



Rolls-Royce

Engine Examination Report

**Rolls-Royce Corporation
Model 250-C30M
Engine CAE 900188**



**Jack Johnson
Air Safety Investigations**

**Las Vegas Metro PD
Las Vegas, Nevada**

**Accident date: 31 December 2014
Investigation date: 14 January 2015
Engine Run/Exam: 20-21 January 2015**

Aircraft Information

Model	MD369FF
Serial Number	0174FF
Registration Number	N530KK
Airframe Total Time	7307.9 Hours
Hobbs Meter:	3727.1 Hours

Engine Information

Engine Model	Rolls-Royce 250-C30M
Rating:	650 HP
Serial Number	CAE-900188
Engine Total Hours	10,096.9 Hours
Time Since Overhaul	134.2 Hours

Accident Flight

On 31 December 2014, a MD Helicopter MD369FF, registered as N530KK, was substantially damaged during a hard landing on a suburban street in Las Vegas, Nevada. The pilot and police observer received minor injuries.

The helicopter was operated by the Las Vegas Metro Police Department (LVMPD) and was being used for police patrol at the time of the accident.

The pilot stated that he was maneuvering when the helicopter reportedly lost power. The pilot made an auto-rotative landing, resulting in substantial airframe damage and minor injuries to the two occupants.

The helicopter was subsequently recovered to a Las Vegas Police Department hangar.

Wreckage Examination

Cursory examination of the wreckage revealed damage consistent with a hard landing.

The tail boom was severed roughly six feet from the fuselage, from an apparent main rotor strike. The severed tail rotor was intact and appeared undamaged.

The landing skids were spread, but not fractured.

Four of the main rotor blades had been removed by recovery crews; one blade had fractured near the grip during the accident sequence. All blades exhibited evidence of bending, with three blades exhibiting evidence of ground and/or tail boom contact.

When examined, the anti-torque pedals and cyclic were found centered, and the collective in the full-down position; the throttle was in the 'OFF' position.

Control continuity was established from the anti-torque pedals to the severed ends of their respective control tubes in the tail boom. Control continuity was also established from the collective and cyclic to the main rotor, and from collective and throttle twist-grip to the engine.

The engine cowling and inlet housing were then removed to facilitate engine examination.

Initial Engine Examination

The wreckage was examined at the LVPD hangar on 14 January 2015, under the auspices of the NTSB.

Inspection of the engine exterior revealed no evidence of fire or uncontained failure. The Outer Combustion Case (OCC) exhibited impact damage.

The engine mounting structure was intact and properly secured within the compartment. All fuel, lube and pneumatic lines, coupling ("B") nuts and their associated fittings were checked by hand for security and were found at least finger tight. The B-Nut attaching the fuel supply line to the Fuel Spray Nozzle was damaged by impact. Additionally, the 90-degree elbow to the fuel supply line was abraded and holed from impact damage. An FAA Inspector who examined the wreckage on 2 January is reported to have found this B-nut loose, but due to impact damage, it was not possible to determine if this fitting was loose prior to the accident.

The lower edges of both engine bay doors were contaminated with a small amount of an oily substance, which had adhered what appeared to be pulverized asphalt from the accident site. There was insufficient evidence to determine the source of this oily contamination or when it occurred. Aircraft maintenance records documented an ongoing minor oil leak.

Inspection of the engine inlet plenum chamber did not reveal any evidence of foreign material or missing hardware. Inspection of the compressor inlet revealed no visible damage or signs of foreign object ingestion. The compressor rotated easily by hand. N1 drive continuity was confirmed to the starter/generator.

The power turbine was visually inspected; no evidence of operational failure or foreign object damage was noted. The power turbine (N2) was rotated by hand. N2 continuity was established to the main transmission, to the main rotor and to the tail rotor drive shaft. Rotation of all engine components was smooth and quiet, with no unusual binding, noise or resistance.

Ample clean oil was present in the engine oil system. Removal of the engine's magnetic chip detectors revealed no captured ferrous debris. The engine was equipped with a "pop-up" bypass indicator on the engine oil filter; this indicator was not extended, which is consistent with non-bypassed operation.

The engine was removed from the airframe by LVPD personnel to facilitate further examination and to test run the engine.

Engine Test Run

The engine was shipped to AeroMaritime in Mesa, Arizona for testing and examination on 20-21 January 2015.

Prior to testing, the engine was examined by AeroMaritime mechanics to ensure it was in a satisfactory condition for running. Impact damage necessitated replacing the engine's original Outer Combustion Case and Fuel Supply Line with serviceable components.

The engine was installed onto a test cell and a standard 5-point calibration run was performed on the engine.

The engine performed normally and met or exceeded specified power output at all test points. The engine did not meet specified performance on fuel consumption, showing roughly a 10% difference in specific fuel consumption.

Following the test, a leak check was performed on the engine's pneumatic control system. A fitting on the Pc line, immediately downstream of the Pc Accumulator exhibited minor leakage when a soapy solution was applied while pressurized. A torque reading of the fitting was not obtained prior to the mechanic tightening it to the minimum 65 inch-pounds. Once tightened, the fitting no longer leaked. All other fittings were verified to be at least 65 inch-pounds.

It should be noted that a loss of Pc air to the engine control system would result in a significant reduction in power. However, the engine was tested satisfactorily in its original, as-received condition.

All fuel and oil filters were examined following the test; all were found free of debris. The Fuel Spray Nozzle was disassembled and inspected; no anomalies were noted.

Following the tests and inspection, the engine was returned to the LVPD.

Engine Maintenance and Records

Component	Serial Number	Part Number	TSO	Total Time
Engine	CAE-900188	23009300	134.2	9962.7
Gearbox	CAG-97708	23053333	UNK	UNK
Compressor	CAC-98518	23065557	UNK	UNK
Turbine	CAT-90147	23035128	UNK	UNK
Fuel Control Unit	325033	2549092-8	UNK	UNK
Turbine Governor	BR52049	23065125	UNK	UNK
Fuel Pump	T-0474	6896810	UNK	UNK
Bleed Valve	FF26669	23073353	UNK	UNK
Fuel Spray Nozzle	AG663193	23010604	UNK	UNK

Summary of Findings

No evidence of mechanical engine failure was found, and the engine met rated power performance during testing.

An under-torqued fitting was found on the Pc air system, allowing a small leak at the fitting; however, the engine performed satisfactorily with the fitting as-received.

The fitting attaching the fuel supply line to the fuel spray nozzle was found loose by an FAA inspector. However this fitting was damaged by impact, and there was no evidence of a high-pressure fuel leak within the engine compartment.