ACCIDENT

Aircraft Type and Registration:	Rans S6-116 Coyote II, G-BUWK	
No & Type of Engines:	1 Rotax 912-UL Piston engine	
Year of Manufacture:	1993 (Serial no: PFA 204A-12448)	
Date & Time (UTC):	4 August 2020 at 1000 hrs	
Location:	Bradley's Lawn airstrip, Cross in Hand, Heathfield, East Sussex	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - 1 (Fatal)	Passengers - N/A
Nature of Damage:	Destroyed	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	65 years	
Commander's Flying Experience:	6,070 hours (of which 5,800 were on type) Last 90 days - 79 hours Last 28 days - 37 hours	
Information Source:	AAIB Field Investigation	

Synopsis

G-BUWK, a Rans S6-116, took off from Bradley's Lawn airstrip, East Sussex. Witnesses then saw the aircraft make a spiral descent to the ground. There was a post-impact fire; the aircraft was destroyed and the pilot was found deceased. A post-mortem examination indicated that the pilot probably suffered a cardiac event resulting in incapacitation shortly after takeoff.

History of the flight

The pilot left his home at 0820 hrs on the morning of the flight, arriving at Bradley's Lawn airstrip, East Sussex at 0850 hrs. The landowner initially saw the pilot on his mobile telephone and again, at some point later, with the engine cowl of G-BUWK open (The landowner presumed this was for pre-flight checks). He chatted with the pilot for about 20 minutes during which the pilot commented that he intended to fly to Popham Airfield, Hampshire, where his partner had probably already landed. The pilot's partner had planned to fly her own aircraft to Popham from another departure airfield, meeting up airborne with the pilot prior to arrival. On the day of the accident, the pilot advised his partner by SMS that his departure was delayed, and he would fly direct to Popham and meet her there. The landowner commented that the pilot did not seem to be in a hurry.

The pilot indicated on the airstrip's 'Departures Log' that he would depart at 0950 hrs, listing Popham as his destination. About 10 minutes after the conversation, as the landowner

was walking down a track behind the hangars, he heard the aircraft start up and, shortly afterwards, from a gateway abeam the windsock[1], saw the aircraft already airborne. He stated that the takeoff looked and sounded normal. Having turned away, he heard a loud bang a few moments later and looked up to see a column of black smoke and flames rising upwind of the airstrip.

Witnesses

A witness on the opposite side of the valley to the airstrip, south-east and under ½ nm away, had a clear view of the airstrip and the hangars. He saw the aircraft takeoff and stated that it was airborne by the time it passed the hangars. He considered that the takeoff looked normal and that the aircraft climbed steadily before disappearing behind trees. He then heard the engine stop and, about 15 seconds later, a large bang followed by a plume of smoke and two further bangs.

Another witness, about ¾ nm to the west, saw the aircraft come into view from the direction of the airfield and fly normally before suddenly "spinning" twice and disappearing behind some trees. A plume of smoke rose above the treeline. On seeing the smoke, the witness called the emergency services at 1001 hrs.

A third witness, at a car workshop about ¾ nm to the west of the airstrip recalled seeing an aircraft with markings and lettering similar to the accident aircraft whose engine sounded as if it was "running extremely rough". At the time he was at the entrance to the workshop looking to the west and was on a telephone call. Call logs showed the call began at 0959 hrs. He lost sight of the aircraft as he walked inside to the office, but about 30 seconds later, from the office window as he looked east, he stated that he saw the same aircraft above the treeline but that he could not hear any engine sound. The witness then described seeing the aircraft fly normally before "the tail pitch[ed] up and the right wing kick[ed] down and it seemed it was flipping over" as it disappeared below the treeline. At this point the witness hung up on the phone and shortly afterwards he saw black and heavy smoke rising.

Post-accident response

On seeing the plume of smoke, the landowner called the emergency services at 1003 hrs. He helped to direct emergency services to the scene and was joined by another pilot; both determined that they could not assist the pilot. The emergency services arrived within 10 minutes of the call.

