No: 10/88 **Ref: EW/G88/06/08** **Category: 1c**

Aircraft Type and Registration:	Piper PA-28R-200 Arrow, G-BMNL
No & Type of Engines:	1 Lycoming IO-360-C1C piston engine
Year of Manufacture:	1975
Date and Time (UTC):	17 June 1988 at 1230 hrs
Location:	Alderney Airport, Channel Islands
Type of Flight:	Private (pleasure)
Persons on Board:	Crew - 1 Passengers - 3
Injuries:	Crew - None Passengers - None
Nature of Damage:	Severe damage to engine
Commander's Licence	Private Pilot's Licence
Commander's Age:	43 years
Commander's Total Flying Experience:	670 hours (of which 8 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot and AAIB investigation of the engine.

The aircraft was en-route from Bournemouth to Dinard, cruising at 2000 feet amsl, when a slight change of engine noise was noted. The pilot checked the engine instruments, changed fuel tanks and selected electric fuel pump ON; he then noted a further change in engine noise. He declared a Mayday and elected to divert to Alderney, approximately 7 nm away.

The engine was losing power, with worsening vibration and, about 4 nm from Alderney, the aircraft would no longer maintain altitude. The pilot only had sufficient altitude to initiate a curving approach to runway 08 and, at about 700 feet and ½ nm out, selected undercarriage and flaps down. Almost immediately the engine emitted a loud bang, with complete power loss. The pilot retracted the flaps to improve penetration and was just able to clear the perimeter fence, landing safely about 50 yards short of the runway.

Subsequent inspection showed that the No 3 (right aft) cylinder had completely detached from the crankcase and the corresponding connecting-rod (figure 1) had been wrenched from the crankshaft, with considerable damage to the piston.

During AAIB investigation of the engine it became apparent that the connecting-rod failure had occurred after the cylinder had become detached. Of the 8 bolts (figure 2) which are used to secure the cylinder

to the crankcase, at least 5 showed positive evidence of fatigue failure. The apparent sequence of failure was that the bolts had become unevenly loaded, leading to progressive fatigue failure through a portion of their cross-section with final failure in overload as the cylinder detached.

The engine had accumulated 906 hours since major overhaul. All 4 cylinders had, however, been replaced 96 hours before the engine failure.

