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Department for Transport

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# AAIB Bulletin S1/2006

## *SPECIAL*

### ACCIDENT

<b>Aircraft Type and Registration:</b>	Bell 206B, G-WLLY
<b>No &amp; Type of Engines:</b>	1 Allison 250-C20 turboshaft engine
<b>Year of Manufacture:</b>	1969
<b>Date &amp; Time (UTC):</b>	21 December 2005 at 1015 hrs
<b>Location:</b>	3 nm north east of Coupar Angus, Perthshire
<b>Type of Flight:</b>	Aerial work
<b>Persons on Board:</b>	Crew - 1                      Passengers - 1
<b>Injuries:</b>	Crew - 1 (Fatal)              Passengers - 1 (Fatal)
<b>Nature of Damage:</b>	Aircraft destroyed
<b>Commander's Licence:</b>	Airline Transport Pilot's Licence
<b>Commander's Age:</b>	48 years
<b>Commander's Flying Experience:</b>	15,000 hours approximately Last 90 days - 102 hours Last 28 days - 28 hours
<b>Information Source:</b>	AAIB Field Investigation

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This bulletin contains facts which have been determined up to the time of issue. This information is published to inform the aviation industry and the public of the general circumstances of accidents and must necessarily be regarded as tentative and subject to alteration or correction if additional evidence becomes available.

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### **History of the flight**

The crew, consisting of a pilot and observer, arrived at Cumbernauld Airport on the morning of the accident in order to carry out a standard pipeline inspection flight. They were observed starting the aircraft and lifted off at 0922 hrs. They departed along Runway 26 and turned right to cross the airport boundary heading north-east. There were no further radio transmissions from the aircraft. On board GPS equipment recorded their route, which closely followed a gas pipeline heading approximately north-east. Their airspeed throughout the route varied between 100 kt and 120 kt and the short section of the flight captured on radar showed their height to be between 500 ft and 1,000 ft agl. Just prior to the accident the aircraft was seen to enter a gentle descent and as it passed through approximately 100 ft agl, a light coloured part of the rear section fell from the helicopter and it began a right hand turn. It then rolled onto its left hand side before pitching nose down into the ground. Debris came out of the helicopter before impact with the ground. Both occupants were fatally injured. The wreckage trail extended for several hundred metres, with the vertical fin, tail rotor assembly and gearbox being among the earliest items found along the flight path.

### **Initial engineering findings**

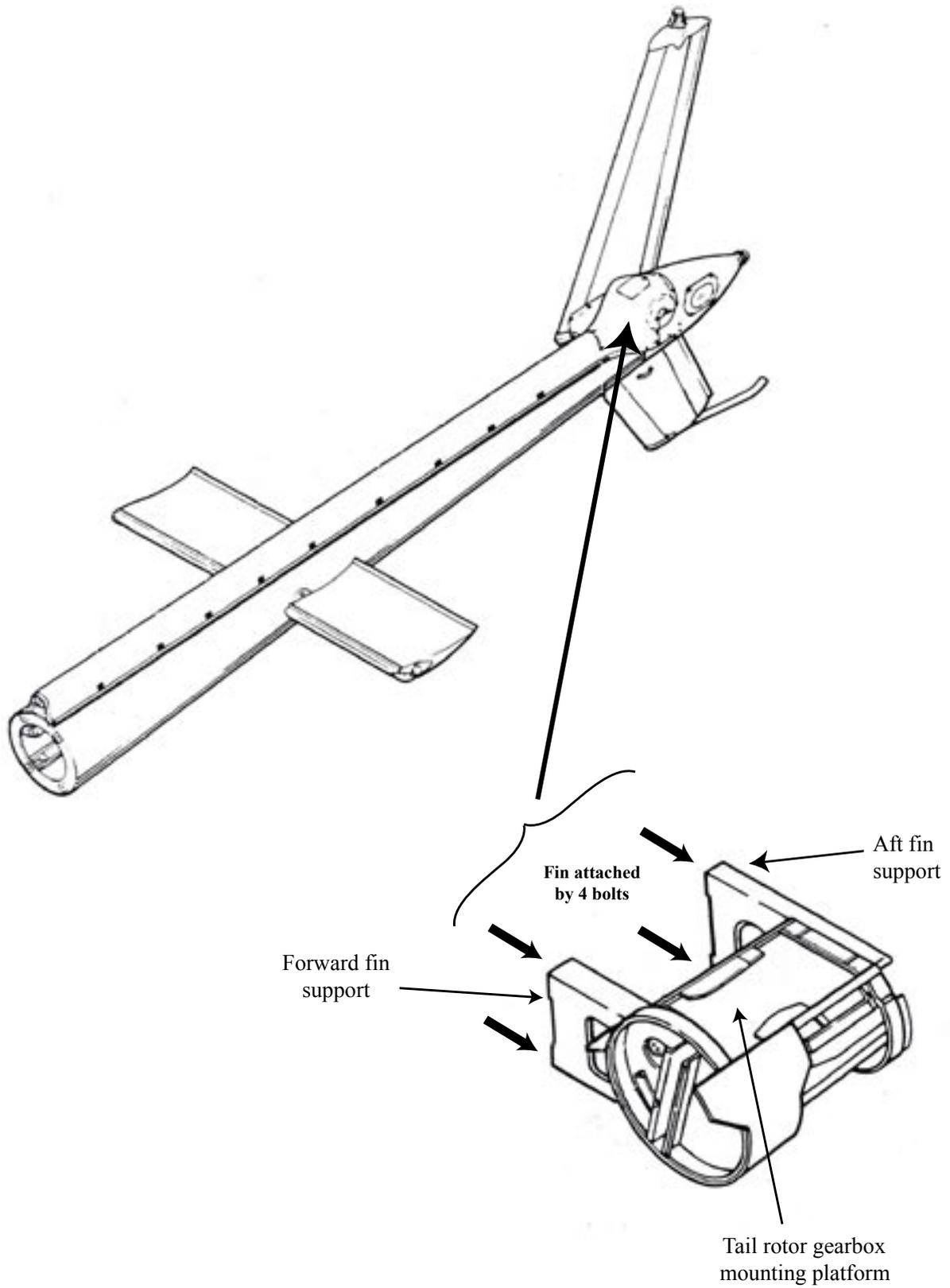
The aircraft wreckage was recovered to the AAIB's facility at Farnborough, where it was subjected to a detailed examination. This revealed that the vertical fin had suffered an in-flight detachment from the aircraft. The manner of its departure was such that the lower part of the fin entered the tail rotor arc; the resulting contact removed the "stinger" at the base of the fin and damaged the rotor blades. The tail rotor and its gearbox were torn from their mountings shortly after the loss of the fin.

