No: 11/92 **Ref: EW/G92/06/33** **Category: 2c**

Aircraft Type and Registration:	Bell 206B Jet Ranger II, G-FFTN
No & Type of Engines:	1 Allison 250-C20 turboshaft engine
Year of Manufacture:	1990
Date & Time (UTC):	29 June 1992 at 0827 hrs
Location:	Badvoon Forest, Highlands
Type of Flight:	Commercial (Aerial Work)
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - Minor Passengers - N/A
Nature of Damage:	Damaged beyond economic repair
Commander's Licence:	New Zealand Commercial Pilot's Licence (Helicopters)
Commander's Age:	43 years
Commander's Flying Experience:	5,790 hours (of which 1,478 were on type) Last 90 days - 184 hours Last 28 days - 79 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and examination of the aircraft by AAIB

The helicopter was engaged in the application of fertiliser using an underslung bucket. After each application the aircraft returned to a loading site where the bucket was refilled by a tractor fitted with a purpose-built loading hopper. To achieve replenishment, the pilot placed the bucket on the ground and manoeuvered the helicopter to hover to the left of the bucket, whilst the tractor moved in from the front right hand side with the 375 kg load. The bucket remained attached to the aircraft by three 4-metre long cables. On completion of the loading the pilot manoeuvered back over the top of the bucket and achieved a vertical lift.

On the day of the accident the helicopter had accomplished 14 applications before re-fuelling. It had then done one application and returned to replenish the bucket. The loading sequence as described above was almost complete and the pilot observed the tractor backing away. He then looked into the cockpit, noting that rotor RPM was indicating 100% and torque reading 62% as he prepared to manoeuvre the aircraft over the bucket. At this point he stated that he became aware of the nose of the helicopter beginning to rise in a slow, smooth motion. Cyclic application appeared to have no effect and the aircraft reached a very steep nose-high attitude but without the tail boom touching the ground.

It then rolled to the left and the main rotor blades struck the ground.with the inevitable consequences. Again there appeared to have been no response to cyclic control inputs to oppose the roll.

The helicopter came to rest on its left side and the pilot evacuated through the right cockpit door without difficulty. A small fire in the engine bay area was rapidly extinguished by the loading crew. The pilot noted that he subsequently developed a slight headache and, upon examining his protective helmet, realised that it had received an impact on the back.

Photographs of the helicopter taken immediately after the accident show it lying on its left side with the tail boom doubled forwards and the lower vertical stabiliser embedded in the right-hand cabin door. A small fire (or possibly exhaust scorching) could be seen in the area of the engine cowling. The main rotor, mast and gearbox were about 3 metres away from the fuselage having torn away the three Powered Flying Control Units (PFCU) and a large amount of the roof structure.

The Company's engineer, who initially examined the wreckage, reported that he could find no obvious defects in the flying control system but reported that one of the PFCU's appeared to be jammed. Although a PFCU or hydraulic malfunction was inconsistent with the pilot's statement that the cyclic control column movement had felt normal, AAIB requested that the helicopter be transported to Farnborough for further investigation. Here it was examined for pre-accident flying control system defects but none was found. The suspect PFCU was tested and inspected at an overhaul agency and was found to perform normally. The reason for the stiffness was an impact-induced dent in the body of the jack.

The state of the wreckage generally was discussed with a representative of Bell Helicopter Textron. As the pilot had stated, there were no signs that the tail rotor had struck the ground whilst under power but the reason why the tail boom had received such gross deformation sufficient to double-back on itself required explanation. The representative suggested that other accidents had shown this feature when initial ground strike had been heavy on the main rotor. He said that the loss of rotational energy on the first blade meant that, as the other invariably made contact with the tail boom it had insufficient energy to slice through the boom completely but sufficient to drag the boom round and project it into the cabin. There can be little doubt that the pilot was saved from death or serious injury by wearing a crash-helmet which apparently had received an impact from the boom or tail rotor.

Both the pilot and the loading crew state that they firmly believed that the cause of the uncontrollable pitch and yaw was not related to the loading operation and the pilot believed that there must have been some malfunction of the cyclic contols. However, the manufacturer could not envisage such a malfunction apart from a disconnection of some part of the system of which no evidence was found.

They did, nonetheless, postulate that if the pilot had inadvertently allowed the helicopter to drift backwards as he hovered, the sequence of pitch and roll moments as the loading strops became taut would match the reported behaviour and also could become uncontrollable if not rapidly and positively corrected. The pilot is adamant that this did not happen.