

ACCIDENT

Aircraft Type and Registration:	Scintex CP301-C1, G-CKCF	
No & Type of Engines:	1 Continental Motors Corp C90-14F piston engine	
Year of Manufacture:	1960 (Serial no: 557)	
Date & Time (UTC):	31 October 2022 at 1058 hrs	
Location:	Blue Bell Hill, Kent	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Aircraft destroyed	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	65 years	
Commander's Flying Experience:	5,425 hours (of which 16 were on type) Last 90 days - 88 hours Last 28 days - 25 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

The aircraft settled into trees shortly after takeoff. The pilot reported that he took action to remain in control of the aircraft until impact and the occupants were rescued uninjured. The pilot suspected that the engine had suffered from carburettor icing and reported that the aircraft encountered turbulence sufficient to cause a loss of control. The aircraft probably exceeded its maximum takeoff weight.

History of the flight

The occupants intended to fly from Rochester to Goodwood. The pilot reported that there was no pressure to undertake the flight.

After the pre-flight ground inspection and start-up, the aircraft remained on the apron for the engine oil to warm up, then taxied on the Eastern Taxiway to the threshold of Runway 20R. An engine check was conducted at the threshold, during which the magnetos performed normally, and the application of carburettor heat was accompanied by a 100 rpm drop. Carburettor heat remained ON until the aircraft was lined up and ready for takeoff, with one stage of flap set, and during this interval the engine ran smoothly and without any signs of carburettor icing.

The pilot reported that the takeoff and initial climb were normal, and flap was raised as usual.

Approaching a wooded ridge south of the aerodrome, the pilot perceived that the aircraft was lower than usual and the passenger, who was also a pilot, noticed that engine speed had reduced. The pilot recalled that the indicated airspeed was 55 kt and that the aircraft then encountered turbulence which resulted in an incipient spin. He immediately applied opposite rudder and nose-down elevator, and regained wings level flight shortly before the aircraft settled into trees, impacting with sufficient force for both occupants' headphones and glasses to come off, but not to cause injury. Their four-point harnesses and the cabin remained intact, and there was no apparent fuel leak.

The pilot switched off the fuel and magnetos, and used the radio to call for assistance. Rescue from the tree canopy was complex and took several hours, involving machinery for working at height.

Aircraft information

The Scintex CP301-C1 is a light two seat taildragger of mostly wood and fabric construction with a maximum takeoff weight of 650 kg. G-CKCF was fitted with two fuel tanks in the fuselage with a total capacity of 120 litres. The propeller, a Hoffman 7H-14-RZ of 178 cm diameter and 120 cm pitch, was refurbished in April 2022.

A witness familiar with the aircraft reported that the engine was equipped with a carburettor heat system that, when selected ON, directed warm air into the carburettor air intake. Such a system can reduce or prevent ice build-up in the intake and throttle body and may reduce ice that has already accumulated.

No pre-existing mechanical defects were reported.

Weight and balance

The aircraft had a basic weight of 427 kg when checked in June 2019. Its maximum takeoff weight was 650 kg. Both fuel tanks were full before the flight.

The pilot calculated that the aircraft's weight on this takeoff was 648.5 kg, stating that he assumed a fuel weight of 73.5 kg. He had understood that the capacity of the tanks was approximately 100 litres, and he used a specific gravity of 0.7 kg per litre to calculate the weight of the fuel.

At standard pressure and temperature, the specific gravity of 100LL (Avgas) fuel is 0.72 kg per litre, and full fuel (120 litres) in both tanks would weigh approximately 86 kg. There was no evidence of activity before takeoff that would have significantly reduced the weight of fuel.

At the time of the accident the pilot estimated that he and his passenger together weighed 148 kg, making the aircraft approximately 11 kg overweight without any additional load.

The pilot stated that the aircraft also carried two headsets, a quart of oil, a fuel strainer and dipstick, some cloths and a bag. He estimated that together these weighed no more than 10 kg. Therefore, the aircraft probably weighed approximately 671 kg, 3.2% above the stated maximum.

Meteorology

An unofficial report of conditions at Rochester at 1058 hrs indicated wind from 140° at 12 kt, visibility more than 10 km, cloud scattered with a base at 2,000 ft and surface temperature 12°C. At 1050 hrs weather information obtained from Biggin Hill, 18 nm west of Rochester, indicated similar conditions, with wind from 150° at 9 kt, temperature 14°C, dewpoint 12°C and QNH 1014. At Southend, 15 nm to the north-east, the wind was from 160° at 12 kt, temperature 16°, dewpoint 13° and QNH 1014.

Wind speed and direction remained largely constant in the hour before and after the occurrence, and there were no reports of significant gusts. There had been light rain at Rochester approximately 24 hours before the takeoff.

