ACCIDENT

Aircraft Type and Registration:	Socata TB9, G-BTWX	
No & Type of Engines:	1 Lycoming O-320-D2A piston engine	
Year of Manufacture:	1991 (Serial no: 1401)	
Date & Time (UTC):	24 March 2016 at 1245 hrs	
Location:	Jericho Farm, Lambley, Nottinghamshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Damaged beyond economic repair	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	69 years	
Commander's Flying Experience:	839 hours (of which 168 were on type) Last 90 days - 0 hours Last 28 days - 0 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB	

Synopsis

Whilst taking off from a farm strip, the pilot believed the aircraft would collide with a van moving along a road that bounded the strip, and climbed the aircraft at a low speed soon after getting airborne. The aircraft's right wing dropped, struck the van and detached from the aircraft. The aircraft came to rest in a field on the other side of the road. There were no injuries.

The pilot used ground roll performance data to calculate the takeoff distance required (TODR), and determined that the distance available was sufficient. Using information about the total distance to clear a 50 ft obstacle would have indicated that the available distance was inadequate.

History of the flight

The pilot stated that he had been monitoring the weather and the farm strip's ground conditions for some weeks before the accident flight, to determine when conditions would be suitable to fly. He had last flown in November 2015, as previously the ground had been too soft or the wind too light.

On the day of the accident the pilot noted that the wind was forecast to be increasing to greater than 20 kt from the south-west after 1200 hrs. When he arrived at the farm strip the wind sock indicated a wind speed of less than 20 kt. He decided to attempt to take off,

but aborted it when the aircraft did not achieve the desired 50 KIAS when half way along the runway. He delayed any further attempt by an hour in anticipation of the wind speed increasing.

At about 1230 hrs the windsock indicated wind from about 225° at more than 20 kt which the pilot equated to a 15 kt headwind component. He started the aircraft and taxied to the eastern end of the strip, lining up with 540 m of the 580 m available because the first 40 m of the westerly runway were soft. During the takeoff, the aircraft had reached the desired 50 KIAS about half way along the runway, so he committed to the takeoff. Shortly thereafter he felt the aircraft's acceleration slow but, at 55 kt, rotated the aircraft and flew it level to increase airspeed. At this point he spotted a van travelling in a southerly direction on the road that passes the end of the runway. Believing he might collide with it the pilot attempted to climb the aircraft, but as he did so the right wing dropped. He attempted to correct this with left rudder and by easing the control column forward, but without success. The right wing struck the van while banked approximately 90° right, and detached from the aircraft. Having crossed the road, the aircraft then slid to a halt in a field on the other side. The pilot vacated the aircraft; both he and the van driver were uninjured. The aircraft was damaged beyond economic repair.

One witness stated that the wind may have reduced at about the time the aircraft passed the halfway point of the runway (when the IAS was above 50 kt).

Airfield information

The farm strip is situated 4 nm north-east of Nottingham. It is approximately 1,902 ft (580 m) long and orientated 257/077°M. There is a hedge at the end of the westerly runway and a road beyond the boundary of the strip. There is no anemometer at the strip but it is equipped with a "20 kt wind sock"[1].

The pilot commented that due to the length of the strip he takes off with no passengers and no more than 5 US gallons of fuel in each tank; each tank has a capacity of 20.8 US gallons. He then flies to Nottingham Airport, 5 nm to the south, to refuel.

Meteorology

A Met Office aftercast for the period stated that the wind across the area was from the south-west at 10 kt increasing to 17 kt later in the day, the temperature was 7 to 9°C and the atmospheric pressure fell steadily through the period from around 1011 to 1007 hPa as surface fronts approached.

Nottingham/Watnall observatory, 6 nm west, reported that at 1200 hrs the wind was from 210° at 10 kt, temperature was 9°C and the QNH was falling from 1010 hPa.

East Midlands Airport, 12 nm south-west, reported at 1250 hrs, the wind was from 210° at 15 kt, temperature 8°C and QNH 1009 hPa.

Footnote

[1] A 20 kt windsock is horizontal when the wind speed is 20 kt or more.