The fin is attached to the tail boom by four bolts, which locate into holes in two fin supports positioned at the front and rear of the tail rotor gearbox platform. (See Figure 1). On G-WLLY this platform is of a fabricated sheet metal construction. The fin supports are machined forgings; the rear support is riveted in position such that it effectively forms the rearmost frame of the tail boom. The front support is bolted to the structure. There is a later design in which the platform and fin supports are an integral, one-piece forging.

A metallurgical examination of the fin supports revealed evidence of fatigue in the fractures that had occurred through and around all four bolt holes. The fatigue was the most extensive in the upper rear support, and corrosion was evident on many of the fracture faces, indicating that the fatigue cracks had been growing over a period of time, although the duration could not be quantified.

The Aircraft Maintenance Manual requires that the fin supports be inspected every 100 hours. This takes the form of a visual inspection only. A dye penetrant process would not normally be used; neither would the fin be removed. Thus a typical inspection would require removing the tail rotor gearbox fairing, which allows access to the inboard faces of the fin supports.

The investigation so far has not revealed an extensive history of cracking in the fin supports of Bell 206 helicopters. The UK Civil Aviation Authority recorded the discovery of a crack in a rear support during a visual inspection on an aircraft in March 1977, and the aircraft manufacturer has stated that they are aware of one occurrence of fin support failure, which occurred in the Gulf of Mexico in April 1991.



**Figure 1**  
Tail boom and fin supports

It is unclear whether the fatigue damage to G-WLLY is related exclusively to this helicopter or whether it could affect other helicopters of this type. In order to gather information to assist this investigation and to protect the fleet, the AAIB proposes a once-off inspection of the affected areas with the fin removed in order to obtain adequate access to the supports and the bores of the bolt holes. Reassembly should be conducted paying particular attention to the torque requirements specified in the Aircraft Maintenance Manual.

**Safety Recommendation 2006-039**

It is recommended that the United Kingdom Civil Aviation Authority require a one-off inspection, within a reasonable timescale, of the vertical fin supports of all Bell and Agusta-Bell 206 series helicopters on the UK register. The inspection should be conducted with the fin removed in order to obtain adequate access.

**Safety Recommendation 2006-040**

It is recommended that Transport Canada, the European Aviation Safety Agency and the US Federal Aviation Administration each consider requiring a one-off inspection, within a reasonable timescale, of the vertical fin supports of all Bell and Agusta-Bell 206 series helicopters within their jurisdictions.

**Further investigation and reporting**

Work will continue to establish the cause of the fatigue crack initiation in the fin supports. The investigation will also consider why this was not detected prior to the catastrophic detachment of the fin. A full report will be published by the AAIB in due course.