Aviation Safety Investigation Report 199600643

Beech Aircraft Corp Bonanza

29 February 1996

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Aviation Safety Investigation Report

199600643

Occurrence Number: 199600643 **Occurrence Type:** Accident
Location: Ballarat
State: VIC **Inv Category:** 3
Date: Thursday 29 February 1996
Time: 1755 hours **Time Zone** ESuT
Highest Injury Level: Fatal
Injuries:

	Fatal	Serious	Minor	None	Total
Crew	1	0	0	0	1
Ground	0	0	0	0	0
Passenger	1	0	0	0	1
Total	**2**	**0**	**0**	**0**	**2**

Aircraft Manufacturer: Beech Aircraft Corp
Aircraft Model: S35
Aircraft Registration: VH-CHX **Serial Number:** D-7946
Type of Operation: Miscellaneous Test
Damage to Aircraft: Destroyed
Departure Point: Ballarat Vic.
Departure Time: 1755 ESuT
Destination: Ballarat Vic.

Crew Details:

Role	Class of Licence	Hours on Type	Hours Total
Pilot-In-Command	Commercial	240.0	890

Approved for Release: Thursday, April 24, 1997

FACTUAL INFORMATION.

The aircraft took off from runway 23 at Ballarat for a test flight. The takeoff was witnessed by many operations and maintenance personnel who work on the airfield.

Witnesses advised that shortly after takeoff they heard some loud bangs from the engine, which some described as backfiring, and then engine noise ceased. They estimated that the aircraft was 300 ft above the ground at this point. The aircraft then turned steeply to the left without much loss of height. After turning through approximately 180 degrees and levelling, the nose dropped and the aircraft spiralled steeply towards the ground. Immediately before impact, the engine surged to high power. Impact was approximately 250 m beyond the end of the runway and 206 m to the left of the extended centerline.

The aircraft was destroyed by impact forces and fire. The impact was not survivable.

The terrain beyond the end of the runway was flat farming land with dispersed buildings and trees, but provided suitable forced landing sites. Extensive fencing was the main hazard to a forced landing in this area.

The pilot of the aircraft was a licensed aircraft maintenance engineer (LAME) and his passenger was an apprenticed aircraft maintenance engineer. Both worked at the aerodrome. The pilot was also the owner of the aircraft, having restored it to flying condition approximately 5 years prior to the accident.

The pilot commenced flying in 1972. He flew regularly and in December 1990 was issued with a rating to fly at night under visual flight rules. In December 1992, he obtained his commercial pilot licence. At the time of the accident, he had flown approximately 890 hours, 240 of which were in the accident aircraft.

Persons who worked with the pilot at the airfield advised that in November 1995, 3 months before the accident, the aircraft was flown interstate by another pilot. During that flight, the engine was reported to have hesitated, run rough and had reduced power available. The aircraft was examined by a LAME but no fault was found. After the aircraft returned to Ballarat, the owner removed the engine-fuel nozzles and fuel distributor valve for testing. The test was satisfactory and the owner reinstalled the components.

The aircraft operated until 20 February 1996 when, as a result of further rough running and reports of the engine cutting out on takeoff, the pilot removed the engine-driven fuel pump, the fuel control unit, and the throttle assembly for testing. The bushes on the mixture shaft of the fuel control unit were replaced, and some minor lint contamination was cleaned from the fuel control unit filter; otherwise, the units were found to be serviceable.

The pilot reinstalled the units and, on 29 February, the day of the accident, carried out engine test runs. After some initial setting up problems, the engine was reported to have operated satisfactorily, and the pilot was observed to taxi out to the runway and take off. The takeoff was reported to be normal until the backfiring that preceded the accident.

It was determined that there was sufficient fuel on the aircraft for the flight as it had only been flown for about 1 hour since having the main tanks filled. The investigation was able to determine that at the time of the main impact, the fuel selector was selected to the right main fuel tank. The investigation could not determine the distribution of the fuel within the tanks, nor the exact quantity on board.

