

**AAIB Bulletin No:** 9/95                      **Ref:** EW/G95/06/13                      **Category:** 2.3

**Aircraft Type and Registration:** Bell 206B Jet Ranger II, G-HRAY  
**No & Type of Engines:** 1 Allison 250-C20B gas turbine engine  
**Year of Manufacture:** 1981  
**Date & Time (UTC):** 16 June 1995 at 2035 hrs  
**Location:** Stapleford Tawney Airfield, Essex  
**Type of Flight:** Private  
**Persons on Board:** Crew - 1                      Passengers - 2  
**Injuries:** Crew - None                      Passengers - None  
**Nature of Damage:** Tailboom kinked aft of joint to main fuselage assembly  
**Commander's Licence:** Airline Transport Pilot's Licence  
**Commander's Age:** 46 years

**Commander's Flying Experience:** 9,500 hours (of which 4,500 were on type)  
Last 90 days - 121 hours  
Last 28 days - 54 hours

**Information Source:** Aircraft Accident Report Form submitted by the pilot and AAIB enquiries

The aircraft had been in maintenance leading up to its annual inspection. It had undergone a 100 hour inspection about 20 hours previously and the only outstanding discrepancy, reported by the pilot and not in the Technical Log, was a request to investigate a tendency for the throttle to 'back-off' from the maximum governed position during flight. After examination of the linkage, the maintenance organisation sent the gas producer fuel control unit to the approved overhauler which, after examining the unit, renewed the input lever detent spring before subjecting it to the standard production test and returning it to the maintainers as serviceable.

After completion of the annual check, the aircraft was submitted for a certification test flight. As the pilot started the power check performance climb at 60 kt, which forms part of the test flight schedule, he noticed that both the engine torque and turbine temperature were reducing together with the rotor RPM. Even after he had lowered the collective pitch lever partially and had checked that the throttle was fully open, the pilot observed the rotor RPM continuing to decay down to the point where the Low Rotor RPM warning horn sounded. He then lowered the collective pitch lever fully and closed the throttle to 'Flight Idle', aiming to land in a crop field near the aerodrome. The pilot elected to make a zero speed, engine off landing as he did not know what the ground was like under the high crop. However, during the descent he had to make an 'S' turn in order to clear some wires which then became visible and, as a result, the subsequent landing was heavier than he would have wished.

After landing, the pilot noted that the engine was still running normally at ground idle RPM, so he checked full throttle operation, which appeared normal. However, since an external inspection of the aircraft, by the engineer who was accompanying the pilot on the test flight, found structural deformation around the tailboom to fuselage joint, the engine was shut down and the aircraft was later transported to the maintenance base.

Examination of the geometry of the twist grip throttle mechanism between the collective lever and the fuel control unit showed that gravitational forces tended to close the throttle. The detent spring, which was changed before this flight, is intended to hold the fuel controller input lever either 'fully closed' in the ground idle position, or 'fully open' in the flight position. When in good condition, the detent spring is adequate to resist any closing forces but a combination of a deteriorated spring with the usual vibration in powered flight may be sufficient to reduce the throttle opening if it is not physically held open by the pilot.

After the accident, the maintenance organisation removed the fuel control unit and the power turbine governor and sent both to the approved overhauler for test and examination. These tests showed that the fuel controller, which had been overhauled immediately before this flight, was still fully serviceable. The power turbine governor, however, had a number of deficiencies including the disbonding of the drive shaft to the splined drive collar. The overhauler's opinion of this specific fault was that although it might lead to some turbine (and rotor) speed instability, it would not result in an engine rundown as experienced by the pilot; they also considered that none of the other shortcomings found in the unit were likely to have led to a rundown.

Whilst removing the fuel system from the engine, one of the Pc air connections was found to be slightly loose (about a half turn). As a result of previous instances of rundown of Allison 250 engines, AAIB has conducted a series of tests, with both Ceco and Bendix fuel systems, to ascertain the effects of loose connections in the Pc signal pipes. These tests indicated that unless the Pc line was completely disconnected, the effect on the fuel system's performance was minimal.

Enquiries revealed that this turbine governor, which has an overhaul life of 2,000 hours, had run a total of 1,228 hours since new and that it had been fitted, previously, on the engine of an aircraft which had suffered an unexplained complete loss of power. At the time of this previous rundown incident the governor had run 614 hours since new. Bench tests after this earlier occurrence had not revealed any apparent shortcomings in the governor and it had, therefore, been recertificated as serviceable.