AAIB Bulletin No: 2/2005 **Ref: EW/G2004/07/19** **Category: 1.3**

Aircraft Type and Registration:	Piper PA-34-200 Seneca, G-BETT
No & Type of Engines:	2 Lycoming IO-360-C1E6 piston engines
Year of Manufacture:	1971
Date & Time (UTC):	22 July 2004 at 1630 hrs
Location:	Field in Frinstead area, near Maidstone, Kent
Type of Flight:	Private
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - 2 serious Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence
Commander's Age:	66 years
Commander's Flying Experience:	7,500 hours (of which 25 were on type) Last 90 days - 60 hours Last 28 days - 25 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

History of the flight

The aircraft was being flown on a Continued Airworthiness Flight Test (CAFT) from Biggin Hill Airport in Kent as part of the Certificate of Airworthiness renewal process. The flight test pilot was flying in the left hand seat, with the aircraft owner flying as second pilot and observer in the right hand seat. The aircraft was prepared for flight with full fuel tanks and subjected to a thorough pre-flight inspection. All engine ground checks were completed in accordance with the flight test schedule. The aircraft departed Biggin Hill at 1552 hrs in conditions of light wind and good visibility with scattered cloud at 2,500 and 5,000 feet. The temperature was 20º C and dew point 13º C. After departure, the pilot was transferred to the approach controller and reported that he would be operating at 2,400 feet initially. He was subsequently asked to report when ready to recover to the airport. No further transmissions were made from the aircraft.

The flight test schedule called for an in-flight engine shut down and single engine climb. The right hand engine was shut down and the propeller was feathered. The climb rate was as expected, with the left hand engine behaving normally on maximum continuous power. The right hand engine was

then re-started and, although the flight test schedule did not require it, the crew decided to repeat the exercise on the other engine. The right engine did not start as readily as expected but, once running, was allowed to warm up before the left engine was shut down and the single engine climb manoeuvre repeated. The pilot reported that the aircraft was at about 3,000 feet at this stage. After about 30 to 45 seconds into this single engine climb, the right hand engine experienced a sudden power loss, reducing to approximately 1,200 RPM, and did not respond to throttle movement. The pilot was not sure if the engine was running at reduced power or windmilling.

The pilot's first action was to attempt to re-start the left engine. The second pilot recalled that the left engine un-feathered but did not start, whilst the pilot reported that the engine did not un-feather, despite oil and fuel pressure and a healthy battery. The second pilot directed the pilot to concentrate on flying the aircraft while he attempted to start the engines. Suspecting that the engines were flooded, he selected the throttles fully open and set the mixtures off, expecting the engines to fire and recover, but they did not. The pilot reported that the fuel booster pumps were most probably selected off initially, but that he would have selected them on when it became clear that the engines were reluctant to start.

Both pilots expected to be able to re-start at least one engine. However, with the aircraft at a very low altitude and with reducing airspeed, the pilot realised that a crash landing was imminent and warned the second pilot. There was no time or altitude to manoeuvre the aircraft further and, with landing gear and wing flaps retracted, the pilot carried out a crash landing into a cornfield immediately ahead of the aircraft. After impact the aircraft ran onto softer ground and came to rest against a fence after a short ground slide of about 80 feet.

The aircraft sustained a major fuselage fracture aft of the wing and was written off. Both pilot seats and the cockpit area had distorted under the vertical deceleration although the main door operated normally and was used by the crew to escape from the aircraft. The pilot suffered a broken eye socket and broken wrist and was assisted out of the aircraft by the second pilot who suffered broken bones in his back and ribs. There was no fire. The second pilot alerted the emergency services using his mobile telephone.

Continued Airworthiness Flight Testing

Pilots proposing to carry out CAFT on aircraft under 5,700 kg maximum all-up weight (AUW) must be acceptable to the CAA in terms of flying experience and recency and must be briefed by the CAA prior to undertaking CAFT activity. The pilot of G-BETT met these requirements in all respects. In briefing such pilots, the CAA seeks to be satisfied that that the pilot concerned fully understands the significance and intent of the flight test as well as the techniques used to minimise any associated risk. The scenario of an engine failure during the single engine climb phase is considered during

this briefing; the advice to pilots is to first attempt a re-start of the shut-down engine, as the pilot of G-BETT did.

The accident flight was conducted in accordance with Flight Test Schedule No 3, issue 2, which is applicable to twin, piston-engined, unpressurised aeroplanes up to 5,700 kg maximum AUW. The schedule lists the minimum flight conditions and stipulates a minimum of 3,000 feet above terrain for the single engine climb. The schedule calls for the climb performance to be recorded with the operative engine at maximum continuous power and with the inoperative engine's propeller feathered. The schedule allows the climb to be conducted with either engine inoperative, but there is no requirement for the climb to be repeated on the other engine.

Discussion

Both pilots thought that the indications of the initial power loss suggested an interruption of fuel to the right engine. The aircraft had not been flown for some time before the flight and was fuelled to full for the accident flight. Routine checks for water contamination were carried out and a post accident inspection showed that uncontaminated fuel was present in the associated fuel lines, pumps and filters. All magnetos on the aircraft had recently undergone overhaul and operated correctly when tested after the accident.

The aircraft owner had previously experienced cases of fuel flooding during warm engine starts on Seneca aircraft fitted with Lycoming IO-360 engines. Although there was no obvious cause for the power loss to the right engine, he was of the opinion that the re-start attempts failed for this reason. Enquiries with other Seneca operators supported the view that it is quite possible to flood the engine during a re-start, particularly if the fuel booster pump is on. However, the pilot of the accident aircraft did not think this was likely and believed he would have recognised the symptoms of a flooded engine.