Aerodrome information

Rochester Airport has an elevation of 426 ft and two parallel grass runways. Runway 02L/20R has a TODA of 830 m and Runway 02R/20L a TODA of 684 m. The average slope from north to south is approximately 1% up.

The pilot recalled that the surface was dry and firm during the takeoff. Other reports indicated that it was wet or very wet, with soft ground in places. Photographs taken shortly after the accident showed wet grass and some standing water in the vicinity.

The area of wood into which the aircraft descended rises to the same elevation as the aerodrome approximately 400 m to the south of the upwind runway threshold, then rises steadily to 130 ft above the aerodrome elevation at the accident site, a further 1,000 m to the south-south-west. The relative locations are shown in Figure 1. The average gradient from the runway end to the accident site is therefore approximately 3%.

A note on the aerodrome's website stated, *'The proximity of large buildings and topography may cause turbulence and windshear [sic] in some wind conditions.'*¹

Aircraft performance

Demonstrated performance

The aircraft manual shown to the AAIB did not contain takeoff performance information. Other sources indicate that at the maximum takeoff weight of 650 kg, a typical takeoff ground roll from a hard runway would be approximately 280 m, and the takeoff distance to clear a 15 m obstacle approximately 500 m.²

During an assessment reported to the LAA in 2021 the aircraft achieved a climb rate of approximately 600 fpm at full throttle and 58 KIAS, between 1,500 and 4,460 ft. The aircraft was found to exhibit a pre-stall buffet at 40 KIAS with flaps up. Insufficient information was recorded to determine the density altitudes at which the assessment was conducted.

Footnote

¹ Aerodrome website accessed October 2023.

² At sea level, 15°C and QNH 1013 hPa.

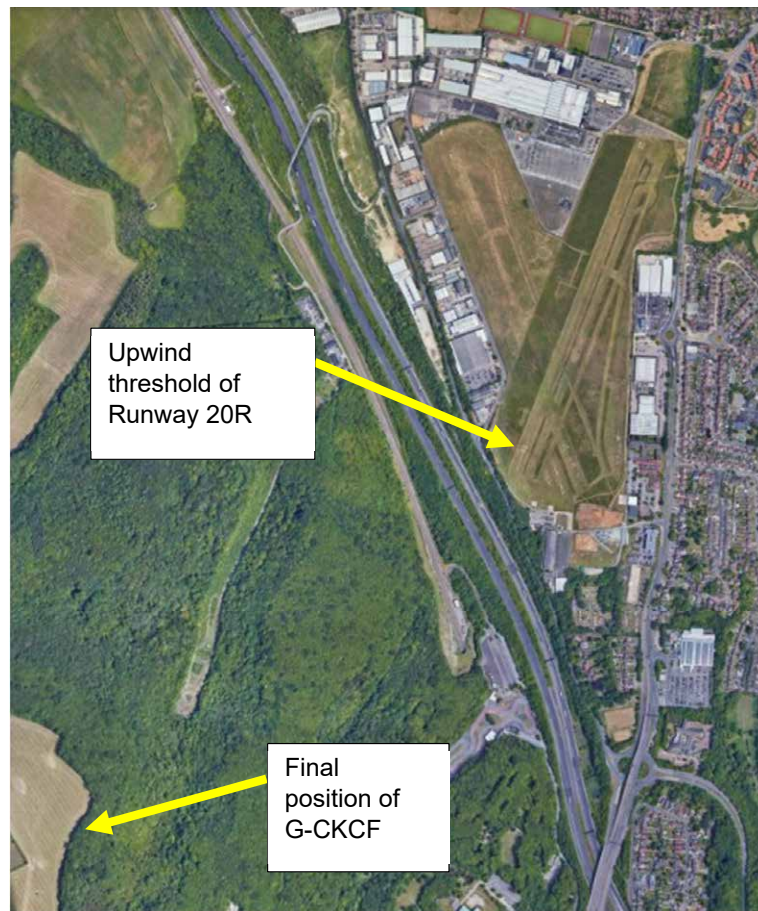


Figure 1

The relative locations of the upwind threshold of Runway 20R and the final position of G-CKCF

During a Permit revalidation check flight in May 2022, the aircraft achieved a climb from 1,000 ft to 2,000 ft in 110 seconds at 61 KIAS, 2,200 rpm. This equates to a climb rate of 545 fpm and a climb gradient of 8.8% in still air. The departure aerodrome for the check flight had an elevation of 565 ft, at which the surface temperature was 14°C and the QNH 1010 HPa.