Accident site

The accident site was in a grass field approximately 480 m south-west of the airstrip's Runway 22 threshold (Figure 1), and approximately in line with the extended runway centreline.

Footnote

[1] The windsock was between the threshold of Runway 22 and the hangars.

Figure 1
Partial ground track derived from ADS-B data

The aircraft had struck the ground in a near-vertical attitude with its wings level. The rear fuselage structure had separated from the front fuselage frame and had come to rest inverted adjacent to the right wing; the elevator and rudder control cables remained connected to the front fuselage. Deformation of the left and right wings indicated that the aircraft was rolling to the right about its longitudinal axis at the time of impact.

An intense post-impact fire destroyed most of the polyester fabric wing and fuselage coverings. All electronic equipment and instruments within the cockpit were also consumed in the fire. The fire had melted the inboard ends of the aluminium rear spars and strut braces. The steel frame of the forward fuselage was complete but severely disrupted.

Both fuel tanks, located between the inboard ends of the wing spars, had been destroyed during the accident. Deformation and flattening of the tubular leading edge spars forward of the tanks suggested that both tanks were close to being full at the time of impact. No fuel could be recovered from the aircraft after the accident.

The inboard sections of both aluminium aileron control rods had melted in the post-impact fire and the forward end of the elevator control rod had fractured as a result of the impact. Other than this damage, there was no evidence the flying controls had become disconnected before impact. It was not possible to determine the elevator trim or flap positions that were set at the time of the accident.

The carbon fibre propeller had been severely heat-damaged in the fire causing extensive delamination. One propeller blade had broken off the hub; the other had broken at the hub. There were no indications of leading edge damage on either of the blades and the location they were recovered from suggested they had little or no rotational energy[2] at impact.

The pilot was known to fly with a small gas camping stove aboard the aircraft. An exploded gas cylinder for such a stove was found in an adjacent field. The exploded casing of the aircraft's fire extinguisher was also found within the wreckage. Both probably exploded as a result of intense heating in the post-impact fire, and account for the two further bangs heard by witnesses after the accident.

Recorded information

Several avionic units were recovered from the accident site, including three tablet devices used for navigation, a Garmin GPS III Pilot, a Pilot Aware electronic conspicuity device and a Dynon Avionics D1 electronic flight instrument system. All were damaged in the post-impact fire and no data could be recovered from their internal memory.

The aircraft was fitted with a Mode S and ADS-B[3] Out transponder but was flying too low to be detected by radar. Some of the ADS-B Out broadcasts were nevertheless detected and recorded by ground stations of the Flightradar24[4] network that were in line of sight of the aircraft. The recordings covered a period of 17 seconds starting shortly after takeoff as the aircraft flew toward the south-west corner of the airstrip and ending about 200 m further on, 130 m north of the accident site. The last 12 seconds of recorded ADS-B Out broadcasts contained the aircraft's latitude and longitude, as shown in Figure 1.

Figure 2 plots the aircraft's GPS altitude (25-ft resolution), track and groundspeed from the ABS-B Out broadcasts. It shows that, shortly after takeoff, the aircraft turned right through about 25°, before turning left 9° on to a track of 237°, which was maintained at a groundspeed of 52 kt for the last seven seconds of recordings.

Footnote

[2] The energy in this type of light propeller is low compared to similarly sized wooden or metal propellers, even when operating at high power.

[3] Automatic dependent surveillance—broadcast (ADS–B) is a surveillance technology in which an aircraft determines its position via satellite navigation and periodically broadcasts it and other information, enabling it to be tracked. This capability is referred to as ABS-B Out. In contrast, ADS-B In refers to a suitably equipped aircraft being capable of receiving and interpreting the broadcasts from other aircraft.

[4] Flightradar24 is a global flight tracking service comprising a network of over 20,000 ADS-B receivers.

