No: 5/90 **Ref: EW/G90/03/04** **Category: 2c**

Aircraft Type and Registration:	Aerospatiale SA341G Gazelle 1, G-RIFF
No & Type of Engines:	1 Turbomeca Astazou 3A turboshaft engine
Year of Manufacture:	1973
Date and Time (UTC):	7 March 1990 at 0905 hrs
Location:	Daresbury, near Runcorn, Cheshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Severe damage to the airframe and rotors
Commander's Licence	Private Pilot's Licence
Commander's Age:	29 years
Commander's Total Flying Experience:	530 hours (of which 290 were on rotary wing and 4 on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot and examination of selected components by the AAIB

During a flight from Butron-on-Trent to Warrington, when in the area of Crewe and at an altitude of 2000ft, the pilot experienced a sudden change in the position of the yaw pedals and realised that he had some form of tail rotor malfunction. However, as he could maintain the helicopter in straight and level flight, albeit with the right skid low, the decision was made to continue rather than attempt an immediate landing. On reaching the destination ground speed was reduced in the normal manner for an into wind approach to the hover but, as power was increased, the pilot realised that he had no tail rotor control. The helicopter began to yaw to the left, and then completed four or five turns before striking the ground and rolling over. There was no fire and the pilot, who was uninjured, was able to make his escape.

Examination of the aircraft established that the tail rotor drive shaft had failed at a position where it passed through a cutout in the rear of the main rotor gearbox (MRG) fairings. The reason for this failure was that the rear of the right side fairing had been bearing against it as a result of a failure of the fairing itself. The forward two thirds of this fairing was missing, having detached from the helicopter in flight. This had allowed the 'leading edge' of the rear portion to rotate outboard and force its 'trailing edge' against the shaft.

The two fairings which encompass the MRG are hinged together, and pivoted to the airframe, at two upper positions and are each latched at three locations. The front and side edges are latched to the

airframe, whilst the rear latch only secures the two fairings together. This rear latch was reported to have been found in a properly closed and locked condition after the accident. In addition there are two fairing mounted pegs which locate in rubber bushed holes on the airframe as the fairings are closed.

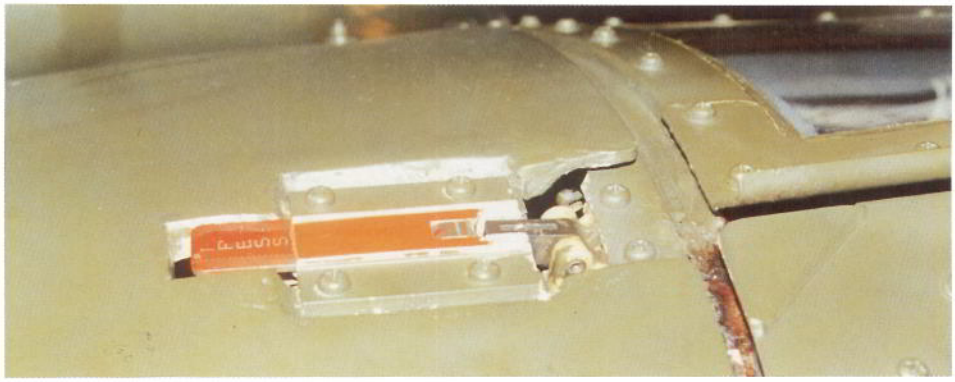
The latch components were removed from the helicopter and examined in some detail. This was done in conjunction with the Army Air Corps (AAC) at their base at Middle Wallop, where a fleet of military SA34 Gazelle helicopters are operated and maintained. In respect of latching of design, their machines are identical. It was established that in this area of the helicopter high vibration levels exist and that there have been a number of incidents where latches have failed, or have come undone in flight (and on the ground) leading to tail rotor drive shaft damage. Most of these incidents were associated with worn latch components. The components from G-RIFF, however, were judged to be serviceable in respect of wear but when compared with identical parts on serviceable helicopters, two items became of interest.

Firstly, the rear latch, which like the front unit is designed as a geometric lock with the operating lever itself locked by a spring lever, is capable of being adjusted in order to effect a firm fit between the fairing halves. This is done by maintenance personnel and involves screwing in, or out, one half of the latch relative to the other. Once set, the screw thread is locked by the insertion of a split pin through the thread to prevent futher rotation when the latch is undone. The latch from G-RIFF showed no evidence that such a split pin had been fitted. In addition, its hole was full of dirt laden grease and it was apparent that the two parts were significantly more unscrewed than others examined. This would have allowed the fairing halves to vibrate to a greater degree than normal.

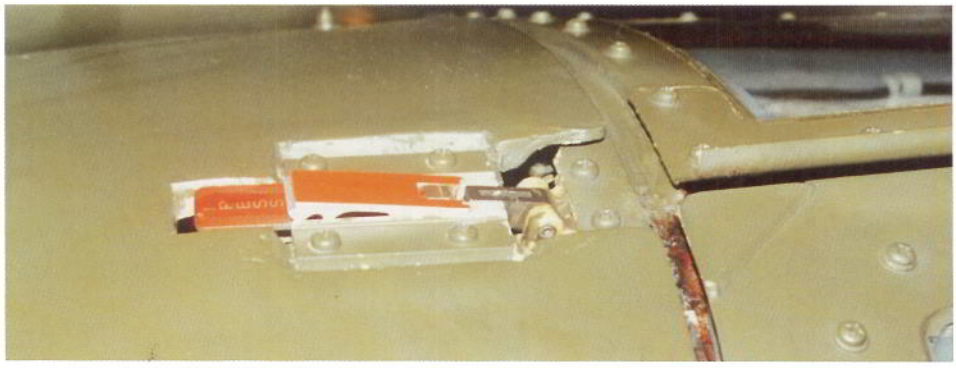
Secondly, the airframe mounted latching bar for the fairing edge spring latch exhibited no witness marks or signs of distress such as might have been expected if the latch had been engaged when the fairing was torn from the helicopter. In addition, the amount of surface corrosion on this bar (whilst in itself not a direct cause for concern) suggested that in comparison to those seen on the AAC helicopters, whose bars were generally polished through use, that this spring latch had only infrequently been operated, and/or that the helicopter had a very low utilisation. When these fairings are closed and latched correctly, a clearance exists between the bar and latch. Tests were carried out which showed that it was possible to close the fairings and correctly latch the front and rear, but with this spring latch not engaged and with its own locking lever in the open position.

Without all of the latching components from the front and side latches it was not possible to determine if these had suffered any failure in flight. However, close examination of the airframe mounted section of the front latch, which contains most of the mechanism, failed to reveal any abnormalities, unusual wear or witness marks consistent with overstressing. As its precise adjustment could not be derived, it was not possible to determine whether it had unlocked due to vibration in flight, or had not been locked beforehand.

It was noted during the tests that the visual difference between the latch operating lever being closed enough to lock the fairing and being pressed fully home, such that the lever itself was locked and flush with the surface, was small, ref. Figure 1.



a)



b)

FRONT LATCH - a) correctly latched b) latched but unsafe

Cowling closed and latched front and rear
Sprung latch not engaged

FIGURE 1