The engine and all recoverable components were removed for examination. The remainder of the badly burned and disintegrated wreckage was examined to the extent the degree of destruction permitted, and no faults were found.

No abnormalities were found during the examination of the engine and components except that five pebbles were discovered in the cockpit-mounted fuel selector. Three were located in three of the five fuel passages in the strainer body. The other two were loose in the cavity between the main rotor and the strainer body and were able to sit over and partially block the fuel-feed passage. The Victoria Police have commenced an investigation into the source of the pebbles, and the motive for their introduction into the fuel system.

This aircraft was equipped with two main fuel tanks, one in each wing, and two auxiliary tip tanks. All fuel tanks had their own filler caps. Fuel was routed from the fuel tanks through the fuel selector to the electric auxiliary fuel pump, and then to the engine. The majority of the airframe-mounted components were consumed in the fire. The investigation was not able to determine whether the fuel tank filter screens were fitted, or whether there were any other pebbles in the airframe fuel system.

The aircraft maintenance records were examined. The aircraft was manufactured in 1965 and the wingtip fuel tanks were installed in 1969. The aircraft flew until 1987 when it was removed from the register, having been withdrawn from use. The deceased pilot restored the aircraft to flying condition and it was re-registered in February 1989. A newly overhauled engine was fitted in December 1993, and, at the same time, the right main fuel tank was replaced because of leaks. In December 1994 it is recorded that the left tip tank was not feeding and an endorsement on the maintenance release advised that the tip tanks were not to be used. This endorsement was current at the time of the accident.

ANALYSIS

The continuing problems with rough running and loss of power were probably caused by the pebbles within the fuel system. The three pebbles in the rotor top would have degraded the performance of the fuel system and it is suspected that one of the two loose pebbles moved to cover the fuel selector rotor fuel passage to further restrict fuel flow.

The power disruption was probably the result of the fuel flow reducing to a point where the mixture became too lean to sustain the power commanded by the throttle position. When this occurred, the fuel distributor would have shut off fuel flow because of the low pressure. It is possible that the surge of power heard just before impact was as a result of the fuel pressure increasing due to the pebble moving away from the rotor passage because of the changes to the attitude of the aircraft. It is also possible that the pilot switched on the electric fuel pump, or moved the selector, thereby disturbing the position of the pebble.

Why the left tip tank was not feeding was not established. It may be that pebbles had been introduced into that tank prior to or during 1994 and had worked their way through the system.

Why the aircraft was banked steeply consistent with a return to the airfield could not be definitely established. A possible scenario is that the immediate reaction to a sudden and unexpected power loss was to attempt a return to the airfield. However, pilots are taught the dangers associated with this manoeuvre and are taught to establish the best glide speed and to land straight ahead unless sufficient height is available to enable a return to be made with moderate angles of bank and proper control of airspeed. The low altitude at which this aircraft suffered power interruption would have precluded a safe return to the airfield, even if control had not been lost. Had the pilot lowered the nose and continued straight ahead for a forced landing, he could have damaged the aircraft on fencing and been faced with an off-airfield recovery of the aircraft. He may also have had the engine recover sufficient power in time to enable a safe return to the airfield.

Control of the aircraft was lost when it was banked sharply after the engine lost power. The loss of power would have caused an immediate and continuing loss of airspeed unless corrective action were taken. Evidence suggests that the steep turn did not involve loss of altitude, which is consistent with the nose not being lowered. The behaviour of the aircraft in the moments preceding the accident was consistent with a stall leading to loss of control.

SIGNIFICANT FACTORS

1. The engine lost power probably because pebbles in the body of the fuel selector restricted the fuel flow.

2. The aircraft was turned steeply, consistent with an attempt to return to the airfield.

3. Control of the aircraft was lost at a height from which the pilot was unable to recover.