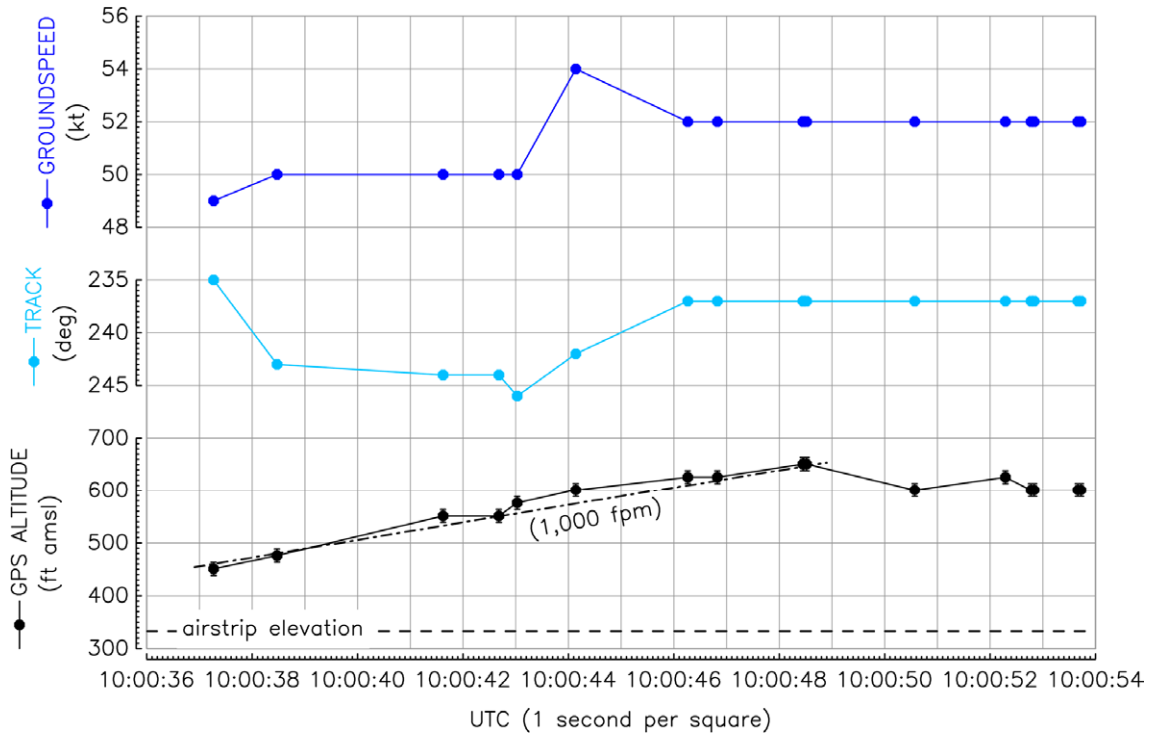

Figure 2

ADS-B Out flight data

As the aircraft passed over the south-west corner of the airstrip it was about 220 ft above the airstrip elevation and climbed a further 100 ft over the next six seconds. The climb rate of the aircraft was, on average, approximately 1,000 ft/min (consistent with normal climb performance information provided by the manufacturer for this aircraft type at a mass of 544 kg). It then descended at about 1,000 ft/min to 270 ft above the airstrip elevation before the recordings stopped. The last recorded point positioned the aircraft about 200 ft above and 130 m north of the accident site.

Aircraft information

The Rans S6-116 Coyote II is a high-wing, strut-braced aircraft with two side-by-side seats. The airframe is mainly of bolted and riveted aluminium tube construction, with the forward fuselage structure consisting of a welded tubular steel cage. The entire airframe is covered with pre-sewn polyester fabric envelopes.

G-BUWK was an ex-demonstrator aircraft, having been constructed from a kit in 1993 and bought by the pilot in October that year. The aircraft had completed 5,795 flight hours since it was built. Its Permit to Fly was valid until 3 June 2021.