Aircraft performance

CAA guidance

Safety Sense Leaflet 7 – Aeroplane Performance states:

> *'The pilot in command has a legal obligation under EU Part-NCO and Article 87 of the Air Navigation Order 2009, which require the pilot to check that the aeroplane will have adequate performance for the proposed flight…*
>
> *Where data allows adjustment for wind, it is recommended that not more than 50% of the headwind component…of the reported wind be assumed.*
>
> *Safety Factors*
>
> *1. Take-off*
>
> *It is strongly recommended that the appropriate Public Transport factor, or one that at least meets that requirement,* ***should be applied for all flights*** [AAIB bold]*. For take-off this factor is x1.33 and applies to all single-engined aeroplanes…The table at the end of this leaflet* [See Figure 1] *gives guidance for pilots of aeroplanes for which there is only UNFACTORED data...*
>
> *Where several factors are relevant, they must be* ***multiplied****. The resulting Take-Off Distance Required to a height of 50 feet (TODR)* ***can become surprisingly high*** [AAIB bold]*.'*

Pilot's calculations

The pilot reported that the aircraft's basic weight was 1,572 lb. He weighed 224 lb and there were approximately 60 lb of fuel aboard; about 19 litres (5 US gallons) in the left fuel tank and 6 litres (1.5 US gallons) in the right. These resulted in a takeoff weight of 1,856 lb.

Using takeoff performance data from the *Pilot's Information Manual* for the aircraft (shown in Figure 2) the pilot calculated that at a TOW of 1,874 lb, at 15°C and at sea level, the TODR would be 804 ft; which he rounded up to 900 ft. He then added 70% to this figure for the variables shown in Figure 3, as follows: 2% uphill slope (10%), soft ground (40%), increased humidity (10%) and engine wear (10%). This indicated that in still-air the TODR would be 1,530 ft. Using a personal 'rule of thumb' he reduced this by a further 1% for each knot of head wind, or a total of 15% (230 ft). This resulted in a calculated TODR of 1,300 ft (396 m).

The pilot commented that he expected the aircraft to be airborne in less than 1,300 ft (396 m) because he believed he had made a generous allowance for these variables.

The pilot was not aware that the CAA recommended applying a factor of 1.33 to takeoff distance calculations. Doing so would result in a calculated TODR of 1,729 ft. Alternatively, using the manufacturer's suggested 38% '*public transport safety factor*' would increase it to 1,794 ft (547 m).

FACTORS MUST BE MULTIPLIED e.g. 1.20 x 1.35

CONDITION	TAKE-OFF		LANDING	
	INCREASE IN TAKE-OFF DISTANCE TO HEIGHT 50 FEET	FACTOR	INCREASE IN LANDING DISTANCE FROM 50 FEET	FACTOR
A 10% increase in aeroplane weight, e.g. another passenger	20%	1.20	10%	1.10
An increase of 1,000 ft in aerodrome elevation	10%	1.10	5%	1.05
An increase of 10°C in ambient temperature	10%	1.10	5%	1.05
Dry grass* - Up to 20 cm (8 in) (on firm soil)	20%	1.20	15%+	1.15
Wet grass* - Up to 20 cm (8 in) (on firm soil)	30%	1.3	35%+ Very short grass may be slippery, distances may increase by up to 60%	1.35
Wet paved surface	-	-	15%	1.15
A 2% slope*	Uphill 10%	1.10	Downhill 10%	1.10
A tailwind component of 10% of lift-off speed	20%	1.20	20%	1.20
Soft ground or snow*	25% or more	1.25 +	25%+ or more	1.25 +
NOW USE ADDITIONAL SAFETY FACTORS (if data is unfactored)		**1.33**		**1.43**

Notes:
1. * Effect on Ground Run/Roll will be greater. Do not attempt to use the factors to reduce the distances required in the case of downslope on take-off or upslope on landing.
2. + For a few types of aeroplane (e.g. those without brakes) grass surfaces may decrease the landing roll. However, to be on the safe side, assume the INCREASE shown until you are thoroughly conversant with the aeroplane type.
3. Any deviation from normal operating techniques is likely to result in an increased distance.

If the distance required exceeds the distance available, changes will HAVE to be made.

