Aviation Investigation Final Report

Location:	Cottonwood, Arizona	**Accident Number:**	WPR24LA243
Date & Time:	July 13, 2024, 10:45 Local	**Registration:**	N473E
Aircraft:	McDonnell Douglas Helicopter 369E	**Aircraft Damage:**	Substantial
Defining Event:	Loss of tail rotor effectiveness	**Injuries:**	4 None
Flight Conducted Under:	Part 91: General aviation - Business		

Analysis

The sightseeing helicopter pilot made a slow, high-powered maneuver near a canyon tour site with three passengers on board in light gusting wind conditions. As the pilot tried to fly away from the area, an uncommanded right yaw occurred. The pilot applied full left pedal control, but the helicopter maintained its right yaw. Shortly after, the low rotor rpm audio warning sounded, and the temperature caution light flashed. The pilot performed a low-level autorotation, and the right yaw stopped, but the helicopter landed hard and bounced. The left skid separated, and the helicopter slid forward, balanced on the right skid. The pilot then departed back to the operator's base airport and made an emergency landing on one skid, at which time the passengers safely disembarked. Shortly after, the pilot relocated the helicopter to an open grass area at the airport to shut down the helicopter, after which the helicopter came to rest on its side and the drivetrain sustained substantial damage.

The pilot reported a possible tail control rigging issue; however, postaccident examination of the 4-bladed tail rotor assembly and the airframe revealed no preimpact mechanical anomalies. Flight control and drivetrain continuity were confirmed from the cockpit to all main and tail rotor flight control surfaces.

Conditions reported by the pilot showed that he was operating at a high density altitude with a high gross weight while the helicopter was in a low-speed, high-powered, descending maneuver. As such, the pilot's maneuvering was in an environment and flight profile that was conducive to the onset of loss of tail rotor effectiveness (LTE). According to the manufacturer and FAA Advisory Circular (AC) 90-95, the 4-bladed tail rotor assembly configuration is susceptible to LTE while operating with a low airspeed (typically below translational speed) with high power setting, and near or above maximum gross weight. It is likely that the pilot flew

a flight profile that resulted in an uncommanded rapid yaw due to LTE, which was only mitigated by a low-altitude autorotation.

Probable Cause and Findings

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

The pilot's low-speed, high-power maneuvering in high density altitude and near maximum gross weight, which resulted in an uncommanded right yaw due to a loss of tail rotor effectiveness and a subsequent hard landing.

Findings

Aircraft	Angle of attack - Attain/maintain not possible
Aircraft	(general) - Capability exceeded
Environmental issues	High density altitude - Effect on equipment
Aircraft	Directional control - Attain/maintain not possible
Environmental issues	Gusts - Effect on equipment

Factual Information

History of Flight

Maneuvering-hover	Loss of tail rotor effectiveness (Defining event)
Maneuvering-low-alt flying	Aerodynamic stall/spin
Autorotation	Hard landing

On July 13, 2024, about 1045 mountain daylight time, a McDonnell Douglas Helicopter 369E, N473E, sustained substantial damage when it was involved in an accident near Cottonwood, Arizona. The pilot and 3 passengers were not injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 sightseeing flight.

The pilot reported that he departed from Cottonwood Airport (P52), Cottonwood, Arizona, with three passengers for a local area sightseeing flight over mountainous terrain. About 30 minutes into the flight, the pilot made a slow, high-powered, descending maneuver near an area with ruins about 15 nm northeast from P52, so that the passengers could take photos. As the pilot attempted to leave the area an uncommanded right yaw occurred. The pilot applied full left pedal control, but the helicopter continued its right yaw. Shortly after, the low rotor rpm audio warning sounded, and the temperature caution light flashed. The pilot then performed a low-level autorotation and nosed down the helicopter to gain airspeed. The helicopter's airspeed increased, and the right yaw stopped, but the helicopter landed hard on the ground and its left skid separated. The helicopter bounced several times and slid forward.

The pilot scanned the instruments; observing that all values were normal, he then opted to depart the mountainous area and, after he believed he achieved satisfactory flight control response during slow maneuvers, returned to P52. He briefed the passengers on his plan for their egress, executed an emergency landing with a single skid, and successfully disembarked his passengers with assistance from another pilot. Shortly after, the pilot relocated the helicopter to a grassy area within the airport and away from structures. Once the helicopter was settled on the ground with one skid, he pulled the fuel cutoff switch while he simultaneously lowered the collective and rolled off the throttle. Subsequently, the helicopter came to rest on its left side and the main rotor blades contacted the ground. The helicopter’s drivetrain sustained substantial damage.

