No: 3/89 **Ref: EW/G88/10/18** **Category: 1c**

Aircraft Type and Registration:	Piper PA-34-200T Seneca II, G-FILE
No & Type of Engines:	2 Continental TSIO-360-EB1 piston engines
Year of Manufacture:	1980
Date and Time (UTC):	14 October 1988 at 1705 hrs
Location:	Elstree Aerodrome, Herts
Type of Flight:	Private
Persons on Board:	Crew - 2 Passengers - 3
Injuries:	Crew -None Passengers - None
Nature of Damage:	Right propeller blade tips bent forward, right engine shock loaded, left engine overboosted.
Commander's Licence	Private Pilot's Licence Groups A & B with Instrument Rating
Commander's Age:	35
Commander's Total Flying Experience:	2221 hours (of which 58 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot, analysis of landing gear schematics and telephone inquiries.

The aircraft was being used to carry out a normal currency check on a prospective hirer of the aircraft.

The off-circuit work was completed satisfactorily and the aircraft joined the circuit for runway 08 right hand. The pre-landing checks were carried out normally and the aircraft was set up for a "touch and go" landing. Following a firm touch-down, the flaps were raised and take-off power was set.

Approximately half way though the ground roll the aircraft started to pull very slightly to the right, as though the wheel brake on that side was binding slightly. The pilot has stated that "just before rotate speed" the right propeller audibly contacted the ground, and he had the impression that the right landing gear was retracting. As flying speed had been achieved, the aircraft was lifted off and a positive rate of climb established. The landing gear was successfully retracted and, at a safe height, the right propeller was feathered and the engine shut down.

A single-engined circuit was flown and the landing gear lowered. The landing gear indicators displayed "three greens" and the landing was carried out without further incident.

On this aircraft type, a propeller strike is only likely to occur with a combination of roll and nose down pitch attitude, tilting the aircraft by a significant amount about one main wheel and the nosewheel, an unlikely condition to occur late in the take off roll.

The landing gear system on the PA-34 utilises hydraulic actuators powered by a reversible, electrically powered hydraulic pump. The electrical power to the pump motor is supplied via two power solenoids, one powering the motor in the UP sense and the other in the DOWN sense. The UP solenoid winding is wired through the landing gear selector switch and the squat switch, thus ensuring that the UP motor contacts close only when the landing gear is off the ground and the selector switch is UP; the DOWN solenoid winding is wired through the selector switch and the downlock switches, allowing the DOWN motor contacts to close whenever one or more of the landing gears is unlocked and the selector switch is DOWN. Selection of landing gear UP on the ground activates the warning horn, flasher, and gear unsafe light, but should have no other effect until the squat switch changes over to the 'air' position.

The landing gear circuit provides little scope for electrical malfunctions to cause an undemanded retraction of the landing gear, principally because of the inhibiting effect of the squat switch. Only a short circuit between the switch contacts in the UP solenoid or a wiring chafe against a live terminal in the section of cable between the solenoid and the hydraulic motor could result in retraction of the landing gears regardless of the position of the squat switch: this would occur immediately the fault condition occurred. A malfunction of the landing gear selector resulting in closure or shorting together of the selector switch contacts controlling the UP solenoid, but without a similar closure of the other pair of switch contacts which control the landing gear warning circuits, could produce a dormant fault condition. Such a (hypothetical) malfunction would be equivalent to an UP selection being made on the ground, but would not cause the warning horn to sound or produce any other indication of abnormality until the squat switch changed to the 'air' position, causing the landing gear to retract. On a bumpy runway, such a fault condition would probably lead to the landing gear starting to retract before the aircraft had fully left the ground, because of cycling of the squat switch as the aircraft became 'light'.

Following this incident, extensive checks on G-FILE were carried out by the maintenance organisation. These checks included examination of the wiring for chafing, functional tests of the landing gear selector switch and the UP solenoid. This solenoid was dismantled to check the condition of the armature spring. No abnormality of any kind was found which could explain an undemanded landing gear retraction.