It was fitted with a Rotax 912 UL four-stroke engine driving a two-bladed composite propeller via an overload clutch. The engine was installed in the aircraft in March 2012, having previously been fitted to another aircraft. Records indicated it had run for a total of 54 hours when it was installed and had achieved 2,531 operating hours at the time of the accident.

The engine logbook showed that the engine had been regularly serviced by the pilot, and was last overhauled in August 2011, before it was installed in the aircraft. The only other recorded engine removal was to complete a shock load assessment after the aircraft had been involved in an accident in October 2012.

The engine manufacturer's recommended overhaul life is 1,500 hours. This can be extended to 2,000 hours if Service Bulletin SB-912-570UL is applied. There was no record of this service bulletin in the engine logbook. As G-BUWK was operated on a Permit to Fly, the LAA did not mandate the manufacturer's service bulletin and, as detailed in LAA Technical Leaflet TL 2.23, there was no defined service life for this type of engine. Therefore, there was no requirement for the engine to have been overhauled during the 2,477 flying hours since it was installed.

The landowner and the other pilot reported that the pilot always re-fuelled the aircraft after each flight. He then re-filled the fuel containers with Mogas as he drove from or to the airfield and left them in the hangar ready to refuel the aircraft upon return. Full fuel containers were found in the aircraft hangar after the accident, indicating that the aircraft tanks were likely to have been full when the aircraft took off. However, the fuel within the containers was not representative of the fuel in the aircraft at the time of the accident, and samples were not taken.

Aircraft examination

The aircraft wreckage was recovered to the AAIB facility in Farnborough for further assessment.

The airframe structure was re-examined. No evidence of any pre-existing damage was found. All fuel lines, ducts and hoses had been consumed by the fire. The fuel selector valve was found in the *'LEFT'* position, which would have been the normal fuel tank for engine start[5].

Engine examination

Both carburettors were dislodged from the engine, but the throttle and choke cables were still attached. Both carburettor butterfly valves were in the open position. The casing around the left carburettor butterfly valve exhibited impact damage which prevented the valve from closing, suggesting the valve was in the open position at the time of impact.

All external engine accessories, including the alternator, electrical ignition system and fuel pump were damaged to the extent that their functionality could not be assessed. All spark plugs were in a good condition with no evidence of erosion or sooting.

Strip examination of the engine found no evidence of an engine malfunction.

Footnote

[5] The fuel system on this engine returned fuel to the left tank whilst in operation, therefore the engine must be started on left tank to prevent over filling the tank.

Weight and balance

An assessment of the likely loading of the aircraft determined that the weight and balance would have been within the required limits.

Aircraft handling characteristics

The handling notes[6] highlight that the aircraft experiences greater speed decay rate owing to its *'lightweight nature where little kinetic energy is to be had.'* Stalls are preceded by easily distinguishable buffet. In a fully developed stall, '*the nose falls through very slightly and a high sink rate develops (approximately 1,000 to 1,500 fpm). The craft can be held wings level with the rudder.*' Flight tests[7] indicated that wing drop was no more than 15° and recovery was instantaneous on the release of back pressure.

The notes further state:

> *'If, during a deep stall (falling leaf) the pilot's feet are removed from the rudder pedals, the Coyote II will begin to dip each wing alternately until finally making a gentle spiral to the right or left. (NOTE: This is not a spin!). At this point it could be argued that it is spinning. However, rotation is not through the plane's center mass. Instead, it is as if it were riding down the sides of a vertical cylinder…. To further support this, the spin properties are very conventional. Entry requires full deflection of elevator and rudder and must be held in full deflection.'*
>
> *'The spin's rotation is approximately 80 degrees nose down with rotation through the center mass, almost through the aircraft centreline…. Rotation speed is 3 seconds per turn…. Sink rates average 1,500 to 2000 fpm, with 200 to 400 feet lost per turn depending on density altitude.'*
>
> *'This spiral and spin difference is easily recognized as well as controlled. Stall and spin testing in all configurations has been done with no unusual characteristics revealed.'*

Meteorology

The actual weather reports at Gatwick Airport recorded minimal cloud coverage at medium level, otherwise the sky was clear with good visibility and light south-westerly winds. Other airfields in the southeast of England reported very similar conditions. Witness statements suggest the wind may have been variable around the time of the accident.