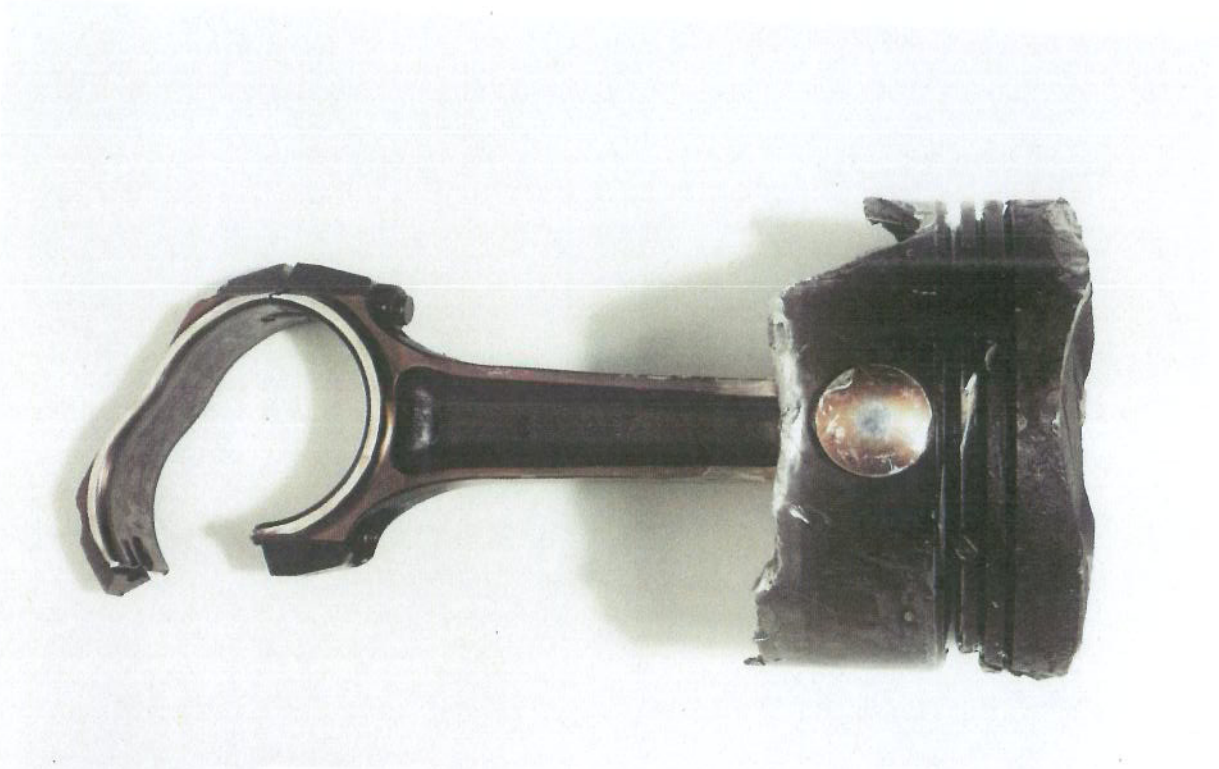

Figure 1: No 3 piston and connecting-rod, G-BMNL

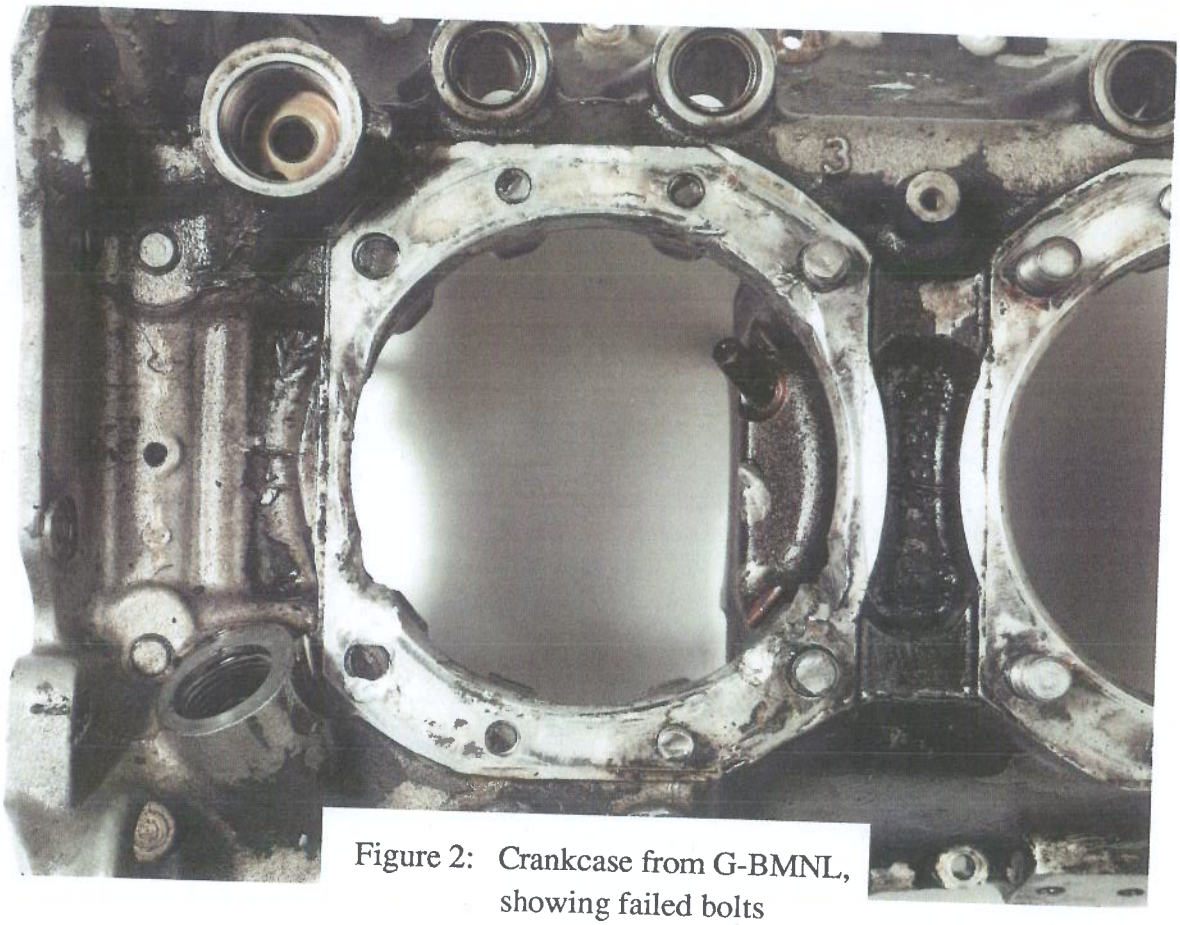

Figure 2: Crankcase from G-BMNL, showing failed bolts