ACCIDENT

Aircraft Type and Registration:	Reims Cessna F182P Skylane, G-DATG
No & Type of Engines:	1 Continental Motors Corp O-470-R piston engine
Year of Manufacture:	1976 (Serial no: 13)
Date & Time (UTC):	10 July 2016 at 1520 hrs
Location:	Near Westcott, Buckinghamshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 2
Injuries:	Crew - 1 (Minor) Passengers - 1 (Minor)
Nature of Damage:	Damage to engine, propeller, fuselage, wings and landing gear
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	62 years
Commander's Flying Experience:	16,000 hours (of which 200 were on type) Last 90 days - 24 hours Last 28 days - 10 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot, and other enquiries by AAIB

Synopsis

The aircraft overran the end of a grass airstrip during landing, sustaining substantial damage and causing minor injury to two of the three occupants. The landing performance calculated by the pilot did not fully account for the landing conditions and did not include a recommended safety factor. The approach itself was flown in a brisk crosswind, with a reduced flap setting from that on which the performance figures were based. Touchdown probably occurred at a higher airspeed than was required, resulting in the pilot being unable to stop the aircraft before the end of the airstrip.

History of the flight

The aircraft took off at 1400 hrs from Oxford Kidlington Airport with the pilot and two passengers on board. The pilot's intention was to land at a private grass airstrip about 13 nm east of Kidlington, an airstrip to which he had flown on three previous occasions. The weather was generally fine, with good visibility and scattered to broken cloud cover with a base of between 3,000 ft and 4,000 ft. There was an automated weather station at the airstrip, which the pilot checked before departure. This reported a wind from about 240° at 16 kt, similar to that at Kidlington. The airstrip was orientated 15/33, so was subject to a crosswind.

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On arriving overhead the airstrip, the windsock indicated that the wind was blowing directly across the strip at an estimated 10 to 15 kt. The pilot commenced an approach to land in the 33 direction. He experienced what he described as a blustery crosswind, so flew the approach with flaps at 20° rather than 40°, believing it to be the recommended setting for the conditions. The approach was not fully stabilised, with airspeed varying by +/- 10 kt.

Touchdown occurred an estimated 30 m into the 540 m long strip. The pilot reported that wheel braking initially seemed effective but that overall deceleration was less than expected as he attempted to maintain maximum braking without locking the wheels.

As the aircraft approached the end of the strip, the pilot applied and maintained full braking but was unable to stop the aircraft. It overran the strip, passing through a hedge and over a small ditch onto a minor road where it came to rest heading in an approximately easterly direction. The aircraft suffered substantial damage, although damage to the cockpit and cabin area was minimal. The pilot and one of the passengers (all of whom were wearing shoulder and lap straps), sustained minor injuries in what the pilot described as a low speed impact. The aircraft occupants were able to vacate the aircraft using both main cabin doors.

In his report, the pilot considered that his decision to use flap 20 instead of flap 40 had been a mistake. The wind conditions had been such that he was unable to fully stabilise speed for the approach and he recognised that he should have made an early decision to go-around. He thought the apparent lack of brake effectiveness may have been due to a higher than ideal touchdown speed, possibly combined with some dampness of the grass. Although he considered rejecting the landing after touchdown, the risk associated with that course of action appeared greater than with a low speed overrun.

The pilot reported that he elected to raise the flaps to improve braking effectiveness during the landing roll (a recognised short field landing technique as described in the aircraft manufacturer's Pilot's Operating Handbook (POH)). However, this did not occur, as the aircraft came to rest with the flaps still in the 20° position.

Meteorological information

There was an area of low pressure to the west of Ireland, placing the bulk of England and Wales in a south-westerly or west-south-westerly airflow of about 15 kt. A weak occluded front was forecast to cross the area during the day.

Weather reports from Oxford Kidlington (13 nm to the west) showed that the wind was largely steady in direction, from 230° or 240°. The pilot assessed the wind at the strip to be similar. Luton Airport, 22 nm east of the airstrip, showed a surface wind from 210°, varying between about 150° and 240°. The wind direction veered slightly later in the afternoon, suggesting that the weak front crossed the general area during the afternoon.

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Aircraft information

For a normal landing, the POH permitted a range of flap settings, from 0° to 40°. Power-on approach speeds were given as 70-80 kt (flaps 0°), and 60-70 kt (flaps down). Landing performance figures in the POH were based on the 'short field' landing technique, which required flap 40°, power off, and a speed of 60 kt. The POH stated that heavy wheel braking should be used after touchdown, and that flaps may be retracted to 0° to improve braking effectiveness. Concerning crosswinds, the POH advised using the minimum flap setting required for field length considerations.

Aircraft performance

The airstrip was 540 m (1,775 ft) long, with an average elevation of 270 ft amsl. The strip had an overall downslope in the 33 direction of approximately 1%. The temperature was 22°C and QNH 1006 hPa.

The group of pilots that operated the aircraft used a computer programme for mass, balance and performance calculations. As a matter of routine, the pilot used this programme (which was accessible on the group's internet site) to produce performance figures for the intended flight. Using this programme, and based on information supplied by the pilot, the landing mass of the aircraft was independently calculated at 2,732 lb (the units used by the programme), or 1,239 kg. This figure was approximately 92% of the maximum allowable landing mass.

