Aviation Safety Investigation Report 199401758

Beech Aircraft Corp Baron

08 July 1994

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Aviation Safety Investigation Report

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Occurrence Number: 199401758 **Occurrence Type:** Accident
Location: 1.5km SW Halls Creek Airport
State: WA **Inv Category:** 4
Date: Friday 08 July 1994
Time: 0430 hours **Time Zone** WST
Highest Injury Level: Serious
Injuries:

	Fatal	Serious	Minor	None	Total
Crew	0	1	0	0	1
Ground	0	0	0	0	0
Passenger	0	3	0	0	3
Total	**0**	**4**	**0**	**0**	**4**

Aircraft Manufacturer: Beech Aircraft Corp
Aircraft Model: 95-C55
Aircraft Registration: VH-CFG **Serial Number:** TE-76
Type of Operation: Charter Passenger
Damage to Aircraft: Destroyed
Departure Point: Halls Creek WA
Departure Time: 0430 WST
Destination: Jandakot WA

Crew Details:

Role	Class of Licence	Hours on Type	Hours Total
Pilot-In-Command	ATPL 2nd Class	2000.0	9581

Approved for Release: Thursday, August 3, 1995

Sequence of Events

The aircraft was on a night departure from runway 22. Shortly after a normal takeoff it struck trees 439 metres from the departure end of the runway. The aircraft then impacted the ground and slid to a stop approximately 360 metres further on. The aircraft was destroyed by a post impact fire. All occupants were able to evacuate the aircraft although they received significant burn injuries.

This summary looks at the factors leading to the accident, some of the events surrounding the post impact evacuation and safety action already taken.

Accident Analysis

The aircraft was in controlled flight, in a shallow descent with wings level, at impact. All aircraft systems were reported to be operating normally at the time.

Evidence indicates that the pilot flew the aircraft to an initial 10 degree nose up attitude after lift-off. However, he then selected the landing gear up, turned the landing light off, introduced forward elevator trim, to relieve an apparent nose up tendency, and attempted to make a radio call. It was during these activities that the aircraft descended and struck the trees.

The pilot, who was a very experienced instructor, met all night flying recency experience requirements at the time of the accident. Evidence indicates that the pilot had commenced work at approximately 0330, on the day prior to the accident. The aircraft arrived at Halls Creek around 1130 and post flight activities were completed by 1200. The pilot then proceeded, by vehicle and in the company of the passengers, to inspect a drill site, arriving back at the motel about 1630. He attended a barbecue, completed planning for the next day's flying and loaded some of the baggage on to the aircraft before retiring for the night. He had about six hours sleep immediately prior to commencing duty at 0330 on the day of the accident. The pilot had planned to depart after breakfast however he had been asked, by his company, to bring the flight forward as a piece of defective machinery was required in Perth as soon as possible. He calculated an earlier departure time based on his assessment of minimum crew duty times as set out in Civil Aviation Order (CAO) 48.

The outside environment (no ambient lighting, no visible horizon) was such that the pilot, immediately after lift-off, had to make a transition from outside visual references (runway, runway lights etc.) to total reliance on the aircraft flight instruments for the aircraft to be flown safely away from the runway environment.

If an effective cross reference of the instruments was not established immediately, potential existed for the aircraft to descend. To establish an effective cross reference, a pilot must accept that dark night take-offs need to be conducted in accordance with the procedures normally used for a departure in instrument flying conditions. The actions of the pilot in becoming involved in other activities including the attempted transmission of a departure report, so soon after lift off, indicates that he had not fully accepted the instrument flying conditions criteria. In addition, the application of nose down trim probably started a descent that went unnoticed by the pilot whilst he was distracted by his other activities.

The pilot advised the investigation team that he was not aware of the somatogravic illusion commonly associated with dark night take-offs. The somatogravic illusion, as outlined in Note 1, is a condition that could also have made the pilot's concentration on a safe departure difficult. The possible presence of fatigue would have increased his susceptibility to the illusion.

Aviation safety research indicates that accidents often occur at a low point in a pilot's circadian rhythm (which often occurs in the early hours of the morning) and/or if a pilot's intake of nourishment is inadequate. The pilot reported that he ate normally except that he did not have any breakfast on the morning of the accident. Whilst no direct evidence was available to support a positive conclusion, the flight timings and other activities indicate that both of these factors may have been relevant to the accident sequence.

