

Rapperport Associates, Inc.  
Engineering and Materials Consultants

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July 30, 2015

Re: Helicopter crash

Rapperport Associates was retained to perform an investigation into the cause of a helicopter crash that occurred on May 4, 2004 in Brooklyn, NY. The helicopter was hovering at 1,000 to 1,200 feet, during a news gathering flight, when it experienced a loss of hydraulic system power. Another helicopter captured the accident sequence from its onboard video camera. The accident helicopter was observed entering a steep descent and quickly leveling off. A fairly constant, level attitude and heading were briefly maintained before the helicopter entered an unstable hover and began to rotate. It then descended and struck the roof parapet of a 4-story building, before it impacted and came to rest on the roof of an adjacent 2-story building.

Examination of the helicopter's hydraulic system revealed that the hydraulic pump drive belt had been installed inside-out and failed due to an overload, leading to a full hydraulic system failure. According to Eurocopter's emergency procedures the pilot action following a hydraulic system failure should be to "*calmly reduce collective pitch and adjust the airspeed to between 40 and 60 knots in level flight*" and then cut off the hydraulic pressure, by moving the toggle switch located on the collective pitch lever to the off position. The procedures further state that when the accumulators are exhausted, the control forces become significantly higher, but "*not unmanageable.*" The helicopter could be controlled without the main and tail rotor servo actuators being hydraulically powered, but this would require the pilot to apply "*non-negligible*" forces that are substantially different than the forces required with the hydraulic system operating properly. The hydraulic system toggle switch was found in the "on" position in the post-crash investigation.

Our findings were that the initiating event was hydraulic failure due to failure of the hydraulic belt. The loss of hydraulic assist caused the helicopter to lose its equilibrium. The pilot was able to pull the Eurocopter out of the nosedive but as soon as he attempted to land, the Eurocopter entered an unstable hover condition. There was no indication that the pilot disengaged the hydraulic system as required subsequent to a loss of hydraulic pressure and his attempt to land on a rooftop and associated loss of forward speed rendered the helicopter uncontrollable causing it to roll left and crash.

**Crash sequence:**