Factors affecting takeoff performance

[Safety Sense Leaflet 7 – ‘Aeroplane performance’](#), published by the CAA, includes guidance on assessing takeoff performance and summarises information provided in [Aeronautical Information Circular \(AIC\) 127/2006](#). These documents include factors that may be applied to basic performance data to determine the likely effect of runway and atmospheric conditions. AIC 127/2006 cautions that for surface and slope factors the increases shown are to the takeoff distance to a height of 50 ft, but that since these factors do not influence the airborne part of the takeoff, the effect on ground run is proportionally greater. As surface and slope have no effect once the aircraft is airborne, it is possible to estimate the effect of these factors on the ground run if data is provided for both takeoff run and takeoff distance.

Applying the factors for wet grass, upslope and soft ground yields a ground run of 700 m or more. Applying the recommended safety factor of 1.33 indicates that the takeoff ground run required may have been 930 m or more, exceeding the takeoff run available.

Lifting off before an adequate climb speed has been achieved results in less than optimum climb performance. The best angle of climb is achieved at the airspeed where excess thrust (the amount of thrust available above thrust required) is greatest. Below this speed, the thrust required to overcome total aircraft drag increases and excess thrust reduces.

Other information

A witness reported that as the aircraft passed the upwind end of the runway it was flying slower than expected, in a steep nose-up attitude.

The pilot stated that his normal technique was to apply carburettor heat until setting power for takeoff, and then to take off with full power and one stage of flap set. He reported that he considered the sustained drop in rpm when carburettor heat was selected ON during the power check, and the absence of rough running indicated that icing was not present. He commented that the performance of the aircraft was normally “ok but not sparkling”.

The pilot recalled that on the accident takeoff he checked that the rpm at full power was correct at about 2,450-2,500 rpm. An engine speed of 2,350 rpm was achieved during a full power takeoff when assessed in 2021.

The pilot reported that the takeoff and initial climb were normal but that the flight path seemed low over the trees. When the trees could not be avoided he resisted the temptation to raise the nose, keeping the wings level and maintaining flying speed until impact.

[Safety Sense Leaflet 14 – ‘Piston engine icing’](#), includes a chart indicating that the prevailing temperature and dewpoint were within the range conducive to the formation of severe icing at any power setting.³

The pilot commented that he could have applied carburettor heat if he had suspected carburettor icing sooner, but that the situation developed so quickly he doubted it would have helped. It is possible for ice to defeat a carburettor heating system if it has accumulated before the system is selected ON.

A pilot who had flown G-CKCF from Rochester reported that with one person on board and full fuel the performance was “barely sufficient” to clear obstacles in the takeoff flight path, and that in 30 hours of operating the aircraft he had not encountered carburettor icing on takeoff.

Another pilot reported that he would not fly the aircraft from Rochester with full fuel and a passenger.

Footnote

³ Accessed August 2023.

Analysis

There was no report of pre-existing mechanical defects. The aircraft weight probably exceeded its maximum for takeoff of 650 kg.

It was not possible to determine if carburettor icing had reduced the available engine power. The pilot's statements indicate he had determined no carburettor icing was present before the aircraft was ready for takeoff. However, the temperature and dewpoint were within the range conducive to the formation of severe icing at any power setting.

The investigation did not determine at what point on the runway the aircraft became airborne, nor its initial climb speed. The takeoff ground roll would have been influenced by the aircraft weight, aerodrome elevation, surface condition, and upslope. Applying the factors suggested in relevant CAA guidance indicates that the takeoff run required may have exceeded the available runway length. The low speed and steep attitude observed by one witness, if representative, are consistent with an attempt to continue the takeoff without having achieved sufficient speed for adequate climb performance.

The full-throttle climb performance at maximum takeoff weight demonstrated in 2021 and 2022 exceeded the gradient from the runway end to the point of impact. Not achieving this performance in the prevailing conditions, which were not significantly different, is consistent with additional weight, reduced power, takeoff and climb with insufficient speed, or a combination of these.

Information published by the aerodrome indicated that windshear was possible in some circumstances. There were no indications of meteorological conditions conducive to significant windshear.

The aircraft settled into trees upright and largely wings level. The pilot reported having resisted the temptation to raise the nose, maintaining a speed of approximately 50 kt until impact. Maintaining controlled flight until touchdown or impact increases the probability of a survivable outcome.

Conclusion

The aircraft had insufficient performance to clear obstacles in the takeoff path. Its weight probably exceeded the maximum permitted for takeoff, and its performance may have been diminished by a reduction in power due to carburettor icing.

Safety information

CAA [Safety Sense Leaflet 07 – 'Aeroplane performance'](#), [Safety Sense Leaflet 14 – Piston engine icing](#) provide relevant guidance. The [Skyway Code](#) also provides advice and guidance relating to aircraft mass, balance and performance.⁴

Footnote

⁴ Accessed October 2023.