ACCIDENT

Aircraft Type and Registration:	Beech BE76 Duchess, G-GDMW
No & Type of Engines:	2 Lycoming O-360-A1G6D piston engines
Year of Manufacture:	1980 (Serial no: ME-316)
Date & Time (UTC):	6 February 2013 at 1330 hrs
Location:	Bournemouth Airport
Type of Flight:	Training
Persons on Board:	Crew - 2 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to engines and propellers, and right wing skin
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	51 years
Commander's Flying Experience:	10,000 hours (of which more than 3,000 were on type) Last 90 days - 183 hours Last 28 days - 78 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot, report by the aircraft repair organisation and earlier accident reports

Synopsis

During takeoff, the aircraft's landing gear partially retracted. The most likely cause was that the landing gear selector lever had been inadvertently selected to UP, which may have arisen through contact with the pilot's knee as he made rudder inputs in a brisk crosswind. A safety switch linked to airspeed prevented actual retraction until the airspeed rose above the triggering value during takeoff. A detent system designed to prevent inadvertent operation of the gear lever was not effective.

Description of the event

The aircraft commenced takeoff from Runway 08 at Bournemouth Airport for an instrument flying exercise. The left seat pilot was undergoing instrument training and his instructor occupied the right seat; the left seat pilot was handling the aircraft for takeoff. There was a northerly surface wind at 20 kt and the aircraft yawed to the left due to the crosswind, causing the left seat pilot to apply right rudder to correct the deviation. Shortly afterwards, the aircraft's nose pitched down onto the runway and its right wing sank to the ground. The aircraft was brought to a rest on the runway with a collapsed nose gear and partially collapsed main gear. All occupants egressed without difficulty or injury.

The aircraft maintenance and repair organisation reported that the circumstances were consistent with the aircraft's landing gear moving through a normal retraction cycle, although the landing gear control lever was found in the DOWN position. The landing gear was found to operate normally after the accident. It was noted that the landing gear lever on some of the operator's fleet of Duchess aircraft had been fitted with a guard to physically prevent an inadvertent UP selection, but G-GDMW had not been so modified by the time of the accident.

The aircraft commander was aware of past Duchess occurrences in which the landing gear lever had inadvertently been selected to UP while the aircraft was on the ground, and he noted that the detent intended to prevent such movement was sometimes worn and not effective. He considered it most likely that the landing gear lever was inadvertently moved to the UP position during the takeoff roll, quite possibly by the left seat pilot's knee during the rudder inputs just before the gear commenced retraction.

Landing gear operation

Landing gear position on the Beech Duchess 76 is controlled by a two-position lever on the left sub-panel. The handle, which is an electrical switch, must be pulled outwards to clear a safety detent before it can be moved to the opposite position. Hydraulic power to retract and extend the landing gear is provided by an electrically driven hydraulic pump, which provides power to actuators in each wheel well. Inadvertent gear retraction on the ground is prevented by a speed sensing safety switch located in the pitot system, which deactivates the hydraulic pump when airspeed is below 59 to 63 kt (if the landing gear is inadvertently retracted on the ground above this speed, the retraction sequence will cease when the airspeed falls below the threshold).

Previous occurrences

On 11 June 2009, a Beech Duchess 76 (registration G-MULT) suffered a partial landing gear retraction during a touch-and-go landing at Bournemouth Airport. The AAIB report[1] into the accident describes the aircraft making a normal landing before the nose and right landing gears collapsed. The instructor noticed his student's knee in the vicinity of the landing gear lever just before the collapse, which had moved to the UP position. It was later established that the student's knee could contact the lever during rudder pedal movement or even while adjusting his position within the seat.

On 4 June 2009, a Beech Duchess 76 (registration EI-BUN) suffered a partial landing gear retraction during landing at Weston Airport, Co Kildare in Ireland. The Air Accident Investigation Unit (AAIU) established[2] that the student pilot's knee was within 5 cm of the landing gear lever when he was seated normally at the controls, and that it was possible for his knee to come into contact with the selector lever as his feet slid upwards to operate the wheel brake pedals. It was also noted that the safety detent was ineffective, and it was possible for his knee to knock the lever to the UP position without first pulling it to clear the detent. The AAIU report included a photograph depicting this situation, which is reproduced at Figure 1.

The AAIU made the following safety recommendation to the Hawker Beechcraft Corporation:

> ***Safety Recommendation IRLD2010001:***
>
> *Hawker Beechcraft Corporation should review the design and location of the Beech Duchess 76 landing gear selector switch so as to eliminate the possibility of inadvertent selection to the UP position.*

Footnote

1 AAIB report reference: EW/G2009/06/05.
2 AAIU Report No 2010-001, published 18 January 2010.

Figure 1

Extract from AAIU report: proximity of student's knee to landing gear selector lever

The Hawker Beechcraft Corporation's response is reproduced below:

Hawker Beechcraft Corporation Engineering has reviewed the landing gear switch installation in the Model 76 Duchess. The landing gear switch is a two position switch. The switch handle is spring loaded to be held in position at each furthest end of its travel (i.e. landing gear retracted, landing gear extended) in a detent. To be moved from one position to the other (up or down), the switch handle must first be pulled out (aft) to release the handle from the detent. This dual action required to activate the switch minimizes the possibility of inadvertent actuation.

With the switch in the down position, while not normal, it is possible for the pilot's leg/knee to contact the switch handle. The angle of movement of the pilot's leg and in relation to the axis of the switch handle in addition to the shape of the handle would likely result in a force that is perpendicular to the axis of the handle or a force forward. Since the detents prevent the switch from being moved without pulling the handle aft in line with the axis of the handle, it is unlikely that the switch could be moved from the down position to the up position as a result of contact with the pilot's knee.

The statement above assumes that the detents of the switch functioned properly. Airplanes that are used for flight training will have a significantly greater number of landing gear cycles than airplanes not used for training. If the down (landing gear extended) detent was worn significantly or the spring had lost its ability to hold the handle in the detent, the likelihood of the switch being moved from the down position to the up position as a result of contact with the pilot's knee is increased.

HBC has no record of this type of incident prior to M-371 and M-396 (G-MULT).

The Beechcraft Duchess 76 Maintenance Manual recommends a landing gear operational check be performed every 100 hours of airplane operation. The Maintenance Manual specifies that maintenance personnel check the retraction system for proper operation of all components through at least two cycles. This includes proper operation of the landing gear switch. Current Maintenance Manual and inspection procedures are adequate to determine proper operation of the landing gear switch detents and spring.