Footnote

[6] There is no generic Pilot's Operating Handbook for this aircraft type. The handling notes for each aircraft are included in the Technical Build manual.

[7] These were flight tests conducted on two other Rans S6-116 by the Light Aircraft Association (LAA). The aircraft in their configuration including the same engine, and weight and balance, were representative.

Airfield information

Bradley's Lawn is a grass airstrip situated on fields surrounded by high trees (Figure 3). Its runway is aligned north-east / south-west; the flight path on departure from Runway 22 is over fields with gently rising ground. A TV aerial 489 ft in height (1,007 ft amsl) is situated just under 1 nm to the southwest from the airstrip.

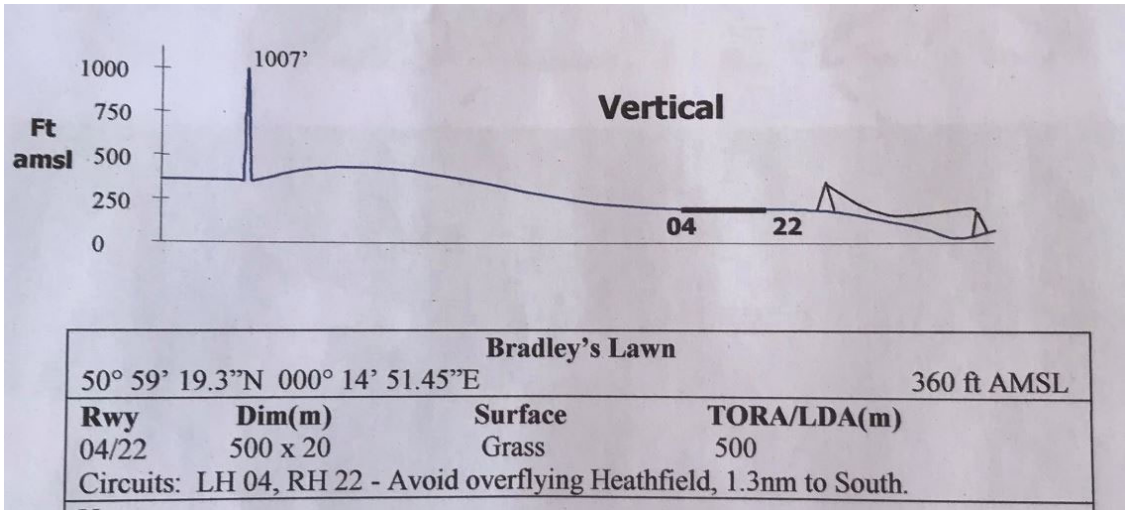

Figure 3
Bradley's Lawn airstrip

Personnel

The pilot held an EASA PPL (A) with a current Single Engine Piston (Land) rating and a Class Instructor rating with Part-FCL.945 privileges. He had owned G-BUWK since 1993, soon after he had gained his licence, and gained the most of his flying experience on it.

Medical information

The pilot held an EASA Class 2 medical valid until March 2021. He suffered from hypertension and had been diagnosed with a cardiac condition. The post-mortem examination found no soot in the airways or upper digestive tract and, despite extensive injuries, there was no adjacent haemorrhage. The post-mortem examination also found moderate three-vessel coronary artery atheroma.[8] The toxicology report was negative.