The known facts concerning the pilot's post lift-off activities, the aircraft's flight profile and the environment to the south-west of the airfield (the prevailing visibility and darkness conditions) suggest that the pilot did not apply the correct departure techniques and that he probably experienced a somatogravic illusion. It is possible that fatigue, a low circadian rhythm and irregular nourishment made him more susceptible to the illusion.

Evacuation Analysis

The investigation determined that the pilot did not conduct a pre-departure safety briefing at either Jandakot, for the flight to Halls Creek, or immediately prior to the departure for the accident flight. Although it was the pilot's normal practice to conduct such a briefing, and it was a company operation's manual requirement to do so, no information was available which would explain the omissions on these occasions. Consequently, none of the passengers were aware of the correct procedure for evacuating the aircraft in the event of an emergency. There were three emergency exits in the cabin area of the aircraft. Two over-wing window exits and a rear door exit. The safety briefing normally covers the use of the emergency exits. In the case of VH-CFG, the release mechanism was such that knowledge on how to operate the emergency exits was essential for a passenger to be able to escape through these openings under conditions of high stress.

One passenger indicated that, after the aircraft had stopped and become engulfed in fire, he observed the sign indicating the location of an emergency window exit but was unable to determine how it operated or to force his way out through it. He had then attempted to escape by moving to the rear of the cabin area only to find that there was no apparent way out. An emergency door exit was located at the rear of the cabin but he was not aware of this fact. A second passenger also attempted, unsuccessfully, to open an emergency window exit.

All occupants, including the two passengers sitting in the middle row of seats adjacent to the emergency exits, were forced to escape through the normal entrance door located on the forward, right side of the combined cabin/cockpit. This led them through the main fire zone.

Safety Action

As a result of concern over a number of previous accidents with circumstances generally similar to this accident, the Bureau of Air Safety Investigation published a research report, in early 1995, titled Dark Night Take-off Accidents in Australia (SAB/RP/95/01).

Reaearch report SAB/RP/95/01 included the following recommendation:

R940219.

The Bureau of Air Safety Investigation recommends that the Civil Aviation Authority:

(i) intergrate and expand human performance and limitation considerations into the day VFR syllabus at and above the level of the GFPT for the private pilot licence;

(ii) review the policy on the testing of human performance and limitation considerations and include this area as an examinable part of the syllabus above the level of the GFPT for the private pilot licence;

(iii) review theory requirements of the instructor, night VFR and instrument ratings, with emphasis on the specific operational and human-factors considerations that the use of these ratings require as compared to day VFR flight;

(iv) review the practical requirements of the syllabus leading to an instrument rating, to ensure that a candidate has experienced conditions of IMC and flight (including takeoffs and landings) at night, in areas with limited lighting, before being granted a rating;

(v) review the policy applicable to the renewal and recency requirement of the night VFR rating, to ensure renewal and recency requirements are similar to other instrument ratings; and

(vi) educate pilots and operators of the effects of fatigue and the need to establish flight and duty times that are commensurate with the demands of their flight operations. In particular, it should stressed that the limits imposed by CAO 48.0 are maximum limits and lower limits may be appropriate to some types of operations.

Note 1. - The Somatogravic Illusion

'If one considers an aircraft flying straight and level and accelerating along the direction of flight because of an increase in power, for example, then the direction of the inertial force due to the acceleration is to the rear of the aircraft and for the purposes of this discussion can be assumed to be along the longitudinal axis of the aircraft. This inertial force combines with the force of gravity to produce a resultant which is inclined to the rear of the aircraft. If this resultant is then used by the pilot as the vertical reference, then the pilot will incorrectly sense that the aircraft is in a nose-up attitude. If the pilot then trims or eases forward on the control column to correct for this nose-up perception, the nose of the aircraft will drop and the airspeed will increase. This change in attitude will change the direction of the resultant force vector in such a manner as to maintain and perhaps magnify the illusory perception of a nose-up attitude.

Significant errors in perception can develop within the first few seconds of a change in the force environment. Experiments carried out in flight have shown that there is little lag in the onset of the illusion and that there is a relatively rapid increase in its magnitude during the initial six to eight seconds. This illusion is known as the somatogravic illusion, and it is particularly dangerous when it occurs on take-off or when overshooting, especially at night or in poor visibility. An aircraft deceleration will result in the opposite effect, that is, a perceived nose-down attitude. '

Transportation Safety Board of Canada, Report 89H0007