

ACCIDENT

Aircraft Type and Registration:	Piper PA-28-140 Cherokee, G-AZWE	
No & Type of Engines:	1 Lycoming O-320-E2A piston engine	
Year of Manufacture:	1972	
Date & Time (UTC):	31 August 2005 at 1400 hrs	
Location:	Netherthorpe, Nottinghamshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - 1 (Serious)	Passengers - 1 (Serious)
Nature of Damage:	Aircraft destroyed	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	54 years	
Commander's Flying Experience:	415 hours (of which 321 were on type) Last 90 days -13 hours Last 28 days - 4 hours	
Information Source:	AAIB Field Investigation	

Synopsis

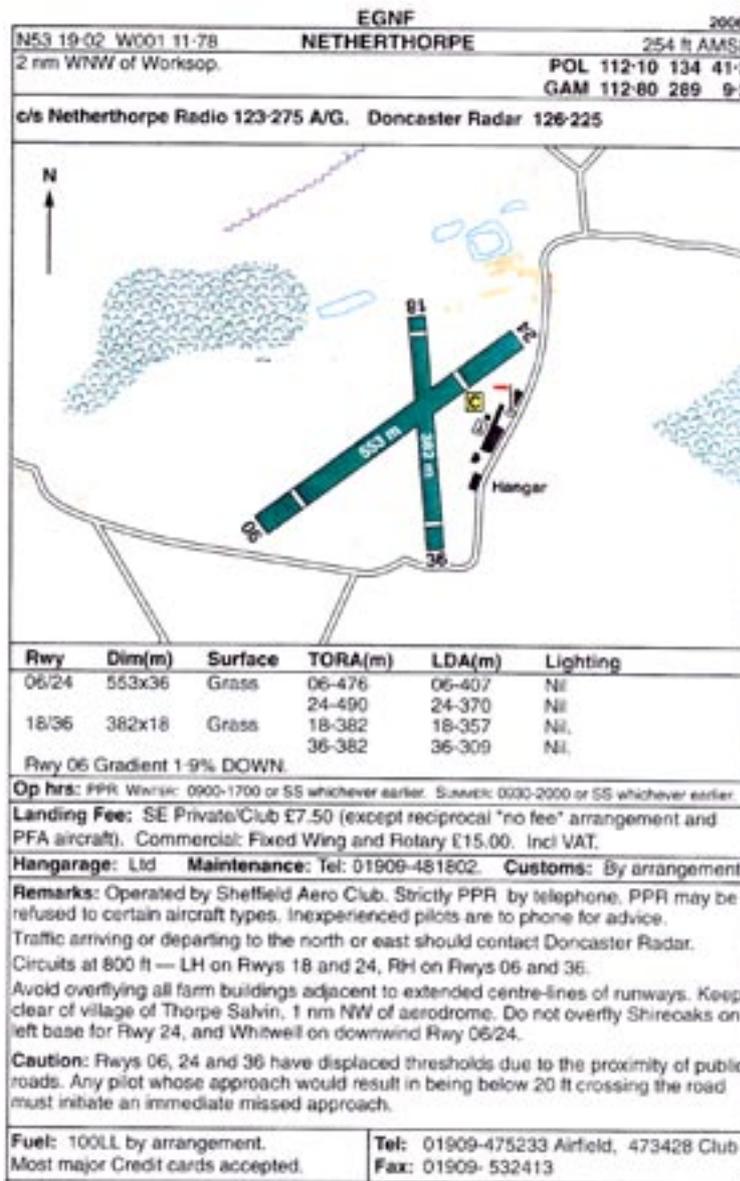
The aircraft was departing from Netherthorpe's Runway 06 with no headwind and an OAT of 29°C. After the pilot rotated, the aircraft became airborne but then sank back down onto the runway with the airspeed stagnated. It crossed the airfield boundary, with the throttle closed, and hit a stone wall approximately 75 m beyond the runway's end which rendered both occupants unconscious. The aircraft did not catch fire. Given the aircraft's configuration, weight, weather and runway conditions at the time, it was determined that there was insufficient take-off run available for the aircraft to become safely airborne.

