

## Agusta A109C, G-RNLD

**AAIB Bulletin No: 12/2000 Ref: EW/G2000/02/03 Category: 2.2**

**Aircraft Type and Registration:** Agusta A109C, G-RNLD

**No & Type of Engines:** 2 Allison 250-C20R/1 turboshaft engines

**Year of Manufacture:** 1996

**Date & Time (UTC):** 7 February 2000 at 1030 hrs

**Location:** Near Coventry Airport, West Midlands

**Type of Flight:** Private

**Persons on Board:** Crew - 1 - Passengers - 3

**Injuries:** Crew - None - Passengers - None

**Nature of Damage:** One main rotor blade tip cap detached

**Commander's Licence:** Airline Transport Pilot's Licence (Helicopters)

**Commander's Age:** 54 years

**Commander's Flying Experience:** 9,200 hours (of which 160 were on type)

Last 90 days - 66 hours

Last 28 days - 26 hours

**Information Source:** Aircraft Accident Report Form submitted by the pilot and enquiries of the helicopter manufacturer

Whilst in the cruise with the auto-pilot engaged in Heading and Altitude modes, the commander became aware of a very slight one-per-revolution noise. After about one minute, as he was trying to decide if the noise was indeed real or imaginary, it increased slightly. He turned the helicopter towards Coventry Airport, using the heading bug, with the intention of making a precautionary landing. When in sight of the airfield, there was a sudden increase in vibration to an alarming level. The commander immediately lowered the collective, disconnected the auto-pilot, lowered the landing gear and transmitted a Mayday call to Coventry Approach who had been providing a Radar Information Service. With the severe vibration continuing, he landed the helicopter as quickly as possible and immediately shutdown the engines and applied the rotor brake. Unable to contact Coventry Approach or any other aircraft on the approach frequency, and having checked that his passengers were all right, the commander contacted Coventry by mobile phone to advise them that the helicopter had landed safely without damage and that the occupants were unhurt.

On inspection, it was noticed that one main rotor blade tip cap had detached. (Figure 1)

The tip caps are each formed of upper and lower aluminium alloy shells welded together at the cap leading edge, bonded to a honeycomb core and attached to the main rotor blade tip by a combination of bonding and screw type fasteners. The helicopter manufacturer had issued 'Bollettino Tecnico (BT) No 109-106, dated 21<sup>st</sup> July 1998', following two cases of tip cap leading edges opening up with subsequent increases in helicopter vibration on blades of part No 709-0103-01. The investigation of these two cases had identified the presence of extensive areas of disbond between the tip cap shells and the core, and concluded that these had caused a 'pulsating' effect leading to cracks on the leading edge joint line of the shells. The BT was issued to introduce a tap type inspection with a specific hammer to identify the presence of voids between the shells and the core, and a visual inspection to check for cracks at the welded joint of the shells.

Pertinent details of the BT were as follows:-

### Helicopters Affected

All main rotor blades Part No 709-0103 01 up to Serial No 1428 inclusive, preceded by code A5 or EM, installed on Agusta A109C helicopters or stocked parts.

### Compliance

Within and not later than ten operating hours from the receipt of this BT and subsequently every twenty five operating hours.

### The detailed compliance instructions included:-

- 1 Inspect tip cap for debonds between metal shells (upperside and lowerside) and honeycomb core (see Figure 1), using the steel hammer part No 109-3101-58-1, in accordance with the pertinent Maintenance Manual instructions.

### CAUTION

The tapping inspection with the hammer must be carried out by skilled personnel, able to identify defects if present on the bonded components. If skilled personnel are not available please contact Agusta.

- 2 Visually inspect the tip cap (upperside and lowerside) for swellings and/or deformations.
- 3 Using an 8 to 10 power magnifying glass, visually inspect on tip cap leading edge welded bead (joint line between two metallic shells) for presence of cracks and/or damage (refer to area indicated in Figure 1).

If any doubt exists perform an inspection with dye penetrant (Ref;-MIL-I-25135, method , type II, sensibility level 2).

- 4 The blade that shows debonds voids which exceed the prescribed limits of the pertinent Maintenance Manual and/or swellings, deformations and/or cracks, must be removed from service. In this case please inform immediately Agusta.

## NOTE

The inspections required with this BT are not applicable if tip cap replaced with new cap Part No 709-0103-29-109. The replacement is carried out by Agusta or authorised service station.

The details of the blade which had lost its tip cap are as follows:-

Main Rotor Blade Part No 709-0103-01-105 Serial No A5-1135, total flight hours 287.30.

Consequently, the tip cap part no 709-0103-29-107, which was installed on the blade at original blade construction, was subject to the inspection requirements of BT109-106. The operator, a distributor for Agusta helicopters, confirmed that the tip cap had been inspected at 274.30 operating hours, 13 hours before the detachment, with no defects reported. The blade was returned to the manufacturer for investigation.

The manufacturer's investigation concluded that the tip cap to blade separation exhibited two different failure modes. The trailing edge fibres were torn, whereas, at the leading edge/spar there was evidence of adhesive rupture. From this evidence it was concluded that, at manufacture, a satisfactory tip cap to blade bond had been achieved. Comparing the evaluation carried out in the two cases which lead to the release of BT109-106, and the results of the analysis in this case, Agusta concluded that the loss of the tip cap was caused by it opening up in the region of the weld line between the two shells, starting from an undetected crack. Further detailed investigation is ongoing to refine this conclusion.

As a result of this event, Agusta is considering improvement of the inspection of the top and bottom shells welded joint, required by BT109-106, by the introduction of a routine dye penetrant check.