AAIB Bulletin No: 10/95	**Ref: EW/G95/06/03**	**Category: 1.3**
Aircraft Type and Registration:	Socata TB20 Trinidad, G-TRIN	
No & Type of Engines:	1 Lycoming IO-540-C4D5D piston engine	
Year of Manufacture:	1990	
Date & Time (UTC):	5 June 1995 at 1735 hrs	
Location:	Field adjacent to Addenbrooks Hospital, Cambridge	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Engine damaged beyond repair	
Commander's Licence:	Private Pilot's Licence with Night Rating	
Commander's Age:	37 years	
Commander's Flying Experience:	397 hours (of which 112 were on type) Last 90 days - 24 hours Last 28 days - 12 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot, AAIB and Metallurgical examination	

The aircraft was on a flight from Perranporth to Cambridge. Approximately 4 nm from Cambridge Airport and at a height of 2,000 feet the pilot reduced power to start the descent to land. About five seconds later he became aware of a severe engine vibration and a slight smell of burning. The pilot reduced the power further, but the vibration continued. Suspecting a broken propeller, he shut down the engine and the vibration reduced. The pilot then decided to restart the engine, whereupon severe vibration occurred and the engine appeared to be producing very little power. The pilot shut down the engine again and carried out a forced landing into a field, with no damage to the aircraft. After evacuating the aircraft the pilot inspected the engine and found a large hole in the engine crankcase, in the area of the No 1 connecting rod big end bearing. There was also a large amount of metallic debris in the bottom of the engine cowling.

The engine was subsequently taken to a manufacturer's approved engine overhaul facility and strip examined. As a result of this examination it became evident that a failure of the No 1 connecting rod big end cap, or the cap retaining bolts, had occurred. There was no evidence of lack of oil or of crankshaft counterweight failure. The oil scavenge screen was found to contain a medium amount of

debris, which would not have restricted the passage of oil, indicating that the failure sequence had been short term. The main oil filter canister was sectioned and washed. A medium quantity of small white bearing metal particles were present.

Amongst the metallic debris found in the engine cowling were the lower sections of both of the No 1 connecting rod big end cap retaining bolts, together with both associated nuts. One nut was completely disengaged from the bolt thread and the other was engaged on the bolt by the last one and a half threads. Also found within this debris were both severely damaged white metal bearing shells and the badly deformed remains of the big end cap strap.

Metallurgical examination indicated that the damage to the engine had resulted from the progressive loosening in service of the nuts on the No 1 connecting rod big end cap retaining bolts. It was considered that fracture of one of these bolts had initiated the final failure sequence, followed by the fracture of the big end cap strap and finally an overload bending failure of the other big end cap bolt. The examination found no associated material defects and the components, specifically the big end cap bolts, were of the correct material specification. There was no evidence of any significant thread stripping on either bolt, or within either of the nuts. The torque faces of both nuts showed indications that at some time torque had been applied.

During the engine strip examination, a torque check of the remaining connecting rod big end cap nuts indicated that they were torqued to a figure consistent with that required.

The engine was manufactured in 1989. In May 1993, after a total of 126 hours since new, a bottom end overhaul was carried following a suspected engine overspeed. During this bottom end overhaul, new main and connecting rod big end bearings were fitted, together with new big end cap nuts and a reconditioned set of crankshaft counterweights. The organisation which carried out this overhaul is an approved engine overhaul facility which has good quality assurance procedures. These quality assurance procedures included an independent torque check of all connecting rod big end nuts during engine assembly. Since the bottom end overhaul, the engine had completed 100 hours prior to this failure.

No positive reason was found to account for this failure. It would appear that one, or both, No 1 connecting rod big end cap nuts had progressively loosened in service for unknown reasons.