History of flight

The pilot and his passenger, another qualified pilot, had planned a day's flight in this aircraft from their home base at Dunkeswell. They planned to land at several different airfields before returning to Dunkeswell at the end of the day and were each going to fly alternate legs. They had booked into Netherthorpe by telephone and been made aware that the runways there were particularly short. Although the commander noted this, he commented that he was very distracted by domestic issues and was relying on his less experienced flying partner to have dealt with any performance issues. After departing Dunkeswell, they landed at Garston Farm strip in Wiltshire and then flew to Turweston Airfield where the aircraft was refuelled to full tanks before departing

to Netherthorpe. They took off from Runway 27 at Turweston, which has a Take off Run Available (TORA) of 800 m, during which time they became momentarily airborne, sank back onto the runway became airborne again and eventually climbed away. The first approach into Netherthorpe was to grass Runway 06 and the pilot initiated a go-around as he touched down, having decided that the aircraft's speed was slightly too fast. They

landed off the second approach to the same runway and took lunch in the clubhouse. The acting Chief Flying Instructor at Netherthorpe explained that both runways (06/24) were in operation as the wind was blowing directly across the runway and suggested that they used Runway 06 for departure due to its downhill slope¹. They accepted his suggestion and shortly afterwards taxied for Runway 06 which has a TORA of 476 m, Figure 1.



402
Published by kind permission of R Pooley
Figure 1

Footnote

¹ The mean downhill slope of Runway is quoted as 1.9%.

Engine power checks were completed as normal and the flaps were left retracted for the takeoff, which was commenced from a rolling start using the full runway length. The aircraft appeared slow to accelerate and the non flying pilot called out the airspeed in miles per hour, as per his usual routine. At approximately 60 mph, the pilot attempted to raise the aircraft's nose but the nosewheel did not leave the ground so he returned the control column to the neutral position. At 65 - 67 mph, he attempted to rotate again and the aircraft became momentarily airborne before settling back down on the runway with the airspeed stagnating. The pilot called to his colleague "we are not going to make it" and closed the throttle as they approached the end of the runway. Neither pilot recalls hitting the airfield boundary fence but both remember seeing a stone wall ahead before losing consciousness.

Performance

It was not possible to determine the exact weight of the aircraft at the time of the accident but it is likely to have been at close to its maximum weight of 2,150 lbs when it departed Turweston with full fuel tanks. Thus, departing Netherthorpe, its weight would have been approximately 2,100 lbs.

The grass runway was firm and the grass was about 2-3 inches long. The grass was cut each Thursday, and was cut on schedule the morning after the accident. After cutting, it was about 1½ inches long.

The manufacture's flight manual provides takeoff performance data for a takeoff with full throttle, flaps retracted and lift off initiation at 73 mph. CAA Change Sheet No 3 Issue 1 to this flight manual states that:

'It has been established from air testing that the aeroplane fails to achieve the performance scheduled in Section V of the flight manual'

and offers correction data to the Take off Distance Required (TODR). TODR is defined as the distance required from the start of the take-off run until the aircraft achieves a height of 50 ft.

Netherthorpe Airfield is 250 ft amsl and the prevailing weather conditions were a surface wind of 150°/10 kt and a temperature of 29°C. Taking into account the downslope of 1.9% on Runway 06, the performance table in the flight manual including the correction data, suggests a TODR of 856 m using a short, dry grass runway. This figure includes some margin for loss of performance for which it is difficult to make an allowance operationally, such as small and unavoidable variations in airspeed and variations from the average airframe drag and engine power. The manual also notes that the take-off run must be taken as 55% of the TODR, ie, 471 m. This distance has been factored by 1.15 to provide scheduled data, so the calculated take-off run with no safety factors included would have been 409 m.

