NTSB Identification: WPR14LA341

On August 11, 2014, about 2000 mountain daylight time, a McDonnell Douglas Helicopter 500N, N18GH, was substantially damaged when it impacted terrain during takeoff from a private residence near Idaho Falls, Idaho. The helicopter was registered to Kabrit LLC, Salt Lake City, Utah, and operated by the pilot under the provisions of Title 14 Code of Federal Regulations Part 91. The private pilot and his two passengers were not injured. Visual meteorological conditions prevailed and no flight plan was filed for the local flight, which was originating at the time of the accident.

In a written statement to the National Transportation Safety Board (NTSB) investigator-in-charge (IIC), the pilot reported that during takeoff from a private residence, he initiated a vertical climb in order to clear trees and a residential structure. As the helicopter was about 90 feet above ground level (agl), the helicopter banked to the left and immediately began to rotate. The pilot stated that despite his control inputs, he was unable to regain control of the helicopter and initiated an autorotation "to get the torque out of the rotor head." Subsequently, the helicopter impacted the ground and rolled over onto its right side, which resulted in damage to the main rotor blades, fuselage, and tailboom. The engine was shut down by the pilot after impact.

Examination of the helicopter by representatives from Boeing Helicopters and MD Helicopters, under the supervision of the NTSB IIC was conducted on September 25, 2014, at the facilities of SP Aircraft, Boise, Idaho.

The airframe exhibited damage to the sheet metal skin and the composite fuselage components. The front canopy frame and windscreen sections were broken and separated from the airframe. The upper pylon and NOTAR inlet was damaged with the composite structures crushed and fractured.

Cyclic and collective control continuity was verified from the control sticks to the upper flight controls, which included the collective, lateral and longitudinal links, and collective/cyclic mixers, scissors assembly, pitch change links, rotating and stationary swashplates, which were in place, functional and sustained varying degrees of impact damage. The anti-torque flight control linkage was continuous from the left pedal set to the two-piece cable assembly and to the NOTAR fan pitch control mechanism. Continuity continued from the cable assembly separation point on the tailboom to the rotating cone assembly. The rotating cone and bearings appeared functional.

The NOTAR system experienced extensive damage during the accident sequence which included separation of the tailboom, damage to the pedal sets and deformation of the fan shroud assembly. There was no visible damage to the fan transmission, and the gearbox operation functioned when rotated by hand. The fan driveshaft from the main transmission to the fan gearbox and from the fan gearbox to the fan assembly was undamaged. The fan assembly was in place; however the fan blades were in contact with the deformed shroud and sustained substantial foreign object damage to the blades.

The main rotor system sustained substantial impact damage. The hub assembly components (upper and lower shoe, pitch change housings, feather bearings, strap assemblies, dampers, pitch change links, droop stops, striker plates, etc.) exhibited varying degrees of visible damage consistent with sudden stoppage from impact with terrain. All main rotor blades sustained substantial damage. Severity of damage varied but included blade fractures, gouges, bent spars, chord-wise wrinkling, leading and trailing edge bending, separation and tip cap damage. There were indications that several blades made contact with the fuselage, cockpit and tailboom. Damage to the rotor blades was consistent with sudden stoppage and ground impact.

The main transmission showed no exterior impact damage. The upper and lower transmission chip detectors were removed for inspection and were clean of debris. The transmission support structure was undamaged, with both the static mast and main transmission securely attached. The main transmission rotated when the engine to transmission driveshaft was actuated. The transmission anti-torque output pinion also rotated. The main rotor driveshaft had fractured approximately three inches above the splined fitting into the transmission, which precluded the transmission from rotating when the main rotor blades were moved. The fracture surface was smeared but appeared that it had fractured in overload. The engine to transmission shaft was undamaged. The over-running clutch appeared functional.

Weight and balance calculations were performed by the manufacturer, with the helicopter found to be within limits. In addition, performance calculations were calculated for the weight of the helicopter and weather conditions at the time of the accident and it was verified that the helicopter was within the published operational limits for an out of ground effect hover.