AAIB Bulletin No: 3/93 **Ref: EW/G92/12/11** **Category: 1c**

Aircraft Type and Registration:	Piper PA-28-161 Cherokee Warrior II, G-BSGL
No & Type of Engines:	1 Lycoming O-320-D3G piston engine
Year of Manufacture:	1981
Date & Time (UTC):	16 December 1992 at 1305 hrs
Location:	Near Liverpool Airport, Merseyside
Type of Flight:	Private (training)
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Nose wheel spat and nose landing gear oleo
Commander's Licence:	Basic Commercial Pilot's Licence with IMC, Night and Instructor ratings
Commander's Age:	30 years
Commander's Flying Experience:	3,929 hours (of which 1,080 were on type) Last 90 days - 65 hours Last 28 days - 21 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot, examination by an AAIB Inspector (Engineering) and the Materials Department of the DRA, Farnborough.

The aircraft was being flown on an IMC renewal flight test when, during the cruise at 2,500 feet, a muffled 'bang' came from the engine, immediately followed by failure of the engine. The instructor took control of the aircraft and chose a field for a forced landing whilst the student transmitted a Mayday call. The instructor observed that the propeller was windmilling freely, without any associated vibration, and that there was little engine oil pressure. A successful forced landing was made into the selected field and both occupants were uninjured.

Subsequent strip examination of the engine revealed that the crankshaft gear (*ie* the gear wheel that was attached to the end of the crankshaft to provide the drive to the engine accessory gearbox) had become loose. The crankshaft gear attaching bolt was still in place and correctly locked by its lockplate, but no check torque was made when it was removed. These parts are shown in the diagram at Fig. 1. After removal of the crankshaft gear, it was found that the associated locating dowel had failed (Fig 2) and that the crankshaft and crankshaft gear mating faces displayed evidence of fretting. Examination of the locating dowel fracture showed the dowel to have failed in double fatigue, which had initiated from surface areas which displayed evidence of heavy fretting.

The fretting and fatigue on the locating dowel appeared to have occurred over a considerable period. Examination of the crankshaft gear attachment bolt and its lockplate showed very good evidence of long term fretting between the bolt and its lockplate, indicating that the attachment bolt had either not been torqued correctly when assembled, or that the torque had been lost due to incorrect assembly.

The aircraft had been imported from the USA in 1990 with a total of 765 hours since overhaul. The UK engine log book indicated that the engine was rebuilt on 31 August 1988. At the time of the accident the engine had accumulated 1714 hours. Inspection of the UK engine and airframe log books found no evidence of any occurance which might have been related to this failure. The US log books that were imported with the aircraft were not available for examination.