Runway 06 at Netherthorpe has a total runway length of 553 m and a TORA of 476 m. The TORA finishes 77 m from the end of the runway in order that departing aircraft can climb clear of any vehicles positioned on the public road adjacent to the airfield.

The flight manual gives no guidance for short field take-off technique or performance figures for taking off with any flap setting other than retracted.

Aircraft information

The aircraft was manufactured in 1972 and carried the constructor's number 28-7225303. It last received a star annual inspection on 17 June 2005, by which time it had accumulated a total of 13,071 flying hours. At the time of the accident it had accumulated 13,144 hours. The last 50 hour inspection was carried out on 9 August 2005, at

13,118 hours. There were no defects or rectifications recorded in the log books since that inspection.

Examination of the accident site and wreckage

The aircraft's landing gear had left ground marks from the end of the runway to the boundary fence, and also across the adjoining field beyond the end of the runway, but there were no marks visible on a road between the airfield and the adjoining field. The ground marks indicated that, close to the end of the runway, the aircraft had tracked slightly to the left while yawing to the right. It had then passed through the boundary fence, striking a fence post and hedge with the left wingtip. This initiated a significant yaw to the left which continued as the aircraft entered the adjoining field, causing the aircraft to track some 15° to the left of the runway heading. The left yaw then reduced but the track continued until impact with a substantial stone wall occurred some 275 ft from the end of the grass at the edge of the airfield. The final track was approximately 045° M and the final heading was approximately 035° M.

Examination of the wreckage and witness information did not indicate that there had been any major pre-accident defects with the aircraft's structure, flight controls or engine. At impact, the aircraft had been configured with the flaps retracted and examination of the flap selector gate showed that this had been the pre-accident setting. The aircraft was destroyed in the impact but damage to the propeller indicated that it had been turning under low power at the point of impact with the wall. Initial contact was made by the aircraft with its left wing tip, which caused the left wing to detach and swung the aircraft further to the left, just before the propeller made contact with the wall. Even though the damage to the aircraft was severe, the cabin remained intact and the seats remained secured to the floor. The passenger's diagonal harness had pulled out

of the aircraft structure, due to overload; otherwise the belts and harnesses were undamaged and appear to have functioned as intended.

The fuel, magnetos and battery master switch were turned off shortly after the accident, and the throttle and mixture controls had been moved during the impact and/or evacuation. The engine tachometer had jammed on impact at about 650 rpm, and this was consistent with the engine being at idle at the point of impact with the wall. The air speed indicator was undamaged, and was removed from the aircraft. When checked for accuracy, it was found to be not more than 1 mph in error between 74 and 40 mph. It was, however, an old style of presentation which made it easy to confuse the dual knots and mph scales². The aircraft carried a GPS, but this was not recording data during the takeoff.



Figure 2

G-AZWE's air speed indicator. The larger figures are mph, the smaller figures are knots. Note that the legend 'KNOTS' is larger than that for 'MPH'.

Footnote

² This type of ASI was implicated in an accident to a PA-28, G-OSOW, at Bournemouth International Airport. The report on this accident was published in the 8/2000 edition of the AAIB Bulletin.

The left fuel tank was ruptured by impact with the wall and the right tank drain valve had sheared off, allowing fuel to escape. A considerable quantity of fuel had been collected by the fire services as it drained from the aircraft.

Netherthorpe Procedures

The CAA's *Aeroplane Performance Safety Sense Leaflet 7c* quotes Article 43 of the Air Navigation Order, which states that it is the responsibility of the pilot-in-command to ensure that the aircraft will have adequate performance for the proposed flight. The leaflet goes on to say that it may not be necessary to check the performance data before every flight, especially if there is an obvious surfeit of runway available.

Netherthorpe, however, is a licensed airfield with one of the shortest available take-off and landing distances in the UK. Performance margins for certain types of light aircraft, particularly when taking off from this airfield, can become very small and several previous accidents and incidents have occurred where the short runway length has been a contributory factor.

