ACCIDENT

Aircraft Type and Registration:	Robinson R22 Beta, G-BZYE
No & Type of Engines:	1 Lycoming O-360-J2A piston engine
Year of Manufacture:	2001
Date & Time (UTC):	22 September 2008 at 1400 hrs
Location:	Blackbushe Airport, Surrey
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - 1 (Minor)
Nature of Damage:	Damage to engine frame, rear undercarriage legs and both engine side panels
Commander's Licence:	Private Pilot's Licence
Commander's Age:	48 years
Commander's Flying Experience:	378 hours (of which 350 were on type) Last 90 days - 4 hours Last 28 days - 2 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

After takeoff, during the transition from the hover into forward flight, the engine power varied intermittently and the pilot had difficulty in controlling the helicopter, which was damaged in the subsequent landing. It transpired that the engine had exceeded its rated speed on the previous day but the maintenance organisation had not been informed and the relevant inspection did not take place.

History of the flight

On 21 September a student was authorised for a solo flight at Blackbushe Airport, to practise flight in the hover and circuits. During the pre-start checks the student did not ensure that the throttle was fully closed and when he started the engine the rpm increased rapidly. On hearing the high engine rpm, the student instinctively closed the throttle but was unable to recall what the maximum achieved rpm had been, although he estimated it to be approximately 80–85%. The limit for the engine is 2,700 rpm, approximately 105%, but no overspeed, even momentary, is permitted. After some thought, the student decided to continue with his planned flight. Later he told his instructor what had happened during the engine start.

The instructor questioned the student and formed the opinion that the student had probably not oversped the engine. He had already briefed his

next student on their planned flight, and there was no alternative helicopter available, so he decided to fly G-BZYE to see if it had been affected in any way. He considered that it behaved normally and all the engine temperature and pressure indications were normal. This reinforced his opinion that the student had not oversped the engine, so he continued with his instructional flight.

After landing, and aware that the helicopter was due to fly to its maintenance facility for a 100 hour inspection the next day, the instructor attempted to contact the maintenance organisation. As it was a Sunday afternoon he was unable to contact them, so he telephoned his Chief Pilot to discuss the circumstances. The Chief Pilot reminded the instructor that the student should have shut down the engine after the suspected overspeed and that he should not have taken the aircraft for his flight. Nevertheless, the flight had taken place without incident and without any other abnormal indications, so the Chief Pilot considered that the engine had probably not been oversped. He decided that the helicopter could be flown to its maintenance facility as planned and, as a precaution, the instructor put a loose note with the technical log to advise the maintenance organisation about the suspected overspeed.

The following day, an experienced R22 private pilot planned to fly the aircraft, with a passenger, to the maintenance facility. Whilst checking the aircraft paperwork, the pilot read the note to the maintenance organisation. The note mentioned that there had been a possible engine overspeed and that continued flight had been authorised by the Chief Pilot. However, since there were no entries in the technical log relating to an overspeed, the pilot decided to continue with his planned flight.

The engine start was normal and the pilot flew the helicopter into the hover before hover taxiing to the takeoff point. All aircraft and engine indications were within limits and, after ensuring that the area was clear, the pilot commenced his transition into forward flight. Shortly after the helicopter started moving forwards it yawed violently to the right, the manifold pressure increased and the aircraft began to climb. The pilot lowered the collective lever and applied left pedal to correct the yaw but had difficulty in maintaining control. He suspected some kind of engine governor failure, so, as soon as he felt he was able, he levelled the aircraft and attempted a slow running landing. Just before landing, when he applied the collective lever to cushion the touchdown, the aircraft yawed and climbed, becoming very difficult to control once more. The pilot stabilised the helicopter and attempted a further landing, but this time he made no attempt to cushion the touchdown and the aircraft landed more heavily than normal and quickly came to a halt. On the ground, with the rotor at 100% rpm, the pilot noticed that the manifold pressure was varying between 12 and 17 inches and the engine was running rough. He advised ATC that the aircraft was safely on the ground and shut it down. The pilot and his passenger, who sustained minor injuries in the heavy landing, vacated the helicopter normally.

The maintenance organisation inspected the helicopter and found damage to the lower frames, the rear undercarriage legs, a crosstube, and both engine side panels. The damage was consistent with a heavy landing.

An inspection of the engine found that the plastic gear for the left engine magneto was broken, which could account for the rough running engine and the fluctuating manifold pressure. The maintenance organisation had previous experience of this failure,

which was normally associated with an engine overspeed or an inadvertent 'dead cut', where both magnetos are turned off whilst the engine is still running. The engineers also found evidence that the engine cooling fan had moved on its shaft, which they also considered to be consistent with an overspeed event. As a result of these findings the engine was sent to an approved Lycoming engine maintenance facility for an overspeed inspection. Clear evidence was found of an engine overspeed, with all cylinders having excessively worn valve guides and stepped valve springs.

Comment

The instructor and the Chief Pilot involved in this chain of events were open and honest about the decisions they made. They both agreed that, with the benefit of hindsight, a safer course of action would have been to ground the aircraft and seek engineering advice as soon as they became aware of a suspected engine overspeed. The Chief Pilot has since issued a company-wide memorandum to remind all instructional staff of the need to brief students always to treat incidents as 'a worse case scenario' and not to fly an aircraft after any suspected exceedence until appropriate engineering action has been completed.