Ralph
Additional Participating Persons:	Robert Reynolds; FAA/FSDO; Charlotte, NC James Childers; Lycoming Engines; Williamsport, PA Thom Webster; Robinson Helicopter; Torrance, CA James Keating; Total Traffic & Weather Network; Lawrenceville, GA
Original Publish Date:	May 2, 2024
Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=106348