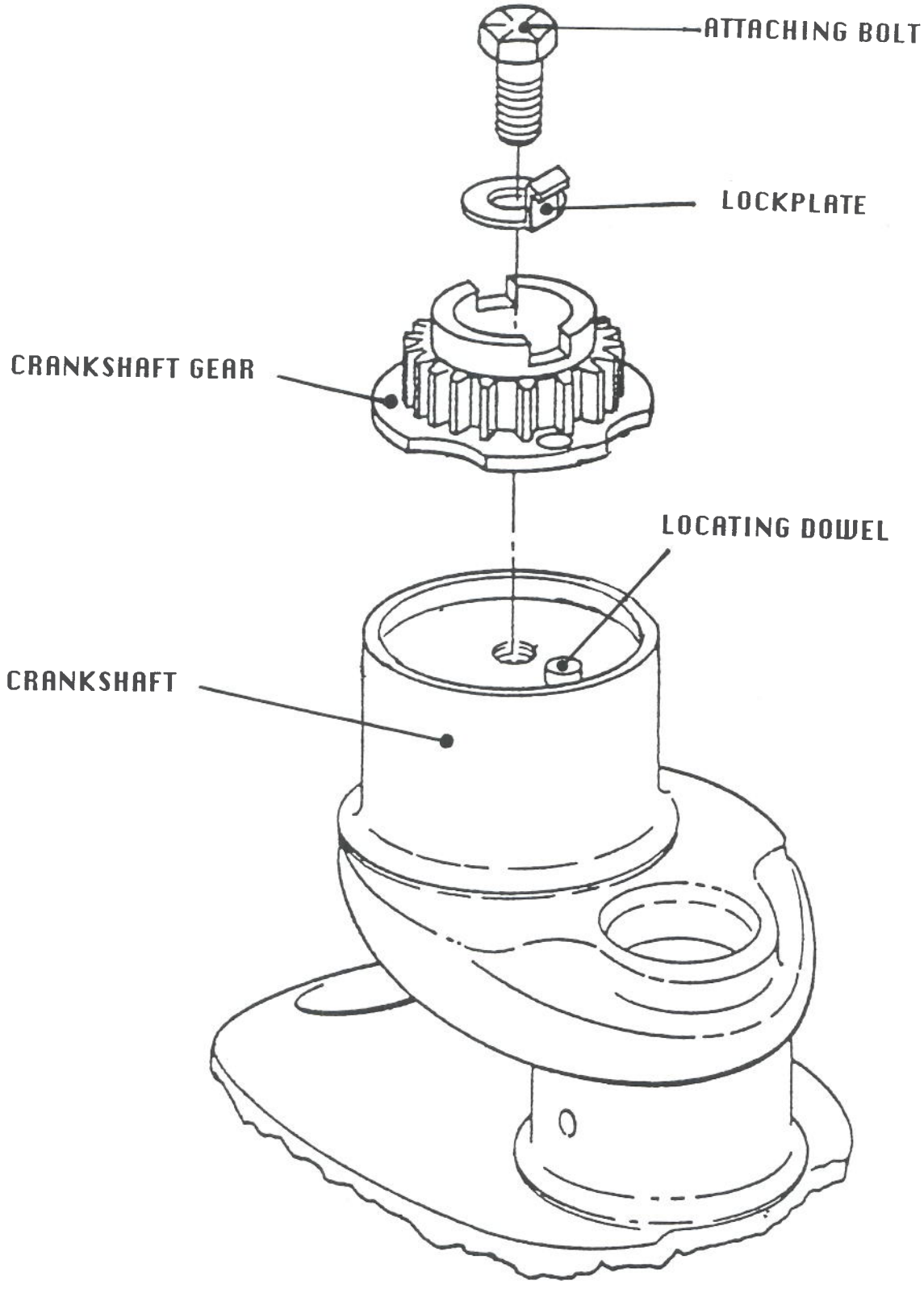

FIGURE 1. REAR END VIEW OF CRANKSHAFT SHOWING ASSOCIATED PARTS

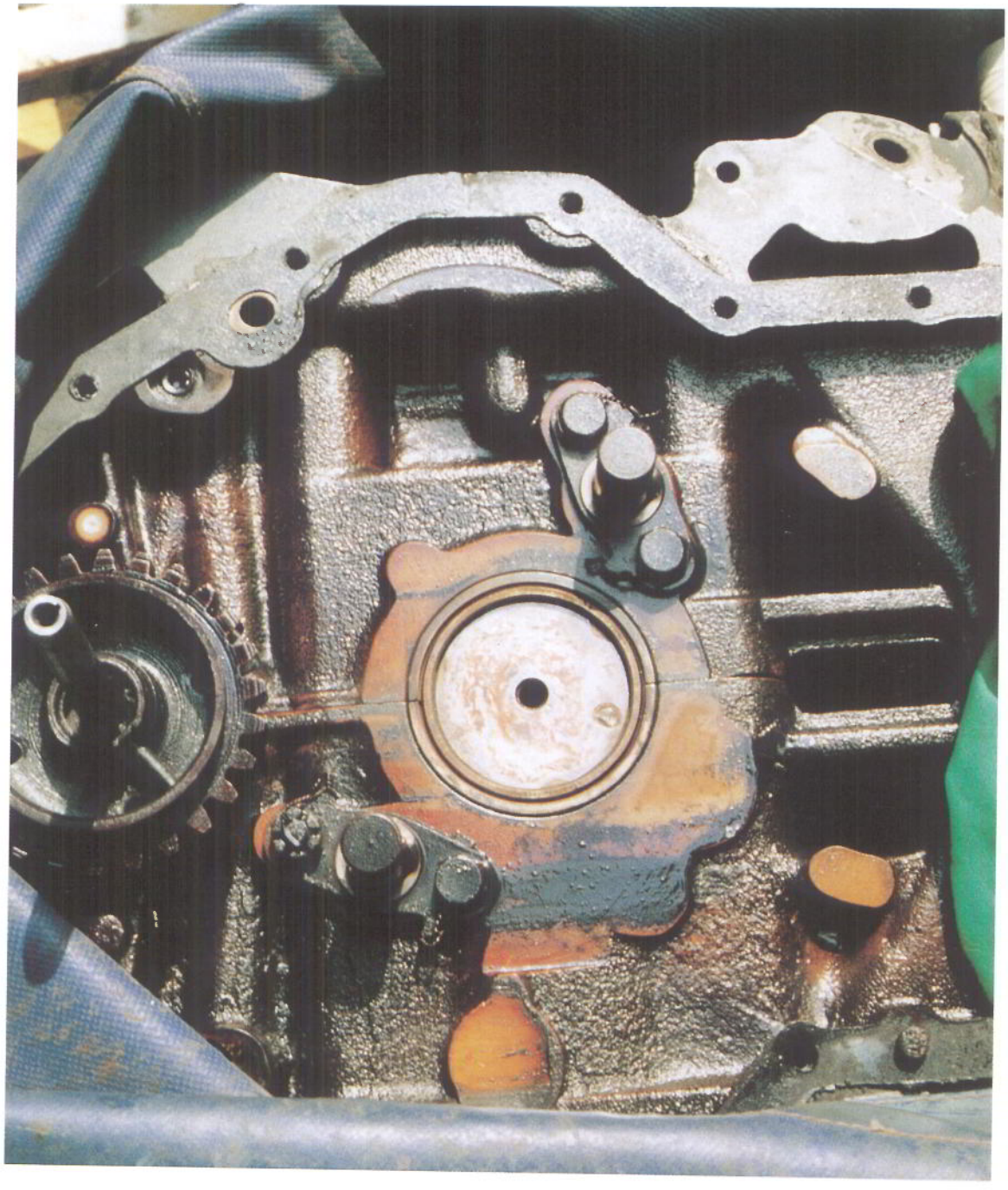

FIGURE 2. SHOWING FRACTURED LOCATING DOWEL