No: 5/86 **Ref: 2b**

Aircraft type and registration:	Sikorsky S61N G-BFPF
No & Type of engines:	2 General Electric Company CT58-140-1 turbine engines
Year of Manufacture:	1971
Date and time (GMT):	29 March 1986 at 0926 hrs
Location:	Aberdeen airport
Type of flight:	Training
Persons on board:	Crew — 2 Passengers — None
Injuries:	Crew — None Passengers — N/A
Nature of damage:	Damage to main rotor, tailwheel and upper surface of rear fuselage. Tail rotor drive-shaft sheared.
Commander's Licence:	Air Transport Pilot's Licence (Helicopters)
Commander's Age:	39 years
Commander's Total Flying Experience:	7700 hours (of which approximately 6000 are on type)
Information Source:	AIB Field Investigation.

The aircraft was being used for a company base check. The handling pilot was a training captain and was flying the aircraft from the left-hand seat. The aircraft was loaded with fuel and ballast to bring its gross weight on take-off to 94% of its maximum take-off weight. It was operating on runway 35 (true heading 338°), with a surface wind fluctuating between 250° and 290°T and varying between 5 and 11 knots.

Following a practice failure of the No 2 engine after take-off, the aircraft was climbed to 700 feet (above ground level) and positioned for a single-engined, run-on landing on a simulated 50 feet square, the ILS touchdown point of runway 35 being specified as the aiming point. The handling pilot lined the aircraft up with the runway at approximately 500 feet agl and executed a constant sight picture approach. Both pilots stated that the approach was normal with a rate of descent of 300 to 400 feet per minute, an IAS of approximately 45 kt and torque on the No 1 engine increasing to 85 to 90% as the aircraft approached the landing decision point (LDP) at 100 feet agl. At the LDP, the handling pilot announced that he could reach the aiming point and instructed the training captain to increase rotor rpm to maximum. Approaching the aiming point, the handling pilot began a gentle flare at a height he estimated to be about 12 feet agl but which the training captain thought might have been as high as 20 feet. As the aircraft was being levelled from the flare, it descended very rapidly and landed heavily, tailwheel first, with zero groundspeed. The handling pilot later stated that the aircraft dropped so sharply that he could not apply collective pitch quickly enough to cushion the touchdown. The training captain agreed that the final descent was very rapid, unexpected and untypical of the normal behaviour of the aircraft. During the landing he had his right hand resting on his right thigh and his left hand on the speed select

levers; he was thus unable to comment on the timing or amount of collective pitch lever movement but he was able to confirm that excessive aft cyclic control was not used.

Examination of the aircraft showed that two consecutive main rotor blades had contacted the tail rotor drive-shaft, about one foot forward of the intermediate gearbox and at a low angle of blade pitch; the first blade had glanced off the shaft and the second had severed it. The main landing-gear was not damaged but the tail landing gear had suffered structural failures at the top and bottom of the oleo assembly due to vertical overload. The design limitation for the tail landing-gear is a sink speed of 390 fpm at maximum landing weight. The No 1 engine was subsequently ground run and found to be on the lower limit of acceptabiliy for power. Accordingly, the fuel control unit was removed for testing and found to operate normally but a strip examination revealed a half inch length of locking wire lying loose within the unit. It could not, however, be established whether or not this loose length of wire could have affected engine performance during the landing.

After the accident a record of rotor rpm was obtained from the aircraft cockpit voice recorder. It showed an increase from 100% to 103.5% as the speed select lever was advanced 10 seconds before the landing. It then showed a progressive decrease to 93%, indicating that collective pitch was increased in the 10 seconds before touchdown.

The aircraft weight was some 4500 lb above the maximum weight for free air hover with one engine inoperative but this condition was standard for this training exercise. Wind conditions were unhelpful in that there was little headwind but the anemometer record showed that there was also little likelihood of the aircraft having experienced a tailwind on landing. It may be significant that the aircraft operating handbook warns that the aircraft can be subject to power settling at low forward speed and high power settings, even with comparatively low rates of descent.