ACCIDENT

Aircraft Type and Registration:	Enstrom 280FX, G-VVWW
No & Type of Engines:	1 Lycoming HIO-360-F1AD piston engine
Year of Manufacture:	1990
Date & Time (UTC):	20 July 2006 at 1815 hrs
Location:	1.5 to 2 miles north of Epsom Racecourse, Surrey
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Tail rotor blades bent and tail rotor transmission system shock loaded
Commander's Licence:	Private Pilot's Licence
Commander's Age:	41 years
Commander's Flying Experience:	137 hours (of which 137 were on type) Last 90 days - 27 hours Last 28 days - 11 hours
Information Source:	AAIB Field Investigation

Synopsis

A few minutes after leaning the fuel mixture the pilot felt a significant engine vibration, shortly after which the low rotor rpm warning horn sounded and the warning light illuminated. The pilot lowered the collective lever and opened the throttle which briefly restored the rotor rpm. The engine rpm continued to decrease and the pilot realised that the helicopter could not maintain level flight and decided to enter an autorotation to land. During the landing flare the tail rotor contacted the ground. Following repair a number of test flights were conducted where full engine power was achieved. It was found that there was an unusual engine-generated vibration which, on examination, was found to have been caused by a partially restricted fuel injector nozzle.

History of the flight

After departure the pilot climbed the helicopter to 1,300 ft amsl where he leaned the fuel mixture until the exhaust gas temperature (EGT) gauge indicated 1,600ºF. The manifold pressure was noted as reading 29 inches, the engine rpm was in the green sector of the gauge and the fuel flow decreased to 80 lb/hr. After a few minutes the pilot felt a significant engine vibration, shortly after which the 'LOW ROTOR RPM' warning horn sounded and the warning light illuminated. The pilot lowered the collective lever and increased the engine power which restored the rotor rpm for a brief period of time. As the engine rpm continued to decrease he became aware that continued level flight would not be possible and transmitted an RTF 'MAYDAY' call. The pilot lowered

the collective lever and commenced autorotation. He selected a suitable landing site and, while keeping the rotor speed 'in the green', reduced the helicopter's airspeed. The pilot cushioned the touchdown by use of the collective lever but did not level the helicopter in time to prevent the tail rotor from striking the ground. The pilot cannot recall if he moved the fuel mixture control towards the rich position following the initial indication of a possible engine power problem or when he entered the autorotation.

The weather at the time was reported as a wind of 8 kt from 240º, scattered cloud at 3,000 ft, temperature 29ºC and QNH 1026 mb.

Engineering examination

A licensed aircraft engineer, who maintains this particular helicopter and is extremely familiar with the type, went to the accident site and recovered it to his maintenance facility where he and the AAIB carried out an extensive examination. During the examination, which included testing and a partial strip of the fuel injector unit, no fault or failure of the engine or engine systems could be found that would explain the circumstances experienced by the pilot. It was observed that the spark plugs and the engine exhaust, and its surrounding area of the engine cowling, showed very good evidence that the engine had been running on a very lean fuel mixture for a period of time.

Following the repair of the damage to the tail rotor, a number of engine runs and test flights were conducted. During the first two test flights, when full engine power was achieved, it was noted that there was an unusual engine-generated vibration and that the No 4 cylinder temperatures were marginally lower than those of the other three cylinders. The No 4 cylinder fuel injector nozzle was removed and found to be partially restricted by what appeared to be a light sandy-coloured hard deposit similar to that observed on the spark plugs and engine exhaust when the helicopter was first examined following the accident. This partial restriction of the injector nozzle would have reduced the maximum fuel flow that could be delivered and would have severely disrupted the fuel spray pattern. The injector nozzle was cleaned and refitted to the engine. A further test flight was carried out during which the engine performed satisfactorily and without any unusual vibrations.