Figure 1

CAA Safety Sense Leaflet additional factors

SOCATA
MODEL TB 9

SECTION 5
PERFORMANCE

TAKE-OFF PERFORMANCE

Conditions: IAS : Lift off : 60 KIAS – 69 MPH IAS
Clear 50 ft : 62 KIAS – 71 MPH IAS
Weight : 1874 lbs (850 kg)

Temperature	Distance	Pressure altitude (ft)				
		0	2000	4000	6000	8000
- 4°F (- 20°C)	Roll (ft)	574	705	853	1050	1230
	Clear 50 ft (ft)	902	1099	1345	1673	2100
+ 32°F (0°C)	Roll (ft)	689	804	1001	1181	1411
	Clear 50 ft (ft)	1066	1247	1558	1936	2526
+ 59°F (+ 15°C)	Roll (ft)	804	951	1083	1280	1558
	Clear 50 ft (ft)	1198	1427	1723	2182	2936
+ 86°F (+ 30°C)	Roll (ft)	869	1001	1198	1411	1706
	Clear 50 ft (ft)	1312	1542	1936	2494	3412
+ 104°F (+ 40°C)	Roll (ft)	951	1116	1280	1509	1887
	Clear 50 ft (ft)	1427	1690	2083	2690	4249

Fig 5.6 – TAKE-OFF PERFORMANCE (1874 lbs)

September 30, 1988 5.9

Figure 2

Aircraft takeoff performance table

SOCATA
MODEL TB 9 "U.K. Version"

SECTION 5
PERFORMANCE

NOTICE

Performance given in this Section are based on tests and interpolated to standard conditions (ICAO) and extrapolated from parameters : weight, altitude, temperature…

Factors relative to pilot's experience, to relative bad airplane's condition are not taken into account.

It is prudent to add safety factors :

A list of variables affecting performance together with guide line factor is shown hereafter, This table represents the increase in take-off distance to a height of 50 ft or the increase in landing distance from 50 ft.

Variable	Increase in take-off distance to height 50 ft	Increase in landing distance from 50 ft
Dry grass (*) – Short (under 5 in) – Long (between 5 & 10 in)	20 % 25 %	20 % 30 %
Wet grass (*) – Short – Long	25 % 30 %	30 % 40 %
A 2 % slope (*)	uphill 10 %	downhill 10 %
Soft ground or snow (*)	25 % or more	25 % or more
Public transport safety factor	38 %	43 %

(*) Effect on ground run / roll will be greater

NOTE :
For higher humidity conditions, such as those found in the United Kingdom and Northern Europe, the scheduled figures should be amended as follows:

Take-off ground runs and total distance to clear
50 ft obstacle : Increase by 10 %
Rate of climb : Reduce by 10 %

September 30, 1989 5.7

Figure 3
Takeoff variables

AAIB calculations

The manufacturer's publication advised that safety factors should be added. Accordingly, the AAIB calculated that at a TOW of 1,874 lb, at 8°C and at 300 ft amsl, with a pressure of 1009 hPa (412 ft pressure altitude) the basic TODR to clear 50 ft would be 1,178 ft. When increased by the pilot's chosen variables of 70%, plus 20% for short dry grass, the resulting still-air TODR was 2,238 ft. The AAIB was not aware of a documented basis for applying the pilot's 'rule of thumb' for this aircraft, but doing so would produce a TODR of 1,903 ft (580 m). Adding the manufacturer's public transport safety factor this rises to 2,626 ft (800 m).

Using the same factors, but multiplying them as recommended by the CAA, would result in a TODR of 3,090 ft (942 m).

Discussion

The pilot calculated the TODA was adequate by calculating the TODR using the ground roll from the aircraft's take off performance tables. Given the hedge at the end of the farm strip and traffic passing on the road, the distance to clear 50 ft would have been more appropriate. He also did not include the factor for short dry grass. Had the pilot used this distance the calculated TODR would have been 590 m, 50 m in excess of the TODA and the takeoff should not have been attempted. Using the conditions on the day the TODR was also greater than the TODA. When the manufacturer's safety factor is added the TODRs are increased to a greater degree.

The wind reports at Nottingham and East Midlands indicated that the wind speed was less than 20 kt at these locations. If at the time of the accident this was the case at the strip, or the wind reduced as one of the witnesses noted, the takeoff run would have been further extended.