AS350B Ecureuil, G-PLMB

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Aircraft Type and Registration:	AS350B Ecureuil, G-PLMB
No & Type of Engines:	1 Turbomeca Arriel 1B turboshaft engine
Year of Manufacture:	1980
Date & Time (UTC):	20 April 1998 at 1245 hrs
Location:	2 km east of Ledmore Junction, Scottish Highlands
Type of Flight:	Aerial Work
Persons on Board:	Crew - 1 - Passengers - None
Injuries:	Crew - None - Passengers - N/A
Nature of Damage:	Broken tail rotor, tail boom, drive shaft and gearbox; damage to landing skids, horizontal and vertical stabilisers and to one main rotor blade. Engine and gearbox removal for stress checks
Commander's Licence:	Air Transport Pilot's Licence
Commander's Age:	52 years
Commander's Flying Experience:	12,595 hours (of which 5,450 were on type) Last 90 days - 161 hours Last 28 days - 78 hours
Information Source:	AAIB Field Investigation

History of flight

The aircraft was engaged on underslung load transfers of drainage materials. There were 16 pallets of corrugated sheet materials, each weighing 600 to 700 lb, to be transferred a distance of about 2 kilometres. The sheets were tied to wooden pallets with polypropylene rope. Each pallet was in turn attached to the helicopter's cargo strop with polypropylene ropes which passed underneath the pallet and attached to a hook above the load such that the pallets remained horizontal. This hook was slipped over another hook at the bottom of the cargo strop when the load was lifted. Before

commencing the task the commander and his ground handler checked the security of the pallets which had been prepared by the client's staff; both were satisfied that the loads were suitable for underslung transport. Weather conditions were fine with a south easterly wind of 10 to 12 kt.

The first 10 lifts were accomplished uneventfully. The 11th pallet was lifted as normal with no tendencies to swing or spin during transit. Approximately half way to the delivery site the commander was flying at 40 kt IAS into a 10 kt headwind at 65 feet agl overhead a forestry plantation when he heard a loud bang followed by vibration from the tail section. The helicopter began to turn to the left but using lateral cyclic control he was able to contain the yaw. However, by this stage the helicopter was downwind, losing height and losing airspeed which exacerbated the undemanded yaw. To keep the yaw rate under control the commander lowered the collective lever. The helicopter touched down heavily amongst young pine trees (between 2 and 3 metres high) where further damage was inflicted to one main rotor blade and the landing gear cross tubes. Having secured the helicopter the commander noticed that the entire load had slipped off the pallet. The pallet was still attached to the strop but the drainage materials were about 200 metres away.

Aircraft Damage

The lifting strop consisted of a chain with a portion of it parallelled by a shorter length of rope, which served to attenuate shock loads. The upper end of the chain was equipped with a swivel assembly and a shackle, which attached to a hook on the underside of the helicopter. The lower end of the chain terminated in a hook. A cylindrical weight, for stabilising purposes, was free to slide up and down the chain, with the lower limit set by a 'stop block' which was fixed to the chain approximately one metre above the hook.

It was apparent that the lowermost section of chain, between the stop block and the hook, had struck the tail rotor blades. There were heavy indentations on the leading edges which matched the shapes of the chain links. In addition, there was an impact on a blade tip, together with paint deposits, which appeared to have been made by the stop block. The extreme aft end of the tail boom had been deflected downwards, with compressive buckling of the skin on the underside. The tail rotor driveshaft had failed close to where it passed over this area, which was immediately ahead of the tail rotor gearbox. It was thought that the chain momentarily tautened as it became entangled with the rotor blades, thereby imparting a load on the tail boom. The driveshaft would have failed as a result of a combination of torsional shock loads and bending due to the boom distortion.

The chain had additionally damaged the trailing edge of the horizontal stabiliser. However, there was no evidence of either the pallet or the polypropylene ropes having contacted the helicopter.

Analysis

Sudden loss of the load caused the pallet to spring upwards and rearwards, resulting in the lower section of the cargo strop becoming entangled in the tail rotor. Pallets were used for the task because the drainage sheets were too flexible to be carried in a cargo net and they would have distorted in flight. Following this accident the operator has decided to review the approved method for attaching this type of cargo to a pallet.