Aviation Investigation Final Report

Location:	Thompson Falls, Montana	**Accident Number:**	WPR20LA235
Date & Time:	July 21, 2020, 05:58 Local	**Registration:**	N208MP
Aircraft:	McDonnell Douglas 600	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 None
Flight Conducted Under:	Part 133: Rotorcraft ext. load		

Analysis

While on an approach to the landing zone, the pilot lowered the collective to start a vertical descent to land. At that time, the engine and rotor speeds suddenly decreased, the helicopter yawed to the left and started to settle. Because the helicopter was approaching the ground fast, the pilot increased the collective to use the remaining engine power to cushion the landing. The helicopter impacted the ground, and the pilot rolled the throttle to idle, but noticed that engine speed and rotor rpm gauges were below the normal idle parameters. When he rolled the throttle to off, he heard a grinding "metal-to-metal" noise, and the rotor blades stopped spinning almost immediately.

Data downloaded from the onboard incident recorder captured a “low rotor RPM” event during the flight, followed by “Flameout” and “Ng Low” triggers. According to the data, the full authority digital engine control system (FADEC) attempted to re-light the engine for the next 53 seconds until the throttle was rolled to cut-off; however, the engine did not restart.

A postaccident examination of the engine revealed no evidence of any preimpact mechanical malfunctions or failures that would have precluded normal operation, and the reason for the low rotor rpm triggering event could not be determined.

Probable Cause and Findings

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

A partial loss of engine power for reasons that could not be determined based on available evidence.

Findings

Aircraft	(general) - Unknown/Not determined

Factual Information

History of Flight

Maneuvering-hover	Loss of engine power (partial) (Defining event)

On July 21, 2020, at 0558 Pacific daylight time, a McDonnell Douglas 600N helicopter, N208MP, was substantially damaged when it was involved in an accident near Thompson Falls, Montana. The pilot was not injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 133 rotorcraft external load operation.

The pilot stated that, as he was on an approach to the landing zone, he lowered the collective to start a vertical descent to land. At that time, the engine and rotor speeds suddenly decreased, the helicopter yawed to the left and started to settle. As the helicopter was approaching the ground fast, the pilot increased the collective to use the remaining engine power to cushion the landing. The helicopter impacted the ground, and the pilot rolled the throttle to idle, but noticed that engine speed and rotor rpm gauges were below the normal idle parameters. When he rolled the throttle to off, he heard a grinding "metal-to-metal" noise, and the rotor blades stopped spinning almost immediately.

A postaccident examination revealed the N1 system turned smoothly and was continuous from the compressor to the starter/generator and first-stage turbine wheel. The N2 system turned smoothly and was connected to the aircraft power train. Foreign object damage (FOD) was not observed on the compressor impeller blades or compressor inlet and the inlet barrier filter system was intact and free of debris. The fourth-stage turbine wheel was normal in appearance when viewed from the exhaust collector. The first-stage turbine nozzle and blades were viewed via borescope with no abnormalities observed. The engine mounted fuel filter bowl retained about 1/3 bowl of fuel, which was normal in smell and appearance. The fuel filter element presented no obvious contamination. All the fuel lines from the airframe to the engine were flow-checked with no obstructions noted.

The engine electronic control unit (ECU), which retains data in nonvolatile memory, was downloaded during the wreckage examination. The ECU includes an incident recorder function, which begins capturing engine and input parameters upon trigger actuation and records a line of data (“record”) every 1.2 seconds. The initial incident recorder triggering event was “low rotor RPM” (Nr Droop), which fell below the 92% threshold. Then, within 3 seconds, the incident recorder captured the “Flameout” and “Ng Low” triggers. According to the data, the FADEC system attempted to re-light the engine for the next 53 seconds until the throttle was rolled to cut-off; however, the engine did not restart.

The engine was transported to an inspection facility and installed on a calibrated test stand. After the engine was warmed up for about 5 minutes, the power was gradually increased to the takeoff setting, where the observed power was 680 shaft horsepower (shp). No unusual vibration was noted. Several accelerations and decelerations were achieved followed by testing

of the anti-ice system and bleed valve, all of which were within specification. A full power calibration protocol was achieved resulting in a maximum predicted take-off rating of 664 shp at standard day conditions, with no anomalies noted.

The fuel nozzle was removed and inspected. The inlet screen was normal in appearance and not obstructed. The fuel hose was installed in a test bench and 600 pounds per hour of fuel was flowed through the hose to check for leaks. No leaks were observed.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	37,Male
Airplane Rating(s):	Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	June 9, 2020
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	6450 hours (Total, all aircraft), 150 hours (Total, this make and model), 6300 hours (Pilot In Command, all aircraft), 140 hours (Last 90 days, all aircraft), 65 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	McDonnell Douglas	**Registration:**	N208MP
Model/Series:	600 N	**Aircraft Category:**	Helicopter
Year of Manufacture:	1998	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	RN042
Landing Gear Type:	High skid	**Seats:**	2
Date/Type of Last Inspection:	May 7, 2020 Annual	**Certified Max Gross Wt.:**	4100 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:	2984.6 Hrs at time of accident	**Engine Manufacturer:**	Rolls Royce
ELT:	Installed, not activated	**Engine Model/Series:**	M250-C47M
Registered Owner:	On file	**Rated Power:**	505 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	Rotorcraft external load (133), Agricultural aircraft (137)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	SZT,2131 ft msl	**Distance from Accident Site:**	
Observation Time:	05:55 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	280°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.95 inches Hg	**Temperature/Dew Point:**	11°C / 10°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Thompson Falls, MT	**Type of Flight Plan Filed:**	
Destination:	Thompson Falls, MT	**Type of Clearance:**	None
Departure Time:	08:54 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	47.559688,-115.43952(est)

Administrative Information

Investigator In Charge (IIC):	Smith, Maja
Additional Participating Persons:	Douglas Belcher; FSDO; Spokane, WA Jon-Adam Michael; Rolls Royce Joan Gregoire; MD Helicopters, Inc
Original Publish Date:	July 12, 2022
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=101660