The performance programme allowed input of certain variables and produced landing performance figures which were evidently based on the POH. The programme 'rounded up' altitude and temperature inputs, which in this case effectively accounted for the relatively low atmospheric pressure and high temperature of the day. As in the POH, all landing performance figures were based on the maximum landing mass, using flap 40°, power off, an approach speed of 60 kt and with heavy braking after touchdown.

The pilot calculated a landing ground roll of 645 ft (197 m) and an uncorrected *landing distance from 50 ft* of 1440 ft (439 m). The programme applied a 15% increment to the *landing distance from 50 ft* to allow for the grass surface, producing a *landing distance from 50 ft* of 1,656 ft (505 m).

Examination of the programme identified the following shortcomings:

- The 15% factor applied by the programme for a grass runway was in accordance with the recommendation contained in the CAA's publication, *Safety Sense Leaflet 7c*[1] and the UK Aeronautical Information Circular (AIC) 127/2006 (*Pink 110*)[2]. However it was less than the 20% factor recommended by the manufacturer in the POH. When the performance data was selected for printing, it included a cautionary note: '*It is the Pilot*

Footnote

[1] Safety Sense Leaflet 7c: *Aircraft Performance* (www.caa.co.uk/publications).
[2] AIC 127/2006: *Take-off, climb and landing performance of light aeroplanes.*

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in Command's duty to ensure that the Pilot's Operating Handbook takes precedence over the above'.

- The programme did not allow for input of runway slope, although it advised users to '*add 10% factor for adverse runway slopes > 2%'.*

- The ground roll distance presented was that for a dry paved runway, irrespective of input of surface type or condition. Thus the distance given would be erroneous for anything other than a dry paved runway. The figure given was ambiguously titled *'landing distance'*, whereas the POH referred to this value as *'ground roll'*.

Had a grass runway factor of 20% been used, and the down slope accounted for (5%), the resulting figures would have shown a landing ground roll of 1,019 ft (310 m) and a *landing distance from 50 ft* of 1,814 ft (553 m). This was greater than the landing distance available of 540 m.

Supplementary information to pilots regarding the takeoff and landing performance of light aircraft has been published in Safety Sense Leaflet No 7c and AIC 127/2006. These documents stress that the performance figures given in the POH for most light aircraft are unfactored and achieved using a new aircraft and engine in ideal conditions, flown by a highly experienced pilot. Although not a mandatory requirement for a private flight, it was recommended that a safety factor of 1.43 (applicable to Public Transport flights) be applied. SSL 7c further recommended that pilots:

> *'always ensure that after applying all the relevant factors, including the safety factor, the Landing Distance Required (LDR) from a height of 50 ft does not exceed Landing Distance Available.'*

The performance programme automatically applied the recommended 1.43 safety factor, which gave a *landing distance from 50 ft of* 2,368 ft. This was the only figure also given in metres (722 m). Applying the same safety factor to the fully corrected landing figures given above would have produced a landing distance required of 2,594 ft (790 m).

Analysis

The shortcomings of the performance programme may not normally have been apparent for operations to reasonably long, paved runways, such as that at the aircraft's home airfield. However, the construction and presentation of the programme invited errors, which could prove significant in other cases. The factor applied to account for a grass runway was less than that stipulated in the POH, and the landing ground roll figure, which was ambiguously labelled, did not reflect the actual conditions selected. The absence of a runway slope input might lead to this aspect not being fully considered by the user, and the note concerning slope could be taken to mean that an adverse slope of 2% or less need not be considered at all.

Using the aircraft manufacturer's factor for the grass surface and taking into account the adverse slope, the resulting *landing distance from 50 ft* of 1,814 ft (553 m) exceeded

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the landing distance available, even before a safety factor was applied. Nevertheless, the figures produced by the programme would have indicated to the pilot that the airstrip was marginal in length in even optimum conditions and was not suitable for use with the recommended safety factor applied. It is possible that the pilot was misled by the erroneous landing groundroll figure in deciding whether to land at the strip, and may have considered the landing mass as being sufficiently below maximum to provide a safety margin, although he would not have been able to quantify this. The fact that he had previously visited the airstrip, presumably without incident, may also have been a factor in his decision to proceed.

An additional factor not considered in the calculations was a possible tailwind component. With the wind blowing directly across the airstrip, any variability could lead to a tailwind condition which is unlikely to have been detected once on the approach. The crosswind also had the effect of producing handling complications which had the potential to delay brake application and to interfere with it by producing directional control difficulties after landing.

The pilot would have been aware of the requirements for landing in terms of configuration, speed and techniques. However, he continued with an unstable approach in a non-standard configuration when an alternative was to discontinue the approach and divert elsewhere. In what would have been a high workload situation, it would appear that he became more concerned about the crosswind than the landing distance, to the extent that he prioritised the crosswind handling requirement for a reduced flap setting over the landing distance requirement for full flap and an accurate speed.

The pilot may well have been subject to a common cognitive bias known as plan continuation bias, in which there is an unconscious tendency to continue with a plan of action despite changing conditions that would otherwise be recognised as demanding a change of plan. This effect is stronger near the end of a task, such as during the approach and landing phase, when the desire to complete the task as originally planned can be difficult to overcome.

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