Stinson V-77 Reliant, G-BUCH

AAIB Bulletin No: 6/97 Ref: EW/G96/08/30Category: 1.3

Aircraft Type and Registration:	Stinson V-77 Reliant, G-BUCH
No & Type of Engines:	1 Lycoming R-680-E3B piston engine
Year of Manufacture:	1942
Date & Time (UTC):	8 August 1996 at 1540 hrs
Location:	White Waltham Airfield, Berkshire
Type of Flight:	Private
Persons on Board:	Crew - 1 - Passengers - None
Injuries:	Crew - None - Passengers - N/A
Nature of Damage:	Engine seized, no damage to airframe
Commander's Licence:	Private Pilot's Licence
Commander's Age:	37 years
Commander's Flying Experience:	450 hours
	Last 90 days -Nil
	Last 28 days -Nil
Information Source:	Aircraft Accident Report Form submitted by the pilot and metallurgical examination of the failed engine cylinder

After a normal start and ground run of the engine, the pilot tookoff from White Waltham intending to fly to Popham airfield. Theaircraft climbed quickly to 1,800 feet when the pilot becameaware of slight puffs of smoke from the engine which he initiallythought were reflections or small pockets of cloud. He checkedthe engine Temperature and Pressure indications which were normalbut the smoke continued. He calculated that it would be quickerto return to White Waltham than to continue to Popham and accordinglyturned the aircraft through 180°. Shortly afterwards thepilot believed that the engine had caught fire when it depositedoil on the windscreen, despite the engine Temperature and Pressureinstruments indicating normally. As he was still at 1,800 feet,he tried to restore power by closing and opening the throttle,but the airframe vibrated violently so he feathered the propeller. With White Waltham in sight he continued to track towards theairfield at the appropriate glide speed whilst upgrading his previousPAN message to a MAYDAY.

The pilot realised that a landing within the airfield boundarywas probably achievable. Even though it would be downwind hefelt this was preferable to some fields which, although into wind,may

have been of a rough, uneven nature. Touchdown was smoothon the airfield but not on the runway. He applied fairly hardbraking which caused the brakes to overheat and lock on, howeverthe aircraft did not tip onto its nose and there was no furtherdamage. The fire services attended promptly but there was nosign of fire.

There was a delay of some three months in notification to AAIBof this incident as the pilot did not think it was notifiable. During that time, the aircraft was examined by both its maintainerand an insurance surveyor who found that the upper cylinder ofthe radial engine had fractured (Figures 1 & 2) causingsevere distress to the rest of the engine and loss of oil. Therewas no sign of fire around the engine, the symptoms of which wereprobably smoke and vapour from the ruptured cylinder barrel.The AAIB requested that they examine the cylinder and piston andasked for the engine log book to determine the engine's maintenancehistory. The parts were obtained but the owner seemed to experiencedifficulty in finding the log book. From his recall, an organisationspecialising in vintage aircraft engines had last done work onthe engine in January 1992 and they were contacted for details. They were unable to give any figures as to the overhaul historyof the engine and it appeared that their involvement had been,at the (previous) owner's request, to address a reported problemof high oil consumption by honing the cylinder bores, fittingnew piston rings, valve springs and guides. At that time, theorganisation concerned did not have any CAA approvals to certifythe work, which was carried out under the signature of the licensedengineer who maintained the aircraft. They recalled that 0.010of an inch oversize pistons were fitted to the engine but theirmeasurements showed that the degree of wear was such that 0.020of an inch oversize rebore and pistons were more appropriate. At the insistence of the owner to in order to minimise cost,only honing and fitment of 0.020 of an inch oversize piston ringswas specified.

Metallurgical examination of the failed cylinder showed that thea fatigue crack had developed from the outside, originating atthe location shown in Figure 1 and associated with corrosion pitting. It was concluded that the crack had developed slowly over a largenumber of cycles and had been present for some considerable periodof time. Examination of the exterior of the cylinder showed evidenceof extensive corrosion damage under the varnish, which had apparentlybeen cleaned-out by abrasive blasting prior to re-painting. Figure2 illustrates this effect and the eroded thickness of the coolingfins which suggests that it had probably been done more than once. Measurement of the cylinder wall thickness showed it to be 0.078of an inch in the region of the failure. A Lycoming drawing indicateda minimum thickness of 0.091 of an inch for a new component.The engineering company referred-to above stated that a maximumoversize rebore of 0.020 of an inch was permitted so that theminimum wall thickness of a cylinder in this maximum rebored statewould be 0.081 of an inch.