

Westland Scout, G-BXRL

AAIB Bulletin No: 11/2000 **Ref:** EW/C99/10/7 **Category:** 2.2

Aircraft Type and Registration: Westland Scout, G-BXRL

No & Type of Engines: 1 Rolls-Royce Nimbus 10501 turboshaft engine

Year of Manufacture: 1966

Date & Time (UTC): 16 October 1999 at 1715 hrs

Location: Tarmac Quarry, Hearts Hill, Nuneaton, Warwickshire

Type of Flight: Private

Persons on Board: Crew - 2 - Passengers - 1

Injuries: Crew - Minor - Passengers - None

Nature of Damage: Aircraft destroyed

Commander's Licence: Private Pilot's Licence (Helicopters)

Commander's Age: 48 years

Commander's Flying Experience: 900 hours (of which 70 were on type)

Last 90 days - 48 hours

Last 28 days - 8 hours

Information Source: AAIB Field Investigation

History of the flight

At about 1600 hrs on the day of the accident the pilot arrived at Baxterly near Tamworth, Staffordshire where he completed a pre-flight inspection of his helicopter. He noted there was about 800 lb, (3/4 fuel) on board. He intended to fly from Baxterly to Bulkington, Warwickshire but flew for about 15 minutes in the local area before returning to Baxterley prior to the flight to Bulkington. The pilot knew he would need help to put the helicopter into a hangar at Bulkington, and so two friends, one of whom was a part owner of the helicopter, accompanied him on the flight.

After taking off the pilot routed along the A5 road, skirting Nuneaton to the north and he arrived over the airstrip after about 15 minutes. The hangar was blocked by a World War II tank, which was the property of the hangar owner. It had run out of fuel and since use of the hangar was not possible the pilot decided to return to Baxterley. In the cruise at about 90 kt while passing abeam Mancetter at 1,500 feet the helicopter shuddered and yawed left. The pilot lowered the collective pitch lever to enter auto-rotation and heard an audio warning. In front of and below him there was a

fun fair and some houses and so the pilot turned right and descended over a quarry, the base of which was flooded. The pilot noticed the cross hatched 'zero power' (torque) warning on the instrument panel. Approaching the surface, he 'flared' late and the helicopter impacted the water hard, before coming to rest inverted.

Survivability aspects

The pilot was in the habit of releasing the lock for the shoulder straps of his harness while in the cruise; in the emergency he forgot to re-lock it and considers that this contributed to his minor injury as his upper body moved forward in the impact. He also reported some difficulty in releasing his harness until he remembered to press the release catch first before trying to twist it. He believed that he exited the helicopter underwater through the broken windscreen. Upon reaching the surface he saw the other two occupants had also escaped and they all climbed on to the bottom of the helicopter, with minor cuts and bruises as their only injuries. The helicopter was sinking and so they swam for the side of the quarry, some 80 or 90 yards away, where they experienced great difficulty getting out of the water due to the steep sides. They eventually obtained assistance from passers by who used a dog lead and a belt to reach them. The water was cold and the pilot became alarmed for their safety during the swim and whilst trying to climb out of the water.

Examination of the wreckage

The helicopter sank and was not recovered for about a month due to difficulties with the recovery process. When it was recovered it was transported to the AAIB facility at Farnborough where it was examined in detail. The main rotor blades had been damaged in a manner consistent with water impact whilst under rotation. The tail rotor gearbox had separated from the tail boom as a result of water impact loads. The tail rotor drive was intact with no evidence of overstressing but the drive shaft between the engine accessory gearbox and the main rotor gearbox had fractured in torsion, indicating that the engine was running when the main rotors struck the water. No evidence of disruption of the main rotor gearbox, rotor brake, free wheel or tail drive system was found. After accounting for the corrosion caused by the submersion, all the power train was considered to have been free to turn at impact. There was no evidence of oil loss, deterioration of the oil, or contamination of the filters or magnetic chip detectors. The fuel tanks were full of water but there was a considerable quantity of fuel within the tanks and neat clean fuel was found throughout the fuel control unit, heat exchanger and low pressure filter. The engine was stripped and no pre-existing defect was found. Some wear was found in the power turbine governor, which would probably have eventually shown up as an inability to govern the RPM within published limits. This is reportedly a known problem, which is corrected by replacing the governor unit of which there are currently sufficient spares to avoid the need to refurbish worn governors.

Flight tests

In view of the pilot's report of a power loss, the AAIB conducted some flight tests with another Scout. It was observed that about half an inch of twist grip throttle rotation from maximum was required to allow the power turbine, and therefore rotor RPM, to come out of the governed range. Experienced pilots expressed the view that this could be inadvertently done, particularly if, as in this case, the pilot had trained on piston powered helicopters where rotation of the throttle with collective pitch lever movement was a trained response. It was found that in similar flight conditions, similarly loaded, the torque required at 90 kt was 60%. On the ground, with this torque setting and the throttle rolled off as described, the gas generator ran down to below 70% N_1 , the speed at which an audio 'gas generator' warning is activated. The 'Zero Power' warning is a cross

hatch indicator giving a low torque warning. This was observed at 73% N_1 . In flight, during autorotation, N_1 stabilised at 73% and, although the zero power indication was observed, at no stage was a gas generator warning heard, as 70% N_1 was not reached.

Conclusions

The probable sequence of events was that the pilot inadvertently allowed the throttle to move out of the governed range, thereby causing the helicopter to exhibit the symptoms of a power loss. The pilot then probably reacted by immediately reducing collective pitch, which caused the zero power warning to occur. During the autorotative descent N_1 may have dropped briefly to 70% thus causing a gas generator audio warning to sound. The pilot interpreted these indications as confirmation of an engine failure and had by then decided to make an autorotative landing.