The pathologist concluded that the lack of soot indicated the pilot was not alive during the fire. This was corroborated by the lack of evidence of adjacent haemorrhage indicating that the pilot had no pulse or measurable blood pressure at the time that he sustained the injuries. The pathologist stated that atheroma in association with hypertension can be associated with sudden death. No acute myocardial infarctions were identified in the myocardium, a finding which is *'normal in cases of sudden death due to coronary heart disease.'*

Footnote

[8] Atheroma is the build-up of materials that can narrow an artery enough that it severely restricts blood flow.

The pathologist stated that the findings were:

> *'entirely consistent with a medical event, of likely cardiac origin occurring shortly after takeoff with unconsciousness and cardiorespiratory failure occurring prior to the crash. There is no evidence to suggest that the pilot was alive at the time of the impact or when the fire started.'*

Analysis

Witness evidence and recorded data indicate that the aircraft performance was normal during takeoff and climb. Witnesses described the loss of control in flight as sudden with a large drop of the nose followed by a rapid spiralling descent. The aircraft wreckage indicated that it struck the ground in a near-vertical nose-down attitude with right rotation.

Technical issues

The absence of leading edge strike marks on the propeller blades would normally be consistent with the engine at low power; however, as the engine was fitted with an overload clutch which protects the engine crankshaft in the event of a prop strike, the inertia of the engine would not have been transmitted through to the propeller when it struck the ground. Therefore, the lack of leading propeller damage may not indicate low engine speed on impact.

Examination of the two carburettors revealed that the butterfly valves were both open during the impact sequence, suggesting that the throttle lever was set for maximum engine power at the time. It was not possible to determine when the throttle was moved to this position.

Although the aircraft sustained extensive damage during the impact sequence and subsequent fire, there was no evidence of a pre-existing technical issue with the aircraft or engine.

Loss of control

Witnesses reported that the aircraft seemed to perform normally on departure with no indication of engine problems; this is corroborated by the recorded climb performance and aircraft speed, suggesting that the engine was producing sufficient power at least up until the point where a loss of control appears to have occurred.

Although one witness reported hearing the engine stop shortly after he lost sight of the nose-down attitude aircraft behind trees, this may have been as a result of the trees and wind masking the sound. While a separate witness reported seeing an aircraft with similar markings whose engine was running rough, it has not been possible to reconcile this sighting with the recorded data.

It was not possible to determine the exact cause for the loss of control in flight. The extent of the pilot's experience on the aircraft suggests that he should have been capable of recovering from a stall and any associated wing drop that might have resulted from a loss of performance. Therefore, an engine failure alone was not sufficient to result in such an outcome.

Witness evidence indicated that the loss of control in flight was sudden and unexpected. The phase of flight, the likely aircraft configuration and performance, and the finding of the flight test report that full control deflection was required to enter a spin, together suggest that inadvertent mishandling was unlikely to cause loss of control resulting in a spin.

The post-mortem report suggests incapacitation was likely of cardiac origin occurring shortly after takeoff, and the absence of other factors likely to have caused the loss of control indicate, it is the most probable cause of the accident.

Conclusion

G-BUWK experienced a loss of control in flight shortly after takeoff, which resulted in a steep spiral descent. The aircraft struck the ground and a post-impact fire started shortly afterwards.

Although engine failure could not be discounted, the loss of control was probably the result of the pilot suffering a cardiac event resulting in incapacitation shortly after takeoff.

Published: 4 March 2021.

Bulletin Correction

Following publication the Recorded information section of this report was amended.

The words 'capable of ADS-B In/Out,' were removed from line three of the first paragraph of this section. The paragraph now reads:

> Several avionic units were recovered from the accident site, including three tablet devices used for navigation, a Garmin GPS III Pilot, a Pilot Aware electronic conspicuity device and a Dynon Avionics D1 electronic flight instrument system. All were damaged in the post-impact fire and no data could be recovered from their internal memory.

The online version of the report was corrected on 10 March 2021.