Postaccident examination revealed no preimpact mechanical failures or malfunctions to the airframe. The pilot reported a possible tail control rigging issue; however, the 4-bladed tail rotor assembly was examined for rigging and revealed no anomalies. Flight control and drivetrain continuity was confirmed from the cockpit to all main and tail rotor flight control surfaces.

The pilot reported that during the maneuver near the accident site, the helicopter was flying about 100 ft above ground level at about 20 kts. The helicopter flight manual's height/velocity performance chart showed that the helicopter was at a combination of height and velocity which pilots are recommended to avoid operating (assuming a smooth hard surface and calm winds), as it would leave the pilot with insufficient time, altitude, or kinetic energy to cushion the touchdown from an autorotation.

According to the operator's calculation, using a pressure altitude of 5,100 ft (the reported tour site altitude) and an outside air temperature of 32°C, the helicopter flight manual's hover ceiling performance chart showed that the recommended maximum operational weight for out-of-ground effect (OGE) hover was about 2,740 lbs with the air conditioning (AC) unit off, and about 2,640 lbs with the AC unit on. According to the operator, the helicopter's gross weight at the time of the accident was about 2,826 lbs.

The manual noted that the 4-bladed tail rotor's OGE directional controllability in winds greater than 3 kts had not been determined; the manufacturer added that the 4-bladed tail rotor system was susceptible to LTE while operating in high winds, with low airspeed (typically below translational speed) and high-power settings, and near or above maximum gross weight.

FAA AC 90-95 ("Unanticipated Right Yaw in Helicopters") discusses the phenomenon of LTE. According to the AC, LTE is a critical, low-airspeed aerodynamic flight characteristic, which can result in an uncommanded rapid yaw rate. Conditions under which LTE may occur include maneuvers that require the pilot to operate in a high-power, low-airspeed environment with a left crosswind or tailwind. Other factors that significantly influence the severity of the onset of LTE include high gross weight, high density altitude, and low indicated airspeed. The advisory circular further states that a pilot should conduct low-level, low-airspeed maneuvers with minimum weight and, when maneuvering between hover and 30 kts, the pilot should avoid OGE hover and high-power demand situations. At the time of the accident, the pilot was operating at a density altitude of about 8,119 ft.

Pilot Information

Certificate:	Airline transport	**Age:**	50,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
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:**	April 29, 2024
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	April 5, 2024
Flight Time:	9221 hours (Total, all aircraft), 15 hours (Total, this make and model), 8354 hours (Pilot In Command, all aircraft), 35 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	McDonnell Douglas Helicopter	**Registration:**	N473E
Model/Series:	369E	**Aircraft Category:**	Helicopter
Year of Manufacture:	1991	**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	0473E
Landing Gear Type:	None; Skid	**Seats:**	5
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:		**Engine Manufacturer:**	ROLLS-ROYC
ELT:		**Engine Model/Series:**	250-C20B
Registered Owner:	HELIVENTURE LLC	**Rated Power:**	420 Horsepower
Operator:	HELIVENTURE LLC	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KSEZ,4827 ft msl	**Distance from Accident Site:**	14 Nautical Miles
Observation Time:	10:55 Local	**Direction from Accident Site:**	60°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/ 18 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.24 inches Hg	**Temperature/Dew Point:**	36°C / 5°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Cottonwood, AZ	**Type of Flight Plan Filed:**	None
Destination:	Cottonwood, AZ	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	Class G

Airport Information

Airport:	COTTONWOOD P52	**Runway Surface Type:**	
Airport Elevation:	3560 ft msl	**Runway Surface Condition:**	Dry
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	3 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	4 None	**Latitude, Longitude:**	34.731998,-112.03661(est)

Administrative Information

Investigator In Charge (IIC):	Nepomuceno, Eleazar
Additional Participating Persons:	Ty Tennison; Federal Aviation Administration; Scottsdale, AZ Lawrence Johnson; MD Helicopters ; Mesa, AZ
Original Publish Date:	July 16, 2026
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=194698