The Aero Club which operates Netherthorpe requires visiting aircraft to request prior permission before attempting a landing. They reserve the right to refuse certain types of aircraft and require inexperienced pilots to call in advance for advice. This advice would consist of a discussion with one of the club's instructors who explains the peculiarities associated with Netherthorpe, with particularly emphasis on the length of the runways. The commander of G-AZWE had phoned in advance and assured the Aero Club that he was familiar with short grass fields. Nevertheless he was told that the runways were short and that an overrun had occurred the previous day.

Discussion

Although Netherthorpe was always a planned destination on this day's flight, neither pilot had fully considered the performance requirements for operating from that airfield. The pilot flying at the time of the accident had noted the runway length as 553 m but was not aware of the TORA for Runway 06 which was 476 m. He had developed a personal limit for runway operations in this aircraft of 500 m, which was based upon previous experience and discussions with other pilots. Prior to their arrival at Netherthorpe, neither pilot had checked the performance figures given in the flight manual and both commented that this was not a procedure they had carried out since their basic training.

On this particular day they were flying at an unusually heavy weight, due to the full refuel at Turweston, and were subject to an unusually high ambient temperature. The difficulty they experienced in getting airborne from Turweston, on what was a much longer and also a paved surface, should have been an indication that aircraft performance was a potential problem that day. Although they had received a telephone brief on the issues of short field operations at Netherthorpe from the resident flying club, the only performance issue the pilots debated was which runway to use for departure. Using an alternative takeoff technique, or delaying the takeoff until more favourable conditions existed, were not considered. The accident pilot had a pressing engagement scheduled for the following day in Devon and this, combined with a number of other domestic issues, may have added 'self induced' pressure to depart on their next leg without delay. It is also likely that these issues were a significant distraction to his concentration on flying.

The performance data from the flight manual, suggests that the aircraft could not have become airborne any earlier than 67 m before the end of the published TORA

on Runway 06. Witness statements indicate that at, or about, this point, the aircraft did become airborne but then sank back onto the ground. Why this should have occurred is unclear but it may have been that the aircraft was influenced by ground effect. Ground effect reduces the induced drag on aircraft significantly at heights up to one half of the wingspan. G-AZWE had a wingspan of 30 ft and would be subject to this effect at heights up to 15 ft. If the lift off technique had not been correct, the aircraft may not have had the energy to climb when leaving ground effect. Neither of these pilots were used to flying the aircraft at its maximum take-off weight and initiating lift off at speeds of six to eight mph slower than recommended would be unlikely to have given them enough energy to climb away. This may explain the similar problem experienced at Turweston where the aircraft was even heavier and lift off was initiated five mph slower than recommended. Fortunately, there was sufficient runway remaining for the speed to increase after the aircraft settled back down and allow the takeoff to continue successfully.

Although it is the ultimate responsibility of the commander to ensure adequate performance for the flight, Netherthorpe is an unusual airfield from which to operate. He had been made aware of the runway length but a combination of mistaking runway length for TORA,

distraction and a reliance on his flying partner to have resolved any performance issues, led to this accident. The Aero Club at Netherthorpe encourage visiting pilots to consider their aircraft's landing performance prior to arrival but, having landed there, there is no active method of doing the same for departure. There have been another five incidents/accidents at Netherthorpe since 1997 where take-off performance has been the dominant issue. In light of these incidents, it was considered that a more formal method of raising performance awareness prior to the arrival/departure of visiting pilots needed to be established at the airfield.

Safety action

As a result of this accident, Netherthorpe Airfield is amending the airfield information contained in the Aeronautical Information Publication and other airfield directories. The remarks section will contain the following:

'Inexperienced pilots are to phone for advice before arriving at Netherthorpe and are to contact a member of the flying staff for a short briefing before departure.'

In view of this, no formal safety recommendations are made.