ACCIDENT

Aircraft Type and Registration:	Piper PA-22-150, G-ARCC
No & type of Engines:	1 Lycoming O-320-A2B piston engine
Year of Manufacture:	1956
Date & Time (UTC):	30 July 2006 at 1110 hrs
Location:	Popham Airfield, Hampshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 3
Injuries:	Crew - 1 (Minor) Passengers - 3 (Minor)
Nature of Damage:	Damage to rear fuselage, wing tips, propeller and engine
Commander's Licence:	Private Pilot's Licence
Commander's Age:	42 years
Commander's Flying Experience:	90 hours (of which 10 were on type) Last 90 days - 3 hours Last 28 days - 0 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot, statements of witnesses and examination by an AAIB inspector

Synopsis

The aircraft adopted a very high pitch attitude on takeoff, climbed at a low rate but failed to gain speed. It then stalled, dropped a wing and descended into the ground, striking it with a wing tip before somersaulting and coming to rest inverted.

History of the flight

The pilot had planned a local flight with two friends and their son. He carried out pre-flight checks on the aircraft before refuelling to two-thirds full. He considered that everything was normal until he began the takeoff run from the grass Runway 26.

The aircraft had one stage of flap set for the takeoff and the pilot considered that acceleration was normal; temperatures and pressures were in the normal range and the airspeed was rising satisfactorily. As the speed passed 50 mph, he applied back pressure to the control column and the aircraft took off and began to climb. Shortly after takeoff, the pilot realised he had selected an inappropriately high nose attitude and the airspeed was not rising as it should have been. Although he knew that the solution to the problem was to lower the nose, he was uncertain of his position relative to the runway and felt that lowering the nose might result in the aircraft's inability to clear a hedge on the airfield boundary. He decided to continue at the higher attitude until he was

certain that the aircraft had climbed above the level of some neighbouring trees before lowering the nose to gain an increase in speed. Before the aircraft reached the desired height, it began to roll and yaw violently to the left.

The aircraft was observed from the clubhouse, approximately 200 metres from the start of the runway, just airborne and flying at a steeply nose-up attitude. Another observer, positioned approximately mid-way down the runway, first saw the aircraft at an estimated 30 to 40 ft, with a nose high attitude. He estimated that it climbed to approximately 130 ft by the time it was two-thirds of the way down the runway, before sinking 20 to 30 ft and suffering a wing drop to the left. A third observer, also positioned approximately two-thirds of the way along Runway 26, on the north side, saw the aircraft pass him at a height he judged to be level with the lower trees on the south side of the field, in a steep nose-up attitude. From the engine noise he deduced that it was operating at high power. The aircraft was not, however, gaining height. He noted that the wing shuddered and the left wing began to drop, followed by the nose. This altered the aircraft's track by 30º to 50º before it struck the ground on the southern edge of the field close to the Runway 08 threshold. In the observer's opinion, the engine noise remained unchanged until the impact occurred.

Examination of the wreckage site indicated that the aircraft impacted initially on the left wing tip and the nose before coming to rest inverted but facing in the original takeoff direction. The pilot confirmed that the aircraft somersaulted two or three times before coming to rest. Although it was very extensively damaged, the cabin area was not significantly deformed. The occupants were able to evacuate with minimum delay and only minor injuries.

According to the pilot's calculations the aircraft was flying at almost its maximum all-up weight. The Met Form 214 covering the relevant period, together with the TAF for the period at nearby Southampton, indicated that the ambient temperature would have been 20ºC or above and little wind would have been present.

Discussion

The evidence is that the aircraft climbed at too steep a pitch angle. The symptoms described are consistent with a stall and entry to the incipient spin and are the expected consequences of persisting to climb with decaying airspeed.

According to the pilot's figures, the aircraft was operating at almost its maximum takeoff weight. Meteorological information and ground observations showed that there was a relatively high ambient temperature and no significant wind. A relatively inexperienced pilot, in a low performance aircraft, faced with a 900 metre grass strip having a slight down slope followed by a gentle up slope, surrounded by trees and having a fairly high hedge at the end, could, under these atmospheric conditions, find the takeoff challenging. The difference in behaviour from that of the same aircraft without passengers and with less fuel, on a cooler day, with a significant wind down the runway, is considerable. Under the former adverse circumstances, pilots might inadvertently achieve high pitch attitudes immediately after takeoff, thereafter preventing the aircraft from reaching the normal speed and climb rate. The process of establishing and maintaining a suitable pitch attitude immediately after takeoff and allowing speed to build before initiating a cautious climb, is increasingly important as weight and ambient temperature increase. These last two factors reduce climb rate and hence angle. Careful pitch angle selection is particularly important with a low or zero head wind component since

a particular rate of climb creates a lower climb angle than would occur with a greater headwind. This lower climb angle can create a compelling but false impression of low climb rate, encouraging the pilot to raise the nose higher than optimum, in an effort to achieve the anticipated climb angle.

At smaller airfields, calculations of runway distance available compared with the distance required, help to reassure pilots that obstructions at the end of the runway can be cleared comfortably. Should such calculations suggest that the takeoff performance is other than generous for the available distance, inexperienced pilots need to take particular steps to improve the margin, such as greatly reducing the passenger load and/or carrying less fuel. If necessary the intended flight should not be attempted until conditions become more favourable. It should be borne in mind that many private aircraft fly from much smaller airfields, with different surfaces from those on which their pilots train. The problems highlighted at such fields generally do not exist at the airfields from which flying schools operate.

Although the aircraft was very extensively damaged, the cabin area did not deform significantly. This fact, coupled with the nature of the initial impact on the wing tip, followed by crumpling of the outer wing, reduced the deceleration on ground impact and appears to have limited the occupant injuries.